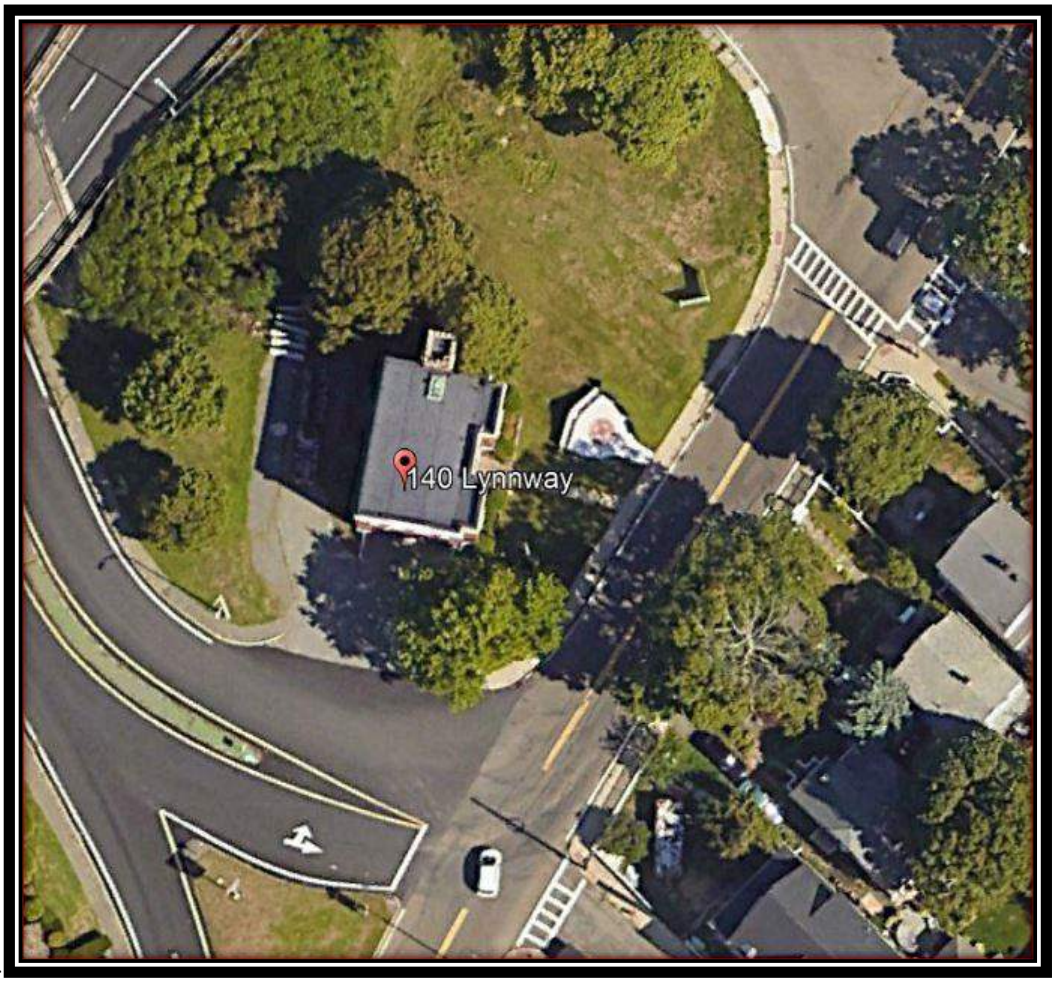
PROPOSED ENVIRONMENTAL IMPACT REPORT

ALDEN FIRE STATION
140 LYNNWAY, REVERE MA



Prepared for:
Winter Street Architects
27 Congress Street, Suite 201
Salem, MA 01970

Prepared by:
Brennan Consulting
24 Ray Avenue
Burlington, MA 01803
February 28, 2022

Brennan Consulting
ENGINEERING • TRANSPORTATION • SURVEYING

February 28, 2022

Executive office of Environmental Affairs
MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

Subject: **Alden Fire Station**
140 Lynnway
Revere, Massachusetts

Dear MEPA Coordinator:

On behalf of the City of Revere, Brennan Consulting is submitting the following Proposed Environmental Impact Report (EIR) in accordance with 301 CMR 11.00, Massachusetts Environmental Policy Act (MEPA) Regulations for the proposed construction of a fire station (referred to as The Project) with associated parking and utilities. This EIR is being submitted alongside an Expanded Environmental Notification Form (EENF) as part of a proposed rollover filing. However, we have noted that we are requesting a Single EIR on the Environmental Notification Application if the Secretary does not feel that a rollover EIR is justified for this filing.

Because the Project is located within 1 mile of an Environmental Justice (EJ) Population an EIR is required under Section 58 of the Climate Roadmap Act, effective December 24, 2021. The Act expanded public participation in the MEPA review process for EJ populations. The EJ population is defined by criteria based on income, English proficiency, and minority composition. This EIR provides a complete and detailed description and analysis of the project and its alternatives, an assessment of its potential environmental impacts, and proposed Section 61 mitigation measures for the appropriate State agencies to fulfill their obligations in accordance with M.G.L Chapter 30, Section 61.

If there are any questions regarding this filing, please do not hesitate to contact me at (781) 273-3434 ext. 100 or cemilius@brennanconsults.com. Thank you for your time and consideration in this matter.

Thank you,

Chris Emilius

Chris Emilius, P.E.
Principal

TABLE OF CONTENTS

1. SUMMARY 1

2. PROJECT DESCRIPTION 1
   2.1 Description of the Project 1
   2.2 Timetable and Approximate Project Cost 2

3. ALTERNATIVES TO THE PROJECT 2

4. EXISTING ENVIRONMENT 3
   4.1 Topography, Geology & Soils 3
   4.2 Surface and Groundwater Hydrology 3
   4.3 Traffic, Transit, and Pedestrian and Bicycle Transportation 3
   4.4 Scenic Qualities, Open Space, and Recreational Resources 4
   4.5 Zoning 4

5. ASSESSMENT OF IMPACTS 4
   5.1 Article 97 Land 4
   5.2 Environmental Justice Populations 4

6. STATUTORY AND REGULATORY STANDARDS AND REQUIREMENTS 4
   6.1 Applicable Statutory and Regulatory Standards 4
   6.2 Request for Funding Assistance 4

7. ENVIRONMENTAL JUSTICE POPULATION/PUBLIC HEALTH 5
   7.1 Vulnerable Health Environmental Justice Criteria 5
   7.2 Climate Risks 6
   7.3 Analysis of Project Impacts 6

8. MITIGATION MEASURES 6
   8.1 Positive Long-Term Impacts of the Project 6
   8.2 Long-Term Mitigation Measures 6
   8.3 Short-Term Mitigation Measures 7

9. PROPOSED SECTION 61 FINDINGS 9

ATTACHMENTS

ATTACHMENT 1 – SITE PLAN AS-BUILT (EXISTING CONDITIONS)
ATTACHMENT 2 – PROPOSED SITE PLAN
ATTACHMENT 3 – USGS MAP
ATTACHMENT 4 – ANR PLAN
ATTACHMENT 5 – CITY OF REVERE ZONING MAP
ATTACHMENT 6 – ENVIRONMENTAL JUSTICE POPULATION MAP
ATTACHMENT 7 – VULNERABLE HEALTH EJ CRITERIA MAP
ATTACHMENT 8 – RMAT CLIMATE RESILIENCE DESIGN STANDARDS TOOL PRINTOUT
ATTACHMENT 9 – EIR DISTRIBUTION LIST
ATTACHMENT 10 – GEOTECHNICAL REPORT
ATTACHMENT 11 – ENVIRONMENTAL CONSTRAINTS MAP
ATTACHMENT 12 – HYDROCAD REPORT
ATTACHMENT 13 – TRAFFIC MANAGEMENT PLAN

1. SUMMARY

The Alden Fire Station (FS), located at 140 Lynnway in Revere, was demolished, and the site cleared in 2021. This project proposes to construct a modern Fire Station in the same plot of land. However, because the parcel is small, 15,078 sf, additional land is required to be obtained from the Department of Conservation and Recreation (DCR). The plot of land requiring the Land Transfer from DCR is shown in Appendix A, and is 4,592 sf. The need for the DCR land, which is considered Park Land, necessitated the submission of an Environmental Notification Form (ENF), under the Land Standard. The ENF was being developed when the project preparer and proponent were informed that the submission of an ENF for a project in a specific geographic area now required compliance with a new MEPA regulation.

A new MEPA regulation entitled Climate Roadmap Act, effective December 24, 2021, requires consideration and mitigation of public health impacts in EIRs. The Act expanded public participation in the MEPA review process for Environmental Justice (EJ) populations. The EJ population is defined by criteria based on income, English proficiency, and minority composition. The Alden FS is within an EJ population, which requires the submission of an ENF / DEIR / FEIR. However, the regulation also created a new compliance pathway, known as a "rollover EIR", that allows a Proponent to submit an "Expanded ENF / Proposed EIR" as a way to comply with the new requirements to perform full EIRs in EJ communities for projects that previously only required an ENF. The Alden FS fits this situation which is why we are submitting under the rollover EIR pathway.

The proposed FS building is approximately 8,190 sf, and situated between Route 1A to the west, the Lynnway to the east, Route 1A South bound on-ramp to the south, and an MBTA bus-loop to the north. The vehicular access to the FS is from the bus loop, and the egress is into the end of the on-ramp.

2. PROJECT DESCRIPTION

2.1 Description of the Project

The City of Revere is proposing the construction of a new fire station at 140 Lynnway. The existing Alden Fire Station, located on the same lot, has been defunct since approximately 2000. The project is located within the Point of Pines neighborhood which is the community that the fire station will be servicing. The City is proposing this fire station due to the existing fire station's inability to properly service fire trucks, and high response times from neighboring fire stations for the Point of Pines neighborhood. The new 8,190 sf fire station will include 2 service bays for fire trucks as well and a service bay for fireboats. The larger footprint and increased parking area will require a land transfer from DCR as shown in Attachment 4 – ANR Plan.

The proposed fire station will be serviced by electricity through a new manhole connection on site to an existing electric line. Water, gas, sewer, and drain connections will be made off of existing utilities within the Lynnway. The project will be completed in 2 phases of construction: 1) The demolition of the existing fire station which took place in 2021 and 2) the construction of the proposed fire station and associated parking, utilities, and landscaping. The proposed work area will include the entire existing lot and the entire portion of land obtained from the land swap with DCR.

2.2 Timetable and Approximate Project Cost

The City of Revere hopes to complete permitting activities during the spring of 2022, such that construction can begin during the summer of 2022. The proposed fire station will be completed in one phase of construction, which will include the construction of an 8,190 sf fire station with associated utilities, parking, and landscaping. The estimated project cost is $10,400,000. A summary can be found below in Table 1.

Table 1. Cost Estimate

Item	Total
Concrete, Masonry, Metals, Woods Plastics, Composites	$1,508,261
Thermal and Moisture protection	$486,848
Openings, Finishing, Specialties, Equipment, Furnishings	$2,074,001
Fire Suppression, Plumbing, HVAC, Electrical, Comm, Security	$2,821,853
Earthwork	$479,921
Exterior Improvements	$593,325
Sewer and Drain Utilities	$177,430
NET COST	$8,332,117
Margins & Adjustments	2,075,801
TOTAL COST	**$10,407,918**

3. ALTERNATIVES TO THE PROJECT

3.1 No Build

A no-build scenario would mean that the Point of Pines neighborhood would continue to be serviced by neighboring fire stations. Under existing conditions, the fire response times from neighboring stations has been reported to be over 10 minutes long, significantly higher than the 5 minute 20 second benchmark established in NFPA Standard 1710. The safety issues associated with these longer response times are what necessitated the construction of a new fire station.

3.2 Article 97 Land

Construction of the fire station without the acquisition of 4,592 sf would mean an overall reduction in the proposed building size and parking lot. This would significantly impact the department's ability to properly service the Point of Pines neighborhood. Reducing the building footprint would include removal of the fire truck service bays, this would increase the response times for fires and other emergency services. Reducing the parking area means there wouldn't be adequate parking for the fire shifts.

4. EXISTING ENVIRONMENT

4.1 Topography, Geology & Soils

The site is bounded by the Lynnway and MBTA access roadway to the south and east, the route 1A southbound on ramp to the west, and Massachusetts Route 1A to the north. The site is generally flat and level with grades ranging from EL.10.0± feet to EL. 12.0± feet. A highway berm rises approximately 18 feet from the northern edge of the property to the Route 1A roadway surface. The site is situated on a peninsula surrounded by the Atlantic Ocean.

The regional geology was mapped on the USGS Geological Map and MassMapper. The lithology of the area predominantly consists of floodplain alluvium.

A geotechnical investigation was performed in January 2021 by John Turner Consulting (JTC) as reported in the *Geotechnical Investigation Report* dated February 10, 2021. A total of 8 borings were performed in the vicinity of the project site. Bedrock was not encountered at any boring location and is not expected to impact construction. Topsoil material was encountered at ground surface and consists of brown sandy silt with organics, rootlets and trace gravel. Marine deposits consisting of gravel and sand, peat, and structural fill used during the construction of the previous fire station were also encountered on site. Glacial till was also observed below the urban fill.

4.2 Surface and Groundwater Hydrology

Under existing conditions stormwater from the site generally flows overland to either the existing closed drainage network in the Lynnway or the closed drainage network located on the Route 1A on ramp. Under proposed conditions stormwater runoff from the parking lot and monument area would be collected and piped into a proposed subsurface infiltration basin located in the parking lot. This will ensure that groundwater recharge, water quality, and removal of total suspended solids (TSS) will match or exceed the existing conditions of the site.

Groundwater was encountered at a depth of 7ft to 9ft below existing ground elevation. JTC estimates that this investigation occurred during a period of seasonally normal to low ground water. Site groundwater levels should be expected to fluctuate seasonally and in response to precipitation events, construction activity, site use, and adjacent site use.

4.3 Traffic, Transit, and Pedestrian and Bicycle Transportation

The proposed fire station is located on the Lynnway. The Lynnway is a two-way minor arterial road, with a width of 32 ft and an 85 ft wide Right-of-Way. There are sidewalks on both sides of the road for pedestrian movement. The posted speed limit is 30 mph. The annual average daily traffic (AADT) for the Lynnway was 10,442 vehicle trips per day in 2019 (pre-covid). The fire station is expected to increase traffic by 20 trips per day (10 employee shifts entering and exited the site) which is considered negligible.

4.4 Scenic Qualities, Open Space, and Recreational Resources

The proposed fire station is located within the Point of Pines Neighborhood. The site is situated on a peninsula surrounded by the Atlantic Ocean and the surrounding area is developed and mostly residential.

4.5 Zoning

The proposed site is located in the RA – Single Family District with an allowed fire station use. See Attachment 5 – City of Revere Zoning Map.

5. ASSESSMENT OF IMPACTS

As described in the project summary, the proposed fire station will have a positive benefit on the community through improved response times for fires and emergency situations within the Point of Pines neighborhood. There will also be a community center within the fire station.

5.1 Article 97 Land

Development of this project will require transferring 4,592 sf of DCR own land, which is considered Park Land. The need for the DCR land, which is considered Park Land, necessitated the submission of an Expanded Environmental Notification Form (EENF), under 301 CMR 11.03(1)(b)(3) for the conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97.

5.2 Environmental Justice Population

Because the Project is located within 1 mile of an Environmental Justice (EJ) Population an EIR is required under Section 58 of the Climate Roadmap Act, effective December 24, 2021. Information on impact assessment for the EJ populations can be found in Section 7.

6. STATUTORY AND REGULATORY STANDARDS AND REQUIREMENTS

6.1 Applicable Statutory and Regulatory Standards

Implementation of the project will require various approvals from the following agencies:

- MassDOT State Highway Access Permits (Category III Vehicular and Non-Vehicular)
- Department of Conservation and Recreation (DCR) Construction and Access Permit
- Massachusetts Water Resource Authority (MWRA) 8m Permit
- Executive office of Environmental Affairs – MEPA: Expanded Environmental Notification Form and Environmental Impact Report

6.2 Request for Funding Assistance

Revere is not seeking funding assistance from state or federal agencies.

7. ENVIRONMENTAL JUSTICE POPULATION/PUBLIC HEALTH

7.1 Vulnerable Health Environmental Justice Criteria

The proposed fire station is within 1 mile of an EJ population. Under Section 58 of the Act, and consistent with new 301 CMR 11.07(6)(n), this project must submit an EIR that contains "statements about the results of an assessment of any existing unfair or inequitable environmental burden and related public health consequences impacting the environmental justice population from any prior or current private, industrial, commercial, state, or municipal operation or project that has damaged the environment."

The proponent consulted the Massachusetts Department of Public Health (DPH) EJ Tool to identify whether the identified EJ populations exhibited any of four "vulnerable health EJ criteria." Such criteria are environmentally related health indicators that are measured to be 110% above statewide rates based on a five-year rolling average. The EJ population could then be viewed as exhibiting "vulnerable health EJ criteria," and therefore potentially bearing an "unfair or inequitable" environmental burden and related public health consequences. Upon consulting the DPH EJ Tool it was discovered that EJ populations within 1 mile of the site had statistically higher rates of heart attack hospitalization, childhood asthma, and childhood lead exposure.

7.1.1 Heart Attack Hospitalization

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

7.1.2 Childhood Asthma

Childhood asthma is a criterion used to identify vulnerable health EJ Populations because people of color and low-income individuals are at greater risk for asthma exacerbations due to increased exposure to asthma triggers, and uncontrolled asthma can impact an individual's overall health and wellbeing. Uncontrolled asthma can reduce activity levels, negatively impact cardiovascular fitness, and increase school absenteeism.

7.1.3 Childhood Lead Exposure

Childhood lead exposure is a criterion used to identify vulnerable health EJ Populations because lead exposure disproportionately impacts lower income communities and communities of color, and childhood exposure to relatively low levels can cause severe and irreversible health effects, including damage to a child's mental and physical development. Lead paint is the primary cause of childhood lead exposure. Historical housing policies that have perpetuated segregation and limited opportunity for home ownership, such as redlining, have led to the increase in risk factors for lead poisoning in black communities, including older house stock, dilapidated housing, and fewer owner-occupied housing units. Children living in low-income communities are more than 3 times more likely to have elevated blood lead levels than children

living in high income communities, children of color are 1.5 times more likely than white children to exhibit dangerous levels of lead in their blood, and black children are nearly 2.5 times more likely to have lead poisoning than white children.

7.2 Climate Risks

An RMAT Climate Resilience Design Standards analysis was performed for the proposed site area. The report indicated that the project was a high risk for urban flooding and extreme heat within the estimated 30-year lifespan of the project.

7.3 Analysis of Project Impacts

The project is not expected to have a negative impact on EJ populations for several reasons:

Size: The building footprint is only 8,190 sf. The existing lot is only 15,078 sf (19,670 sf after proposed land transfer). There will be a 20-vehicle trip per day increase in traffic which is negligible.

Environmental: Greenhouse Gas Emissions will be minimal (<200 tons/year and <50 lbs CO2/sf-yr) and there will not be any hazardous materials stored on site. Drainage infrastructure will be improved in proposed conditions through the use of a subsurface infiltration basin which will create improvements in water quality, groundwater recharge, and total suspended solid removal over existing conditions.

Community: The proposed fire station will greatly reduce response times to fires and emergency situations, and improve the safety of the neighborhood residents. The fire station will also include a community room.

Due to the small size of the project, the lack of environmental impact expected, and the positive benefits a new fire station brings to the community we believe that the project will not have any adverse impacts on the surrounding EJ Populations.

8. MITIGATION MEASURES

8.1 Positive Long-Term Impacts of the Project

The main focus of this project is to ensure that the surrounding Point of Pines Neighborhood receives quicker response times for fire and emergency situations. There will also be a community center within the fire department that will be used to promote community outreach.

8.2 Long-Term Mitigation Measures

Water quality will be maintained throughout the lifetime of the project through the use of a subsurface infiltration system. This will ensure that groundwater recharge, water quality, and removal of total suspended solids (TSS) will be match or exceed the existing conditions of the site. The stormwater system was design to mitigate a 100-yr storm event using NOAA Atlas 14 precipitation frequency estimates with 90% confidence intervals for rainfall depths.

While the project is not expected to have any adverse impacts on EJ populations the project is a high risk for urban flooding in its 30-year lifespan. In order to mitigate this the stormwater system was designed to mitigate stormwater runoff up to a 25-yr storm event, which is higher than the projected 10-yr return period recommended by the RMAT analysis. Also, the building footprint has been set 1.5 feet above the current 100-yr floodplain elevation in anticipation of it rising over the course of the project lifespan. Current NOAA Atlas 14 rainfall depth values and projected values can be seen in Table 2 below.

Table 2. NOAA Atlas 14 and Projected Rainfall Depths

Design Storm	NOAA Atlas 14 Rainfall Depths (in/hr)	2030/2050 Rainfall Depths (in/hr)
2-yr	3.20	3.46
10-yr	5.05	5.45
25-yr	6.21	6.71
50-yr	7.06	7.62

8.3 Short-Term Mitigation Measures

8.3.1 Traffic Management

Construction of the Alden Fire Station will involve construction activities along the Lynnway and Route 1A on-ramp as well as the closure of pedestrian walkways along the Lynnway. A traffic management plan has been developed to ensure that vehicular and pedestrian traffic is maintained during construction. See Attachment 13 for Traffic Management Plan.

8.3.2 Stormwater

Erosion and sediment control measures, including best management practices (BMPs), will be used to limit turbidity and water quality impacts during construction. Straw wattles, silt sacks, and temporary construction entrances will be used to prevent sediment from leaving the site and entering the closed drainage system on the Lynnway.

8.3.3 Wetland Resources

The project will not impact wetland resources.

8.3.4 Endangered Species

There are no known endangered species within the project area.

8.3.5 Invasive Species

There are no known invasive species within the project area.

8.3.6 ACECs and Outstanding Resource Waters

The project will not impact ACECs and outstanding resource waters.

8.3.7 Invasive Species

The project will not impact cultural and historical resources.

8.3.8 Solid and Hazardous Waste

No hazardous waste is to be generated by the construction activities.

9. PROPOSED SECTION 61 FINDINGS

This section provides a consolidated overview of the proposed mitigation and other environmental and community benefits proposed in order to minimize potential impacts from the proposed fire station. A draft template for Section 61 findings is also provided and in accordance with MGL Chapter 30, Section 61 that states: "Any determination made by any agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the project and a finding that all reasonable measures have been taken to avoid or minimize said impacts." Draft 61 Findings are provided for those issues that are within the scope of this EIR, including the following state agencies, actions and/or statutory requirements:

- Massachusetts Department of Transportation
  - State Highway Access Permit (Category III Vehicular)
  - State Highway Access Permit (Non-Vehicular)
- Department of Conservation and Recreation – Construction and Access Permit
- Massachusetts Water Resource Authority – 8m Permit

A proposed mitigation plan is provided in Table 3 and draft Section 61 Findings are provided for each anticipated State agency Permit.

Table 3. Summary of Proposed Mitigation Measures

Category	*Impact*	*Mitigation Measures*
Traffic Management and Safety	Traffic movement and safety on the Lynnway during construction	Construction activities within the Lynnway and Route 1A Right-of-Ways are to be performed in accordance with the Traffic Management Plan that has been reviewed and approved by MassDOT prior to working within the roadway. The plan includes information pertaining to signage, traffic control device placement and temporary pedestrian curb ramps. Two-way traffic is to be maintained at all times and managed so that motorists travel delay is minimized. A safe means of access and egress for vehicles and pedestrians is to be provided 24 hours per day.
Roadway Restoration	Temporary disruption of roadway areas	When work is not in progress trenches in shall be covered with steel plates capable of safely sustaining an HS20 Loading with 33% impact. The work at each trench shall be practically continuous, with the placing of conduit and piping, backfilling and patching of the surface closely following each preceding operation. Final restoration of roadway area consists of returning asphalt grades and roadway structures to existing grades. Traffic safety lines and pavement markings will be restored to existing conditions.
Construction Stormwater	Temporary Turbidity and water quality impacts due to construction	Erosion and sedimentation control measures, including construction best management practices (BMPs), will be used to limit turbidity and water quality impacts during construction.
Utility Installation	Utility Crossing of an MWRA water main	Contractor shall adhere to the MWRA Water Operations Special Terms and Conditions when construction activities involve crossing or working within 5 feet of the MWRA water line located in the Lynnway Right-of-Way.

Massachusetts Department of Transportation

Draft Findings Pursuant to MGL Ch 30, Section 61

Project Name: Alden Fire Station
Project Location: Revere, Massachusetts
Project Proponent: City of Revere
EEA Number: TBD

Permit: **State Highway Access Permit (Category III Vehicular)**
State Highway Access Permit (Non-Vehicular)

Project Description: This project proposed the construction of an 8,190 sf Fire Station with associated parking, utilities, and landscaping. The new fire station will service the Point of Pines Neighborhood and will also contain a community center aimed to promote community outreach.

MEPA History: The need for the DCR land, which is considered Park Land, necessitated the submission of an Expanded Environmental Notification Form (EENF), under 301 CMR 11.03(1)(b)(3) for the conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97. Because the Project is located within 1 mile of an EJ Population an Environmental Impact Report (EIR) is required under Section 58 of the Climate Roadmap Act, effective December 24, 2021. Both the EENF and Proposed EIR will be submitted together as part of a proposed rollover filing.

Project Impact and Mitigation: Refer to Table A for a list of impacts and corresponding mitigation measures relative to the construction of the proposed fire station.

Table A. Summary of Transportation Related Mitigation Measures

Category	*Impact*	*Mitigation Measures*
Traffic Management and Safety	Traffic movement and safety on the Route 1A on ramp during construction	Construction activities within the Route 1A Right-of-Way are to be performed in accordance with the Traffic Management Plan that has been reviewed and approved by MassDOT prior to working within the roadway. The plan includes information pertaining to signage, traffic control device placement and temporary pedestrian curb ramps. Two-way traffic is to be maintained at all times and managed so that motorists travel delay is minimized. A safe means of access and egress for vehicles and pedestrians is to be provided 24 hours per day.
Roadway Restoration	Temporary disruption of roadway areas	When work is not in progress trenches in shall be covered with steel plates capable of safely sustaining an HS20 Loading with 33% impact. The work at each trench shall be practically continuous, with the placing of conduit and piping, backfilling and patching of the surface closely following each preceding operation. Final restoration of roadway area consists of returning asphalt grades and roadway structures to existing grades. Traffic safety lines and pavement markings will be restored to existing conditions.

Findings: Based on review of the permit application, MEPA criteria, and ongoing discussions with MassDOT, and with implementation by the Proponent of the mitigation measures described in the attached Table A, all practical means and measures will be taken to avoid or minimize the adverse impacts to the environment related to the Project. MassDOT will include appropriate conditions associated with this Section 61 Finding in the State Highway Access Permits to be issued by the Department.

Massachusetts Department of Transportation

_____ _____

BY **DATE**

Executive Office of Energy and Environmental Affairs
Department of Conservation and Recreation

Draft Findings Pursuant to MGL Ch 30, Section 61

Project Name: Alden Fire Station
Project Location: Revere, Massachusetts
Project Proponent: City of Revere
EEA Number: TBD

Permit: **Construction and Access Permit**

Project Description: This project proposes the construction of an 8,190 sf Fire Station with associated parking, utilities, and landscaping. The new fire station will service the Point of Pines Neighborhood and will also contain a community center aimed to promote community outreach. Construction of the proposed fire station will require obtaining 4,592 sf of DCR land on the abutting property, as well as obtaining a construction access permit which will allow access to the fire station from a bus loop that is on the aforementioned DCR property. This land swap is part of a larger 14-acre land transfer between the DCR and City of Revere. Legislation for the land swap has been filed and the City of Revere and DCR are currently working through an agreement to provide the city with usage rights. The DCR Construction and Access application will be filed once the land swap is official.

MEPA History: The need for the DCR land, which is considered Park Land, necessitated the submission of an Expanded Environmental Notification Form (EENF), under 301 CMR 11.03(1)(b)(3) for the conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97. Because the Project is located within 1 mile of an EJ Population an Environmental Impact Report (EIR) is required under Section 58 of the Climate Roadmap Act, effective December 24, 2021. Both the EENF and Proposed EIR will be submitted together as part of a proposed rollover filing.

Project Impact and Mitigation: Refer to Table A for a list of impacts and corresponding mitigation measures relative to the construction of the proposed fire station.

Table A. Summary of Transportation Related Mitigation Measures

Category	*Impact*	*Mitigation Measures*
Traffic Management and Safety	Traffic movement and safety on the Lynnway during construction	Construction activities within the Lynnway Right-of-Way are to be performed in accordance with the Traffic Management Plan that has been reviewed and approved by MassDOT prior to working within the roadway. The plan includes information pertaining to signage, traffic control device placement and temporary pedestrian curb ramps. Two-way traffic is to be maintained at all times and managed so that motorists travel delay is minimized. A safe means of access and egress for vehicles and pedestrians is to be provided 24 hours per day.
Roadway Restoration	Temporary disruption of roadway areas	When work is not in progress trenches in shall be covered with steel plates capable of safely sustaining an HS20 Loading with 33% impact. The work at each trench shall be practically continuous, with the placing of conduit and piping, backfilling and patching of the surface closely following each preceding operation. Final restoration of roadway area consists of returning asphalt grades and roadway structures to existing grades. Traffic safety lines and pavement markings will be restored to existing conditions.

Findings: Based on review of the permit application, MEPA criteria, and ongoing discussions with DCR, and with implementation by the Proponent of the mitigation measures described in the attached Table A, all practical means and measures will be taken to avoid or minimize the adverse impacts to the environment related to the Project. DCR will include appropriate conditions associated with this Section 61 Finding in the Construction and Access Permit to be issued by the Department.

Department of Conservation and Recreation

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BY **DATE**

Massachusetts Water Resource Authority

Draft Findings Pursuant to MGL Ch 30, Section 61

Project Name: Alden Fire Station
Project Location: Revere, Massachusetts
Project Proponent: City of Revere
EEA Number: TBD

Permit: **8mPermit**

Project Description: This project proposed the construction of an 8,190 sf Fire Station with associated parking, utilities, and landscaping. The new fire station will service the Point of Pines Neighborhood and will also contain a community center aimed to promote community outreach.

MEPA History: The need for the DCR land, which is considered Park Land, necessitated the submission of an Expanded Environmental Notification Form (EENF), under 301 CMR 11.03(1)(b)(3) for the conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth to any purpose not in accordance with Article 97. Because the Project is located within 1 mile of an EJ Population an Environmental Impact Report (EIR) is required under Section 58 of the Climate Roadmap Act, effective December 24, 2021. Both the EENF and Proposed EIR will be submitted together as part of a proposed rollover filing.

Project Impact and Mitigation: Refer to Table A for a list of impacts and corresponding mitigation measures relative to the construction of the proposed fire station.

Table A. Summary of Transportation Related Mitigation Measures

Category	*Impact*	*Mitigation Measures*
Traffic Management and Safety	Traffic movement and safety on the Lynnway during construction	Construction activities within the Lynnway are to be performed in accordance with the Traffic Management Plan that has been reviewed and approved by MassDOT prior to working within the roadway. The plan includes information pertaining to signage, traffic control device placement and temporary pedestrian curb ramps. Two-way traffic is to be maintained at all times and managed so that motorists travel delay is minimized. A safe means of access and egress for vehicles and pedestrians is to be provided 24 hours per day.
Roadway Restoration	Temporary disruption of roadway areas	When work is not in progress trenches in shall be covered with steel plates capable of safely sustaining an HS20 Loading with 33% impact. The work at each trench shall be practically continuous, with the placing of conduit and piping, backfilling and patching of the surface closely following each preceding operation. Final restoration of roadway area consists of returning asphalt grades and roadway structures to existing grades. Traffic safety lines and pavement markings will be restored to existing conditions.
Utility Installation	Utility Crossing of an MWRA water main	Contractor shall adhere to the MWRA Water Operations Special Terms and Conditions when construction activities involve crossing or working within 5 feet of the MWRA water line located in the Lynnway Right-of-Way.

Findings: Based on review of the permit application, MEPA criteria, and ongoing discussions with MWRA, and with implementation by the Proponent of the mitigation measures described in the attached Table A, all practical means and measures will be taken to avoid or minimize the adverse impacts to the environment related to the Project. MWRA will include appropriate conditions associated with this Section 61 Finding in the 8m Permit to be issued by the Department.

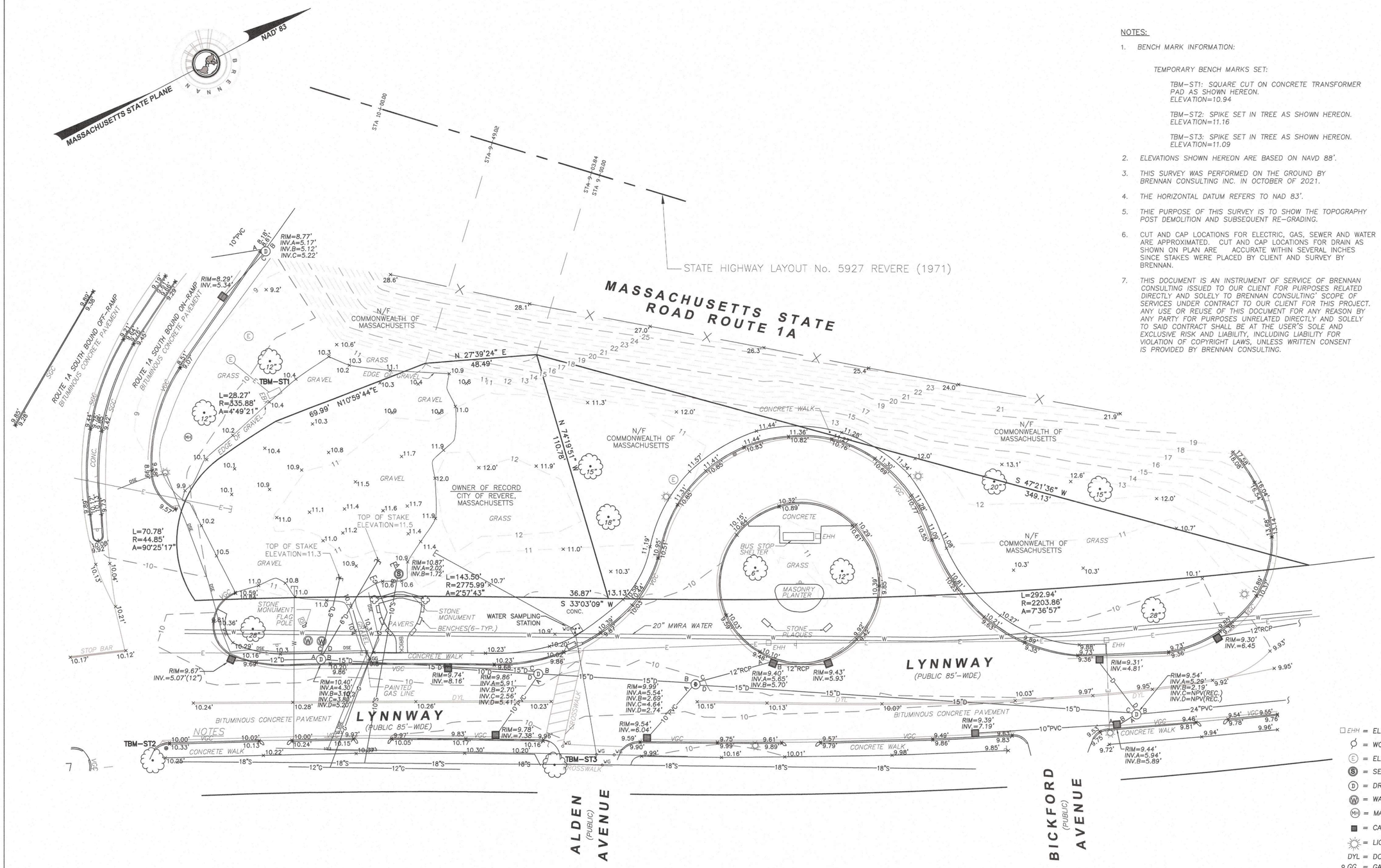
Massachusetts Water Resource Authority

_____ _____

BY **DATE**

ATTACHMENTS

ATTACHMENT 1
SITE PLAN AS-BUILT
(EXISTING CONDITIONS)



NOTES:

1. BENCH MARK INFORMATION:

   TEMPORARY BENCH MARKS SET:

   TBM-ST1: SQUARE CUT ON CONCRETE TRANSFORMER PAD AS SHOWN HEREON. ELEVATION=10.94

   TBM-ST2: SPIKE SET IN TREE AS SHOWN HEREON. ELEVATION=11.16

   TBM-ST3: SPIKE SET IN TREE AS SHOWN HEREON. ELEVATION=11.09

2. ELEVATIONS SHOWN HEREON ARE BASED ON NAVD 88'.
3. THIS SURVEY WAS PERFORMED ON THE GROUND BY BRENNAN CONSULTING INC. IN OCTOBER OF 2021.
4. THE HORIZONTAL DATUM REFERS TO NAD 83'.
5. THIE PURPOSE OF THIS SURVEY IS TO SHOW THE TOPOGRAPHY POST DEMOLITION AND SUBSEQUENT RE-GRADING.
6. CUT AND CAP LOCATIONS FOR ELECTRIC, GAS, SEWER AND WATER ARE APPROXIMATED. CUT AND CAP LOCATIONS FOR DRAIN AS SHOWN ON PLAN ARE ACCURATE WITHIN SEVERAL INCHES SINCE STAKES WERE PLACED BY CLIENT AND SURVEY BY BRENNAN.
7. THIS DOCUMENT IS AN INSTRUMENT OF SERVICE OF BRENNAN CONSULTING ISSUED TO OUR CLIENT FOR PURPOSES RELATED DIRECTLY AND SOLELY TO BRENNAN CONSULTING' SCOPE OF SERVICES UNDER CONTRACT TO OUR CLIENT FOR THIS PROJECT. ANY USE OR REUSE OF THIS DOCUMENT FOR ANY REASON BY ANY PARTY FOR PURPOSES UNRELATED DIRECTLY AND SOLELY TO SAID CONTRACT SHALL BE AT THE USER'S SOLE AND EXCLUSIVE RISK AND LIABILITY, INCLUDING LIABILITY FOR VIOLATION OF COPYRIGHT LAWS, UNLESS WRITTEN CONSENT IS PROVIDED BY BRENNAN CONSULTING.

EHH = ELECTRIC HANDHOLE
= WOODEN UTILITY POLE
= ELECTRIC MANHOLE
= SEWER MANHOLE
= DRAIN MANHOLE
= WATER MANHOLE
= MANHOLE
= CATCH BASIN
= LIGHT POLE
DYL = DOUBLE YELLOW LINE
GG = GAS GATE
WG = WATER GATE
= SIGN
= DECIDUOUS TREE
VGC = VERTICAL GRANITE CURB
NPV = NO PIPES VISIBLE
REC. = RECORD
D = DRAIN LINE
S = SEWER LINE
W = WATER LINE
G = GAS LINE
E = ELECTRIC LINE
X = CHAINLINK FENCE

0 20 40 60
SCALE: 1"=20'

COMMONWEALTH OF MASSACHUSETTS
CHRISTOPHER EMILIUS
CIVIL
No. 37458
REGISTERED PROFESSIONAL ENGINEER

10/22/2021
DATE

PROFESSIONAL ENGINEER
CHRISTOPHER EMILIUS PE# 37458

SITE PLAN AS-BUILT
ALDEN A. MILLS FIRE STATION
LOCATED IN
REVERE, MASSACHUSETTS
(SUFFOLK COUNTY)

PREPARED FOR

WINTER STREET ARCHITECTS

SCALE: 1" = 20'

DATE: 10-22-2021

Brennan Consulting
ENGINEERING · TRANSPORTATION · SURVEYING
24 RAY AVENUE, BURLINGTON, MA
PHONE: (781) 273-3434 FAX: (781) 273-3430

REVISIONS

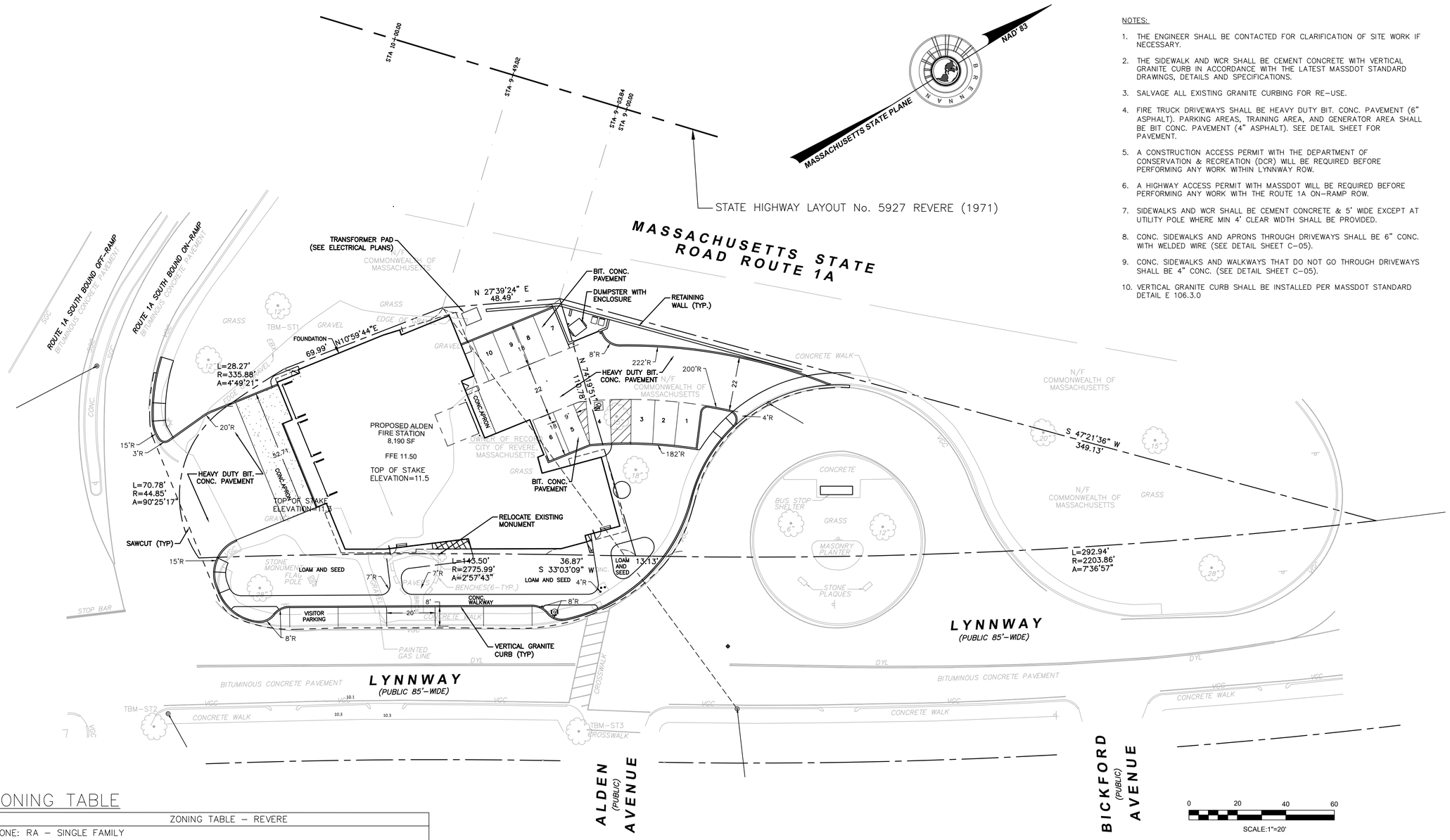
CHECKED BY: WT

DRAWN BY: TMT

PROJECT 19954B-1

SHEET
1 OF 1

ATTACHMENT 2
PROPOSED SITE PLAN



NOTES:

1. THE ENGINEER SHALL BE CONTACTED FOR CLARIFICATION OF SITE WORK IF NECESSARY.
2. THE SIDEWALK AND WCR SHALL BE CEMENT CONCRETE WITH VERTICAL GRANITE CURB IN ACCORDANCE WITH THE LATEST MASSDOT STANDARD DRAWINGS, DETAILS AND SPECIFICATIONS.
3. SALVAGE ALL EXISTING GRANITE CURBING FOR RE-USE.
4. FIRE TRUCK DRIVEWAYS SHALL BE HEAVY DUTY BIT. CONC. PAVEMENT (6" ASPHALT). PARKING AREAS, TRAINING AREA, AND GENERATOR AREA SHALL BE BIT CONC. PAVEMENT (4" ASPHALT). SEE DETAIL SHEET FOR PAVEMENT.
5. A CONSTRUCTION ACCESS PERMIT WITH THE DEPARTMENT OF CONSERVATION & RECREATION (DCR) WILL BE REQUIRED BEFORE PERFORMING ANY WORK WITHIN LYNNWAY ROW.
6. A HIGHWAY ACCESS PERMIT WITH MASSDOT WILL BE REQUIRED BEFORE PERFORMING ANY WORK WITH THE ROUTE 1A ON-RAMP ROW.
7. SIDEWALKS AND WCR SHALL BE CEMENT CONCRETE & 5' WIDE EXCEPT AT UTILITY POLE WHERE MIN 4' CLEAR WIDTH SHALL BE PROVIDED.
8. CONC. SIDEWALKS AND APRONS THROUGH DRIVEWAYS SHALL BE 6" CONC. WITH WELDED WIRE (SEE DETAIL SHEET C-05).
9. CONC. SIDEWALKS AND WALKWAYS THAT DO NOT GO THROUGH DRIVEWAYS SHALL BE 4" CONC. (SEE DETAIL SHEET C-05).
10. VERTICAL GRANITE CURB SHALL BE INSTALLED PER MASSDOT STANDARD DETAIL E 106.3.0

ZONING TABLE

ZONING TABLE – REVERE		
ZONE: RA – SINGLE FAMILY		
USE: FIRE STATION		
DIMENSIONAL REQUIREMENTS	ALLOWED/REQUIRED	PROPOSED
MINIMUM LOT AREA	6,000 SF	32,661 SF
MINIMUM FRONTAGE	60 FT	557 FT
FRONT YARD SETBACK	20 FT	2.0 FT ✳
SIDE YARD SETBACK	10 FT	1.9 FT ✳
REAR YARD SETBACK	30 FT	3.4 FT ✳
MAXIMUM LOT COVERAGE	30%	24.7%
MAXIMUM BUILDING HEIGHT	30 FT/2.5 STORIES	25 FT/2 STORIES
FLOOR AREA RATIO (FAR)	--	0.11
USABLE OPEN SPACE	35%	29% ✳
DUMPSTER SETBACK	10 FT	<10 FT ✳
PARKING REQUIREMENTS	ALLOWED/REQUIRED	PROPOSED
TOTAL NUMBER OF ACCESSIBLE SPACE	1 SPACE	1 SPACE
TOTAL NUMBER OF PARKING	23	10 ✳

✳ = REQUIRES VARIANCE

SITE LAYOUT PLAN
LOCATED IN
140 LYNNWAY
REVERE, MA

PREPARED FOR
WINTER STREET ARCHITECTS

DATE: 4-13-2021

SCALE: 1" = 20'

Brennan Consulting
ENGINEERING · TRANSPORTATION · SURVEYING
24 RAY AVENUE, BURLINGTON, MA
PHONE: (781) 273-3434 FAX: (781) 273-3430

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	12/10/21	RESPONSE TO DOT COMMENTS	CG

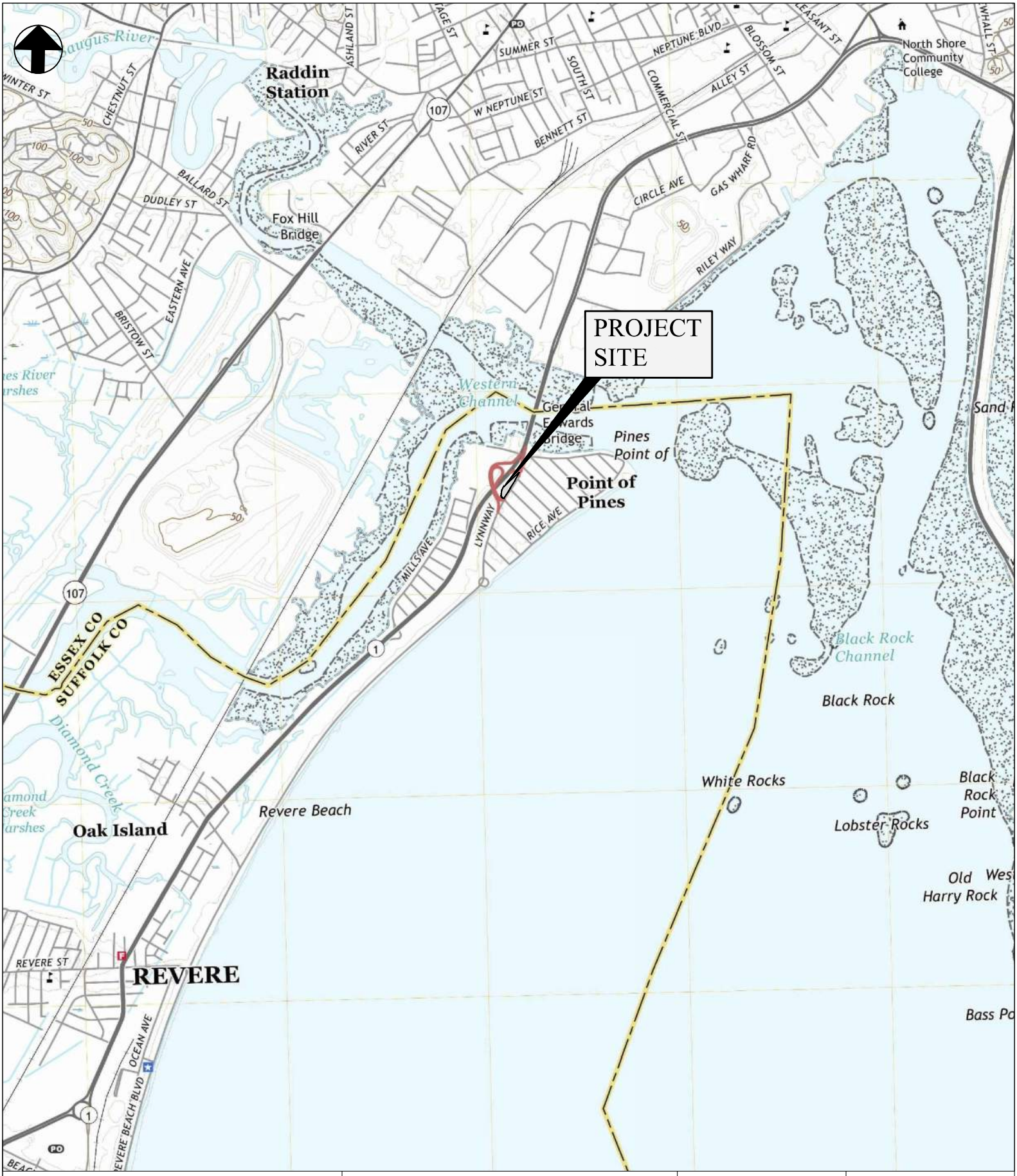
CHECKED BY: CE

DRAWN BY: CG

PROJECT 19954B

C-03

ATTACHMENT 3
USGS MAP



Project Civil Engineer

Brennan Consulting
ENGINEERING · TRANSPORTATION · SURVEYING

BRENNAN CONSULTING, INC.
24 Ray Avenue, Suite 203
Burlington, MA 01803
781.273.3434
www.brennanconsults.com

Project Location

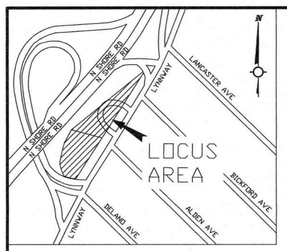
ALDEN FIRE STATION
140 Lynnway
Revere, MA

SCALE: 1"=2000'

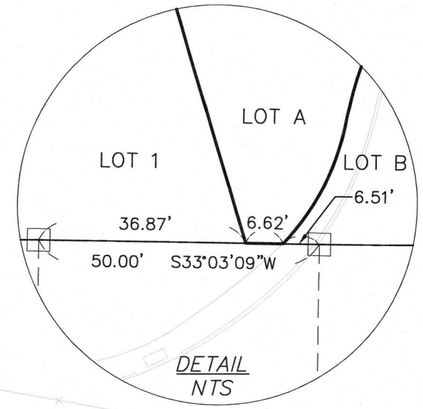
DRAWN BY: WCG
CHECKED BY: CE
ISSUED: 03.31.21
REVISED:

LOCUS MAP

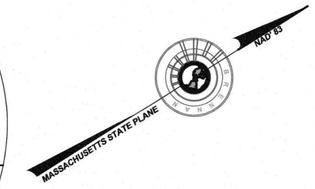
ATTACHMENT 4
ANR PLAN



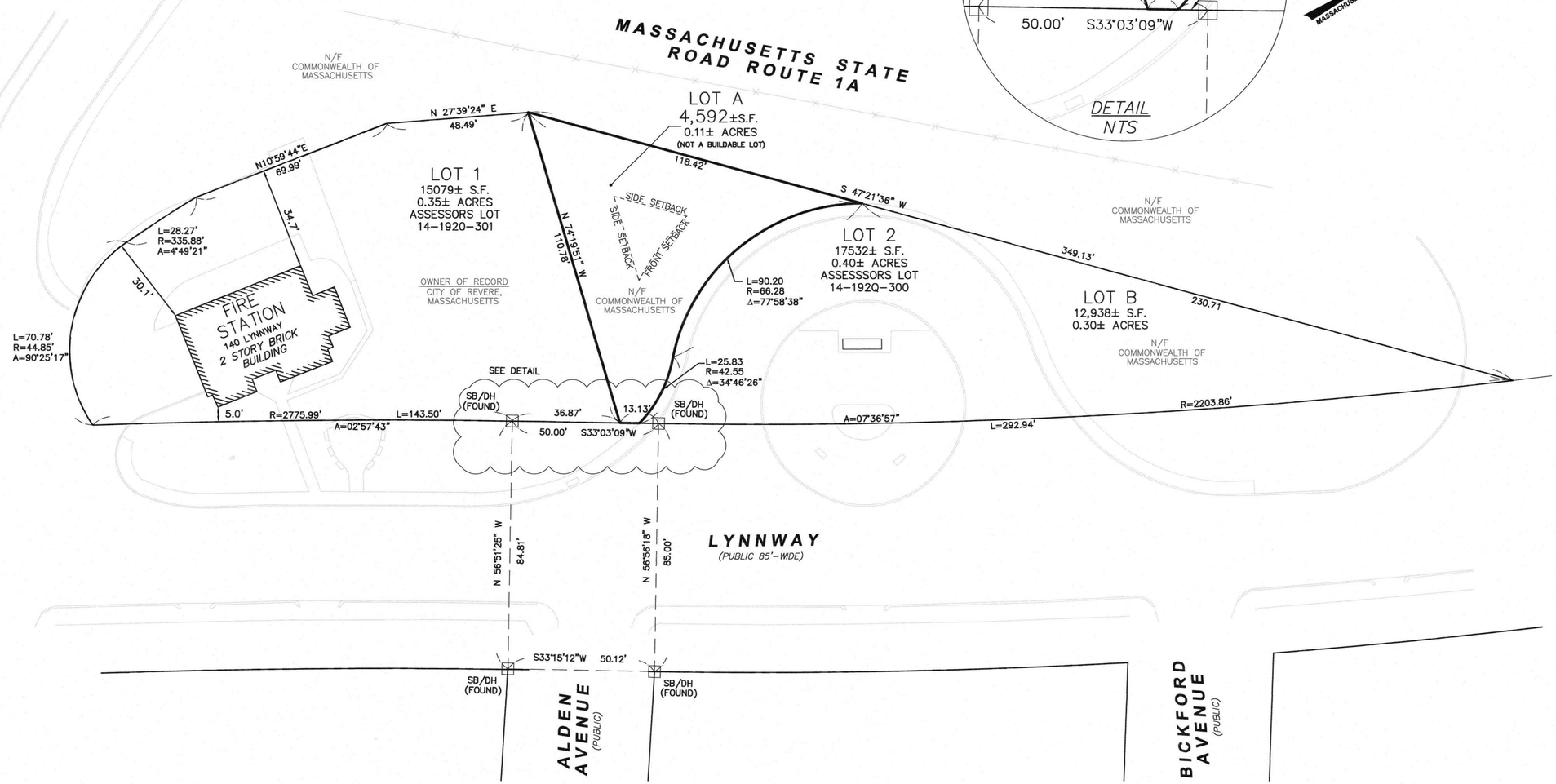
LOCUS MAP:
NOT TO SCALE



DETAIL
NTS



RESERVED FOR REGISTRY ONLY



PLANS OF RECORD

- -23333 V.T.
- -MDC PLAN 174
- -5227-1
- -5927-2
- -7604 PAGE 475

LOCUS DEED

BOOK 7604, PAGE 475

20 0 10 20 40 80

1" = 20'

APPROVAL UNDER THE SUBDIVISION CONTROL LAW NOT REQUIRED
CITY OF REVERE PLANNING BOARD

_____

_____

_____

_____

_____

DATE: _____

NO DETERMINATION OF COMPLIANCE WITH ZONING REQUIREMENTS HAS BEEN MADE OR INTENDED.

CURRENT ZONING INFORMATION:

ZONING DISTRICT: RA			
ZONING ORDINANCE OF THE CITY OF REVERE			
MINIMUM LOT AREA	6,000 SQ FT		
SETBACKS	SIDE YARD 20'	FRONT YARD 20'	REAR YARD 30'
FRONTAGE	60'		
USABLE OPEN SPACE (% OF TOTAL AREA)	35%		
MAXIMUM BUILDING COVERAGE	30%		
MAX HGT. (FT.)	30'		
MAX STORIES	2 1/2		

NOTES

1. THIS SURVEY WAS PERFORMED ON THE GROUND BY BRENNAN CONSULTING INC. IN AUGUST OF 2019.
2. THE HORIZONTAL DATUM REFERS TO NAD 83'.
3. THE PURPOSE OF THIS PLAN IS TO DIVIDE CITY OF
4. REVERE ASSESSORS LOT 14-192Q-300 INTO TWO LOTS A AND B, LOT A BEING A NON BUILDABLE LOT TO BE COMBINED WITH CITY OF REVERE ASSESSORS LOT 14-192Q-301 AS SHOWN HEREON.
5. THIS DOCUMENT IS AN INSTRUMENT OF SERVICE OF BRENNAN CONSULTING ISSUED TO OUR CLIENT FOR PURPOSES RELATED DIRECTLY AND SOLELY TO BRENNAN CONSULTING' SCOPE OF SERVICES UNDER CONTRACT TO OUR CLIENT FOR THIS PROJECT. ANY USE OR REUSE OF THIS DOCUMENT FOR ANY REASON BY ANY PARTY FOR PURPOSES UNRELATED DIRECTLY AND SOLELY TO SAID CONTRACT SHALL BE AT THE USER'S SOLE AND EXCLUSIVE RISK AND LIABILITY, INCLUDING LIABILITY FOR VIOLATION OF COPYRIGHT LAWS, UNLESS WRITTEN CONSENT IS PROVIDED BY BRENNAN CONSULTING.

WE HEREBY CERTIFY THAT THIS PLAN WAS PREPARED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS.

COMMONWEALTH OF MASSACHUSETTS
KEVIN J. KIERNAN
No. 40038
REGISTERED PROFESSIONAL LAND SURVEYOR

KJK 6/8/2021

PROFESSIONAL LAND SURVEYOR FOR BRENNAN CONSULTING

REVISIONS

NO.	DATE	DESCRIPTION	BY	CHK'D

APPROVAL NOT REQUIRED (ANR) PLAN
LOCATED IN
REVERE, MASSACHUSETTS
(SUFFOLK COUNTY)

PREPARED FOR
WINTER STREET ARCHITECTS

SCALE: 1"= 20' DATE: JUNE 8, 2021

Brennan Consulting
ENGINEERING • TRANSPORTATION • SURVEYING
24 RAY AVENUE, BURLINGTON, MA
PHONE: (781) 273-3434 FAX: (781) 273-3430

JUNE 8, 2021 PROJECT No. 19954B

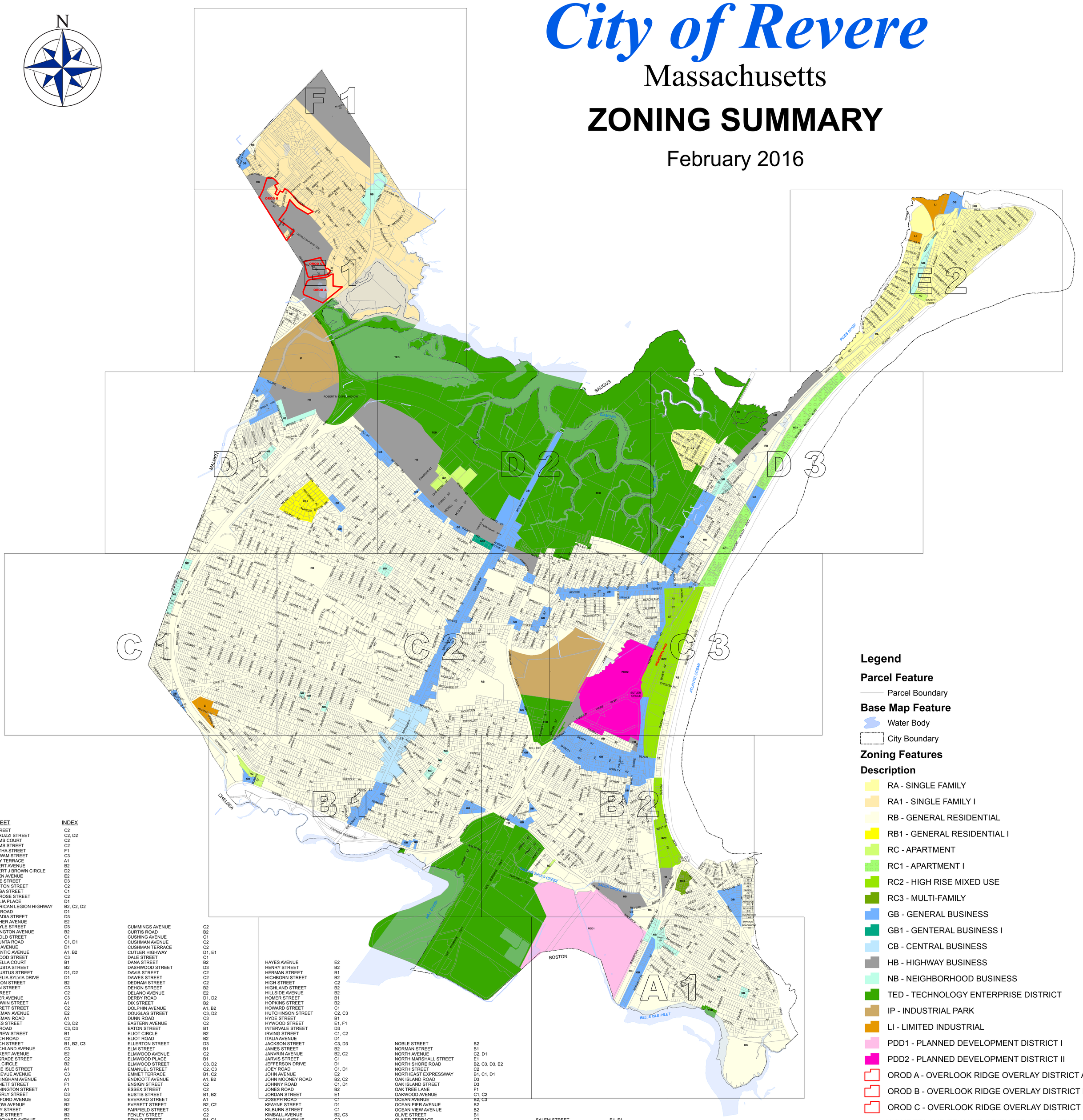
ATTACHMENT 5
CITY OF REVERE ZONING MAP

City of Revere

Massachusetts

ZONING SUMMARY

February 2016



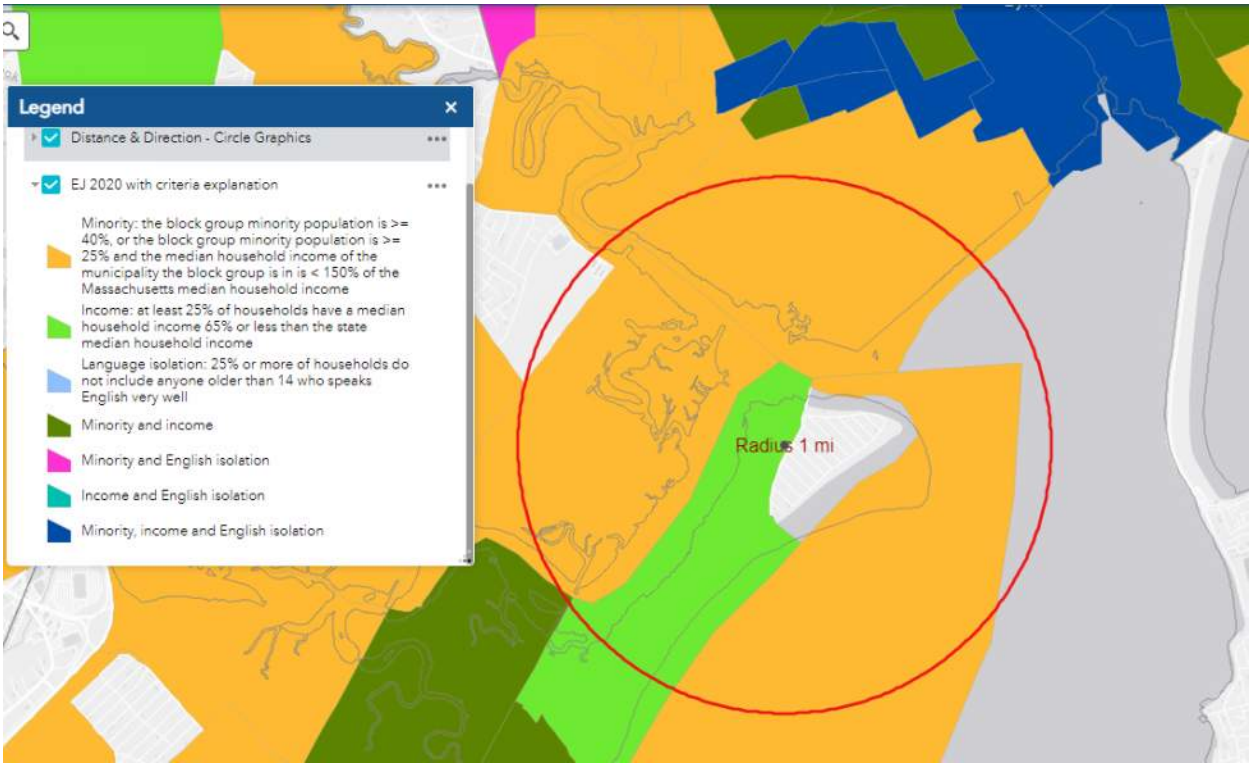
STREET	INDEX
A STREET	C2
ABBRUZZI STREET	C2, D2
ADAMS COURT	C2
ADAMS STREET	C2
AGATHA STREET	F1
AGAWAM STREET	C3
AGRY TERRACE	A1
ALBERT AVENUE	B2
ALBERT J BROWN CIRCLE	D2
ALDEN AVENUE	E2
ALICE STREET	D3
ALLSTON STREET	C2
AMASA STREET	C1
AMBROSE STREET	C2
AMELIA PLACE	D1
AMERICAN LEGION HIGHWAY	B2, C2, D2
ANN ROAD	D1
ARCADIA STREET	D3
ARCHER AVENUE	E2
ARGYLE STREET	D3
ARLINGTON AVENUE	B2
ARNOLD STREET	C1
ASSUNTA ROAD	C1, D1
ASTI AVENUE	D1
ATLANTIC AVENUE	A1, B2
ATWOOD STREET	C3
AUCELLA COURT	B1
AUGUSTA STREET	B2
AUGUSTUS STREET	D1, D2
AURELIA SYLVIA DRIVE	D1
AVALON STREET	B2
AVON STREET	C3
B STREET	C2
BAKER AVENUE	C3
BALDWIN STREET	A1
BARRETT STREET	C2
BATEMAN AVENUE	E2
BATEMAN ROAD	A1
BATES STREET	C3, D2
BAY ROAD	C3, D3
BAYVIEW STREET	B1
BEACH ROAD	C2
BEACH STREET	B1, B2, C3
BEACHLAND AVENUE	C3
BECKERT AVENUE	E2
BELGRADE STREET	C2
BELL CIRCLE	B2
BELLE ISLE STREET	A1
BELLEVUE AVENUE	C3
BELLINGHAM AVENUE	A1
BENNETT STREET	F1
BENNINGTON STREET	A1
BEVERLY STREET	D3
BICKFORD AVENUE	E2
BILLOW AVENUE	B2
BIXBY STREET	B2
BLAKE STREET	B2
BLANCHARD AVENUE	E2
BLANEY COURT	C2
BLANEY STREET	C2
BLODGETT STREET	E1
BORDEN STREET	B1
BOSSON STREET	C3
BRADSTREET AVENUE	A1
BREED STREET	C2
BREEDENS LANE	E1, F1
BRENTON STREET	D1
BRIDGE STREET	D3
BROAD SOUND AVENUE	A1, B2
BROADWAY	B1, C2, D2
BROOKLINE STREET	E1
BRUNO STREET	D1
BRYANT STREET	C2
BURBANK STREET	C1, C2
BURNETT ROAD	C2
BURNHAM STREET	C3
BUTLER CIRCLE	C3
BUTLER STREET	B1, B2
C STREET	C2
CALUMET STREET	C3
CAMBRIDGE STREET	C2
CAMILLE ROAD	C1, D1
CAMPBELL AVENUE	B2
CAREY CIRCLE	E2
CARLETON STREET	C2
CARLSON AVENUE	C2
CARMEN LANE	C1
CARUSO COURT	D1
CARUSO STREET	C1
CARY AVENUE	B1, C2
CASASSA OVERPASS	B1
CASE DRIVE	C1
CATALDO DRIVE	C2
CECILIAN AVENUE	D1
CENTENNIAL AVENUE	B2
CENTRAL AVENUE	B1, C2
CHAMBERLAIN AVENUE	E2
CHARGER STREET	D1, D2
CHARLES AVENUE	B2
CHEEVER STREET	B1
CHESTER AVENUE	C3
CLARK ROAD	B2
CLEVELAND STREET	C3
CLIFTON STREET	F1
CLINTON ROAD	C3
COLONIAL ROAD	D1
COLUMBIA STREET	E1, F1
CONANT STREET	C2, D2
CONCORD STREET	F1
CONSTITUTION AVENUE	C2
COOLEDGE STREET	C2
COOPER TERRACE	E1
CORAL STREET	B2
COTTAGE STREET	A1
COVE STREET	B2
CRESCENT AVENUE	A1
CREST AVENUE	A1
CROSS STREET	A1
CRYSTAL AVENUE	A1
CUMMINGS AVENUE	C2
CURTIS ROAD	B2
CUSHING AVENUE	C1
CUSHMAN AVENUE	C2
CUSHMAN TERRACE	C2
CUTLER HIGHWAY	D1, E1
DALE STREET	C1
DANA STREET	B2
DASHWOOD STREET	D3
DAVIS STREET	C2
DAWES STREET	C2
DEDHAM STREET	C2
DEHON STREET	B2
DELANO AVENUE	E2
DERBY ROAD	D1, D2
DIX STREET	B2
DOLPHIN AVENUE	A1, B2
DOUGLAS STREET	C3, D2
DUNN ROAD	C3
EASTERN AVENUE	C2
EATON STREET	B1
ELIOT CIRCLE	B2
ELIOT ROAD	B2
ELLERTON STREET	D3
ELM STREET	B1
ELMWOOD AVENUE	C2
ELMWOOD PLACE	B1
ELMWOOD STREET	C3, D2
EMANUEL STREET	C2, C3
EMMET TERRACE	B1, C2
ENDICOTT AVENUE	A1, B2
ENSIGN STREET	C2
ESSEX STREET	C2
EUSTIS STREET	B1, B2
EVERARD STREET	A1
EVERETT STREET	B2, C2
FAIRFIELD STREET	C3
FENLEY STREET	C2
FENNO STREET	B1, C1
FENWICK STREET	E1
FERNWOOD AVENUE	C2
FERNWOOD PLACE	C2
FERRAGAMO WAY	D2
FESTA ROAD	C2, D1
FISKE STREET	C2
FITZHENRY SQUARE	B2
FLINT STREET	D3
FLORENCE AVENUE	B2
FLOYD STREET	C2, C3
FOAM AVENUE	B2
FOLSOM STREET	C2
FORD STREET	C3
FOSTER STREET	B1, C2
FOWLER AVENUE	E2
FRANCIS STREET	B2
FRANK AVENUE	E2
FRANK P BENNETT HIGHWAY	F1
FRANKLIN AVENUE	B2
FRANKLIN PLACE	B2
FRANKLIN STREET	E1, F1
FREEMAN STREET	C3
FRIEND STREET	C3
FRYE STREET	C3
FURLONG DRIVE	B2
FURNESS STREET	C2
GAGE AVENUE	C2, D2
GARFIELD AVENUE	B2
GAROFOLO STREET	C3
GENESSEE STREET	C2
GENEVA STREET	D1
GEORGE AVENUE	A1, B2
GILBERT AVENUE	E2
GLADYS STREET	D3
GLENDALE STREET	D3
GLOVER DRIVE	C2
GOLDIE STREET	D1
GOODWIN AVENUE	E2
GORDAN ROAD	C2
GORE ROAD	D1, D2
GRAND AVENUE	C2
GRAND VIEW AVENUE	E1, F1
GRAVES ROAD	C2, D2
GREEN STREET	B2
GREENTREE LANE	C1, D1
GRIFFIN STREET	C1, D1
GRISWOLD STREET	D1
GROVER STREET	D1, D2
HADDON STREET	B1
HAITH STREET	C1, D1
HALL STREET	B1
HANCOCK STREET	C1, C2
HANSEN TERRACE	D3
HARRINGTON AVENUE	E2
HARRINGTON STREET	B1
HARRIS STREET	B2, C2
HASEY STREET	B2
HASKELL AVENUE	C1
HASTINGS STREET	C3, D2
HAUMAN STREET	C2
HAWES STREET	C3
HAYES AVENUE	E2
HENRY STREET	B2
HERMAN STREET	B1
HICHBORN STREET	B2
HIGH STREET	C2
HIGHLAND STREET	B2
HILLSIDE AVENUE	B2
HOMER STREET	B1
HOPKINS STREET	B2
HOWARD STREET	C1
HUTCHINSON STREET	C2, C3
HYDE STREET	B1
HYWOOD STREET	E1, F1
INTERVALE STREET	D3
IRVING STREET	C1, C2
ITALIA AVENUE	D1
JACKSON STREET	C3, D3
JAMES STREET	B2
JANVRIN AVENUE	B2, C2
JARVIS STREET	C1
JEFFERSON DRIVE	D1
JOEY ROAD	C1, D1
JOHN AVENUE	E2
JOHN MOONEY ROAD	B2, C2
JOHNNY ROAD	C1, D1
JONES ROAD	B2
JORDAN STREET	E1
JOSEPH ROAD	C1
KEAYNE STREET	D1
KILBURN STREET	C1
KIMBALL AVENUE	B2, C3
KINGMAN AVENUE	C2
LAMBERT STREET	C1
LAMSON STREET	D1
LANCASTER AVENUE	E2
LANTERN ROAD	C2, D1, D2
LARKIN STREET	C2, D2
LAWRENCE ROAD	C3
LAWSON AVENUE	E2
LECHMERE STREET	D2
LEE BURBANK HIGHWAY	B1, B2
LEE STREET	C2
LEONARD ROAD	C3
LEVERETT AVENUE	A1
LIBERTY AVENUE	E1
LIBRARY STREET	B1, B2
LILLY COURT	D2
LINCOLN STREET	C1, C2
LINEHURST ROAD	F1
LOOMIS STREET	D1
LORING ROAD	C3
LOWE STREET	B1
LOWE STREET PLACE	B1
LOWELL STREET	C3
LUCIA AVENUE	D1
LYNN STREET	E1
LYNNWAY	E2
MADISON STREET	C1
MAGGI ROAD	D3
MALDEN STREET	C2, D1
MAPLE STREET	F1
MARBLE STREET	D1
MARSHALL STREET	D1, E1, F1
MARSHVIEW TERRACE	E1
MARTIN STREET	C3
MCCLURE STREET	C2
MCCOBA STREET	D2
MCKINLEY STREET	C3
MCLEAVEY STREET	C1
MERMAID AVENUE	B2
MICHAEL ROAD	C1
MILAN AVENUE	D2
MILANO AVENUE	D1
MILL STREET	B1
MILL STREET PLACE	B1
MILLS AVENUE	E2
MONTFERN AVENUE	A1
MORETTI STREET	C1
MORRIS STREET	F1
MOUNTAIN AVENUE	C1
MOUNTAIN AVENUE	C2
MOUNTAIN AVENUE EAST	C2
MUZZEY STREET	F1
NAHANT AVENUE	B2
NAPLES ROAD	C2, C3
NELL ROAD	D1
NEPONSET STREET	C3
NERIOUS AVENUE	B2
NEWBURY STREET	C1
NEWDIGATE STREET	B2
NEWELL STREET	D2
NEWHALL STREET	C2, D1
NEWMAN STREET	C2, D2
NOBLE STREET	B2
NORMAN STREET	B1
NORTH AVENUE	C2, D1
NORTH MARSHALL STREET	E1
NORTH SHORE ROAD	B2, C3, D3, E2
NORTH STREET	C2
NORTHEAST EXPRESSWAY	B1, C1, D1
OAK ISLAND ROAD	D3
OAK ISLAND STREET	D3
OAK TREE LANE	F1
OAKWOOD AVENUE	C1, C2
OCEAN AVENUE	B2, C3
OCEAN PIER AVENUE	B2
OCEAN VIEW AVENUE	B2
OLIVE STREET	B1
OLIVER TERRACE	C2
ORCHARD STREET	A1
ORVIS ROAD	D1, D2
OVERLOOK AVENUE	B2
OVERLOOK RIDGE DRIVE	E1
OVERLOOK RIDGE TERRACE	E1
OXFORD PARK	C2
OXFORD STREET	C1
PAGE STREET	B1
PARK AVENUE	C1, C2
PARKSIDE PLACE	E1
PATRIOT PARKWAY	C2, D2
PAUL STREET	E1
PAYSON STREET	B1, C2
PEARL AVENUE	A1
PEBBLE AVENUE	B2
PEMBERTON STREET	D1
PENN STREET	B1
PHILLIPS AVENUE	A1
PHILOMENA AVENUE	D1
PIER VIEW AVENUE	B2
PIERCE STREET	C3
PINES ROAD	E2
PITCAIRN STREET	C2, D2
PLEASANT STREET	B1
POMONA STREET	C2
PORTER AVENUE	B2
PRATT COURT	B2
PRATT PLACE	B2
PRATT STREET	B2
PRINCE STREET	C2, C3
PROCTOR AVENUE	C1, C2
PROSPECT AVENUE	B1, C1
PROSPECT PLACE	C1
PUTNAM ROAD	D3
PUTNAM STREET	C2
QUINCY STREET	D2
RAILROAD STREET	B1, B2
RAND STREET	C1
RANDALL ROAD	D1
RAVENA STREET	E1
RAYMOND ROAD	C2
RESERVOIR AVENUE	B1, C1, C2
REVERE BEACH BOULEVARD	B2, C3, D3, E2
REVERE BEACH PARKWAY	B1, B2
REVERE STREET	C2, C3
RICE AVENUE	E2
RICHARD STREET	F1
RICHIE ROAD	C1
RIDGE ROAD	B1, C1
RIVER AVENUE	E2
ROBERT M COPELAND CIRCLE	D1
ROBERT ROAD	C2
ROBERT STREET	F1
ROLAND ROAD	D1
ROOSEVELT STREET	C3
ROSE STREET	C2
ROSSETTI STREET	C2
ROUGHAN STREET	B2
RUMNEY ROAD	C2, D1, D2
SACHEM STREET	C3
SAGAMORE STREET	C3
SALEM STREET	E1, F1
SALES STREET	A1
SARGENT STREET	C1, C2, D1
SAVAGE STREET	C1
SCHOOL STREET	B1, C2
SEARS STREET	C3
SEAVIEW AVENUE	C1
SEWALL STREET	B1, B2
SHAWMUT STREET	C3
SHERMAN STREET	D1
SHIRLEY AVENUE	B2
SHURTLEFF STREET	C3
SIGNORE TERRACE	C2
SIGOURNEY STREET	D1, D2
SMITH STREET	C2
SOUTH AVENUE	C2
SOUTH CAMBRIDGE STREET	C2
SOUTH FURNESS STREET	C2
SOUTH GENESSEE STREET	C2
SOUTH HANCOCK STREET	C1
SOUTH IRVING STREET	C1
SPAGNOLO WAY	D1
SPRAGUE STREET	B1
SPRAY AVENUE	B2
SPRING AVENUE	C1
SPRING STREET	E1
SQUIRE ROAD	D1, D2, E1
ST. MARY'S WAY	D1
STANDISH ROAD	B2
STANTON AVENUE	C2
STARK AVENUE	C2
STATE ROAD	A1, B2
STEEPLE STREET	C2, D1, D2
STEVENS STREET	D1
STONE STREET	E1
STOWERS STREET	C2
SUFFOLK AVENUE	B1, C1
SULLIVAN STREET	C2
SUMMER STREET	A1
SUMMIT AVENUE	B2
SUMNER STREET	B2
SWEENEY AVENUE	C1, C2
TAFT STREET	B1
TAPLEY AVENUE	C2
TAPLEY PLACE	C2
TEDFORD AVENUE	C2
TEMPLE STREET	C3, D2
THAYER AVENUE	E2
THOMAS CARROLL WAY	B1, C2
THORNDIKE STREET	C3
THORNTON STREET	B2
THURLOW AVENUE	B2, C2
TOBIN AVENUE	E2
TRACY ALAN WAY	B2
TREVALLEY ROAD	C2
TRIFONE ROAD	D1
TRUE STREET	C2
TUCKERMAN STREET	C2
TUDOR STREET	B1, C2
TUSCANO AVENUE	D1
TUTTLE STREET	C2
UNDINE AVENUE	B2
UNION STREET	C2, C3
UNITY AVENUE	A1
UPHAM STREET	B2, C3
VALLEY STREET	F1
VANE STREET	B1, C1, C2
VENDITTO ROAD	C1
VERA STREET	D3
VETERANS OF FOREIGN WARS PARKWAY	B2, C3
VICTORIA STREET	B1
VIEW STREET	D3
VINAL STREET	B1
VIVIEN STREET	C1
WADLEIGH AVENUE	E2
WADSWORTH AVENUE	E2
WAITE STREET	C2, C3
WAITT COURT	E1
WAITT PARK	E1
WALDEN STREET	B2
WALLEY WAY	B2
WALNUT AVENUE	B2, C3
WALNUT PLACE	B2
WALNUT STREET	E1, F1
WARD STREET	D2
WARREN DRIVE	E1
WARREN STREET	C2
WASHBURN AVENUE	A1, B2
WASHINGTON AVENUE	C1, D1, E1
WASHINGTON STREET	C3
WAVE AVENUE	B2
WAVERLY AVENUE	B2
WEBSTER STREET	A1
WENTWORTH ROAD	C2, D1
WEST STREET	B2
WHARF STREET	B1
WHITIN AVENUE	E2
WILSON STREET	B1
WINTHROP AVENUE	A1, B1, B2
WINTHROP PARKWAY	A1, B2
WINTHROP PLACE	B2
WITHERBEE AVENUE	E2
WOLCOTT ROAD	B2
WOODLAND ROAD	D3
WOODS AVENUE	B2
YEAMANS STREET	B1, C2
YORK STREET	D3
ZOLLA CIRCLE	B1

CDM Smith

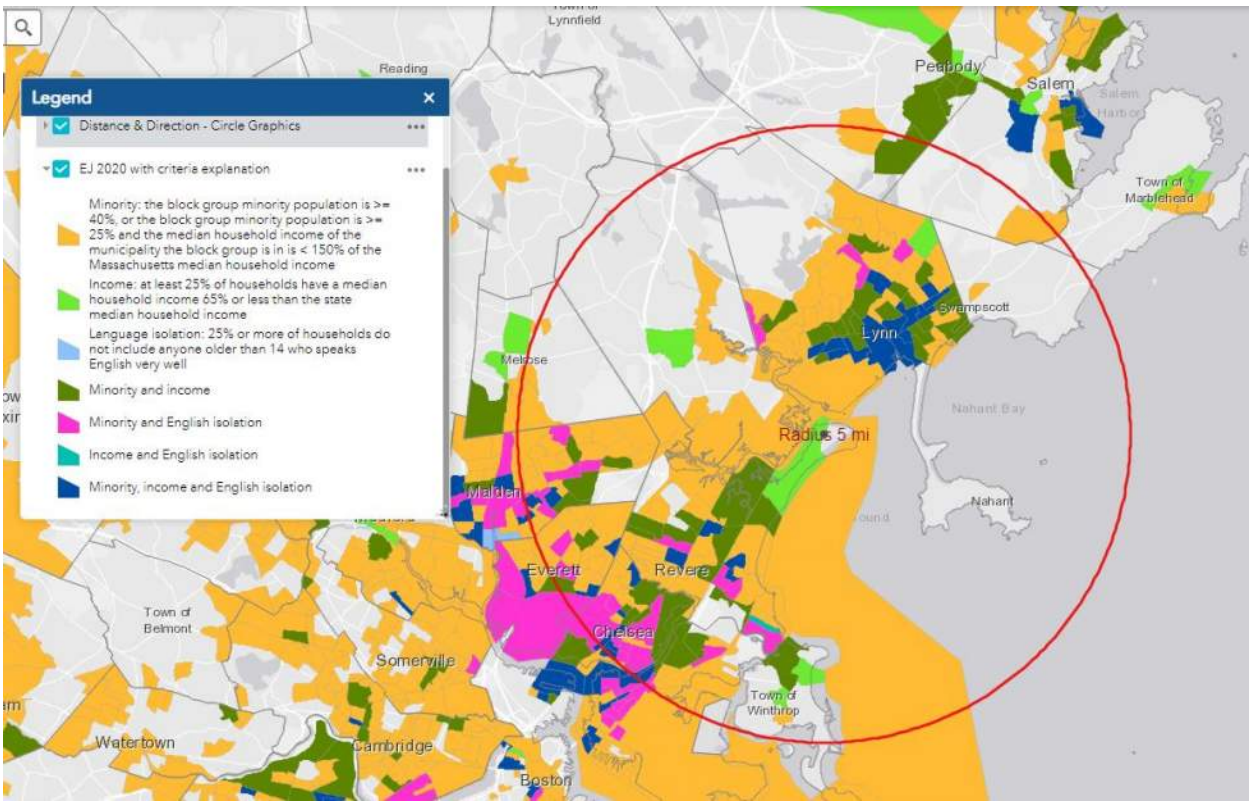
* THIS IS NOT THE OFFICIAL ZONING MAP

P:\Revere\Map_Documents\ZoningCitywide.mxd

ATTACHMENT 6
ENVIRONMENTAL JUSTICE POPULATION MAP

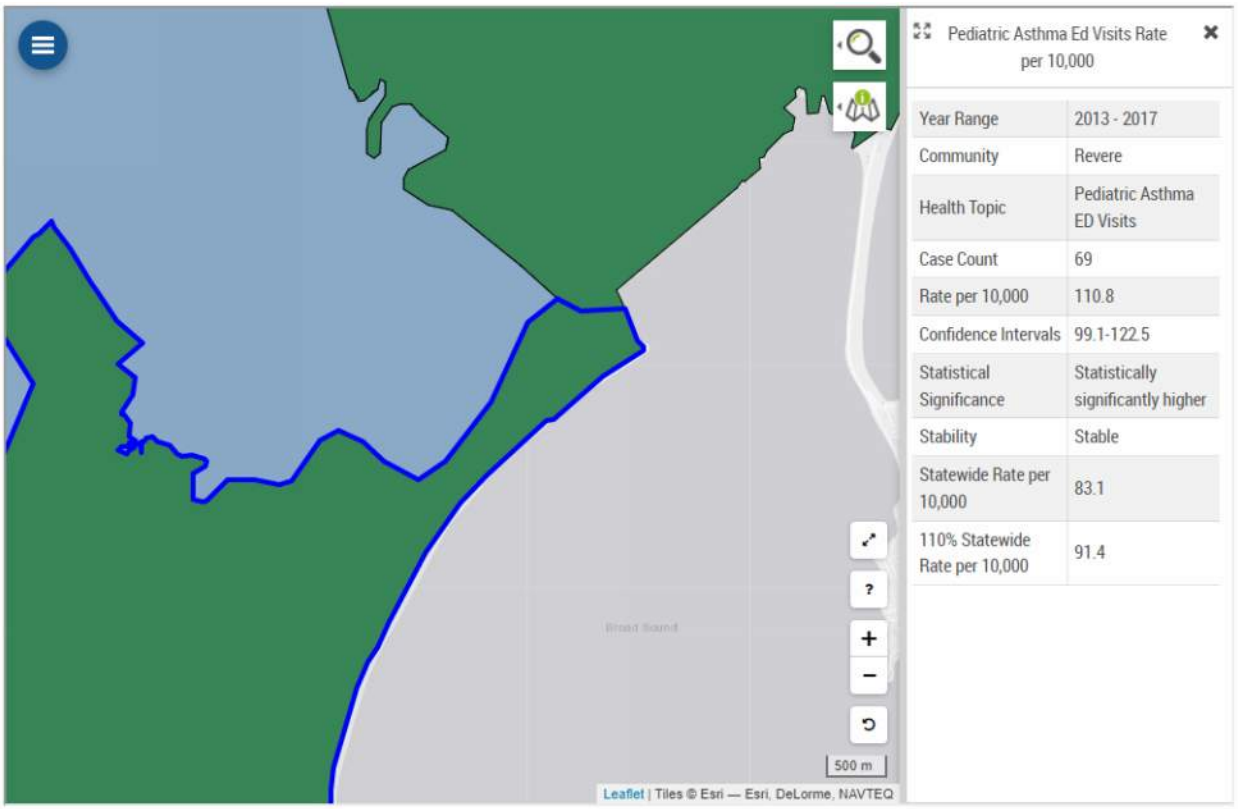


ENVIRONMENTAL JUSTICE POPULATION MAP – 1 MILE

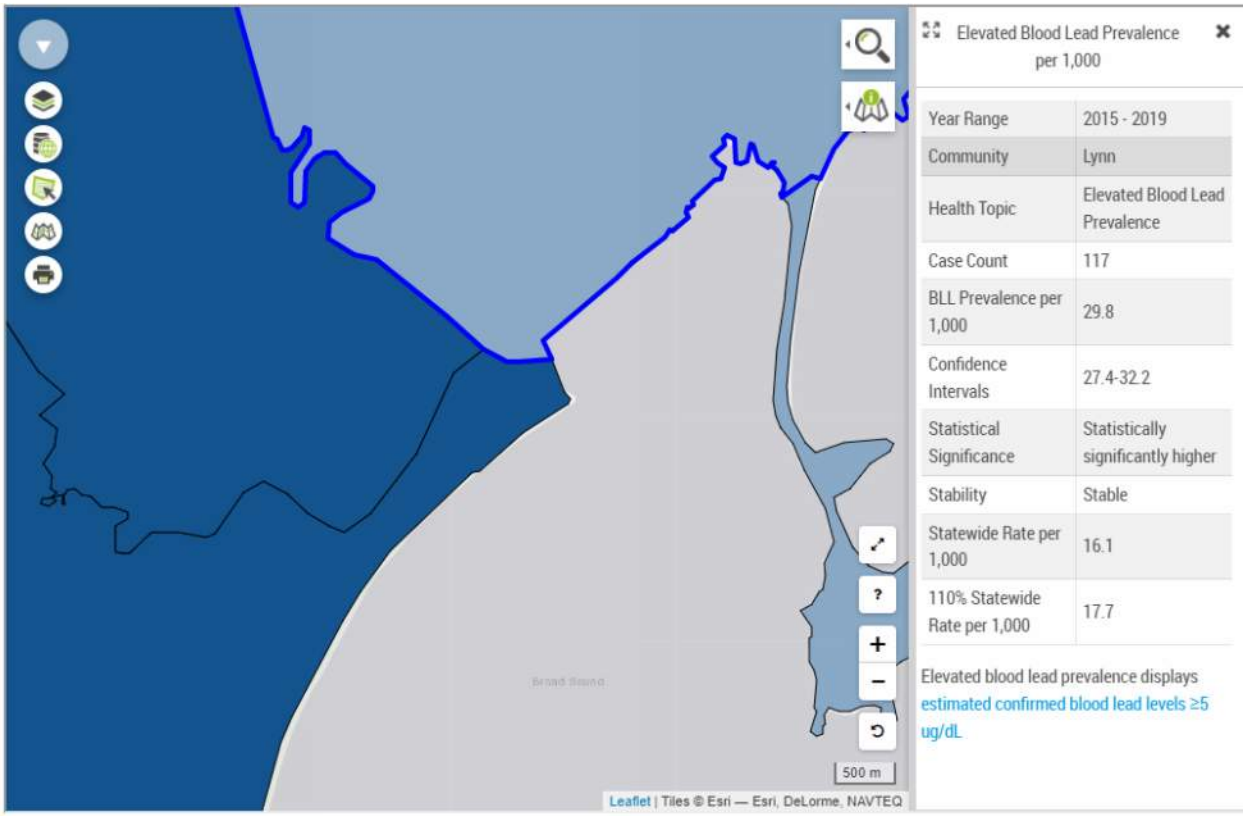


ENVIRONMENTAL JUSTICE POPULATION MAP – 5 MILES

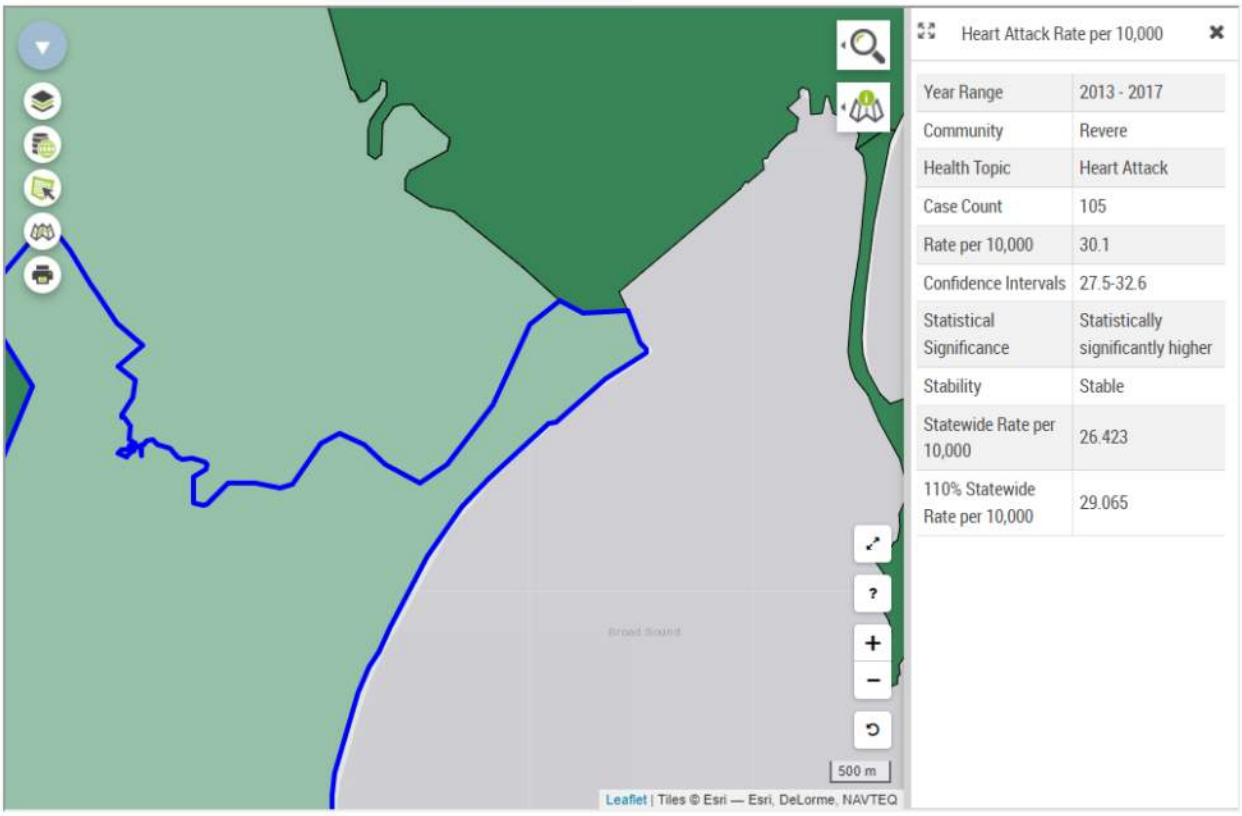
ATTACHMENT 7
VULNERABLE HEALTH
EJ CRITERIA MAP



PEDIATRIC ASTHMA RATES PER 10,000

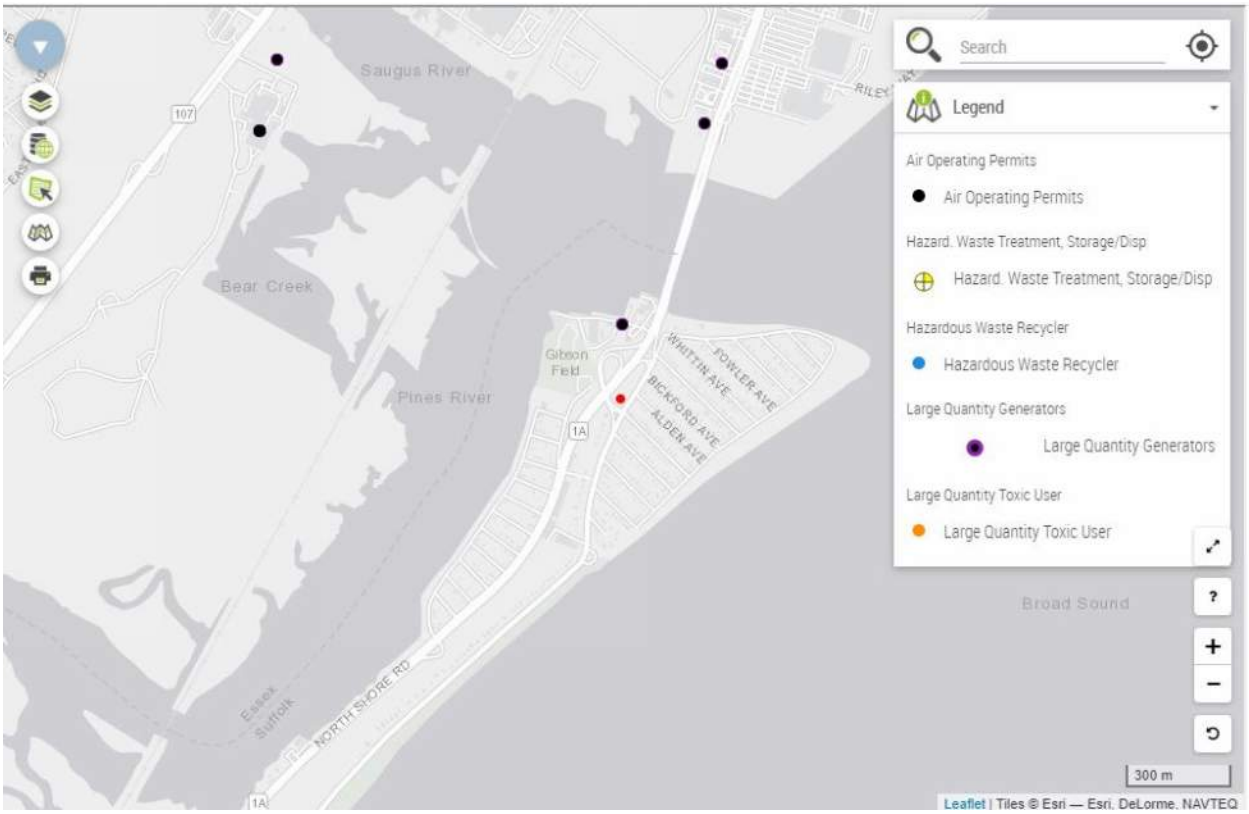


ELEVATED BLOOD LEAD PREVALENCE PER 1,000

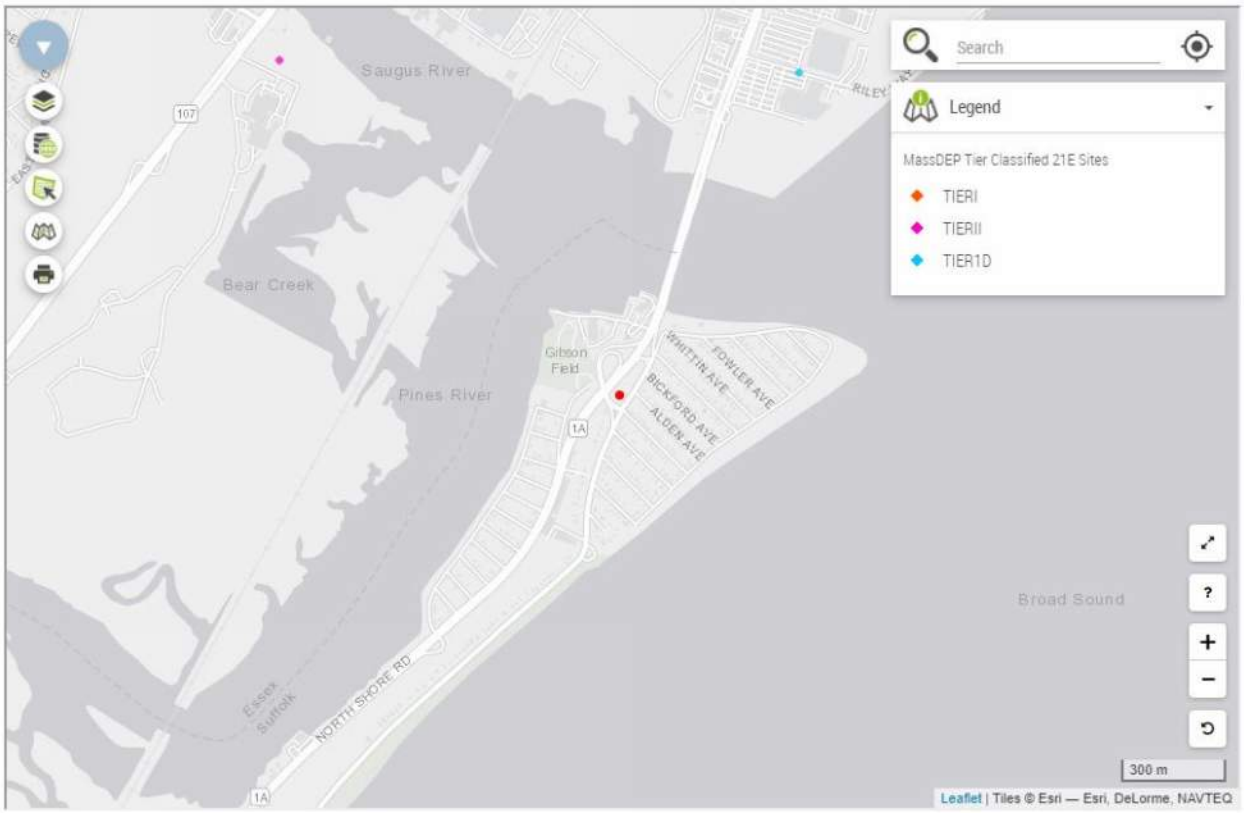


Year Range	2013 - 2017
Community	Revere
Health Topic	Heart Attack
Case Count	105
Rate per 10,000	30.1
Confidence Intervals	27.5-32.6
Statistical Significance	Statistically significantly higher
Stability	Stable
Statewide Rate per 10,000	26.423
110% Statewide Rate per 10,000	29.065

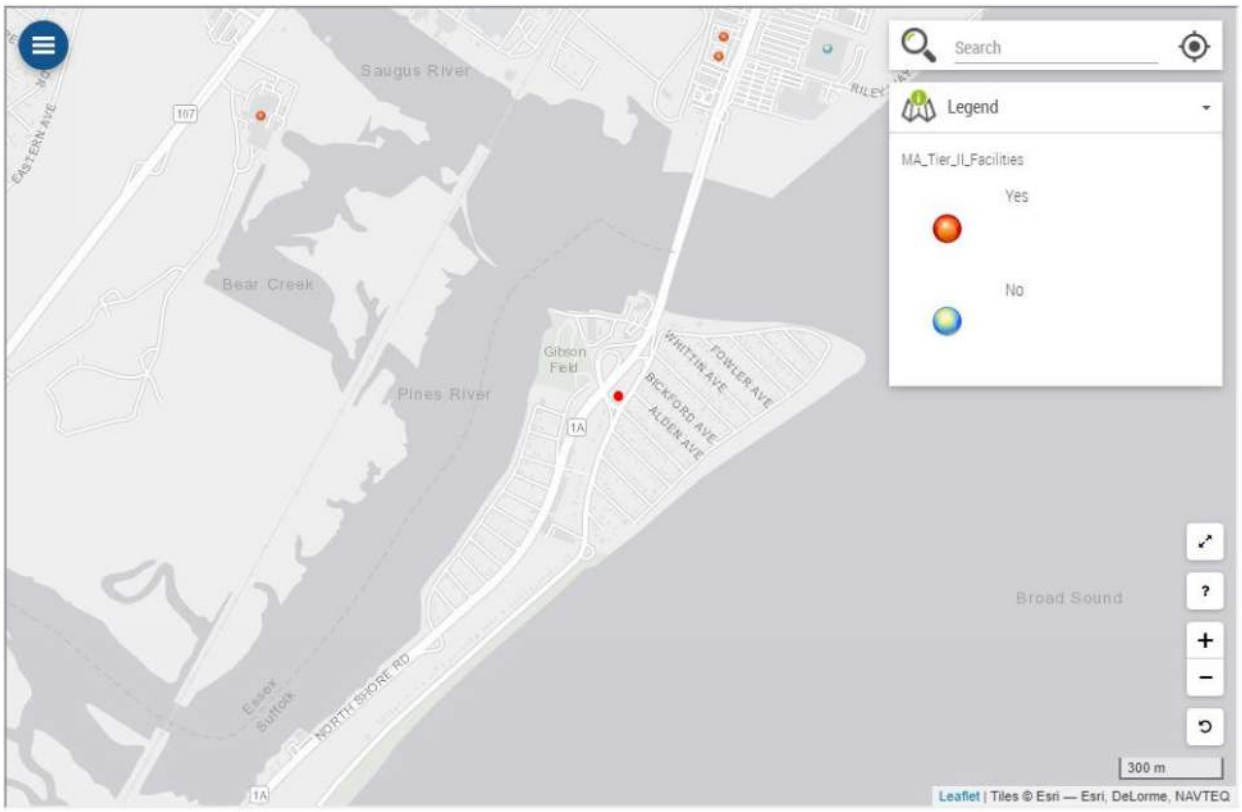
HEART ATTACK RATE PER 10,000



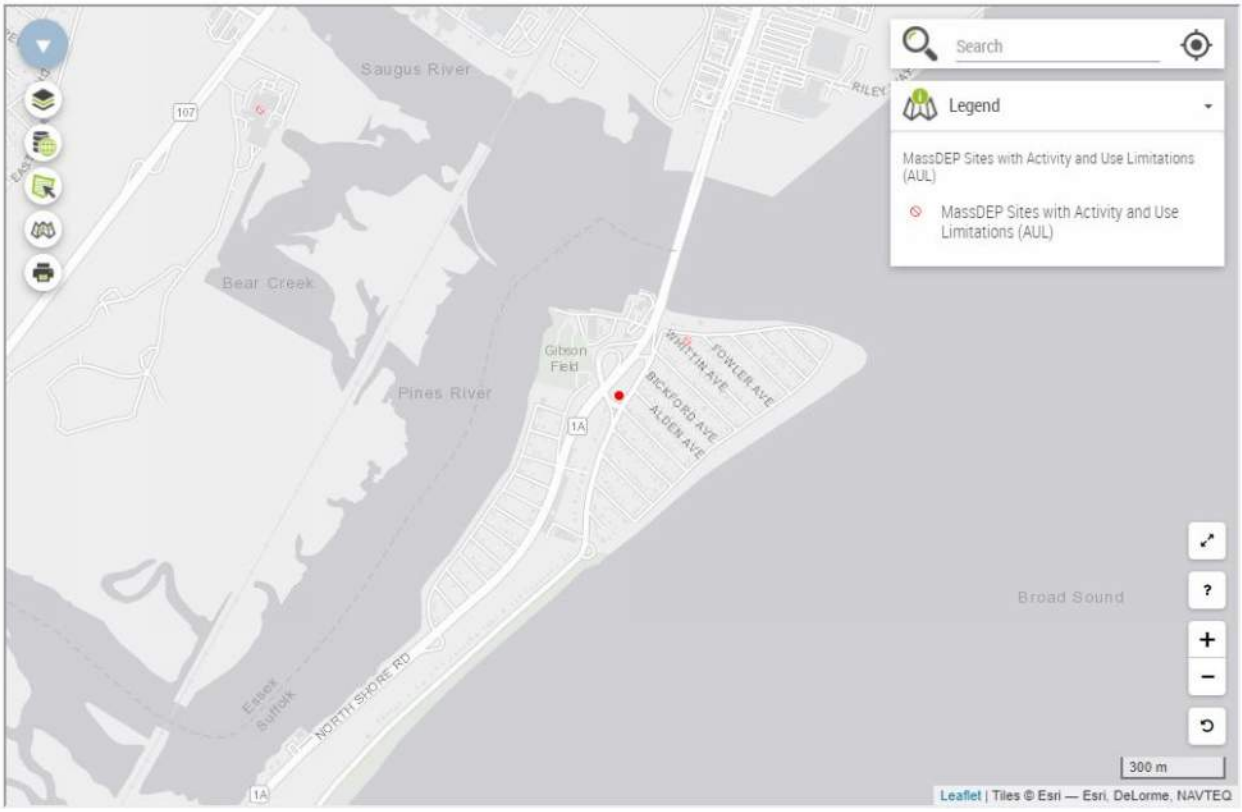
MAJOR AIR AND WASTE FACILITIES



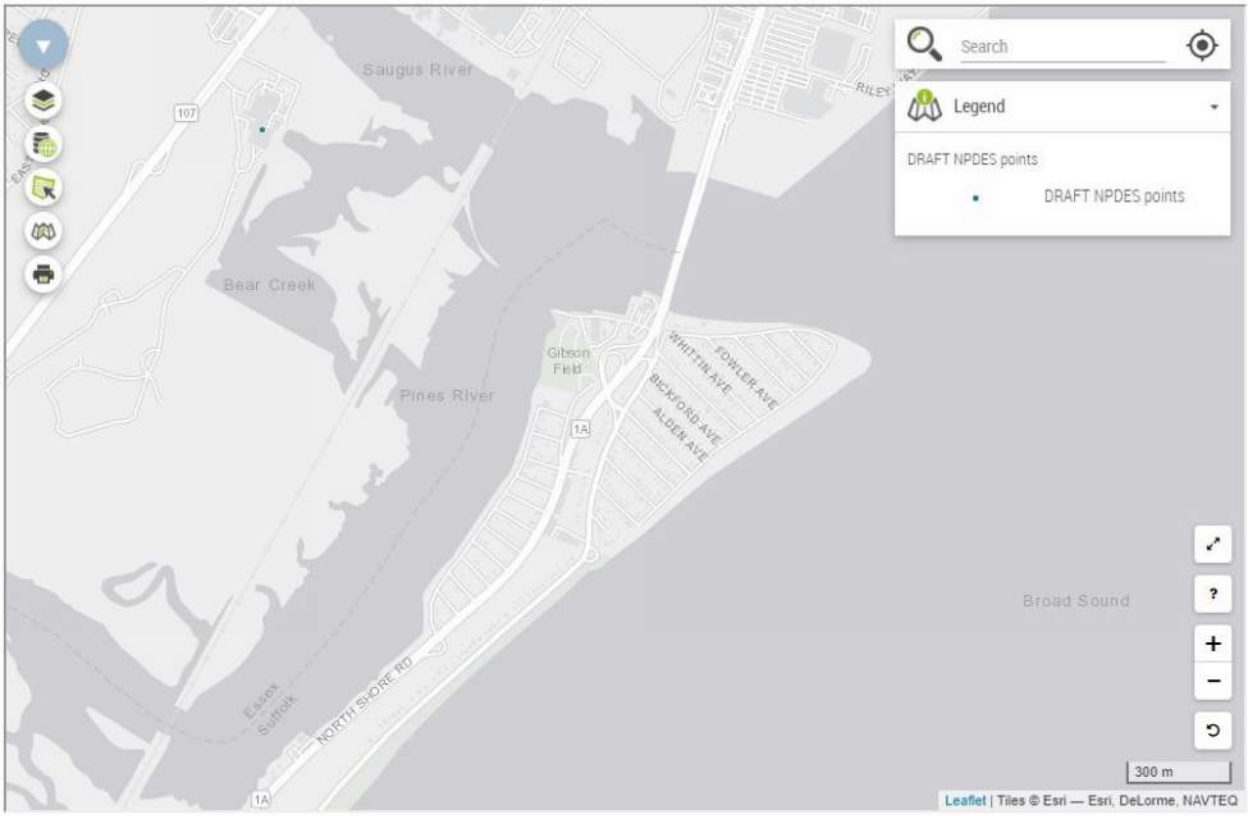
M.G.L. c. 21E SITES



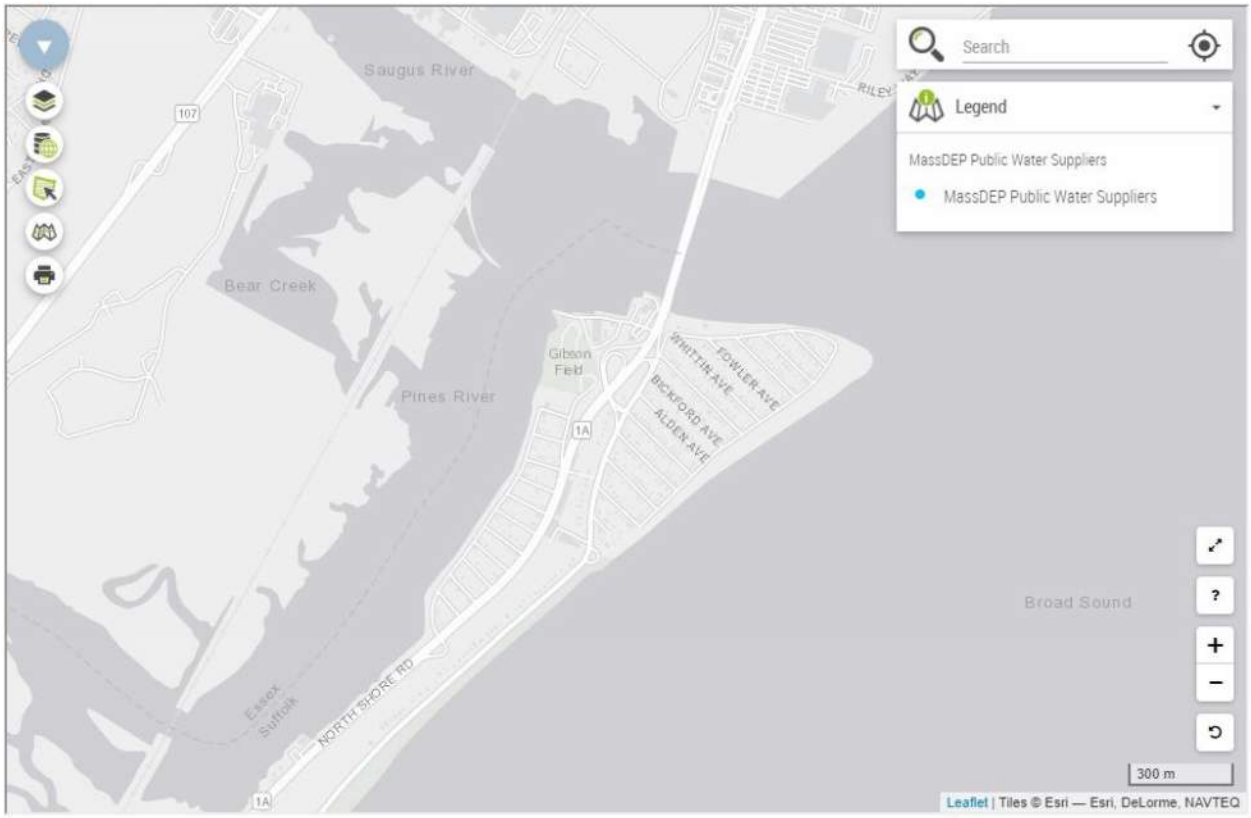
MASSDEP TIER II FACILITIES



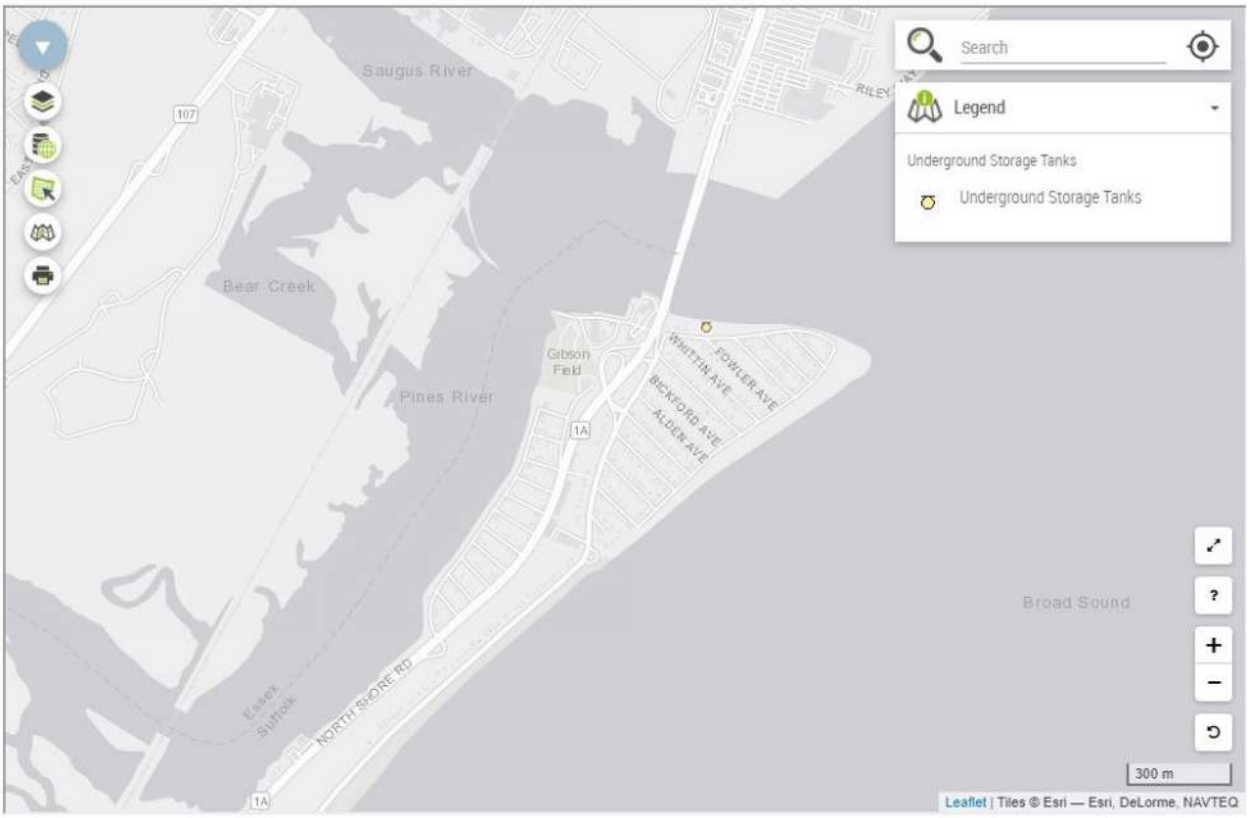
MASSDEP SITES WITH AULS



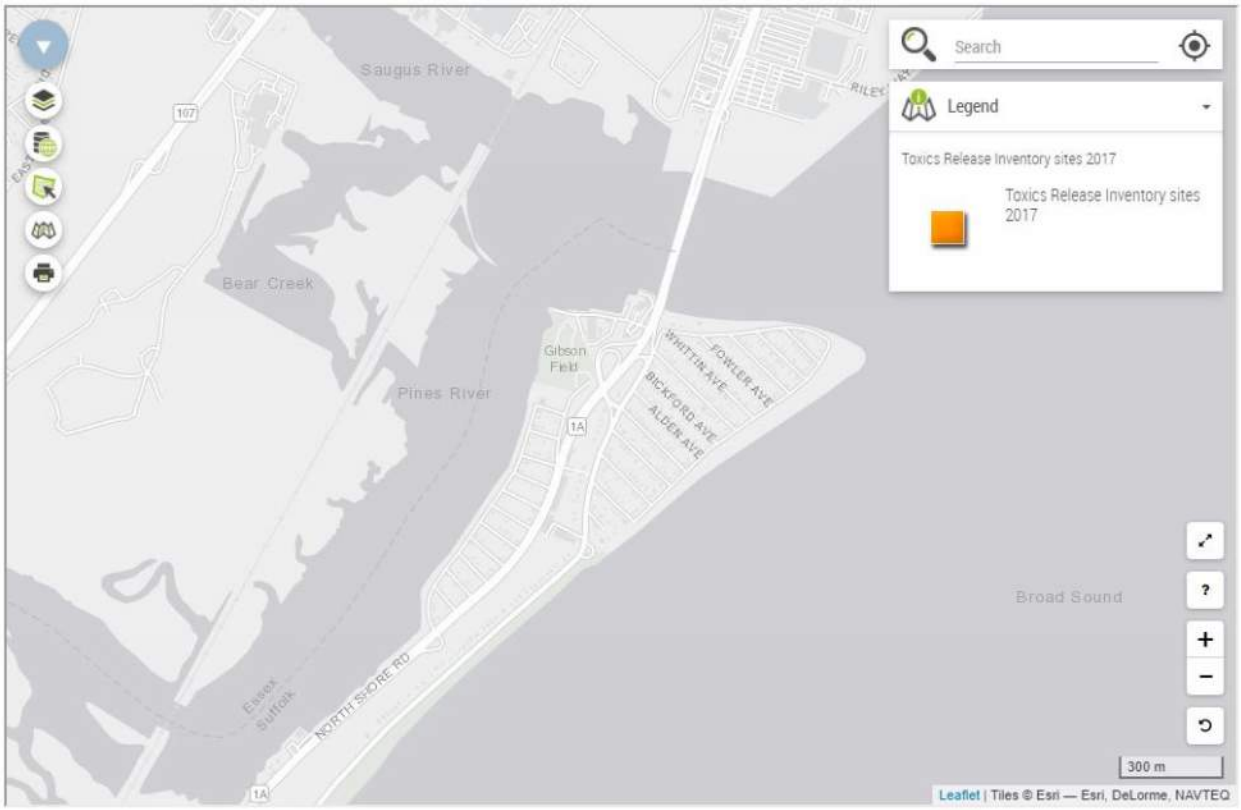
MASSDEP GROUNDWATER DISCHARGE PERMITS



MASSDEP PUBLIC WATER SUPPLIERS



UNDERGROUND STORAGE TANKS



EPA FACILITIES

ATTACHMENT 8
RMAT CLIMATE RESILIENCE DESIGN STANDARDS TOOL PRINTOUT

RMAT Climate Resilience Design Standards Tool Project Report

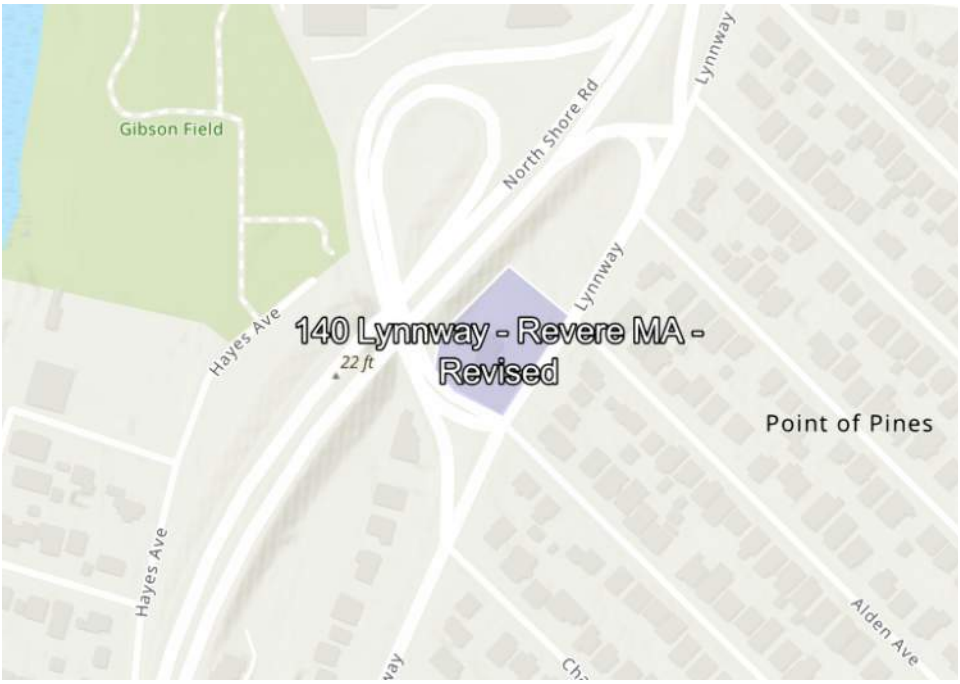
140 Lynnway - Revere MA - Revised
Date Created: 2/24/2022 3:41:24 PM Created By: cemilius Download

Project Summary

Link to Project

Estimated Construction Cost: $10400000.00
End of Life Year: 2052
Project within mapped Environmental Justice population: Yes

Ecosystem Benefits	Scores
Project Score	Low
Exposure	**Scores**
Sea Level Rise/Storm Surge	Moderate Exposure
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Not Exposed
Extreme Heat	High Exposure



Asset Summary

Number of Assets: 1

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
Alden Fire Department	Moderate Risk	High Risk	Low Risk	High Risk

Project Outputs

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Alden Fire Department	2050			50-yr (2%)	Tier 2
Extreme Precipitation					
Alden Fire Department	2050			10-yr (10%)	Tier 2
Extreme Heat					
Alden Fire Department	2050		50th		Tier 2

Scoring Rationale - Exposure

Sea Level Rise/Storm Surge

This project received a "Moderate Exposure" because of the following:

- Exposed to the 1% annual coastal flood event as early as 2030
- Located within the 0.1% annual coastal flood event within the project's useful life
- Not located within the predicted mean high water shoreline by 2030

Extreme Precipitation - Urban Flooding

This project received a "High Exposure" because of the following:

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site

- Existing impervious area of the project site is between 10% and 50%

Extreme Precipitation - Riverine Flooding

This project received a "Not Exposed" because of the following:

- No historic riverine flooding at project site
- The project is not within a mapped FEMA floodplain [outside of the Massachusetts Coast Flood Risk Model (MC-FRM)]
- Project is more than 500ft from a waterbody
- Project is not likely susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Less than 10% of the existing project site has canopy cover
- 10 to 30 day increase in days over 90 deg. F within project's useful life
- Located within 100 ft of existing water body

Scoring Rationale - Asset Risk Scoring

Asset - Alden Fire Department
Primary asset criticality factors influencing risk ratings for this asset:

- Asset can be inaccessible/inoperable more than a week after natural hazard event without consequences
- Less than 10,000 people would be directly affected by the loss/inoperability of the asset
- The building is located in an environmental justice community, and/or does provide services to vulnerable populations
- Inoperability of the asset would be expected to result in minor impacts to people's health, including minor injuries or minor impacts to chronic illnesses
- Cost to replace is less than $10 million
- Impact on natural resources can be mitigated naturally with the inoperability of the asset

Project Design Standards Output

Asset: Alden Fire Department — Building/Facility

Sea Level Rise/Storm Surge — Moderate Risk

Target Planning Horizon: 2050
Intermediate Planning Horizon: Not Applicable
Return Period: 50-yr (2%)

Applicable Design Criteria

Tiered Methodology: Tier 2 (Link)

Tidal Benchmarks: No
Stillwater Elevation: Yes
Design Flood Elevation (DFE): Yes
Wave Heights: Yes
Duration of Flooding: Yes
Design Flood Velocity: Yes
Wave Forces: Yes
Scour or Erosion: No

Extreme Precipitation — High Risk

Target Planning Horizon: 2050
Return Period: 10-yr (10%)

Applicable Design Criteria

Tiered Methodology: Tier 2 (Link)

Total Precipitation Depth for 24-hour Design Storms: Yes
Peak Intensity for 24-hour Design Storms: Yes
Riverine Peak Discharge: No

Riverine Peak Flood Elevation: No
Duration of Flooding for Design Storm: Yes
Flood Pathways: No

Extreme Heat High Risk

Target Planning Horizon: 2050
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 2 (Link)

Annual/Summer/Winter Average Temperature: Yes
Heat Index: Yes
Days Per Year With Max Temperature > 95°F: Yes
Days Per Year With Max Temperature > 90°F: Yes
Days Per Year With Max Temperature < 32°F: Yes
Number of Heat Waves Per Year: Yes
Average Heat Wave Duration (Days): Yes
Cooling Degree Days (Base = 65°F): Yes
Heating Degree Days (Base = 65°F): Yes
Growing Degree Days: No

Project Inputs

Core Project Information

Name:	140 Lynnway - Revere MA - Revised
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2052
Location of Project:	Revere
Estimated Capital Cost:	$10,400,000
Who is the Submitting Entity?	City/Town Revere Cam Gosine (cgosine@brennanconsults.com)
Is this project identified as a priority project in the Municipal Vulnerability Preparedness (MVP) plan or the local or regional Hazard Mitigation Plan (HMP)?	No
Is this project being submitted as part of a state grant application?	No
Which grant program?	
What stage are you in your project lifecycle?	Permitting
Is climate resiliency a core objective of this project?	No
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	No
Brief Project Description:	Redeveloped fire station.
Project Submission Comments:	

Project Ecosystem Benefits

Factors Influencing Output

✓ Project reduces storm damage
✓ Project recharges groundwater
✓ Project filters stormwater using green infrastructure
✓ Project improves water quality

Factors to Improve Output

✓ Incorporate nature-based solutions that may provide flood protection
✓ Protect public water supply by reducing the risk of contamination, pollution, and/or runoff of surface and groundwater sources used for human consumption
✓ Incorporate strategies that reduce carbon emissions
✓ Incorporate nature-based solutions that sequester carbon carbon
✓ Increase biodiversity, protect critical habitat for species, manage invasive populations, and/or provide connectivity to other habitats
✓ Preserve, enhance, and/or restore coastal shellfish habitats
✓ Incorporate vegetation that provides pollinator habitat
✓ Identify opportunities to remediate existing sources of pollution
✓ Provide opportunities for passive and/or active recreation through open space
✓ Increase plants, trees, and/or other vegetation to provide oxygen production
✓ Mitigate atmospheric greenhouse gas concentrations and other toxic air pollutants through nature-based solutions
✓ Identify opportunities to prevent pollutants from impacting ecosystems
✓ Incorporate education and/or protect cultural resources as part of your project

Is the primary purpose of this project ecological restoration?

No

Project Benefits

Provides flood protection through nature-based solutions	No

Reduces storm damage	Yes
Recharges groundwater	Yes
Protects public water supply	No
Filters stormwater using green infrastructure	Yes
Improves water quality	Yes
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	No
Protects land containing shellfish	No
Provides pollinator habitat	No
Provides recreation	No
Provides cultural resources/education	No
Project Climate Exposure	
Is the primary purpose of this project ecological restoration?	No
Does the project site have a history of coastal flooding?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
Does the project site have a history of riverine flooding?	No
Does the project result in a net increase in impervious area of the site?	Yes
Are existing trees being removed as part of the proposed project?	Yes
Project Assets	

Asset: Alden Fire Department
Asset Type: Typically Occupied
Asset Sub-Type: Emergency operations/response building (fire, police, etc.)
Construction Type: New Construction
Construction Year: 2022
Useful Life: 30

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Building may be inaccessible/inoperable more than a week after natural hazard event without consequences

Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss of use or inoperability of the building/facility.
Less than 10,000 people

Identify if the building/facility is located within an environmental justice community or provides services to vulnerable populations.
The building is located in an environmental justice community, and/or provides some services to vulnerable populations (services are not available elsewhere to same population)

If the building/facility became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the building/facility would be expected to result in minor impacts to people's health, including minor injuries or minor impacts to chronic illnesses

If there are hazardous materials in your building/facility, what are the extent of impacts related to spills/releases of these materials?
There are no hazardous materials in the building/facility

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Minor – Inoperability will not likely affect other facilities, assets, or buildings

If this building/facility was damaged beyond repair, how much would it approximately cost to replace?
Less than $10 million

Is this a recreational facility which can be vacated during a natural hazard event?
No

If the building/facility became inoperable for longer than acceptable in Question 1, what are the public and/or social services impacts?
Some alternative programs and/or services are available to support the community

If the building/facility became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
Impact on natural resources can be mitigated naturally

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the building is not able to serve or operate its intended users or function)?
Loss of building may reduce the ability to maintain some government services, while a majority of services will still exist.

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to loss of confidence in government (i.e. the building is not able to serve or operate its intended users or function)?
Reduced morale and public support

Report Comments

N/A

ATTACHMENT 9
EIR DISTRIBUTION LIST

EENF and EIR Distribution List

1. **Massachusetts Environmental Policy Act (MEPA) Office**
   MEPA@mass.gov
   MEPA Office
   100 Cambridge Street, Suite 900
   Boston, MA 02144

2. **MassDEP – Boston Office**
   helena.boccadoro@mass.gov
   Commissioner's Office
   One Winter Street
   Boston, MA 02108

3. **MassDEP – Northeast Regional Office**
   john.d.viola@mass.gov
   Attn: MEPA Coordinator
   205B Lowell Street
   Wilmington, MA 01887

4. **MassDOT – Public/Private Development Unit**
   MassDOTPPDU@dot.state.ma.us
   Public/Private Development Unit
   10 Park Plaza, Suite #4150
   Boston, MA 02116

5. **MassDOT – District 4 Office**
   timothy.paris@dot.state.ma.us
   Attn: MEPA Coordinator
   519 Appleton Street
   Arlington, MA 02476

6. **Metropolitan Area Planning Council**
   mpillsbury@mapc.org
   afelix@mapc.org
   60 Temple Place, 6th Floor
   Boston, MA 02111

7. **Massachusetts Coastal Zone Management**
   robert.boeri@mass.gov
   patrice.bordonaro@mass.gov
   Coastal Zone Management
   Attn: Project Review Coordinator
   251 Causeway Street, Suite 800
   Boston, MA 02114

8. **Division of Marine Fisheries**
   DMF.EnvReview-North@mass.gov
   DMF – North Shore
   Attn: Environmental Reviewer
   30 Emerson Avenue
   Gloucester, MA 01930

9. **Department of Conservation & Recreation**
   andy.backman@mass.gov
   Attn: MEPA Coordinator
   251 Causeway Street, Suite 600
   Boston, MA 02114

10. **EEA Environmental Justice Director - Rishi Reddi**
    MEPA-EJ@mass.gov
    MEPA Office
    Attn: EEA EJ Director
    100 Cambridge Street, Suite 900
    Boston, MA 02144

11. **Department of Public Health**
    dphtoxicology@massmail.state.ma.us
    Director of Environmental Health
    250 Washington Street
    Boston, MA 02115

12. **Massachusetts Water Resource Authority**
    katherine.ronan@mwra.com
    Attn: MEPA Coordinator
    100 First Avenue
    Charlestown Navy Yard
    Boston, MA 02129

13. **City of Revere:**
    a. **City Council**
       Gerry Visconti
       gvisconti@revere.org

    b. **Department of Planning and Community Development**
       Tech Leng
       tleng@revere.org

    c. **Conservation Commission**
       concom@revere.org

    d. **Board of Health**
       Dr. Nathalee Kong
       nkong@revere.org

    e. **Public Library**
       rev@noblenet.org

ATTACHMENT 10
GEOTECHNICAL REPORT

GEOTECHNICAL INVESTIGATION REPORT

PROPOSED ALDEN MILLS/POINT OF PINES FIRE STATION
140 Lynnway
Revere, Massachusetts

Prepared for:

CBI Consultants, LLC
250 Dorchester Avenue
Boston, MA 02127

Prepared by:

John Turner Consulting, Inc.
356 Manchaug Road
Sutton, Massachusetts 01590

JTC Project No. 20-04-114

February 10, 2021

Thomas A. McIntosh III, PE
Senior Geotechnical Engineer
356 Manchaug Road
Sutton, MA 01590
Tmcintosh@consultjtc.com
Ph: (508) 446-6180

Judson Zachar, PE
Director of Geotechnical Engineering
356 Manchaug Road
Sutton, MA 01590
Judsonz@consultjtc.com
Ph: (508) 320-4668

February 10, 2021

Jennifer dos Santos, CDT, MCPPO, Associate A.I.A
Project Manager
CBI Consultants, LLC
250 Dorchester Ave.
Boston, Massachusetts 02127
D: 617.464.6965
C: 978.985.9317
F: 617.464.2971

RE: Geotechnical Investigation Report
Proposed Alden Mills/Point of Pines Fire Station
140 Lynnway
Revere, Massachusetts

Dear Ms. Dos Santos:

In accordance with our proposal and authorization to proceed, John Turner Consulting, Inc. (JTC) has performed a geotechnical investigation for the above captioned project. Presented herein and attached are the results of the site subsurface investigation, and our recommendations regarding the design and construction of the foundation, and other geotechnical related concerns or issues.

We appreciate the opportunity to assist you on this venture and we look forward to working with you on this project through its completion. Please do not hesitate to contact us if you have any questions or require additional information.

Sincerely,
JOHN TURNER CONSULTING, INC.

Thomas A. McIntosh III, PE
Senior Geotechnical Engineer
356 Manchaug Road
Sutton, MA 01590
Tmcintosh@consultjtc.com
Ph: (508) 446-6180

Table of Contents

1.0 INTRODUCTION 3
2.0 PROJECT INFORMATION 3
2.1 Site Description 3
2.2 Proposed Development 3
3.0 GEOTECHNICAL EXPLORATIONS 4
3.1 Subsurface Investigations 4
4.0 GEOTECHNICAL LABORATORY TESTING 5
5.0 GEOTECHNICAL FIELD TESTING - INFILTRATION TESTING 5
5.1 Testing Setup 5
5.2 Infiltration Test Procedure 5
5.3 Infiltration Test Results 6
6.0 SUBSURFACE CONDITIONS 6
6.1 Soils - Borings 6
6.1.1 Asphalt-Concrete Pavement 6
6.1.2 Topsoil/Subsoil 6
6.1.3 Fill 7
6.1.4 Salt Marsh Deposits/Peat 7
6.1.5 Marine Deposits 7
6.2 Bedrock 7
6.3 Groundwater 7
7.0 GEOTECHNICAL ANALYSIS & RECOMMENDATIONS 8
7.1 Removal and Replacement of Fill Option 8
7.2 Placement of Aggregate Piers and/or Rigid Inclusions Option 8
7.3 Site Preparation and Grading 9
7.4 Shallow Foundations and Foundation Walls 10
7.5 Floor Slab-On-Grade 13
7.6 Seismic Considerations 13
7.7 Re-Use of Site Soils 14
7.8 Construction Monitoring and Quality Control Testing 14
7.9 Additional Considerations 15
8.0 CLOSING 16
APPENDIX A: Limitations
APPENDIX B: Recommended Soil Gradation & Compaction Specifications
APPENDIX C: Site Plan & Test Boring Location Plan
APPENDIX D: Test Boring Logs & Key to Symbols and Descriptions
APPENDIX E: Geotechnical Laboratory Testing Reports
APPENDIX F: Site Photographs

1.0 INTRODUCTION

John Turner Consulting, Inc. (JTC) is pleased to present this *Geotechnical Investigation Report* for the proposed Fire Station to be located at 140 Lynnway in Revere, Massachusetts. JTC conducted geotechnical explorations and laboratory testing in January of 2021. Engineering evaluations were completed in general accordance with our proposed scope of services submitted to CBI Consultants, LLC on December 08, 2021. Our work was authorized on January 28, 2021.

The purpose of the geotechnical investigation was to obtain information on the subsurface conditions at the site and to provide geotechnical engineering recommendations to support the planning, design, and construction of the proposed development. This investigation did not include an assessment relative to oil, gasoline, solid waste, and/or other hazardous materials. Similarly, this investigation/evaluation did not include review of site design or construction issues such as infiltration systems, dry wells, underground utilities, protection of existing structures, retaining walls, temporary excavation support, and/or other site/temporary design issues unless specifically addressed herein.

This report summarizes available project information, presents the geotechnical exploration and laboratory testing programs, describes the subsurface conditions encountered, and provides geotechnical engineering recommendations to support the planning, design, and construction of the proposed development. The contents of this report are subject to the attached *Limitations*.

2.0 PROJECT INFORMATION

The following subsections provide general descriptions of the site, the regional geologic setting, and the proposed development.

2.1 Site Description

The site is presently occupied by the existing Fire Station and paved driveway, centrally located within a 15,283 s.f., irregularly shaped, property. The existing building will be demolished to make way for the new facility. The site is bounded by the Lynnway and MBTA access roadway to the south and east, the route 1A southbound on ramp to the west, and Massachusetts Route 1A to the north. The site is generally flat and level with grades ranging from EL.10.0± feet to EL. 12.0± feet. A highway berm rises approximately 18 feet from the northern edge of the property to the Route 1A roadway surface. The site is situated on a peninsula surrounded by the Atlantic Ocean.

2.2 Proposed Development

JTC understands the proposed development involves the construction of a new, 3-story facility, access road constructed at the north side of the building and connecting into the existing MBTA traffic circle, and associated parking areas. The existing fire station will be demolished. The intent is to support the building on conventional shallow spread footing foundations and a slab-on-

grade, i.e., no basement. The development will also include associated stormwater infiltration areas.

The site is generally flat and level and will require only minor cuts and/or fills of up to about 2 feet within the building site.

Preliminary structural loading has not been provided, however, based on JTC's experience with this type of construction we are anticipating the following approximate loading conditions:

- Exterior strip/wall footing loads will be on the order of 5 kips per linear foot or less;
- Column loads will range generally range from 100 to 150 kips;
- Live loads applied to the floor slab-on-grade will be on the order of 150 pounds per square foot (psf) or less.

3.0 GEOTECHNICAL EXPLORATIONS

3.1 Subsurface Investigations

JTC subcontracted Soil Exploration Corp. to drill eight (8) geotechnical test borings (designated as B-1 through B-8, inclusive) via a truck-mounted Mobile B-57 drill rig. Test borings were drilled within close proximity to borings B-6 and B-7 for infiltration testing. Test boring B-4 was reinstated as a monitoring well with the well screen placed at 15.0 feet below the ground surface. JTC directed the drilling, testing, and sampling activities and logged the subsurface conditions encountered at each exploration location. The test boring locations were selected in relation to the existing site features and proposed development. The attached *Exploration Location Plan* depicts the approximate test boring locations.

The test borings were advanced to depths ranging from 9 to 27.0 feet below the ground surface (bgs) utilizing 4¼-inch inside-diameter continuous-flight hollow-stem-augers. As the borings were advanced, standard penetration tests (SPTs) were conducted at regular intervals and soil samples were obtained via 2-inch outside-diameter split-spoon samplers driven by a 140-pound safety (SAFE-T) hammer. SPTs were performed in general accordance with ASTM D1586, Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.

Selected soil samples were sealed in moisture-tight containers and returned to JTC's office for further review, classification, and/or geotechnical laboratory testing. Detailed records of the drilling/excavation, testing, sampling performed, and the soil, bedrock, and groundwater conditions observed at each test boring location are provided on the attached *Test Boring Logs*.

4.0 GEOTECHNICAL LABORATORY TESTING

JTC selected representative soil samples for geotechnical laboratory testing at our in-house laboratory. The following tests were performed:

- 7 Moisture contents;
- 7 Particle-size analyses;
- 2 Atterberg Limits tests;
- 4 hydrometer tests.

Geotechnical laboratory testing was performed in general accordance with ASTM procedures. Test results are provided on the attached *Geotechnical Laboratory Testing Reports*.

5.0 GEOTECHNICAL FIELD TESTING - INFILTRATION TESTING

JTC performed infiltration tests at the bottom of borings B-6 [IT-1] and B-7 [TP-2.] Testing was performed in accordance with the Massachusetts Stormwater Handbook: Volume 3, Chapter 1.

5.1 Testing Setup

At the bottom of each test pit, a clean, flat surface was prepared in the native soils approximately 4.75 feet bgs. A 4-inch diameter Schedule 40 PVC pipe was placed on the testing surface and the surrounding soils were tamped and secured around the pipe. Subsequently, JTC added approximately 2 inches of fine gravel inside the PVC pipe to prevent scouring and hydraulic conductivity laterally during testing. A 2 feet head of water was added to the pipe on January 19, 2021 and the soils left to soak for the next 24 hours.

5.2 Infiltration Test Procedure

JTC returned to the site the following day to perform infiltration testing at the prepared locations. The testing procedure consisted of:

- Filling the pipes with water to a depth of 2 feet above the bottom of pipe;
- Taking regular water level measurements over the following hour;
- Refilling the water after each hour and repeating the process for a total of four cycles.

5.3 Infiltration Test Results

The test results are summarized in the following tables:

Summary of Infiltration Testing

Infiltration Test #	Proximal Boring Designation	Depth (feet bgs)	Soil Type	Measured Infiltration Rate (in/hr)				Average Measured Rate (in/hr)
				Trial 1	Trial 2	Trial 3	Trial 4	
IT-1	B-6	4.75	SC-SM	**0.125**	**0.125**	**0.125**	**0.125**	**0.125**
IT-2	B-7	4.75	SC-SM	**4.8**	**4.32**	**4.0**	**2.88**	**4.0**

As presented in the tables above, JTC concludes that the silty clayey Sand (SC-SM) with gravel encountered at boring locations B-6/IT-1 and B-7/IT-2 exhibited infiltration rates of approximately 0.125 in/hr and 4.0 inches/hr, respectively.

No factors of safety have been applied to the measured rates presented in the table. JTC recommends applying a minimum safety factor of 2 to the measured rates for design purposes.

6.0 SUBSURFACE CONDITIONS

The following subsections describe the site soil, bedrock, and groundwater conditions encountered, based on results of the geotechnical explorations and laboratory testing. Detailed descriptions of the conditions observed at each test boring are provided on the attached *Test Boring Logs*.

6.1 Soils - Borings

The overburden soils encountered at the test boring locations appear to be consistent with those described by the published geologic data. The primary soil strata are briefly described in the paragraphs below.

6.1.1 Asphalt-Concrete Pavement

Asphalt-concrete pavement was encountered at the ground surface of test boring B-8. The pavement was approximately 3 inches thick and was underlain by approximately 6 inches of granular pavement base.

6.1.2 Topsoil/Subsoil

Topsoil materials were encountered at the ground surface of borings B-1 through B-7. The Topsoil

consisted of brown sandy Silt (ML), with organics, rootlets and trace gravel. Where encountered, the thickness of the Topsoil was approximately 6 to 10 inches.

6.1.3 Fill

Fill materials were encountered beneath the asphalt-concrete pavement and/or topsoil at each test boring location. The Fill typically consisted of dark tan, silty clayey Sand (SC-SM) with gravel and dark, tan silty clayey Sand (SC-SM). Isolated layers of silty Sand (SM) with gravel and tan clayey Sand (SC) were observed in boring B-4 and B-5. Borings B-6 and B-7 were terminated in the fill at a depth of 9.0 feet bgs. The Fill was typically loose to medium dense based on SPT N-values.

6.1.4 Salt Marsh Deposits/Peat

Dark brown, fibrous Peat (PT) was observed within borings B-1 through B-4 from 7.5 feet to 10.0 feet bgs. Where encountered the peat was no more than 6 inches thick. The Peat was typically loose based on SPT N-values.

6.1.5 Marine Deposits

Marine Deposits consisting of grey Gravel with sand (GP); grey, silty Sand (SM); and grey Sand (SP-SC) with silty clay were encountered underlying the Fill to the full depth of boring at boring locations B-1 through B-5 and B-8. silty sand (SM) with little gravel were encountered beneath the Urban Fill in all boring locations with the exception of borings B-4 and B-4a. This stratum is interpreted to be Glacial Till and was about 2 to 8.5 feet thick. The Glacial Till was described as medium dense to very dense based on observations of drilling.

6.2 Bedrock

Practical refusal to further penetration of the augers and/or split-spoon sampler was not encountered at any boring location. Bedrock is not anticipated to impact construction.

6.3 Groundwater

Groundwater was encountered at all boring locations at a depth of 7.0 feet to 9.0 feet bgs at the time of drilling and upon completion of the drilling operations. Short-term (i.e., during drilling, upon completion of drilling, and/or a few hours after drilling) water levels observed in test borings performed in silty soils should be considered approximate.

JTC estimates that this investigation occurred during a period of seasonally normal to low ground water. Site groundwater levels should be expected to fluctuate seasonally and in response to precipitation events, construction activity, site use, and adjacent site use.

7.0 GEOTECHNICAL ANALYSIS & RECOMMENDATIONS

The evaluation of the site and the proposed development was based on the subsurface conditions encountered at the geotechnical test borings, results of geotechnical laboratory testing, preliminary site plans, and preliminary/assumed structural loading conditions, as described herein.

The Topsoil, Fill, and Peat materials are not suitable for direct support of shallow foundations. As such, JTC recommends that ground improvements [e.g., removal and replacement (R&R) of Existing Fill and/or installation of Aggregate Piers/Rigid Inclusions] be implemented to provide suitable bearing/support for shallow foundations and/or to minimize post-construction settlement of shallow foundations. Subsequent to the recommended ground improvements (i.e., R&R, Aggregate Piers/Rigid Inclusions, and/or equivalent), JTC believes that the proposed building can be supported on a system of continuous and/or isolated shallow spread footings bearing on Structural Fill and/or improved subgrade soils, provided that the design and construction recommendations presented herein are satisfied.

7.1 Removal and Replacement of Fill Option

R&R of unsuitable soils within/beneath a proposed building pad is a common ground improvement method. R&R for the proposed development would involve the removal/excavation of all Existing Fill and Former Topsoil materials. These excavations/over-excavations would generally extend 7 to 10 feet bgs across the proposed building pad (i.e., footprint of the addition, plus about 5 to 10 feet laterally, as needed to accommodate the footing zone of influence, as described herein). These excavations/over-excavations may require temporary excavation to protect the existing site features and existing sidewalks.

The Fill material may be suitable to remain in place beneath the floor-slab-on-grade provided:

- The Existing Fill is subjected to proof-rolling densification with a minimum 10-ton vibratory roller utilizing a crisscross pattern of at least 8 passes. JTC should directly observe the proof-rolling/densification efforts to check for areas of instability, which are typically evidenced by pumping or weaving. Any unstable areas should be over-excavated and replaced with Structural Fill.
- JTC reviews the excavations/over-excavations for the footings/FZOI. Any organics, compressible matter, and other unsuitable materials observed will be subject to complete removal and replacement with Structural Fill.

7.2 Placement of Aggregate Piers and/or Rigid Inclusions Option

Alternatively, ground improvements consisting of Aggregate Piers and/or Rigid Inclusions may be considered. For this site, the boulders observed in the Fill may require selective excavation to facilitate the installation of Aggregate Piers and/or Rigid Inclusions. In general, Aggregate

Pier/Rigid Inclusion foundation elements would be constructed by drilling (or displacing) 18-inch to 30-inch diameter cavities through the Fill and into the underlying native Glacial Till. The cavities are then backfilled with crushed stone that is densified with impact and/or vibratory compaction. The densification process pushes the crushed stone radially outward into the sidewalls of the cavities and thereby increasing the lateral stresses in the matrix soil surrounding the Aggregate Pier elements. The end product is the formation of very stiff aggregate elements that are extremely efficient in providing foundation support and reducing foundation settlement. Aggregate Piers are sometimes grouted (via Portland cement) where soft and/or organic soils are present. And, in some cases, the cavities are backfilled with concrete. The grouted and/or concrete elements are even stiffer than the traditional Aggregate Pier and are commonly referred to as Rigid Inclusions. Aggregate Piers and/or Rigid Inclusions are typically designed and constructed by a specialty design-build firm and/or Geo-Contractor. Some products included patented/licensed technology. The design of Aggregate Piers/Rigid Inclusions and/or equivalent should be completed by a Professional Engineer licensed in Massachusetts. The design should be provided as a *Technical Submittal*.

7.3 Site Preparation and Grading

Site preparation and grading should be performed in accordance with the following procedures:

- A geotechnical engineer should directly observe site preparation and grading activities;
- The site soils contain substantial proportions of fine sand, and silt, and may degrade and/or become unworkable when subjected to construction traffic or other disturbance during wet conditions. As such, site preparations, grading, and earthworks should be performed during a dry season if possible. The Contractor shall be aware of these conditions and must take precautions to minimize subgrade disturbance. Such precautions may include diverting storm run-off away from construction areas, reducing traffic in sensitive areas, minimizing the extent of exposed subgrade if inclement weather is forecast, backfilling excavations and footings as soon as practicable, grading (and compacting) exposed subgrades to promote surface water run-off, and maintaining an effective dewatering program, as necessary. Over-excavation to remove degraded or unworkable subgrade soils should be anticipated and budgeted (cost and schedule);
- Any existing buildings, structures, and/or associated foundations (including footings, foundation walls, slabs-on-grade, and/or basements) should be completely removed from proposed building and pavement areas and replaced/backfilled with properly placed and compacted *Structural Fill;*
- Any existing subsurface utilities and underground structures should be completely removed from the footprint of the proposed building and replaced/backfilled with properly placed and compacted *Structural Fill.* Any existing subsurface utilities in proposed pavement areas should be removed and/or appropriately abandoned in place (e.g., pressure grouting), as approved by the on-site geotechnical engineer;
- The site should be cleared and stripped of any existing asphalt-concrete pavement not

designated to remain; existing trees/vegetation not designated to remain; Topsoil, rootmat, forest mat; loamy/organic-laden Subsoil; and any otherwise unsuitable materials;

- In cut areas, the final foot of excavation should be performed using a smooth-edged cutting bucket (no teeth) to minimize subgrade disturbance;
- Following clearing, stripping, and/or cutting, the exposed subgrade soils should be proof-rolled with successive passes aligned perpendicularly. The proof-rolling/densification of the Existing Fill within the building pad (i.e., the building footprint plus about 5 feet laterally) should occur prior to the R&R operations for the proposed footings. Within the building pad, the exposed subgrade should be proof-rolled and subject to vibratory densification via at least 8 passes using a large (10-ton) smooth-drum roller and a crisscross pattern. Proof-rolling/densification should not be performed if/when the exposed subgrade soils are wet (i.e., due to presence of groundwater, stormwater, perched water, etc.) because this may result in soil pumping and instability. Therefore, the proof-rolling efforts, including the number of passes and whether to employ static or vibratory methods, should be directed by the on-site geotechnical engineer;
    - Any loose, soft, wet, and/or otherwise unsuitable soils (typically evidenced by rutting, pumping, and/or deflection of the subgrade) should be over-excavated to expose suitable soils, or other remedial measures should be taken, as approved by the on-site geotechnical engineer; and
    - The over-excavation should then be backfilled with properly placed and compacted *Structural Fill*.
- *Structural Fill* should be used for subgrade fill in the building pad. The placement of *Structural Fill* materials to achieve design subgrades in the building pad should not begin until the exposed subgrade soils have been directly observed and approved by the on-site geotechnical engineer;
- *Common Fill* is acceptable for subgrade fill in parking and driveway areas. The placement of *Common Fill* materials to achieve design subgrades in pavement areas should not begin until the exposed subgrade soils have been directly observed and approved by the on-site geotechnical engineer; and
- *Structural Fill* and *Common Fill* materials and placement and compaction requirements are provided in the attached Specifications.

7.4 Shallow Foundations and Foundation Walls

Based on the subsurface conditions encountered at the exploration locations and our current understanding and assumptions relative to the proposed development, the following foundation design recommendations are provided [note that the recommendations for shallow foundations assume that the recommended ground improvements (i.e. Remove & Replace, Aggregate Piers/Rigid Inclusions, and/or equivalent) will be completed]:

- The Urban Fill materials are not suitable for direct support of shallow foundations.

- The building can be supported on a system of continuous and/or isolated shallow spread footings bearing on improved Urban Fill and/or on *Structural Fill* or crushed stone built-up from properly prepared native soil subgrades;
- Following ground improvements (Rammed/Grouted Aggregate Piers and/or equivalent), shallow foundations may be designed using an allowable bearing pressure of approximately 5,000 psf. [An allowable bearing pressure of 3,000 psf may be used if the method of ground improvement is R&R only (i.e. Aggregate Piers/Rigid Inclusions are not used)]. Design bearing pressures may be increased by one-third (⅓) when considering seismic and or transient wind loading conditions;
- Continuous wall footings should have a minimum width of 2 feet. Isolated column footings should have a minimum width of 3 feet;
- Exterior footings should be founded at least 4 feet below the lowest adjacent grade to provide adequate frost protection. Interior footings in heated portions of the building should be founded at least 2 feet below FFE;
- Total post-construction settlements due to applied foundation loads are estimated to be on the order of 1 inch or less, based on strip footing widths and column footing widths of up to 3 feet and 5 feet, respectively. Differential settlements along continuous wall footings and/or between isolated column footings are estimated to be on the order of 0.5 inches or less. The estimated settlements and resulting angular distortion are anticipated to be within the allowable limits for this type of structure; and
- Recommended lateral earth pressures and friction factors for unbalanced/basement walls are provided in the attached *Specifications*.

Recommendations for shallow foundation subgrade preparation and construction are provided as follows:

- A geotechnical engineer or his/her representative should directly observe foundation subgrade preparation activities;
- If shallow and/or perched groundwater is encountered, it must be continuously maintained at least 2 feet below the bottom of excavation and subsequent construction grade until the backfilling is complete;
- The native foundation subgrade soils will be sensitive to moisture and will readily disturb or soften if exposed to wet conditions during construction activities. Therefore, the final foot, at a minimum, of excavation for foundations should be performed using a smooth-edged cutting bucket (no teeth) to minimize subgrade disturbance. Furthermore, the exposed foundation subgrade should be protected with an 8-inch (minimum) thick layer of ¾-inch minus crushed stone encased in a geotextile fabric (e.g., Mirafi 140N or equal). The crushed stone shall be placed immediately upon exposure of the native foundation subgrade soils and densified with a plate compactor until exhibiting stable conditions. The purpose of the crushed stone is to protect the fine-grained subgrade soils from disturbance, facilitate construction dewatering (if necessary), and provide a dry/stable

subgrade upon which to progress construction

- Prior to setting forms and placing reinforcing steel, a geotechnical engineer should directly observe footing subgrades;
    - Footing subgrades should be level or suitably benched and free of standing water and/or debris;
    - Loose, soft, wet, frozen, or otherwise unsuitable soils should either be re-compacted or over-excavated to a suitable subgrade, as approved by the on-site geotechnical engineer; and
    - Over-excavations should be backfilled with properly placed and compacted *Structural Fill* as approved by the on-site geotechnical engineer.
- Foundation subgrade soils should be protected against physical disturbance, precipitation, and/or frost throughout construction. Surface water run-on/run-off should be diverted away from open foundation excavations. The Contractor shall ultimately be responsible for the means and methods to protect the foundation subgrade during construction;
- Interior footings, piers, and/or walls and the interior side of balanced perimeter foundation walls should be backfilled with *Clean Granular Fill* and/or 3-inch minus material meeting the requirements of *Structural Fill,* as described in the attached *Tables*;
- Exterior footings, piers, and the exterior side of balanced foundation walls should be backfilled with non-frost-susceptible fill in order to mitigate potential adverse effects of frost. Backfill for exterior footings, piers, and foundation walls should consist of well-graded, free-draining, granular soil conforming to the requirements of *Clean Granular Fill*, as described in the attached *Specifications*. Alternatively, a suitable bond break (such as rigid polystyrene insulation) may be provided as approved by the on-site geotechnical engineer. In this case, footings and walls (excluding unbalanced/basement walls) may be backfilled with *Common Fill* (see attached *Specifications*) having a maximum particle-size of 3 inches, as approved by the on-site geotechnical engineer;
- Should bedrock be encountered during excavation for interior or exterior footings, JTC recommends that the bedrock be overexcavated a minimum of 12" and backfilled with compacted *Structural Fill* (see attached *Specifications*) to provide a "cushion" and level bearing surface for the proposed footing.
- Backfill for footings and foundation walls should be placed in uniform horizontal lifts having a maximum loose lift thickness of 8 inches and compacted to 95 percent of its modified proctor maximum dry density (MPMDD; per ASTM D1557). Thinner lifts may be required in order to achieve the required compaction criteria; and
- To minimize the potential for foundation wall damage during the backfill and compaction activities, it is recommended that foundation wall backfill be placed in a manner that maintains a balanced fill height on both sides of the wall (up to the final exterior grade).

7.5 Floor Slab-On-Grade

Design recommendations for the floor slab-on-grade are provided as follows:

- A modulus of vertical subgrade reaction, k_{vi}, of 125 pounds per cubic inch (pci) should be available for structural design of the floor slabs-on-grade, provided that the subgrade, *Structural Fill*, and the *Crushed Stone Base* are prepared as recommended in Subsections 7.0, 7.1, 7.2, and 7.3;
- Basement floor slabs-on-grade should be underlain by a minimum 9-inch thick layer of 1-inch minus *Crushed Stone* to provide a capillary break and a stable working surface. Non-basement floor slabs-on-grade may be underlain by a minimum 9-inch thick layer of *Clean Granular Fill* to provide a capillary break and a stable working surface.
- The floor slab should be isolated structurally from foundation walls and columns/piers to allow for differential movement; and
- The need/desire to provide a moisture/vapor barrier beneath floor slab-on-grade should be evaluated by the architect and/or the structural engineer, based on the building's specific interior usage requirements.

During construction, we expect that much of the building footprint will be excavated or disturbed during site preparation and grading (Subsection 7.3), excavations for shallow foundations (Subsection 7.4), and/or excavations for new underground utilities. It is imperative that the subgrade beneath the floor slab-on-grade be reinstated with properly placed and compacted *Structural Fill* and/or prepared as recommended herein. Additionally:

- A geotechnical engineer should directly observe the subgrade soils prior to the placement of the recommended *Crushed Stone* base course;
  - The subgrade should be level and free of standing water and/or debris;
  - Loose, soft, wet, frozen, or otherwise unsuitable soils should either be re-compacted or over-excavated to a suitable subgrade, as approved by the on-site geotechnical engineer; and
  - Over-excavations should be backfilled with properly placed and compacted *Structural Fill*.
- The *Crushed Stone* base course should not be placed until the subgrade has been reviewed by the on-site geotechnical engineer. Subsequently, the Clean Granular Fill should be compacted to the satisfaction of the geotechnical engineer to 95% of its MPMDD.

7.6 Seismic Considerations

Earthquake loadings must be considered under the requirements of the current edition of the Massachusetts Building Code (MA-Code) which refer to the 2015 edition of the International Building Code (IBC). IBC Table 1613.5.2 is used to establish the site class based on the average

soil properties and soil profile. Site class is then used to determine the site coefficient and mapped spectral response for a given structure. Based on the conditions encountered at the test boring locations, the site is classified as:

Site Class D: Stiff Soil Profile.

Liquefaction refers to the loss of strength in saturated cohesionless soils due to the buildup of pore water pressures during cyclic or seismic loading. Based on the conditions encountered at the test boring locations, the site is NOT considered to be susceptible to liquefaction.

7.7 Re-Use of Site Soils

The Topsoil and Fill materials encountered at the exploration locations are not expected to be suitable for re-use as *Structural Fill, Clean Granular Fill*.

Some of the Fill encountered at the test boring locations may be suitable for re-use as *Common Fill,* provided that it is appropriately segregated from excessively silty fill, oversized boulders, debris/fragments, and/or otherwise unsuitable materials.

7.8 Construction Monitoring and Quality Control Testing

A qualified engineer or representative should be retained to review the site and subgrade operations, as required by Section 1705 of the Massachusetts State Building Code (MA-Code). Similarly, quality control testing, including in-place field density and moisture tests, should be performed to confirm that the specified compaction is achieved. It is recommended that JTC be retained to provide earthwork construction monitoring and quality control testing services.

Quality control testing recommendations are provided as follows:

- During site grading and foundation subgrade preparation, 3 field density tests should be performed for every 4,000 square feet (per lift) of *Structural Fill* placement, at a minimum. At least 3 tests should be performed on each lift of material even if the lift is less than 4,000 square feet;
- During foundation wall backfilling, 3 field density tests should be performed for every 100 linear feet (per lift) of fill placement, at a minimum. At least 3 tests should be performed on each lift of material even if the lift is less than 100 linear feet;
- During placement and compaction of *Clean Granular Fill* as the base course below sidewalks, 3 field density tests should be performed for every 4,000 square feet of placement. At least 3 tests should be performed on each lift of material even if the lift is less than 4,000 square feet;
- During backfilling of utility trenches, at least 1 test should be conducted on *Structural Fill* per 50 linear feet (per lift) of trench; and

During site grading and pavement subgrade preparation, 3 field density tests should be

performed for every 4,000 square feet (per lift) of *Common Fill*, at a minimum. At least 3 tests should be performed on each lift even if the lift is less than 4,000 square feet.

7.9 Additional Considerations

Additional design recommendations are provided as follows:

- Exterior concrete sidewalks shall be underlain by at least 12 inches of *Clean Granular Fill*. The thickness of the *Clean Granular Fill* shall be increased to no less than 18 inches for exterior concrete slabs located adjacent to exterior doorways and ramps to provide additional frost protection at building entry/exit points;
- Roof drains or similar features should be provided to collect roof run-off and prevent ponding near the building. Roof drains and other stormwater controls should not discharge to foundation drains;
- The exterior ground surface adjacent to the building should be sloped away from the building to provide for positive drainage. Similarly, the final surface materials adjacent to the building should be relatively impermeable to reduce the volume of precipitation infiltrating into the subsurface proximate to building foundations. Such impermeable materials include cement concrete, bituminous concrete, and/or vegetated silty/clayey topsoil; and
- Permanent fill or cut slopes should have a maximum slope of 2.5H:1V (horizontal to vertical) or flatter for dry conditions. Permanent fill or cut slopes should be no steeper than 3H:1V for wet/submerged conditions (e.g., stormwater basin) unless a properly designed surface slope stabilization system (e.g. rip rap, geosynthetics) is provided.

Additional construction considerations/recommendations are provided as follows:

- Safe temporary excavation and/or fill slopes are the responsibility of the Contractor. Excavations should be conducted in accordance with local, state, and federal (OSHA) requirements, at a minimum. If an excavation cannot be properly sloped or benched due to space limitations, adjacent structures, and/or seepage, the Contractor should install an engineered shoring system to support the temporary excavation;
- Subgrade conditions will be influenced by excavation methods, precipitation, stormwater management, groundwater control(s), and/or construction activities. Most of the site soils are poorly-drained, moisture-sensitive, and considered susceptible to disturbance when exposed to wet conditions and construction activities. As such, the Contractor shall be aware of these conditions and must take precautions to minimize subgrade disturbance. Such precautions may include diverting storm run-off away from construction areas, reducing traffic in sensitive areas, minimizing the extent of exposed subgrade if inclement weather is forecast, backfilling excavations and footings as soon as practicable, and maintaining an effective dewatering program, as necessary;
- Proper groundwater control and stormwater management are necessary to maintain site

stability. Groundwater should be continuously maintained at least 2 feet below the working construction grade until earthworks and/or backfilling are complete;

- If groundwater seepage and/or wet soils due to shallow groundwater are observed, a ¾-inch minus crushed stone base should be placed atop the exposed subgrade soils. The stone should be immediately placed atop the undisturbed subgrade and then tamped with a plate compactor until exhibiting stable conditions. The stone shall be protected, as required, with a geotextile filter fabric such as Mirafi 140N or equal. The purpose of the stone base is to protect the wet subgrade, facilitate dewatering, and provide a dry/stable base upon which to progress construction; and
- All slopes should be protected from erosion during (and after) construction.

8.0 CLOSING

We trust the contents of this report are responsive to your needs at this time. Should you have any questions or require additional assistance, please do not hesitate to contact our office.

APPENDIX A: LIMITATIONS

Explorations

1. The analyses and recommendations presented in this report are based in part upon the data obtained from widely-spaced subsurface explorations. Subsurface conditions between exploration locations may vary from those encountered at the exploration locations. The nature and extent of variations between explorations may not become evident until construction. If variations appear, it will be necessary to re-evaluate the recommendations of this report.
2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely-spaced explorations and samples; actual strata transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.
3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Review

4. It is recommended that John Turner Consulting, Inc. be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the geotechnical engineering recommendations provided herein.
5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and conclusions of the report modified or verified in writing by John Turner Consulting, Inc.

Construction

6. It is recommended that John Turner Consulting, Inc. be retained to provide geotechnical engineering services during the installation phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

7. This report has been prepared for the exclusive use of CBI Consultants, LLC for specific application to the project located at 140 Lynnway - Revere, Massachusetts. All considerations are based on the available information and is in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.
8. This report has been prepared for this project by John Turner Consulting, Inc. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to preliminary geotechnical design considerations.

APPENDIX B: RECOMMENDED SOIL GRADATION & COMPACTION SPECIFICATIONS

TABLE 1: Structural Fill

SIEVE SIZE	PERCENT PASSING BY WEIGHT
5-inch	100
¾-inch	60 - 100
No. 4	20 - 80
No. 200	0 - 10

NOTES:

1. For use as structural load support below foundations and within the building pad. Structural Fill placed beneath building foundations should include the Footing Zone of Influence which is defined as that area extending laterally one foot from the edge of the footing then outward and downward at a 1:1.5 (H:V) splay.
2. ¾-inch crushed stone may be used in wet conditions.
3. Structural Fill should be free of construction and demolition debris, frozen soil, organic soil, peat, stumps, brush, trash, and refuse;
4. Structural Fill should not be placed on soft, saturated, or frozen subgrade soils;
5. Structural Fill should be placed in lifts not exceeding 12 inches for heavy vibratory rollers and 8 inches for vibratory plate compactors.
6. Place and compact within ± 3% of optimum moisture content.
7. Compact to at least 95% relative compaction per ASTM D1557.
8. The adequacy of the compaction efforts should be verified by field density testing.

TABLE 2: Clean Granular Fill

Clean SIEVE SIZE	PERCENT PASSING BY WEIGHT
3-inch	100
¾-inch	60 – 90
No. 4	20 – 70
No. 200	2 – 8

NOTES:

1. For minimum 9-inch base below floor slab-on-grade.
2. For minimum 18-inch base for exterior concrete slabs exposed to frost.
3. For minimum 24-inch base at exterior ramps, aprons, and loading bays adjacent to entrances/exit ways.
4. For use as footing and foundation wall backfill.
5. For use as backfill behind unbalanced foundation/retaining walls.
6. Place in lifts not exceeding 12 inches for heavy vibratory rollers and 8 inches for vibratory plate compactors.
7. Place and compact within ± 3% of optimum moisture content.
8. Compact to at least 95% relative compaction per ASTM D1557.
9. Compaction efforts should be verified by field density testing.
10. Compact to at least 95% relative compaction per ASTM D1557 when placed as foundation wall backfill in conjunction with a bond break.
11. Compaction efforts should be verified by field density testing.

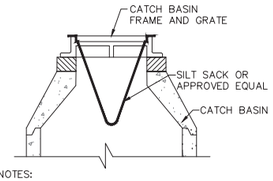
TABLE 3: Common Fill

SIEVE SIZE	PERCENT PASSING BY WEIGHT
6-inch	100
¾-inch	60 – 100
No. 4	20 – 85
No. 200	0 – 25

NOTES:

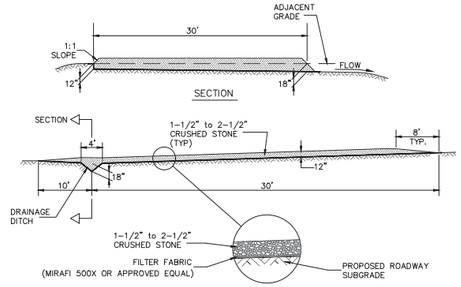
1. For use as common/subgrade fill in parking areas and roadway embankments.
2. For use as foundation wall backfill if used in conjunction with a bond break and sized/screened to 3-inch minus.
3. Place in lifts not exceeding 12 inches.
4. Maximum stone size should not exceed ½ the actual lift thickness.
5. Compact to at least 92% relative compaction per ASTM D1557 when placed as subgrade fill in parking areas or roadway embankments.
6. Compact to at least 95% relative compaction per ASTM D1557 when placed as foundation wall backfill in conjunction with a bond break.
7. Compaction efforts should be verified by field density testing.

APPENDIX C: SITE PLAN & TEST BORING LOCATION PLAN

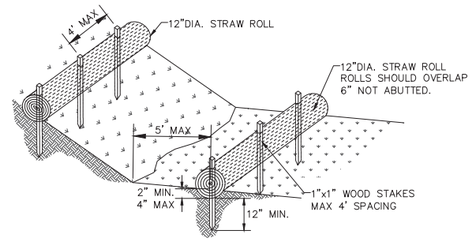


NOTES:
1. TO BE INSTALLED IN ALL CATCH BASINS THAT COULD RECEIVE RUNOFF FROM DISTURBED AREAS UNTIL COMPLETION OF CONSTRUCTION.

SILT SACK DETAIL
NOT TO SCALE



TEMPORARY CONSTRUCTION ENTRANCE DETAIL
NOT TO SCALE



STRAW WATTLE DETAIL
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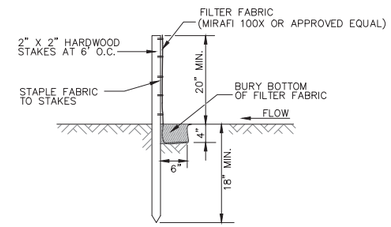
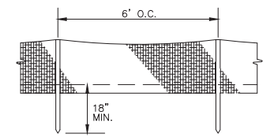
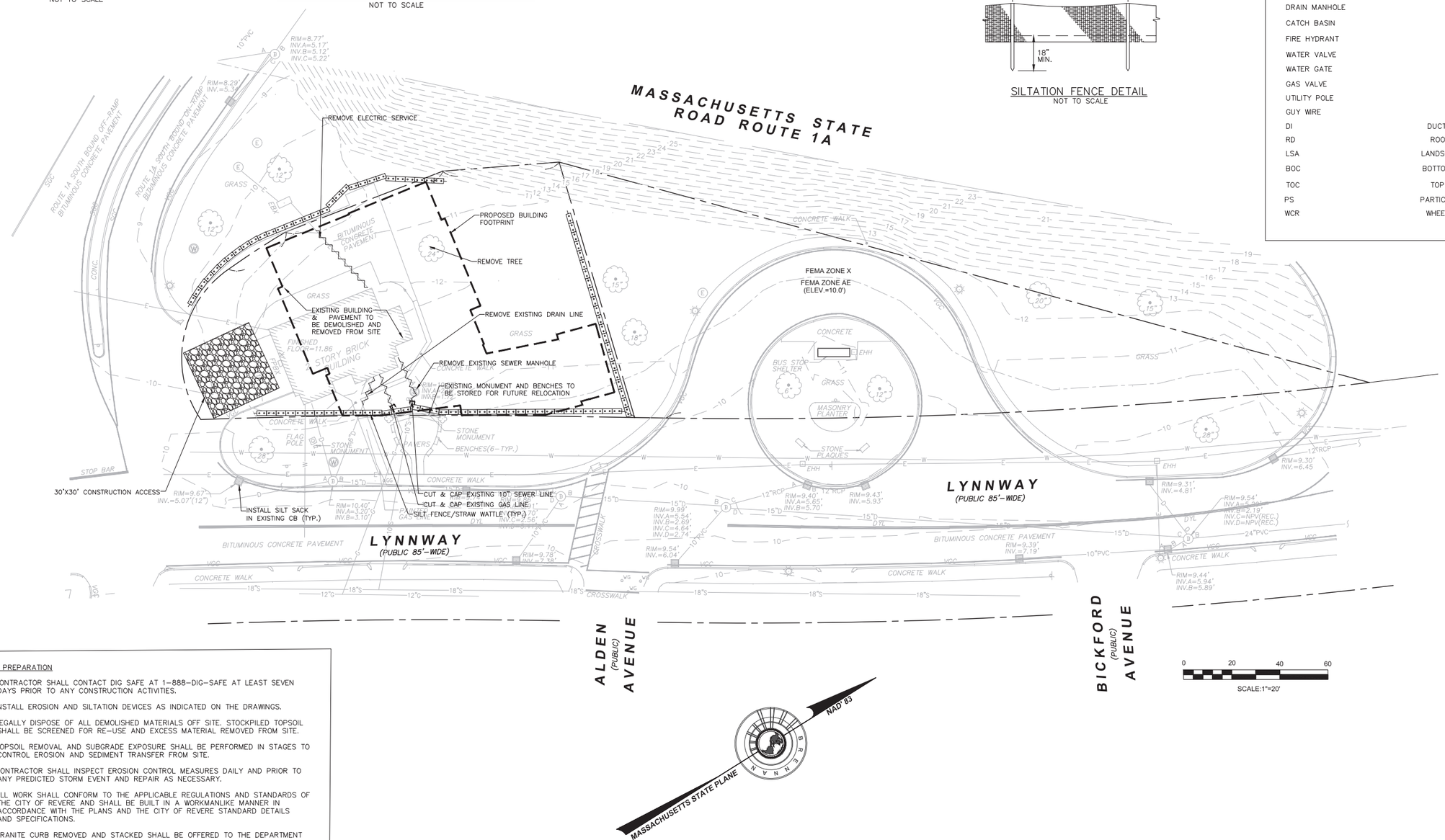




SILTATION FENCE DETAIL
NOT TO SCALE

LEGEND

2' CONTOUR	298
10' CONTOUR	300
PROPERTY LINE	
BUILDING SETBACK LINE	
EDGE OF PAVEMENT	
EDGE OF GRAVEL	
STONE WALL	
FENCE	
TREELINE	
STORM DRAIN LINE	
WATER LINE	
UNDERGROUND TELEPHONE	UGT
GAS LINE	
OVERHEAD WIRES	
DRAIN MANHOLE	
CATCH BASIN	
FIRE HYDRANT	
WATER VALVE	WV
WATER GATE	WG
GAS VALVE	GV
UTILITY POLE	UP-#
GUY WIRE	
DI	DUCTILE IRON
RD	ROOF DRAIN
LSA	LANDSCAPED AREA
BOC	BOTTOM OF CURB
TOC	TOP OF CURB
PS	PARTICLE SEPERATOR
WCR	WHEELCHAIR RAMP



SITE PREPARATION

1. CONTRACTOR SHALL CONTACT DIG SAFE AT 1-888-DIG-SAFE AT LEAST SEVEN DAYS PRIOR TO ANY CONSTRUCTION ACTIVITIES.
2. INSTALL EROSION AND SILTATION DEVICES AS INDICATED ON THE DRAWINGS.
3. LEGALLY DISPOSE OF ALL DEMOLISHED MATERIALS OFF SITE. STOCKPILED TOPSOIL SHALL BE SCREENED FOR RE-USE AND EXCESS MATERIAL REMOVED FROM SITE.
4. TOPSOIL REMOVAL AND SUBGRADE EXPOSURE SHALL BE PERFORMED IN STAGES TO CONTROL EROSION AND SEDIMENT TRANSFER FROM SITE.
5. CONTRACTOR SHALL INSPECT EROSION CONTROL MEASURES DAILY AND PRIOR TO ANY PREDICTED STORM EVENT AND REPAIR AS NECESSARY.
6. ALL WORK SHALL CONFORM TO THE APPLICABLE REGULATIONS AND STANDARDS OF THE CITY OF REVERE AND SHALL BE BUILT IN A WORKMANLIKE MANNER IN ACCORDANCE WITH THE PLANS AND THE CITY OF REVERE STANDARD DETAILS AND SPECIFICATIONS.
7. GRANITE CURB REMOVED AND STACKED SHALL BE OFFERED TO THE DEPARTMENT OF CONSERVATION AND RECREATION FOR SALVAGE.

SITE PREPARATION & DEMOLITION PLAN
LOCATED IN
140 LYNNWAY
REVERE, MA

PREPARED FOR
WINTER STREET ARCHITECTS

DATE: X-X-2020

SCALE: 1" = 20'

Brennan Consulting
ENGINEERING · TRANSPORTATION · SURVEYING
24 RAY AVENUE, BURLINGTON, MA
PHONE: (781) 273-3434 FAX: (781) 273-3430

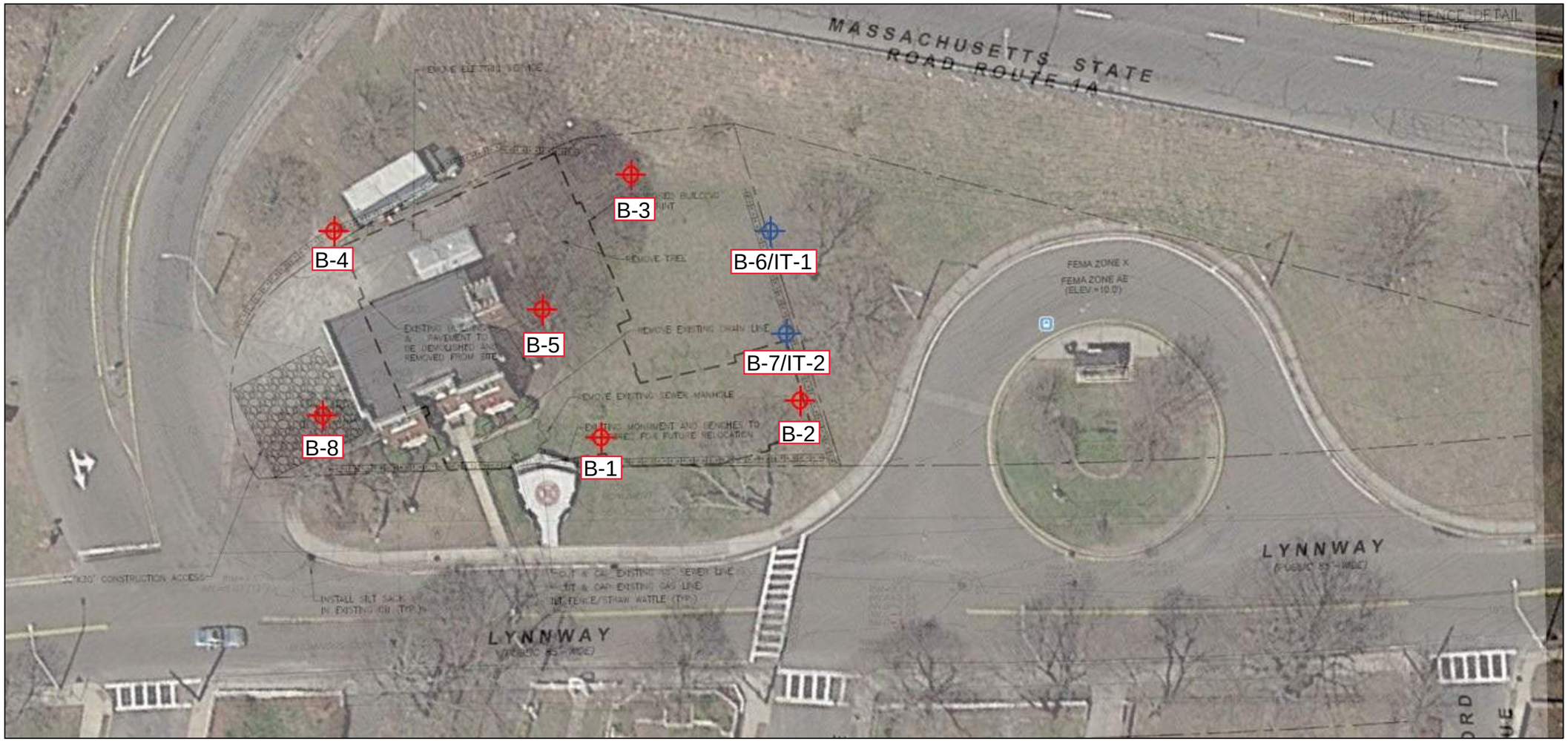
REVISIONS

NO.	DATE	DESCRIPTION	BY

CHECKED BY: CE
DRAWN BY: CG

PROJECT 19954B

C-02



Notes:

1. Test borings were performed on January 19 & 20, 2021 under the direction of JTC. Test boring locations should be considered approximate.
2. Refer to the Test Boring Logs for the subsurface conditions encountered at each exploration location.
3. Basemap source(s): 2020 "Boring Site Preparation and Demolition Plan", prepared by Brennan Consulting – Burlington, MA.
4. Not to Scale.

CBI Consultants, LLC **250 Dorchester Avenue** **Boston, Massachusetts 02127**	**Proposed Fire Station** **140 Lynnway** **Revere, Massachusetts**
JOHN TURNER CONSULTING	**TEST BORING LOCATION PLAN**

APPENDIX D: TEST BORING LOGS & KEY TO SYMBOLS AND DESCRIPTIONS

JOHN TURNER CONSULTING

LOG OF BORING No. B-1

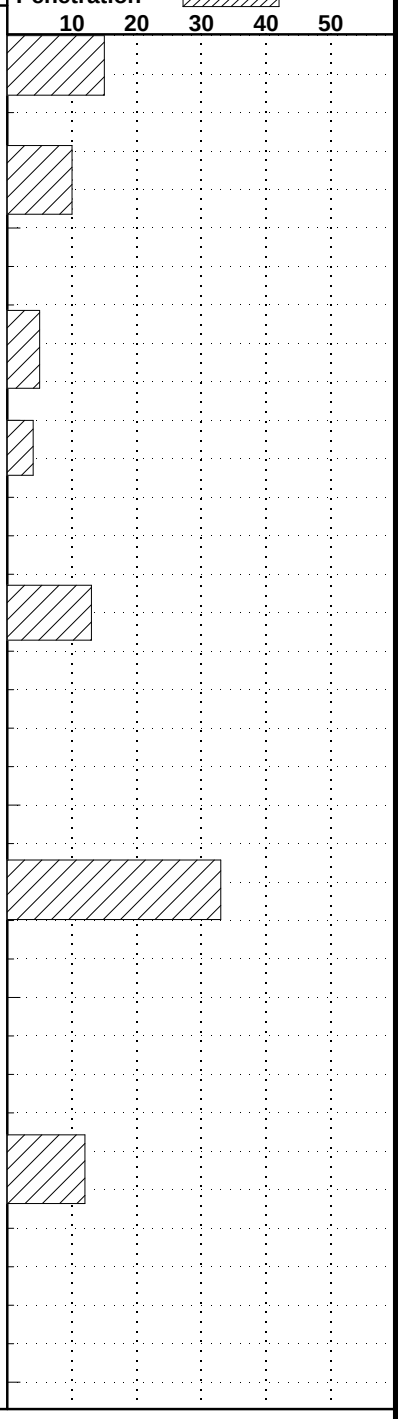
PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-19-21
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[TOPSOIL] Dark brown, sandy Silt (ML), trace gravel, rootlets, organics; medium dense			SS01	3 6 9 10	
	0.83 [FILL] Dark tan, silty clayey Sand (SC-SM) with gravel; medium dense -asphalt particles observed in sample			SS02	5 5 5 5	
3.5	-becomes loose			SS03	3 2 3 3	
7	7 [ORGANICS] Dark brown, Peat (PT); loose; wet			SS04	3 2 2 10	
	7.5 [MARINE DEPOSITS] Dark grey, Gravel (GP-GM) with sand; loose; -peat observed in sample -becomes medium dense			SS05	5 5 8 10	
10.5						
14	-becomes dense			SS06	8 15 18 28	
17.5						
21	Grey, silty Sand (SM); medium dense			SS07	5 6 6 10	
24.5						

TEST RESULTS

Plastic Limit ⊢⊣ Liquid Limit
Water Content - ●
Penetration - ▨



Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

LOG OF BORING No. B-1

PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-19-21
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200	TEST RESULTS (Plastic Limit — Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50)
	-becomes loose -noxious odor observed			SS08	3 3 4 8		
	26 Grey, poorly graded, Sand (SP-SC) with silty clay; loose						
	Boring terminated at 27 ft.						
28							
31.5							
35							
38.5							
42							
45.5							
49							

Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

LOG OF BORING No. B-2

PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-19-21
DEPTH TO - WATER> INITIAL: 8.5 **AFTER 24 HOURS:**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[TOPSOIL] Dark brown, sandy Silt (ML), trace gravel, rootlets, organics; medium dense		SS01	3 6 8 13	
	-no sample recovery;		SS02	13 13 12 13	
3.5					
	[FILL] Dark tan, silty clayey Sand (SC-SM) with gravel; loose (5)		SS03	5 5 2 4	
7			SS04	3 4 5 9	
	[ORGANICS] Dark brown, Peat (PT); loose; wet (8.5)				
10.5	[MARINE DEPOSITS] Dark grey, Gravel (GP-GM) with sand; medium dense (10)		SS05	3 4 8 10	
14	-becomes dense		SS06	12 15 15 27	
17.5					
21	Grey, silty Sand (SM); medium dense		SS07	4 5 6 9	
24.5					

TEST RESULTS
Plastic Limit ⊢⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

LOG OF BORING No. B-2

PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-19-21
DEPTH TO - WATER> INITIAL: 8.5 **AFTER 24 HOURS:**

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200	TEST RESULTS (Plastic Limit ⊢—⊣ Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50)
	-becomes loose -noxious odor observed			SS08	2 3 4 5		
	26						
	Grey, poorly graded, Sand (SP-SC) with silty clay; loose						
	Boring terminated at 27 ft.						
28							
31.5							
35							
38.5							
42							
45.5							
49							

Test boring backfilled with soil cuttings upon completion.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

JOHN TURNER CONSULTING

LOG OF BORING No. B-3

PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-19-21
DEPTH TO - WATER> INITIAL: 9.0 **AFTER 24 HOURS:**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[TOPSOIL] Dark brown, sandy Silt (ML), trace gravel, rootlets, organics; loose		SS01	3 4 5 6	
0.5	[FILL] Dark tan, silty clayey Sand (SC-SM) with gravel; medium dense -red mottling observed in sample		SS02	6 7 7 8	
3.5	-becomes loose -shattered rock in spoon		SS03	4 4 4 4	
7	-orange color mottling observed in sample		SS04	4 3 4 5	
10	[ORGANICS] Dark brown, Peat (PT); medium dense; wet		SS05	12 9 12 18	
10.5	[MARINE DEPOSITS] Dark grey, Gravel (GP-GM) with sand; medium dense;				
14			SS06	6 9 15 18	
16	Grey, silty Sand (SM); medium dense				
17.5					
21			SS07	4 6 11 12	
24.5					

TEST RESULTS

Plastic Limit ⊢—⊣ Liquid Limit
Water Content - ●
Penetration - ▨

10 20 30 40 50

Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

LOG OF BORING No. B-3

PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-19-21
DEPTH TO - WATER> INITIAL: 9.0 **AFTER 24 HOURS:**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200	TEST RESULTS (Plastic Limit ⊢—⊣ Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50)
	25 Grey, poorly graded, Sand (SP-SC) with silty clay; loose			SS08	6 11 12 14		
	Boring terminated at 27 ft.						
28							
31.5							
35							
38.5							
42							
45.5							
49							

Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

LOG OF BORING No. B-4

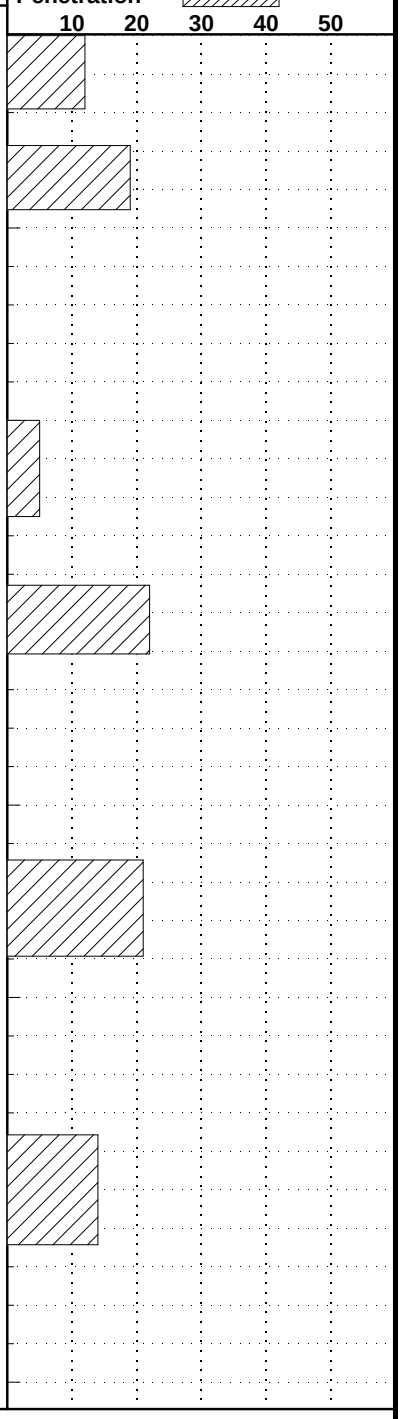
PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-20-21
DEPTH TO - WATER> INITIAL: 7.0 **AFTER 24 HOURS:**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[TOPSOIL] Dark brown, sandy Silt (ML), trace gravel, rootlets, organics; medium dense			SS01	3 5 7 9	
	0.67 [FILL] Dark tan, silty clayey Sand (SC-SM) with gravel; medium dense			SS02	9 8 11 9	
3.5	-shattered rock in spoon			SS03	4 100/3 - -	
7	Tan-grey, clayey Sand (SC); loose			SS04	1 2 3 6	
	8.5 [ORGANICS] Dark brown, Peat (PT); loose; wet					
10.5	10 [MARINE DEPOSITS] Dark grey, Gravel (GP-GM) with sand; medium dense; -peat observed in sample			SS05	5 11 11 11	
14				SS06	6 10 11 12	
17.5	Grey, silty Sand (SM); medium dense			SS07	4 6 8 10	
21						
24.5						

TEST RESULTS

Plastic Limit ⊢—⊣ Liquid Limit
Water Content - ●
Penetration - ▨



Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

LOG OF BORING No. B-4

PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-20-21
DEPTH TO - WATER> INITIAL: 7.0 **AFTER 24 HOURS:**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200	TEST RESULTS (Plastic Limit ⊢—⊣ Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50)
	-noxious odor observed						
	Grey, poorly graded, Sand (SP-SC) with silty clay; medium dense	26		SS08	3 8 19 18		
	Boring terminated at 27 ft.						
28							
31.5							
35							
38.5							
42							
45.5							
49							

Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

LOG OF BORING No. B-5

PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-20-21
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[TOPSOIL] Dark brown, sandy Silt (ML), trace gravel, rootlets, organics; medium dense			SS01	3 4 7 9	
	[FILL] Tan-brown, silty Sand (SM) with gravel; medium dense -shattered rock in spoon tip			SS02	14 10 10 9	
3.5				SS03	5 5 6 10	
7	Dark tan, silty clayey Sand (SC-SM) with gravel; medium dense; wet			SS04	5 5 6 8	
10.5	[MARINE DEPOSITS] Dark grey, Gravel (GP-GM) with sand; medium dense;			SS05	5 10 11 10	
14				SS06	5 7 21 29	
17.5	Grey, silty Sand (SM); medium dense			SS07	5 10 15 12	
21						
24.5						

TEST RESULTS
Plastic Limit ⊢⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

LOG OF BORING No. B-5

PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-20-21
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200	TEST RESULTS (Plastic Limit ⊢—⊣ Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50)
	25 Grey, poorly graded, Sand (SP-SC) with silty clay; medium dense -noxious odor observed			SS08	6 10 9 9		
	Boring terminated at 27 ft.						
28							
31.5							
35							
38.5							
42							
45.5							
49							

Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

LOG OF BORING No. B-6/IT-1

PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-20-21
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200	TEST RESULTS (Plastic Limit ⊢⊣ Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50)
0	[TOPSOIL] Dark brown, sandy Silt (ML), trace gravel, rootlets, organics; medium loose			SS01	5 4 5 15		
	0.67						
	[FILL] Dark tan, silty clayey Sand (SC-SM) with gravel; medium dense			SS02	22 9 9 9		
3.5	-becomes medium dense						
	-becomes loose			SS03	4 4 4 4		
7	7						
	Tan, silty clayey Sand (SC-SM); medium dense			SS04	3 4 3 4		
	Boring terminated at 9 ft.						
10.5							
14							
17.5							
21							
24.5							

Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

LOG OF BORING No. B-7/IT-2

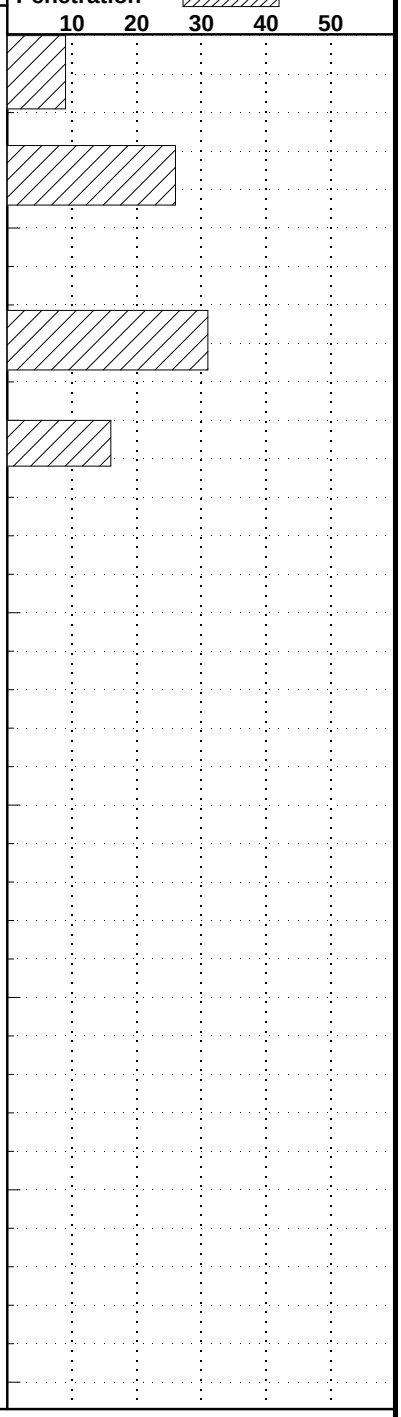
PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-20-21
DEPTH TO - WATER> INITIAL: 8.0 **AFTER 24 HOURS:**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[TOPSOIL] Dark brown, sandy Silt (ML), trace gravel, rootlets, organics; loose			SS01	2 4 5 12	
	0.83					
	[FILL] Dark tan, silty clayey Sand (SC-SM) with gravel; loose			SS02	14 14 12 9	
3.5	-becomes medium dense -shattered rock in spoon					
	Tan, silty clayey Sand (SC-SM); traces of topsoil and roots in sample; dense			SS03	5 22 9 9	
	-shattered rock in spoon					
7	-becomes medium dense			SS04	6 10 6 6	
	Boring terminated at 9 ft.					
10.5						
14						
17.5						
21						
24.5						

TEST RESULTS

Plastic Limit ⊢⊣ Liquid Limit
Water Content - ●
Penetration - ▨



Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

LOG OF BORING No. B-8

PROJECT: Alden Mills/Point of Pines - Proposed Fire Station **PROJECT NO.:** 21-04-008
CLIENT: Revere Fire Department
PROJECT LOCATION: 140 Lynnway - Revere, MA
LOCATION: Refer To Test Boring Location Plan **ELEVATION:** G.S.
DRILLER: Soil Exploration Corp. **LOGGED BY:** TMc
DRILLING METHOD: 4.25" ID HSA **DATE:** 01-20-21
DEPTH TO - WATER> INITIAL: ▽ 7.0 **AFTER 24 HOURS:** ▼

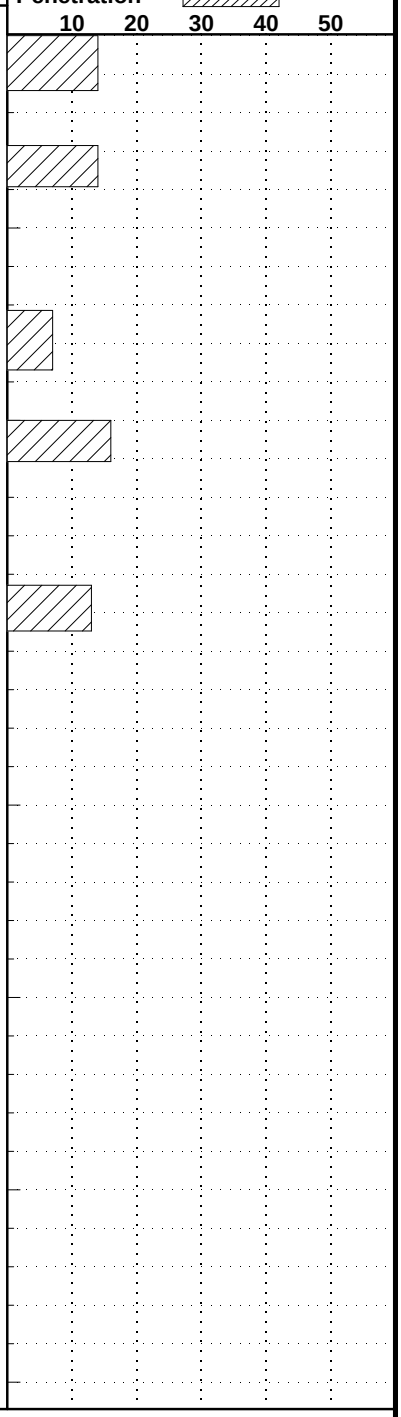
This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[PAVEMENT] 3" bituminous concrete pavement		SS01	8 7 7 9	
0.25	[PAVEMENT BASE] Brown, silty Sand (SM) with gravel; medium dense		SS02	3 4 10 8	
0.75	[FILL] Dark tan, silty clayey Sand (SC-SM) with gravel; medium dense				
3.5	-becomes loose		SS03	2 2 5 9	
6	Tan-brown, silty Sand (SM) with gravel; loose				
7 ▽	[MARINE DEPOSITS] Dark grey, Gravel (GP-GM) with sand; medium dense; -peat observed in sample		SS04	9 10 6 6	
10.5			SS05	5 5 8 10	
	Boring terminated at 12 ft.				
14					
17.5					
21					
24.5					

Graphic

TEST RESULTS

Plastic Limit ├──┤ Liquid Limit
Water Content - ●
Penetration - ▨



Test boring backfilled with soil cuttings upon completion.

JOHN TURNER CONSULTING

KEY TO SYMBOLS AND DESCRIPTIONS

	MAJOR DIVISIONS		SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS OVER 50% > No.200 SIEVE SIZE	GRAVELS	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
	MORE THAN 1/2 OF COARSE FRACTION > No.4 SIEVE SIZE	GRAVELS WITH OVER 15% FINES	GM	Silty gravels, gravel-sand mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS	CLEAN SANDS WITH LESS THAN 5% FINES	SW	Well-graded sand or gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
	MORE THAN 1/2 OF COARSE FRACTION < No.4 SIEVE SIZE	SANDS WITH OVER 15% FINES	SM	Silty sand, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS OVER 50% < No.200 SIEVE SIZE	SILTS & CLAYS	LIQUID LIMIT 50% OR LESS	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS	LIQUID LIMIT GREATER THAN 50%	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
	HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

Shelby Tube
Standard Split Spoon Sample
Rock Core
Vane Shear
Geoprobe Sample
Water Table (at time of drilling)
Auger Cuttings
3" Split Spoon Sample
Dynamic Cone Penetrometer
Bulk/Grab Sample
Sonic or Vibro-Core Sample
Water Table (after 24 hours)

TYPICAL SYMBOLS

SOIL MOISTURE MODIFIERS

Term	Description
Dry	Absence of moisture; dusty, dry to touch
Moist	Damp but no visible water
Wet	Visible free water

The descriptor "damp" should not be used (use "moist").
The descriptor "saturated" should not be used (use "wet").

Recessed Cover Set in Concrete
Top of Well, Recessed Pipe
Covered Riser
Capped Riser w/ Locking Cover
Pipe Riser
Concrete Seal
Gravel Backfill
Assorted Cuttings
Bentonite Slurry
Bentonite Pellets
Silica Sand, blank PVC
Slotted Pipe w/ Sand
Endcap on Pipe Packed in Sand
Silica Sand, No Pipe (End Plug)

WELL SYMBOLS

RANGE OF GRAIN SIZES

CLASSIFICATION	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.75
coarse	3" to 3/4"	76.2 to 19.1
fine	3/4" to No. 4	19.1 to 4.75
SAND	No. 4 to No. 200	4.75 to 0.075
coarse	No. 4 to No. 10	4.75 to 2.00
medium	No. 10 to No. 40	2.00 to 0.425
fine	No. 40 to No. 200	0.425 to 0.075
SILT & CLAY	Below No. 200	Below 0.075

RELATIVE DENSITY/CONSISTENCY

Gravel, Sand, and Silt (nonplastic)		Silt (plastic) and Clay		
N-Value	Relative Density	N-Value	Su	Consistency
0 - 4	Very Loose	0 - 2	0 - 250	Very Soft
5 - 10	Loose	3 - 4	251 - 500	Soft
11-30	Medium Dense	5 - 8	501 - 1000	Medium Stiff
31 - 50	Dense	9 - 15	1001 - 2000	Stiff
51 +	Very Dense	16 - 30	2001 - 4000	Very Stiff
		31 +	4001+	Hard

Standard Penetration Testing (SPT) N_{60} based on blows per 12 inches.
WR = Weight of Rods; WH = Weight of Hammer

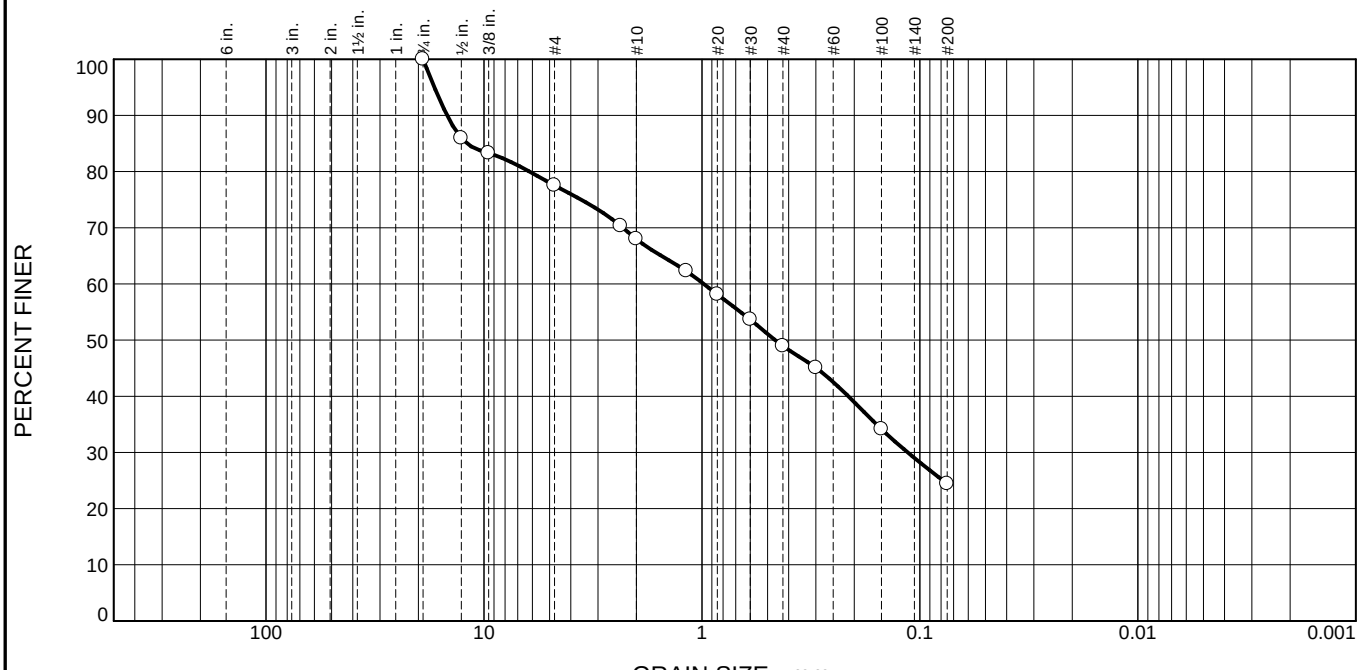
PERCENT OR PORTIONS OF SOIL

Term	Description
Parting:	> 1/16 in.
Seam:	0.5 in. to 1/16 in.
Layer:	12 in. to 0.5 in.
Stratum:	> 12 in.
Pocket:	Small erratic deposit
Lens:	Lenticular deposit
Occasional:	One or less per foot of thickness
Frequent	More than one per foot of thickness
Varved	Alternating seams or layers of silt and/or clay and sometimes f. sand

REFERENCE: UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2488-93

APPENDIX E: GEOTECHNICAL LABORATORY TESTING REPORTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	22.5	9.5	19.1	24.5	24.4	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	86.0		
3/8"	83.3		
#4	77.5		
#8	70.3		
#10	68.0		
#16	62.3		
#20	58.1		
#30	53.6		
#40	48.9		
#50	45.1		
#100	34.1		
#200	24.4		

* (no specification provided)

Material Description

Dark brown silty sand with gravel

Atterberg Limits (ASTM D 4318)

PL= - **LL=** - **PI=** -

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** -

Coefficients

D_{90}= 14.7642 D_{85}= 11.9693 D_{60}= 0.9811
D_{50}= 0.4619 D_{30}= 0.1137 D_{15}=
D_{10}= C_u= C_c=

Remarks

Moisture content 10.7%

Date Received: 1/22/2021 **Date Tested:** 1/26/2021

Tested By: Matt Watson

Checked By: Rob Faria

Title: Lab Manager

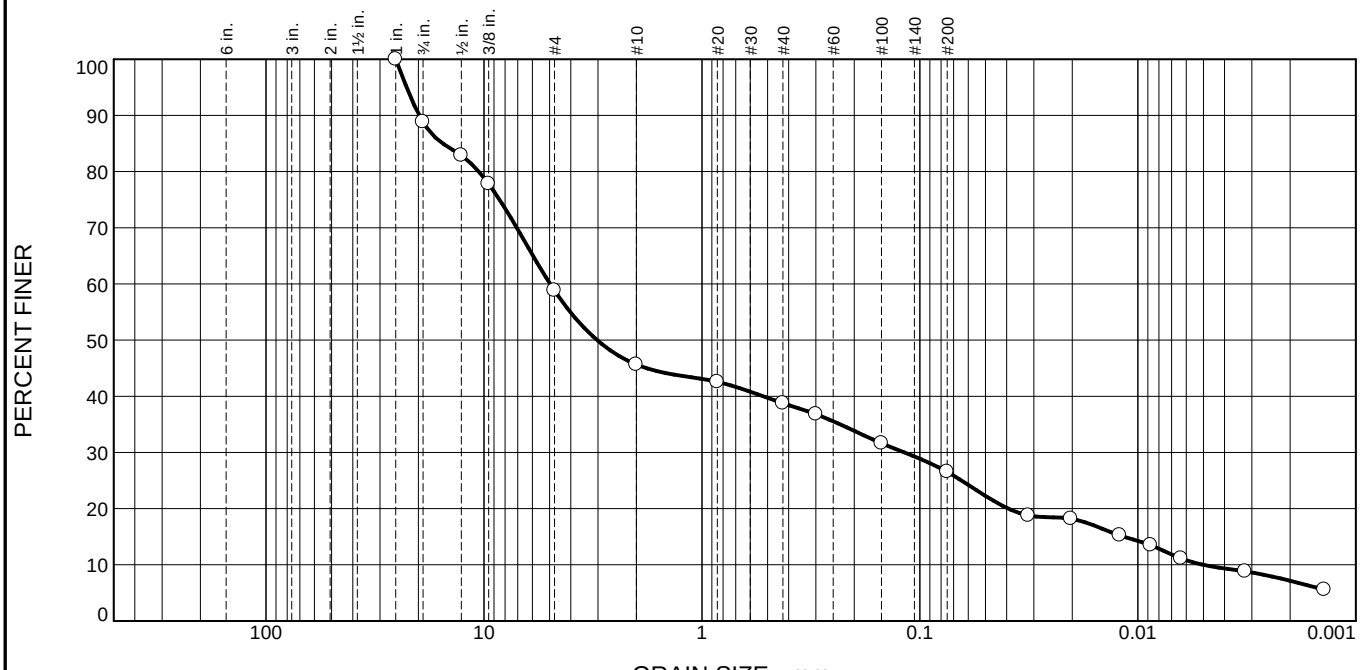
Location: B-5 SS02
Sample Number: 3521-047 **Depth:** 2'-4'

Date Sampled: 1/22/2021

JOHN TURNER CONSULTING

Client: City of Revere
Project: Alden Mills/Point of Pines Fire Station
Revere, MA
Project No: 20-04-114 **Figure** 047A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.2	30.0	13.2	6.8	12.3	16.5	10.0

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	88.8		
1/2"	82.9		
3/8"	77.8		
#4	58.8		
#10	45.6		
#20	42.6		
#40	38.8		
#50	36.8		
#100	31.6		
#200	26.5		
0.0318 mm.	18.8		
0.0203 mm.	18.2		
0.0121 mm.	15.2		
0.0087 mm.	13.5		
0.0063 mm.	11.1		
0.0032 mm.	8.8		
0.0014 mm.	5.6		

* (no specification provided)

Material Description

Light brown silty, clayey sand with gravel

Atterberg Limits (ASTM D 4318)

PL= - **LL=** - **PI=** -

Classification

USCS (D 2487)= SC-SM **AASHTO (M 145)=** -

Coefficients

D_{90}= 19.8151 D_{85}= 15.4674 D_{60}= 4.9730
D_{50}= 3.0265 D_{30}= 0.1180 D_{15}= 0.0116
D_{10}= 0.0050 C_u= 988.66 C_c= 0.56

Remarks

Moisture content 12.6%

Date Received: 1/21/2021 **Date Tested:** 1/29/2021

Tested By: Matt Watson

Checked By: Rob Faria

Title: Lab Manager

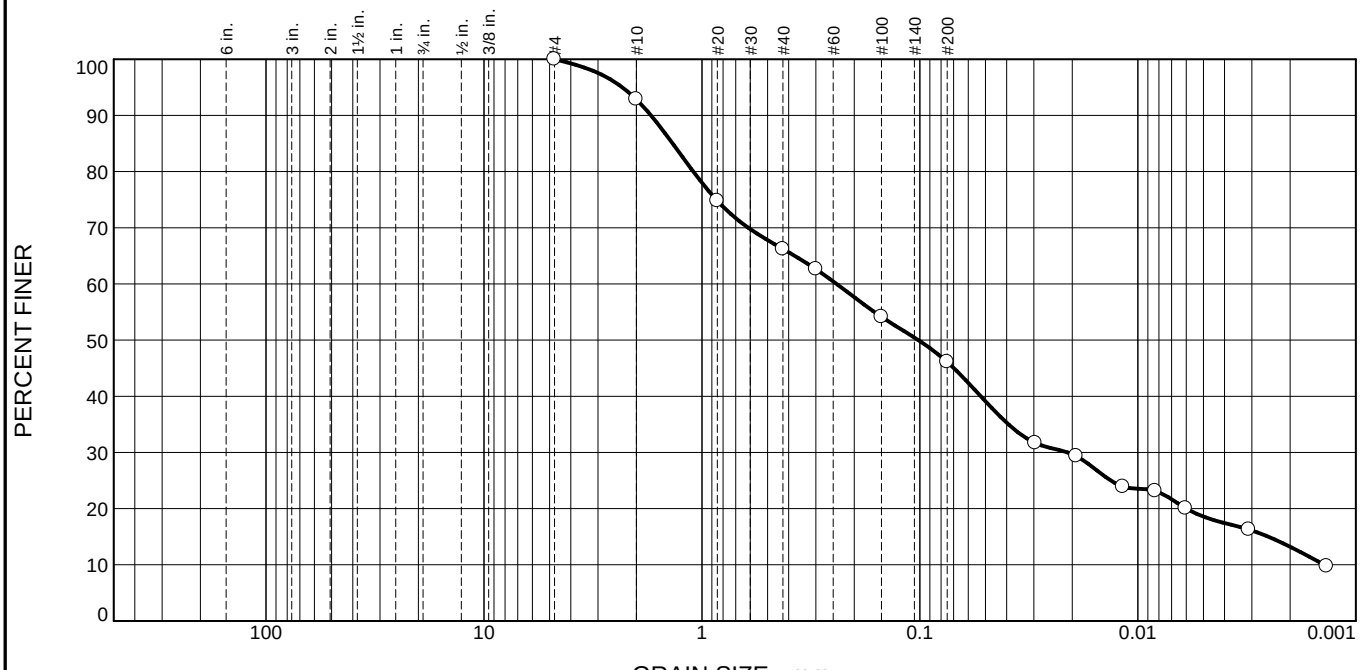
Location: B-6/ IT-1 SS03
Sample Number: 3521-045 **Depth:** 5'-7'

Date Sampled: 1/22/2021

JOHN TURNER CONSULTING

Client: City of Revere
Project: Alden Mills/Point of Pines Fire Station
Revere, MA
Project No: 20-04-114 **Figure** 045A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	7.1	26.7	20.1	27.5	18.6

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	92.9		
#20	74.8		
#40	66.2		
#50	62.6		
#100	54.1		
#200	46.1		
0.0295 mm.	31.7		
0.0192 mm.	29.3		
0.0117 mm.	23.9		
0.0083 mm.	23.1		
0.0060 mm.	20.1		
0.0031 mm.	16.3		
0.0014 mm.	9.8		

* (no specification provided)

Material Description

Light brown silty, clayey sand

Atterberg Limits (ASTM D 4318)

PL= 15 **LL=** 21 **PI=** 6

Classification

USCS (D 2487)= SC-SM **AASHTO (M 145)=** -

Coefficients

D_{90}= 1.7136 D_{85}= 1.3628 D_{60}= 0.2410
D_{50}= 0.1017 D_{30}= 0.0210 D_{15}= 0.0025
D_{10}= 0.0014 C_u= 172.44 C_c= 1.31

Remarks

Moisture content 14.6%

Date Received: 1/22/2021 **Date Tested:** 1/29/2021

Tested By: Matt Watson

Checked By: Rob Faria

Title: Lab Manager

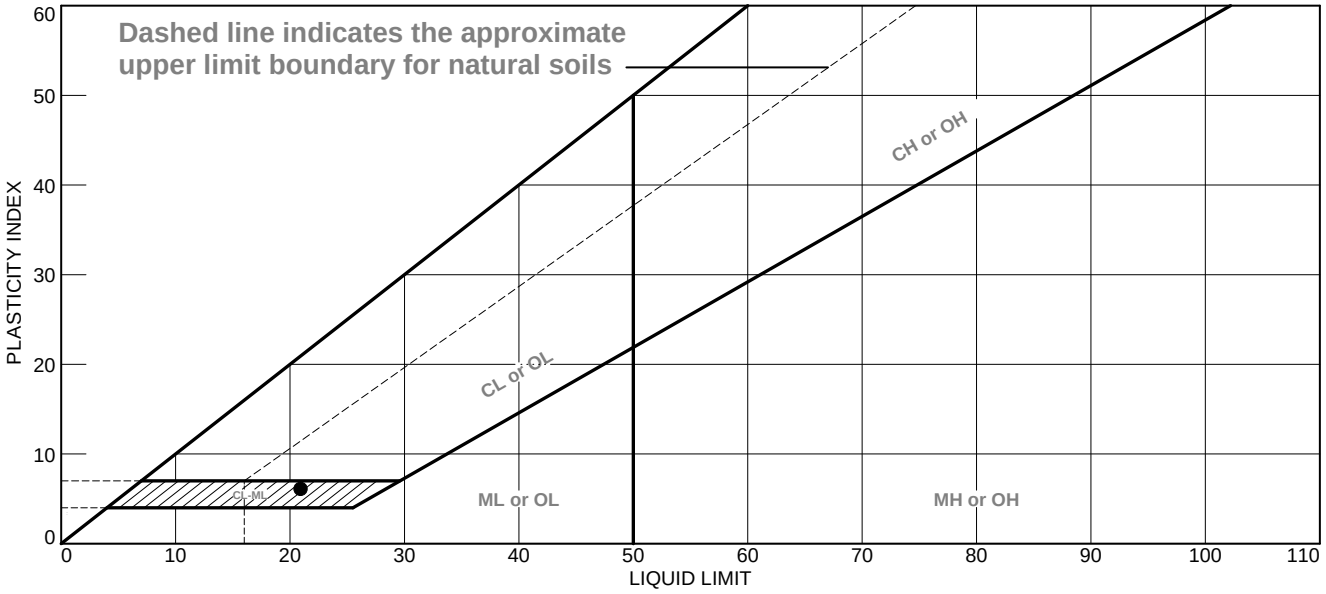
Location: B-7/ IT-2 SS03
Sample Number: 3521-046 **Depth:** 5'-7'

Date Sampled: 1/22/2021

JOHN TURNER CONSULTING

Client: City of Revere
Project: Alden Mills/Point of Pines Fire Station
Revere, MA
Project No: 20-04-114 **Figure** 046A

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light brown silty, clayey sand	21	15	6	66.2	46.1	SC-SM

Project No. 20-04-114 **Client:** City of Revere

Project: Alden Mills/Point of Pines Fire Station

Revere, MA

Location: B-7/ IT-2 SS03

Sample Number: 3521-046 **Depth:** 5'-7'

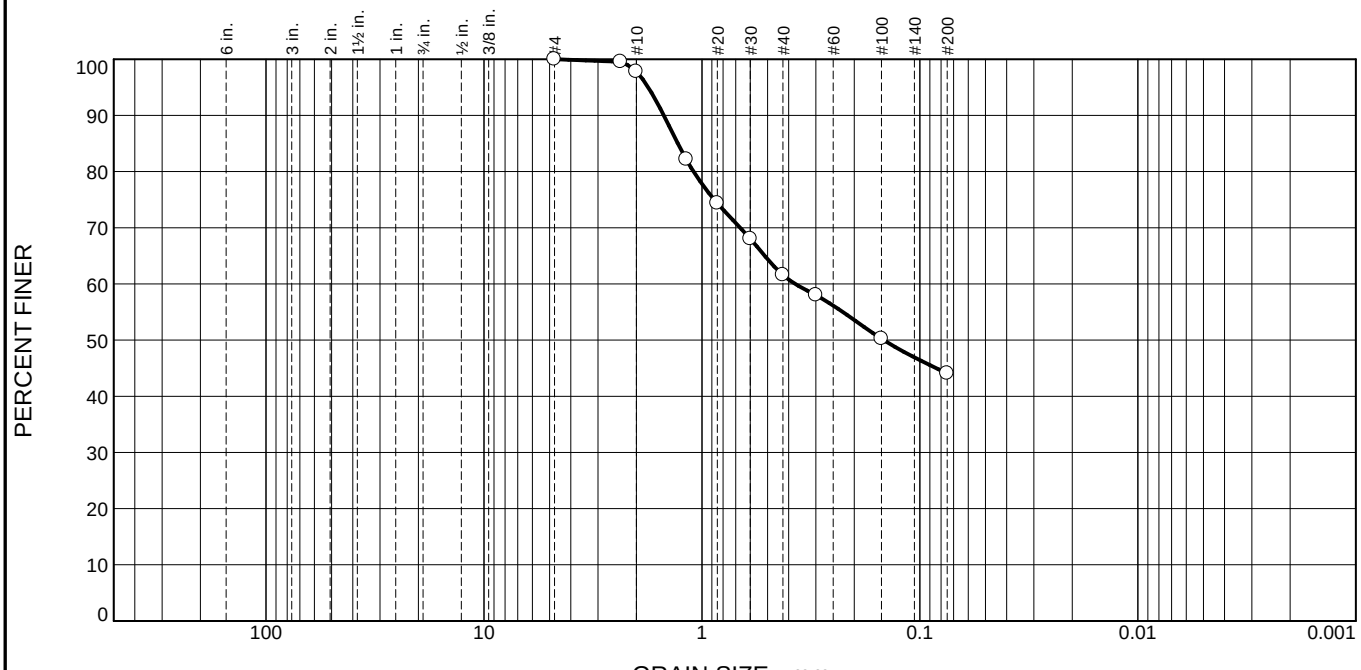
JOHN TURNER CONSULTING

Remarks:

Figure 046B

Tested By: Matt Watson **Checked By:** Rob Faria

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.2	36.2	17.5	44.1	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#8	99.5		
#10	97.8		
#16	82.2		
#20	74.4		
#30	68.0		
#40	61.6		
#50	58.0		
#100	50.3		
#200	44.1		

* (no specification provided)

Material Description

Light gray clayey sand

Atterberg Limits (ASTM D 4318)

PL= 15 **LL=** 24 **PI=** 9

Classification

USCS (D 2487)= SC **AASHTO (M 145)=** -

Coefficients

D_{90}= 1.4969 D_{85}= 1.2903 D_{60}= 0.3737
D_{50}= 0.1465 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Moisture content 15.2%

Date Received: 1/21/2021 **Date Tested:** 1/29/2021

Tested By: Matt Watson

Checked By: Rob Faria

Title: Lab Manager

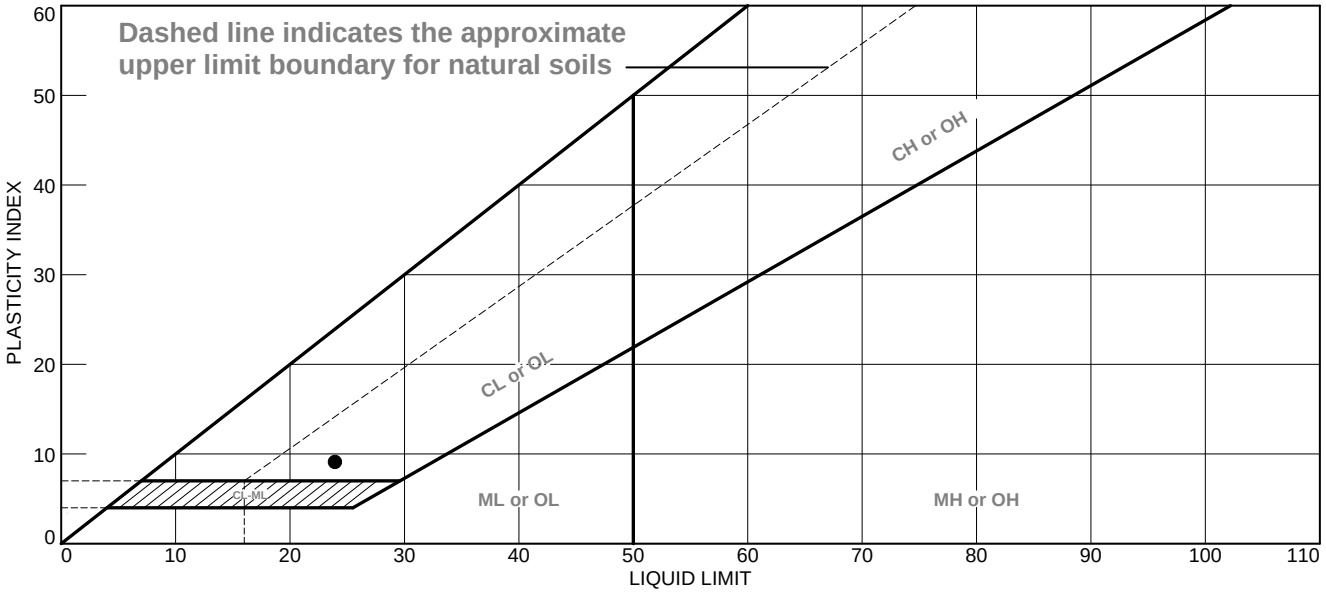
Location: B-4 SS04
Sample Number: 3521-048 **Depth:** 7'-9'

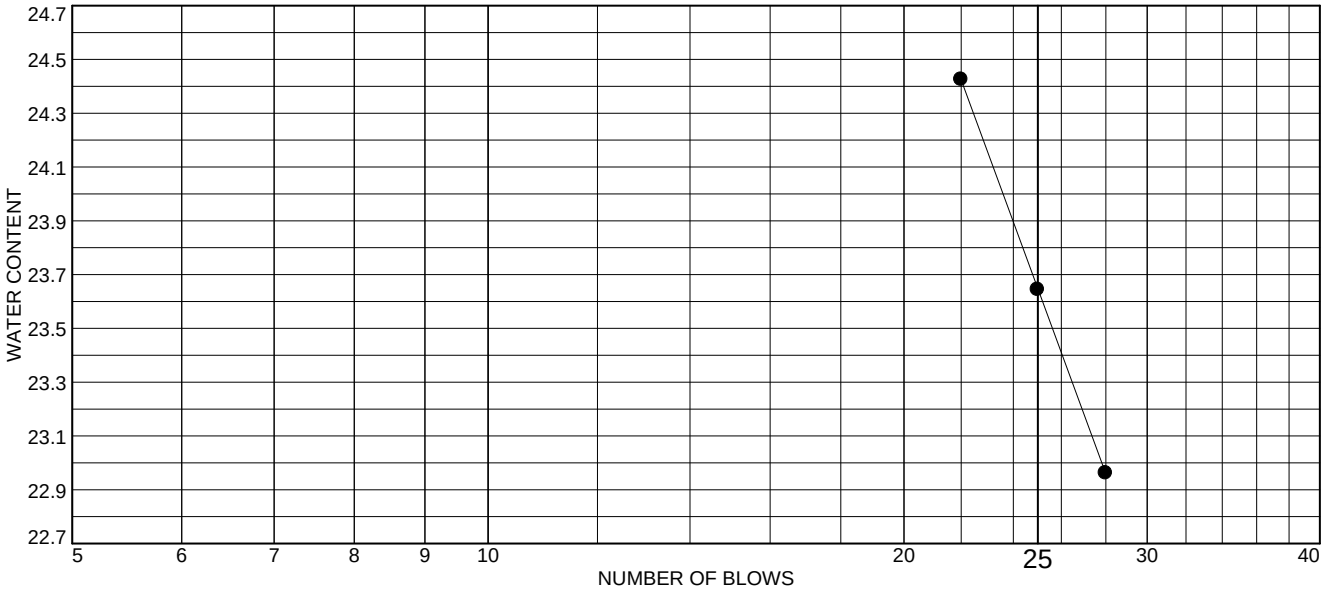
Date Sampled: 1/21/2021

JOHN TURNER CONSULTING

Client: City of Revere
Project: Alden Mills/Point of Pines Fire Station
Revere, MA
Project No: 20-04-114 **Figure** 048A

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light gray clayey sand	24	15	9	61.6	44.1	SC

Project No. 20-04-114 **Client:** City of Revere

Project: Alden Mills/Point of Pines Fire Station

Revere, MA

Location: B-4 SS04

Sample Number: 3521-048 **Depth:** 7'-9'

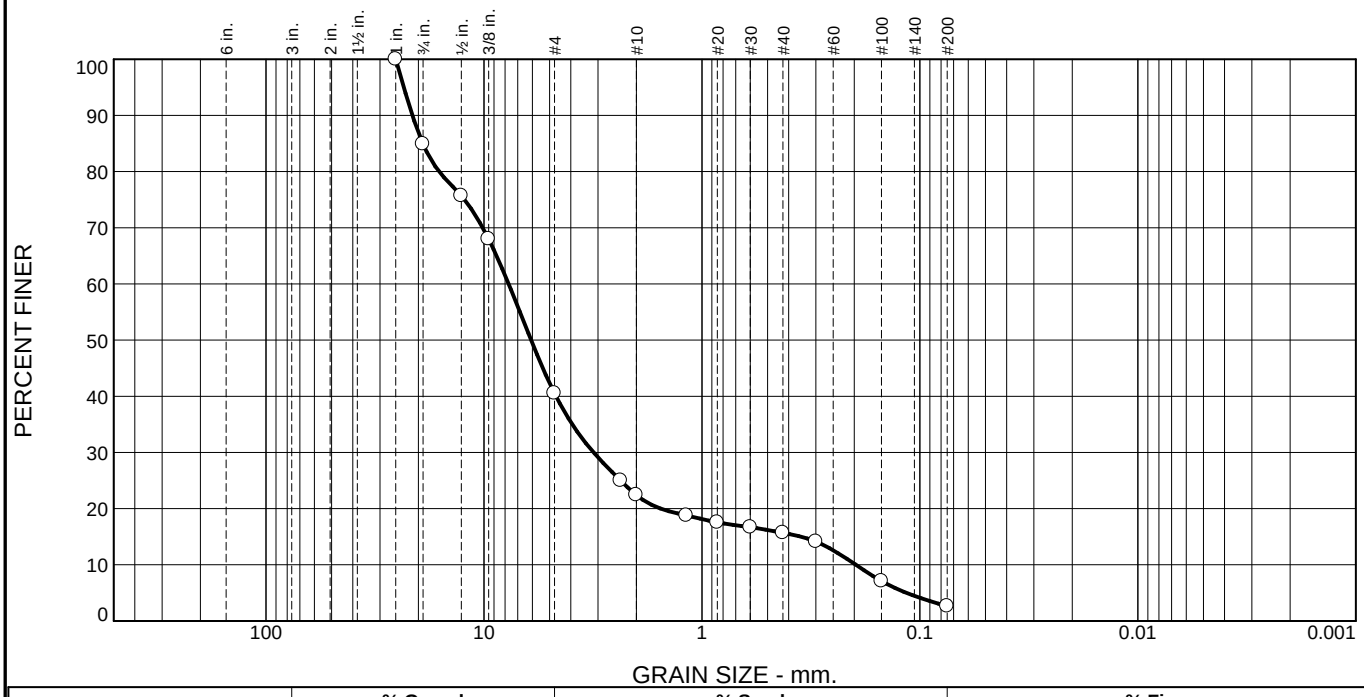
Remarks:

JOHN TURNER CONSULTING

Figure 048B

Tested By: Matt Watson **Checked By:** Rob Faria

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	15.1	44.4	18.1	6.7	13.1	2.6	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	84.9		
1/2"	75.7		
3/8"	68.0		
#4	40.5		
#8	25.0		
#10	22.4		
#16	18.8		
#20	17.5		
#30	16.7		
#40	15.7		
#50	14.1		
#100	7.1		
#200	2.6		

* (no specification provided)

Material Description

Dark brown grayish gravel with sand

Atterberg Limits (ASTM D 4318)

PL= - **LL=** - **PI=** -

Classification

USCS (D 2487)= GP **AASHTO (M 145)=** -

Coefficients

D_{90}= 21.2981 D_{85}= 19.0981 D_{60}= 7.7125
D_{50}= 6.0784 D_{30}= 3.1418 D_{15}= 0.3512
D_{10}= 0.1968 C_u= 39.19 C_c= 6.50

Remarks

Moisture content 6.5%

Date Received: 1/21/2021 **Date Tested:** 1/29/2021

Tested By: Matt Watson

Checked By: Rob Faria

Title: Lab Manager

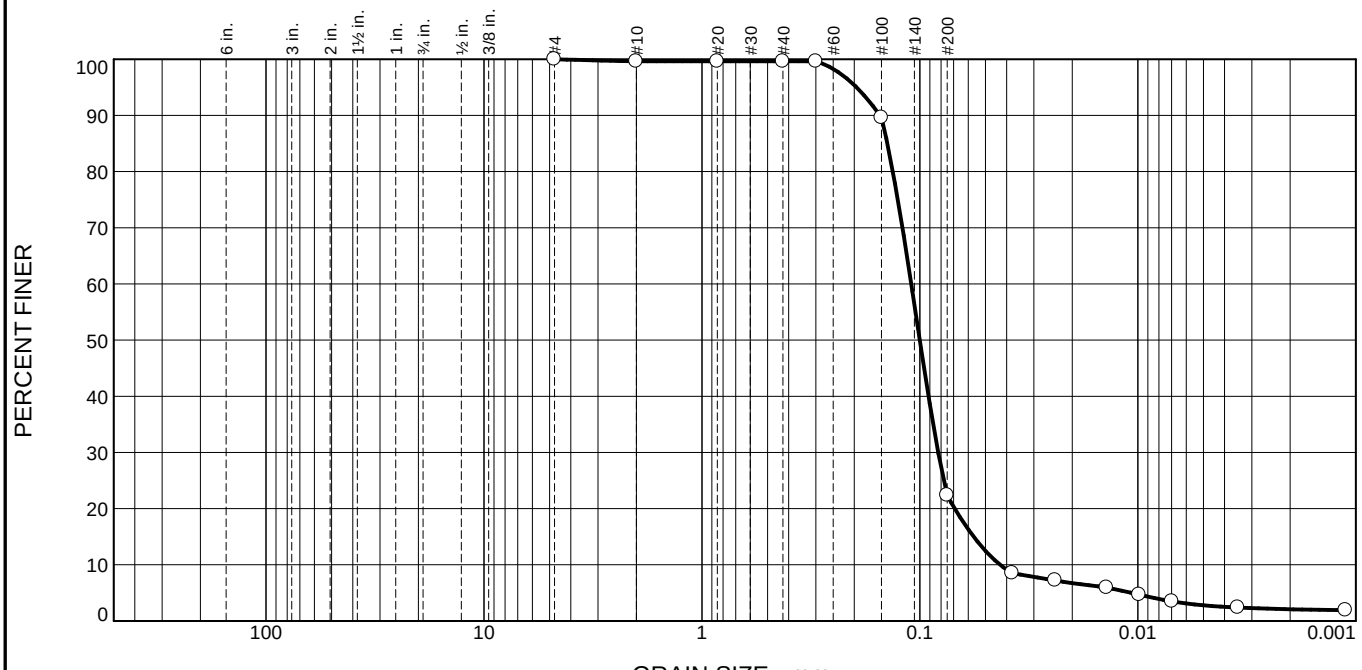
Location: B-1 SS05
Sample Number: 3521-049 **Depth:** 10'-12'

Date Sampled: 1/21/2021

JOHN TURNER CONSULTING

Client: City of Revere
Project: Alden Mills/Point of Pines Fire Station
Revere, MA
Project No: 20-04-114 **Figure** 049A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	0.0	77.2	19.6	2.8

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.6		
#20	99.6		
#40	99.6		
#50	99.6		
#100	89.6		
#200	22.4		
0.0377 mm.	8.5		
0.0240 mm.	7.2		
0.0139 mm.	5.9		
0.0099 mm.	4.7		
0.0070 mm.	3.5		
0.0035 mm.	2.4		
0.0011 mm.	1.9		

* (no specification provided)

Material Description

Light gray silty sand

Atterberg Limits (ASTM D 4318)

PL= - **LL=** - **PI=** -

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** -

Coefficients

D_{90}= 0.1524 D_{85}= 0.1410 D_{60}= 0.1096
D_{50}= 0.1002 D_{30}= 0.0824 D_{15}= 0.0567
D_{10}= 0.0429 C_u= 2.56 C_c= 1.44

Remarks

Moisture content 30.1%

Date Received: 1/21/2021 **Date Tested:** 1/29/2021

Tested By: Matt Watson

Checked By: Rob Faria

Title: Lab Manager

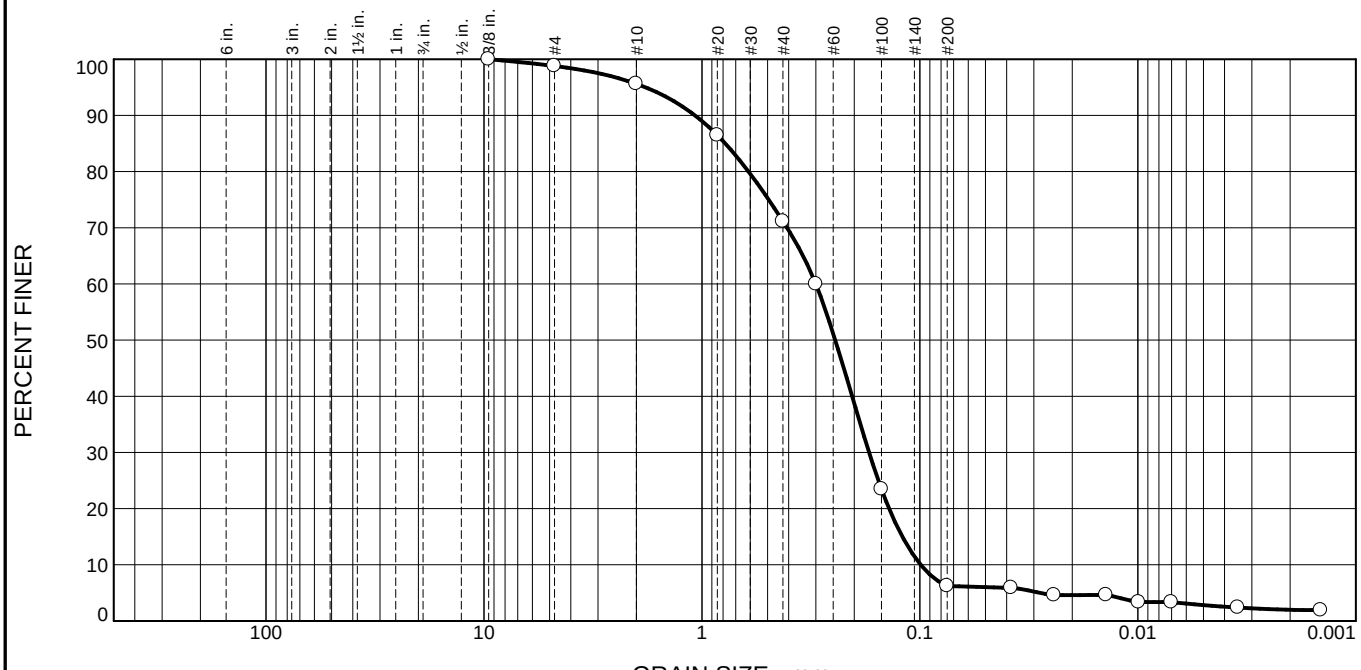
Location: B-3 SS07
Sample Number: 3521-050 **Depth:** 20'-22'

Date Sampled: 1/21/2021

JOHN TURNER CONSULTING

Client: City of Revere
Project: Alden Mills/Point of Pines Fire Station
Revere, MA
Project No: 20-04-114 **Figure** 050A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.2	3.2	24.5	64.9	3.4	2.8

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	100.0		
#4	98.8		
#10	95.6		
#20	86.5		
#40	71.1		
#50	60.0		
#100	23.5		
#200	6.2		
0.0381 mm.	5.9		
0.0242 mm.	4.6		
0.0140 mm.	4.6		
0.0099 mm.	3.4		
0.0070 mm.	3.4		
0.0035 mm.	2.4		
0.0014 mm.	1.9		

* (no specification provided)

Material Description

Light gray sand with silty clay

Atterberg Limits (ASTM D 4318)

PL= - **LL=** - **PI=** -

Classification

USCS (D 2487)= SP-SC **AASHTO (M 145)=** -

Coefficients

D_{90}= 1.0766 D_{85}= 0.7814 D_{60}= 0.3001
D_{50}= 0.2445 D_{30}= 0.1710 D_{15}= 0.1204
D_{10}= 0.0992 C_u= 3.03 C_c= 0.98

Remarks

Moisture content 23.9%

Date Received: 1/21/2021 **Date Tested:** 1/29/2021

Tested By: Matt Watson

Checked By: Rob Faria

Title: Lab Manager

Location: B-2 SS08
Sample Number: 3521-051 **Depth:** 25'-27'

Date Sampled: 1/21/2012

JOHN TURNER CONSULTING

Client: City of Revere
Project: Alden Mills/Point of Pines Fire Station
Revere, MA
Project No: 20-04-114 **Figure** 051A

APPENDIX F: SITE PHOTOGRAPHS

JOHN TURNER
CONSULTING

Proposed Fire Station
140 Lynnway
Revere, Massachusetts

SITE PHOTOGRAPHS

Existing Fire Station

Site Facing West - Typical Drill Rig Setup

Sample of Fill – Silty Clayey Sand (SC-SM) with gravel

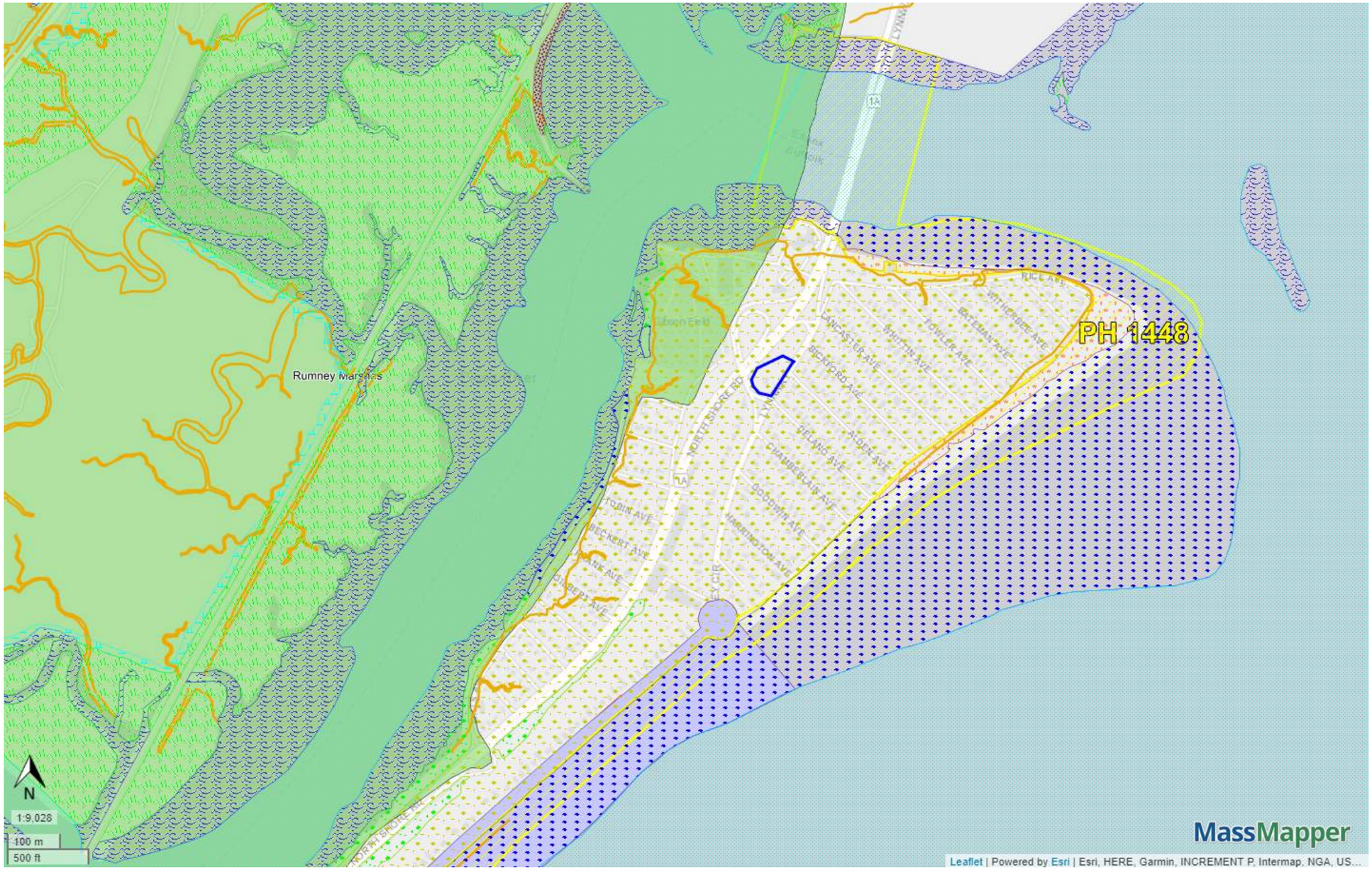
Sample of Peat (PT)

Sample of Native Gravel (GP-GM) with Sand

Sample of Native Silty Sand (SM)

ATTACHMENT 11
ENVIRONMENTAL CONSTRAINTS MAP

140 Lynnway Revere - Environmental Constraints



DEP Wetlands Detailed With Outlines

- Barrier Beach System
- Barrier Beach-Deep Marsh
- Barrier Beach-Wooded Swamp Mixed Trees
- Barrier Beach-Coastal Beach
- Barrier Beach-Coastal Dune
- Barrier Beach-Marsh
- Barrier Beach-Salt Marsh
- Barrier Beach-Shrub Swamp
- Barrier Beach-Wooded Swamp Coniferous
- Barrier Beach-Wooded Swamp Deciduous
- Bog
- Coastal Bank Bluff or Sea Cliff
- Coastal Beach
- Coastal Dune
- Cranberry Bog
- Deep Marsh
- Barrier Beach-Open Water
- Open Water
- Rocky Intertidal Shore
- Salt Marsh
- Shallow Marsh Meadow or Fen
- Shrub Swamp
- Tidal Flat
- Wooded Swamp Coniferous
- Wooded Swamp Deciduous
- Wooded Swamp Mixed Trees

Tidelands Jurisdiction Chapter 91 Jurisdiction

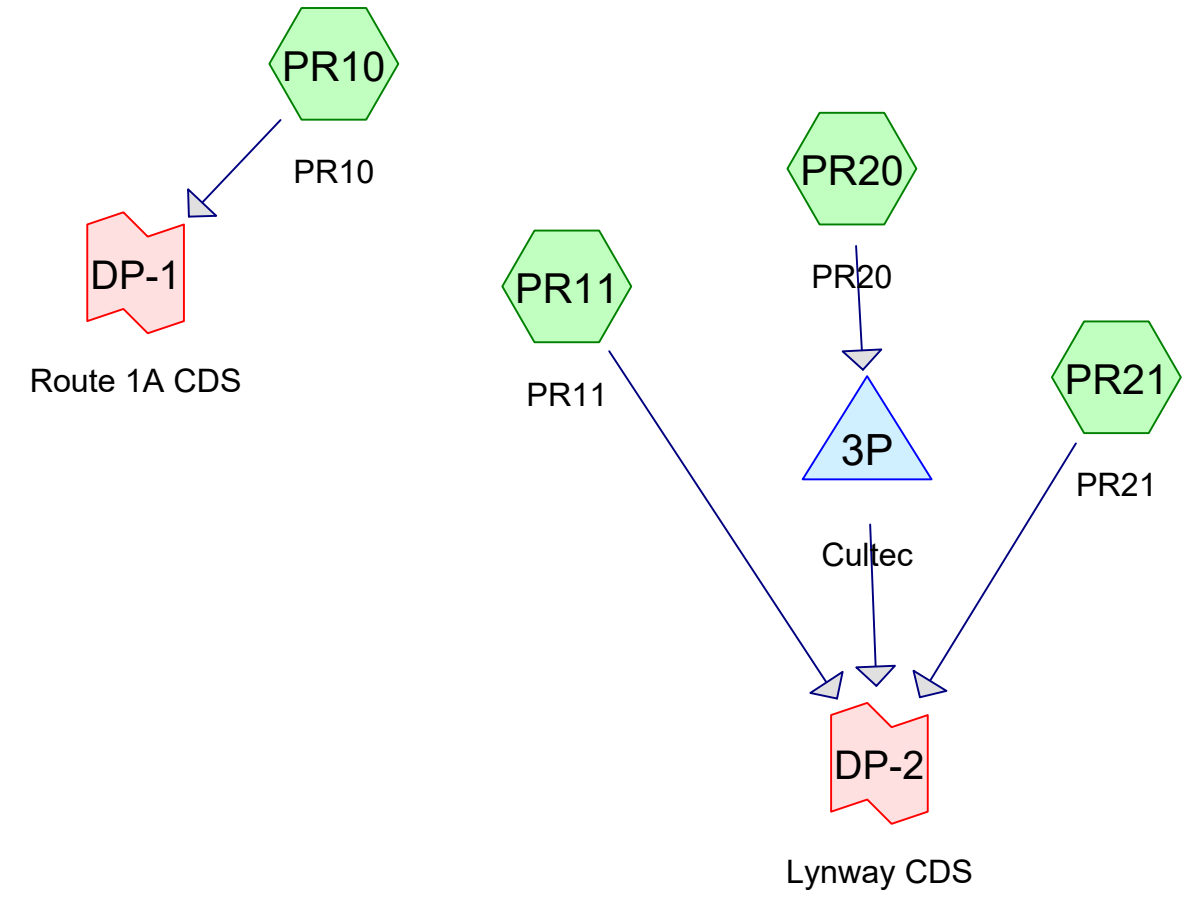
Areas of Critical Environmental Concern ACECs Transparent Green

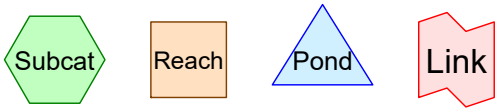
NHESP Priority Habitats of Rare Species

MassHistoric Commission Inventory (Areas)

- National Register of Historic Places
- Preservation Restriction
- Massachusetts Historic Landmark
- Local Historic District
- NRHP and LHD
- Inventoried Property

ATTACHMENT 12
HYDROCAD REPORT





Routing Diagram for 19954B-PR - NOAA
Prepared by Microsoft, Printed 2/28/2022
HydroCAD® 10.10-4a s/n 01301 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YR	Type III 24-hr		Default	24.00	1	3.20	2
2	10-YR	Type III 24-hr		Default	24.00	1	5.05	2
3	25-YR	Type III 24-hr		Default	24.00	1	6.21	2
4	50-YR	Type III 24-hr		Default	24.00	1	7.06	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
9,286	39	>75% Grass cover, Good, HSG A (PR10, PR11, PR20, PR21)
21,331	98	Paved parking, HSG A (PR10, PR11, PR20, PR21)
30,617	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
30,617	HSG A	PR10, PR11, PR20, PR21
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
30,617		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
9,286	0	0	0	0	9,286	>75% Grass cover, Good	
21,331	0	0	0	0	21,331	Paved parking	
30,617	**0**	**0**	**0**	**0**	**30,617**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	3P	6.00	5.00	100.0	0.0100	0.012	6.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR10: PR10 Runoff Area=1,910 sf 88.01% Impervious Runoff Depth>2.26"
Tc=6.0 min CN=91 Runoff=0.11 cfs 359 cf

Subcatchment PR11: PR11 Runoff Area=10,292 sf 92.74% Impervious Runoff Depth>2.54"
Tc=6.0 min CN=94 Runoff=0.66 cfs 2,180 cf

Subcatchment PR20: PR20 Runoff Area=11,661 sf 50.62% Impervious Runoff Depth>0.78"
Tc=6.0 min CN=69 Runoff=0.21 cfs 757 cf

Subcatchment PR21: PR21 Runoff Area=6,754 sf 62.21% Impervious Runoff Depth>1.15"
Tc=6.0 min CN=76 Runoff=0.20 cfs 648 cf

Pond 3P: Cultec Peak Elev=6.87' Storage=0.008 af Inflow=0.21 cfs 757 cf
Discarded=0.02 cfs 691 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 691 cf

Link DP-1: Route 1A CDS Inflow=0.11 cfs 359 cf
Primary=0.11 cfs 359 cf

Link DP-2: Lynway CDS Inflow=0.86 cfs 2,828 cf
Primary=0.86 cfs 2,828 cf

Total Runoff Area = 30,617 sf Runoff Volume = 3,944 cf Average Runoff Depth = 1.55"
30.33% Pervious = 9,286 sf 69.67% Impervious = 21,331 sf

Summary for Subcatchment PR10: PR10

Runoff = 0.11 cfs @ 12.09 hrs, Volume= 359 cf, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
229	39	>75% Grass cover, Good, HSG A
1,681	98	Paved parking, HSG A
1,910	91	Weighted Average
229		11.99% Pervious Area
1,681		88.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR11: PR11

Runoff = 0.66 cfs @ 12.09 hrs, Volume= 2,180 cf, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
747	39	>75% Grass cover, Good, HSG A
9,545	98	Paved parking, HSG A
10,292	94	Weighted Average
747		7.26% Pervious Area
9,545		92.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR20: PR20

Runoff = 0.21 cfs @ 12.11 hrs, Volume= 757 cf, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
5,758	39	>75% Grass cover, Good, HSG A
5,903	98	Paved parking, HSG A
11,661	69	Weighted Average
5,758		49.38% Pervious Area
5,903		50.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR21: PR21

Runoff = 0.20 cfs @ 12.10 hrs, Volume= 648 cf, Depth> 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
2,552	39	>75% Grass cover, Good, HSG A
4,202	98	Paved parking, HSG A
6,754	76	Weighted Average
2,552		37.79% Pervious Area
4,202		62.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Pond 3P: Cultec

Inflow Area = 11,661 sf, 50.62% Impervious, Inflow Depth > 0.78" for 2-YR event
Inflow = 0.21 cfs @ 12.11 hrs, Volume= 757 cf
Outflow = 0.02 cfs @ 11.90 hrs, Volume= 691 cf, Atten= 93%, Lag= 0.0 min
Discarded = 0.02 cfs @ 11.90 hrs, Volume= 691 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 6.87' @ 15.19 hrs Surf.Area= 0.015 ac Storage= 0.008 af

Plug-Flow detention time= 237.6 min calculated for 691 cf (91% of inflow)
Center-of-Mass det. time= 194.9 min (1,073.6 - 878.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	6.00'	0.013 af	**20.83'W x 31.50'L x 3.54'H Field A** 0.053 af Overall - 0.020 af Embedded = 0.033 af x 40.0% Voids
#2A	6.50'	0.020 af	**Cultec R-330XLHD** x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		0.033 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**1.030 in/hr Exfiltration over Surface area**
#2	Primary	6.00'	**6.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 6.00' / 5.00' S= 0.0100 '/' Cc= 0.900
n= 0.012 Concrete pipe, finished, Flow Area= 0.20 sf

#3 Device 2 9.00' **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
Head (feet) 0.20 0.40 0.60 0.80 1.00
Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 11.90 hrs HW=6.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.00' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: Route 1A CDS

Inflow Area = 1,910 sf, 88.01% Impervious, Inflow Depth > 2.26" for 2-YR event
Inflow = 0.11 cfs @ 12.09 hrs, Volume= 359 cf
Primary = 0.11 cfs @ 12.09 hrs, Volume= 359 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: Lynway CDS

Inflow Area = 28,707 sf, 68.45% Impervious, Inflow Depth > 1.18" for 2-YR event
Inflow = 0.86 cfs @ 12.09 hrs, Volume= 2,828 cf
Primary = 0.86 cfs @ 12.09 hrs, Volume= 2,828 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR10: PR10 Runoff Area=1,910 sf 88.01% Impervious Runoff Depth>4.03"
Tc=6.0 min CN=91 Runoff=0.19 cfs 641 cf

Subcatchment PR11: PR11 Runoff Area=10,292 sf 92.74% Impervious Runoff Depth>4.35"
Tc=6.0 min CN=94 Runoff=1.10 cfs 3,735 cf

Subcatchment PR20: PR20 Runoff Area=11,661 sf 50.62% Impervious Runoff Depth>1.99"
Tc=6.0 min CN=69 Runoff=0.60 cfs 1,935 cf

Subcatchment PR21: PR21 Runoff Area=6,754 sf 62.21% Impervious Runoff Depth>2.57"
Tc=6.0 min CN=76 Runoff=0.46 cfs 1,449 cf

Pond 3P: Cultec Peak Elev=8.85' Storage=0.029 af Inflow=0.60 cfs 1,935 cf
Discarded=0.02 cfs 747 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 747 cf

Link DP-1: Route 1A CDS Inflow=0.19 cfs 641 cf
Primary=0.19 cfs 641 cf

Link DP-2: Lynway CDS Inflow=1.55 cfs 5,184 cf
Primary=1.55 cfs 5,184 cf

Total Runoff Area = 30,617 sf Runoff Volume = 7,760 cf Average Runoff Depth = 3.04"
30.33% Pervious = 9,286 sf 69.67% Impervious = 21,331 sf

Summary for Subcatchment PR10: PR10

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 641 cf, Depth> 4.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.05"

Area (sf)	CN	Description
229	39	>75% Grass cover, Good, HSG A
1,681	98	Paved parking, HSG A
1,910	91	Weighted Average
229		11.99% Pervious Area
1,681		88.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR11: PR11

Runoff = 1.10 cfs @ 12.09 hrs, Volume= 3,735 cf, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.05"

Area (sf)	CN	Description
747	39	>75% Grass cover, Good, HSG A
9,545	98	Paved parking, HSG A
10,292	94	Weighted Average
747		7.26% Pervious Area
9,545		92.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR20: PR20

Runoff = 0.60 cfs @ 12.10 hrs, Volume= 1,935 cf, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.05"

Area (sf)	CN	Description
5,758	39	>75% Grass cover, Good, HSG A
5,903	98	Paved parking, HSG A
11,661	69	Weighted Average
5,758		49.38% Pervious Area
5,903		50.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR21: PR21

Runoff = 0.46 cfs @ 12.09 hrs, Volume= 1,449 cf, Depth> 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.05"

Area (sf)	CN	Description
2,552	39	>75% Grass cover, Good, HSG A
4,202	98	Paved parking, HSG A
6,754	76	Weighted Average
2,552		37.79% Pervious Area
4,202		62.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Pond 3P: Cultec

Inflow Area = 11,661 sf, 50.62% Impervious, Inflow Depth > 1.99" for 10-YR event
Inflow = 0.60 cfs @ 12.10 hrs, Volume= 1,935 cf
Outflow = 0.02 cfs @ 11.30 hrs, Volume= 747 cf, Atten= 97%, Lag= 0.0 min
Discarded = 0.02 cfs @ 11.30 hrs, Volume= 747 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 8.85' @ 18.04 hrs Surf.Area= 0.015 ac Storage= 0.029 af

Plug-Flow detention time= 324.5 min calculated for 745 cf (39% of inflow)
Center-of-Mass det. time= 194.4 min (1,043.5 - 849.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	6.00'	0.013 af	**20.83'W x 31.50'L x 3.54'H Field A** 0.053 af Overall - 0.020 af Embedded = 0.033 af x 40.0% Voids
#2A	6.50'	0.020 af	**Cultec R-330XLHD** x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		0.033 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**1.030 in/hr Exfiltration over Surface area**
#2	Primary	6.00'	**6.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 6.00' / 5.00' S= 0.0100 '/' Cc= 0.900
n= 0.012 Concrete pipe, finished, Flow Area= 0.20 sf

#3 Device 2 9.00' **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
Head (feet) 0.20 0.40 0.60 0.80 1.00
Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 11.30 hrs HW=6.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.00' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: Route 1A CDS

Inflow Area = 1,910 sf, 88.01% Impervious, Inflow Depth > 4.03" for 10-YR event
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 641 cf
Primary = 0.19 cfs @ 12.09 hrs, Volume= 641 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: Lynway CDS

Inflow Area = 28,707 sf, 68.45% Impervious, Inflow Depth > 2.17" for 10-YR event
Inflow = 1.55 cfs @ 12.09 hrs, Volume= 5,184 cf
Primary = 1.55 cfs @ 12.09 hrs, Volume= 5,184 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR10: PR10 Runoff Area=1,910 sf 88.01% Impervious Runoff Depth>5.16"
Tc=6.0 min CN=91 Runoff=0.24 cfs 821 cf

Subcatchment PR11: PR11 Runoff Area=10,292 sf 92.74% Impervious Runoff Depth>5.50"
Tc=6.0 min CN=94 Runoff=1.37 cfs 4,718 cf

Subcatchment PR20: PR20 Runoff Area=11,661 sf 50.62% Impervious Runoff Depth>2.87"
Tc=6.0 min CN=69 Runoff=0.88 cfs 2,793 cf

Subcatchment PR21: PR21 Runoff Area=6,754 sf 62.21% Impervious Runoff Depth>3.56"
Tc=6.0 min CN=76 Runoff=0.63 cfs 2,003 cf

Pond 3P: Cultec Peak Elev=9.05' Storage=0.030 af Inflow=0.88 cfs 2,793 cf
Discarded=0.02 cfs 787 cf Primary=0.13 cfs 714 cf Outflow=0.15 cfs 1,501 cf

Link DP-1: Route 1A CDS Inflow=0.24 cfs 821 cf
Primary=0.24 cfs 821 cf

Link DP-2: Lynway CDS Inflow=2.00 cfs 7,436 cf
Primary=2.00 cfs 7,436 cf

Total Runoff Area = 30,617 sf Runoff Volume = 10,336 cf Average Runoff Depth = 4.05"
30.33% Pervious = 9,286 sf 69.67% Impervious = 21,331 sf

Summary for Subcatchment PR10: PR10

Runoff = 0.24 cfs @ 12.09 hrs, Volume= 821 cf, Depth> 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.21"

Area (sf)	CN	Description
229	39	>75% Grass cover, Good, HSG A
1,681	98	Paved parking, HSG A
1,910	91	Weighted Average
229		11.99% Pervious Area
1,681		88.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR11: PR11

Runoff = 1.37 cfs @ 12.09 hrs, Volume= 4,718 cf, Depth> 5.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.21"

Area (sf)	CN	Description
747	39	>75% Grass cover, Good, HSG A
9,545	98	Paved parking, HSG A
10,292	94	Weighted Average
747		7.26% Pervious Area
9,545		92.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR20: PR20

Runoff = 0.88 cfs @ 12.10 hrs, Volume= 2,793 cf, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.21"

Area (sf)	CN	Description
5,758	39	>75% Grass cover, Good, HSG A
5,903	98	Paved parking, HSG A
11,661	69	Weighted Average
5,758		49.38% Pervious Area
5,903		50.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR21: PR21

Runoff = 0.63 cfs @ 12.09 hrs, Volume= 2,003 cf, Depth> 3.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.21"

Area (sf)	CN	Description
2,552	39	>75% Grass cover, Good, HSG A
4,202	98	Paved parking, HSG A
6,754	76	Weighted Average
2,552		37.79% Pervious Area
4,202		62.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Pond 3P: Cultec

Inflow Area = 11,661 sf, 50.62% Impervious, Inflow Depth > 2.87" for 25-YR event
Inflow = 0.88 cfs @ 12.10 hrs, Volume= 2,793 cf
Outflow = 0.15 cfs @ 12.67 hrs, Volume= 1,501 cf, Atten= 83%, Lag= 34.5 min
Discarded = 0.02 cfs @ 10.65 hrs, Volume= 787 cf
Primary = 0.13 cfs @ 12.67 hrs, Volume= 714 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 9.05' @ 12.65 hrs Surf.Area= 0.015 ac Storage= 0.030 af

Plug-Flow detention time= 225.3 min calculated for 1,498 cf (54% of inflow)
Center-of-Mass det. time= 109.0 min (947.3 - 838.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	6.00'	0.013 af	**20.83'W x 31.50'L x 3.54'H Field A** 0.053 af Overall - 0.020 af Embedded = 0.033 af x 40.0% Voids
#2A	6.50'	0.020 af	**Cultec R-330XLHD** x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		0.033 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**1.030 in/hr Exfiltration over Surface area**
#2	Primary	6.00'	**6.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 6.00' / 5.00' S= 0.0100 '/' Cc= 0.900
n= 0.012 Concrete pipe, finished, Flow Area= 0.20 sf

#3 Device 2 9.00' **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
Head (feet) 0.20 0.40 0.60 0.80 1.00
Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 10.65 hrs HW=6.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.12 cfs @ 12.67 hrs HW=9.05' (Free Discharge)
└─**2=Culvert** (Passes 0.12 cfs of 1.03 cfs potential flow)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.62 fps)

Summary for Link DP-1: Route 1A CDS

Inflow Area = 1,910 sf, 88.01% Impervious, Inflow Depth > 5.16" for 25-YR event
Inflow = 0.24 cfs @ 12.09 hrs, Volume= 821 cf
Primary = 0.24 cfs @ 12.09 hrs, Volume= 821 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: Lynway CDS

Inflow Area = 28,707 sf, 68.45% Impervious, Inflow Depth > 3.11" for 25-YR event
Inflow = 2.00 cfs @ 12.09 hrs, Volume= 7,436 cf
Primary = 2.00 cfs @ 12.09 hrs, Volume= 7,436 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR10: PR10 Runoff Area=1,910 sf 88.01% Impervious Runoff Depth>5.99"
Tc=6.0 min CN=91 Runoff=0.28 cfs 954 cf

Subcatchment PR11: PR11 Runoff Area=10,292 sf 92.74% Impervious Runoff Depth>6.34"
Tc=6.0 min CN=94 Runoff=1.56 cfs 5,441 cf

Subcatchment PR20: PR20 Runoff Area=11,661 sf 50.62% Impervious Runoff Depth>3.56"
Tc=6.0 min CN=69 Runoff=1.10 cfs 3,459 cf

Subcatchment PR21: PR21 Runoff Area=6,754 sf 62.21% Impervious Runoff Depth>4.31"
Tc=6.0 min CN=76 Runoff=0.77 cfs 2,424 cf

Pond 3P: Cultec Peak Elev=9.13' Storage=0.031 af Inflow=1.10 cfs 3,459 cf
Discarded=0.02 cfs 814 cf Primary=0.52 cfs 1,336 cf Outflow=0.53 cfs 2,149 cf

Link DP-1: Route 1A CDS Inflow=0.28 cfs 954 cf
Primary=0.28 cfs 954 cf

Link DP-2: Lynway CDS Inflow=2.33 cfs 9,201 cf
Primary=2.33 cfs 9,201 cf

Total Runoff Area = 30,617 sf Runoff Volume = 12,278 cf Average Runoff Depth = 4.81"
30.33% Pervious = 9,286 sf 69.67% Impervious = 21,331 sf

Summary for Subcatchment PR10: PR10

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 954 cf, Depth> 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.06"

Area (sf)	CN	Description
229	39	>75% Grass cover, Good, HSG A
1,681	98	Paved parking, HSG A
1,910	91	Weighted Average
229		11.99% Pervious Area
1,681		88.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR11: PR11

Runoff = 1.56 cfs @ 12.09 hrs, Volume= 5,441 cf, Depth> 6.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.06"

Area (sf)	CN	Description
747	39	>75% Grass cover, Good, HSG A
9,545	98	Paved parking, HSG A
10,292	94	Weighted Average
747		7.26% Pervious Area
9,545		92.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR20: PR20

Runoff = 1.10 cfs @ 12.09 hrs, Volume= 3,459 cf, Depth> 3.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.06"

Area (sf)	CN	Description
5,758	39	>75% Grass cover, Good, HSG A
5,903	98	Paved parking, HSG A
11,661	69	Weighted Average
5,758		49.38% Pervious Area
5,903		50.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR21: PR21

Runoff = 0.77 cfs @ 12.09 hrs, Volume= 2,424 cf, Depth> 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-YR Rainfall=7.06"

Area (sf)	CN	Description
2,552	39	>75% Grass cover, Good, HSG A
4,202	98	Paved parking, HSG A
6,754	76	Weighted Average
2,552		37.79% Pervious Area
4,202		62.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Pond 3P: Cultec

Inflow Area = 11,661 sf, 50.62% Impervious, Inflow Depth > 3.56" for 50-YR event
Inflow = 1.10 cfs @ 12.09 hrs, Volume= 3,459 cf
Outflow = 0.53 cfs @ 12.36 hrs, Volume= 2,149 cf, Atten= 51%, Lag= 15.7 min
Discarded = 0.02 cfs @ 10.25 hrs, Volume= 814 cf
Primary = 0.52 cfs @ 12.36 hrs, Volume= 1,336 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 9.13' @ 12.36 hrs Surf.Area= 0.015 ac Storage= 0.031 af

Plug-Flow detention time= 180.1 min calculated for 2,145 cf (62% of inflow)
Center-of-Mass det. time= 73.4 min (905.5 - 832.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	6.00'	0.013 af	**20.83'W x 31.50'L x 3.54'H Field A** 0.053 af Overall - 0.020 af Embedded = 0.033 af x 40.0% Voids
#2A	6.50'	0.020 af	**Cultec R-330XLHD** x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		0.033 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**1.030 in/hr Exfiltration over Surface area**
#2	Primary	6.00'	**6.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 6.00' / 5.00' S= 0.0100 '/' Cc= 0.900
n= 0.012 Concrete pipe, finished, Flow Area= 0.20 sf

#3 Device 2 9.00' **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
Head (feet) 0.20 0.40 0.60 0.80 1.00
Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 10.25 hrs HW=6.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.49 cfs @ 12.36 hrs HW=9.12' (Free Discharge)
└─**2=Culvert** (Passes 0.49 cfs of 1.05 cfs potential flow)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.49 cfs @ 0.99 fps)

Summary for Link DP-1: Route 1A CDS

Inflow Area = 1,910 sf, 88.01% Impervious, Inflow Depth > 5.99" for 50-YR event
Inflow = 0.28 cfs @ 12.09 hrs, Volume= 954 cf
Primary = 0.28 cfs @ 12.09 hrs, Volume= 954 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: Lynway CDS

Inflow Area = 28,707 sf, 68.45% Impervious, Inflow Depth > 3.85" for 50-YR event
Inflow = 2.33 cfs @ 12.09 hrs, Volume= 9,201 cf
Primary = 2.33 cfs @ 12.09 hrs, Volume= 9,201 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Events for Subcatchment PR10: PR10

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-YR	3.20	0.11	359	2.26
10-YR	5.05	0.19	641	4.03
25-YR	6.21	0.24	821	5.16
50-YR	**7.06**	**0.28**	**954**	**5.99**

Events for Subcatchment PR11: PR11

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-YR	3.20	0.66	2,180	2.54
10-YR	5.05	1.10	3,735	4.35
25-YR	6.21	1.37	4,718	5.50
50-YR	**7.06**	**1.56**	**5,441**	**6.34**

Events for Subcatchment PR20: PR20

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-YR	3.20	0.21	757	0.78
10-YR	5.05	0.60	1,935	1.99
25-YR	6.21	0.88	2,793	2.87
50-YR	**7.06**	**1.10**	**3,459**	**3.56**

Events for Subcatchment PR21: PR21

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-YR	3.20	0.20	648	1.15
10-YR	5.05	0.46	1,449	2.57
25-YR	6.21	0.63	2,003	3.56
50-YR	**7.06**	**0.77**	**2,424**	**4.31**

Events for Pond 3P: Cultec

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Storage (acre-feet)
2-YR	0.21	0.02	**0.02**	0.00	6.87	0.008
10-YR	0.60	0.02	0.02	0.00	8.85	0.029
25-YR	0.88	0.15	0.02	0.13	9.05	0.030
50-YR	**1.10**	**0.53**	0.02	**0.52**	**9.13**	**0.031**

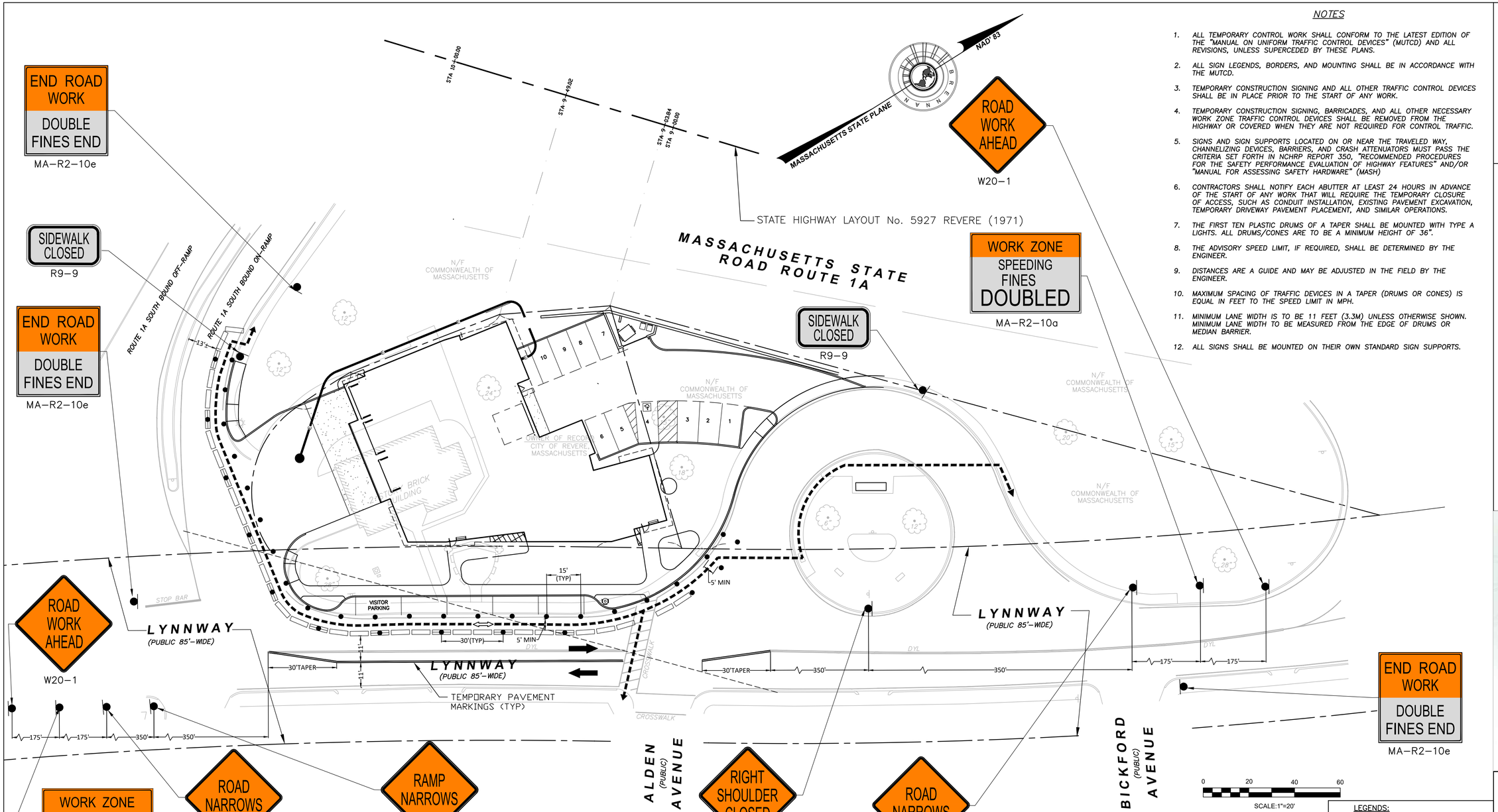
Events for Link DP-1: Route 1A CDS

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
2-YR	0.11	0.11	**0.00**
10-YR	0.19	0.19	0.00
25-YR	0.24	0.24	0.00
50-YR	**0.28**	**0.28**	0.00

Events for Link DP-2: Lynway CDS

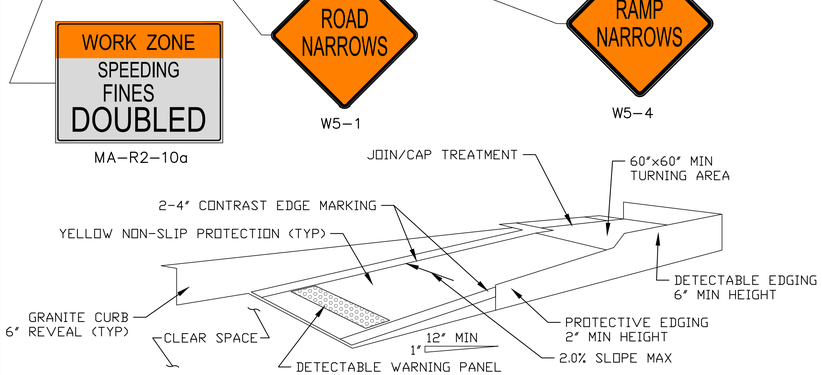
Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
2-YR	0.86	0.86	**0.00**
10-YR	1.55	1.55	0.00
25-YR	2.00	2.00	0.00
50-YR	**2.33**	**2.33**	0.00

ATTACHMENT 13
TRAFFIC MANAGEMENT PLAN

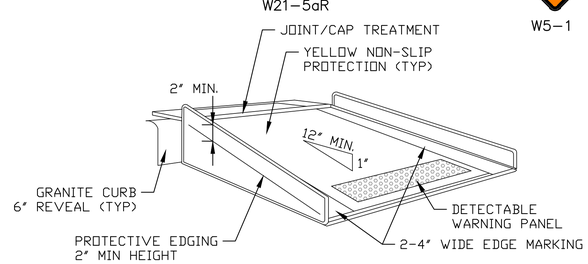


NOTES

1. ALL TEMPORARY CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
2. ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
3. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
4. TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL TRAFFIC.
5. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH)
6. CONTRACTORS SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
7. THE FIRST TEN PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A LIGHTS. ALL DRUMS/CONES ARE TO BE A MINIMUM HEIGHT OF 36".
8. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
9. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
10. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
11. MINIMUM LANE WIDTH IS TO BE 11 FEET (3.3M) UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
12. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.



TEMPORARY CURB RAMP–PARALLEL TO CURB
NOT TO SCALE



TEMPORARY CURB RAMP–PERPENDICULAR TO CURB
NOT TO SCALE

NOTES

1. CURB RAMPS SHALL BE 60" MINIMUM WIDTH WITH A FIRM, STABLE AND NON–SLIP SURFACE.
2. PROTECTIVE EDGING WITH A 2" MINIMUM HEIGHT SHALL BE INSTALLED WHEN THE CURB RAMP OR LANDING PLATFORM HAS A VERTICAL DROP OF 6" OR GREATER OR HAS A SIDE APRON SLOPE STEEPER THAN 1:3(33%). PROTECTIVE EDGING SHOULD BE CONSIDERED WHEN THE CURB RAMPS OR LANDING PLATFORMS HAVE A VERTICAL DROP OF 3" OR MORE.
3. DETECTABLE EDGING WITH 6" MINIMUM HEIGHT AND CONTRASTING COLOR SHALL BE INSTALLED ON ALL CURB RAMP LANDINGS WHERE THE WALKWAY CHANGES DIRECTION (TURNS).
4. THE CURB RAMP WALKWAY AND LANDING AREA SURFACE SHALL BE OF A SOLID CONTINUOUS CONTRASTING COLOR ABUTTING UP TO THE EXISTING SIDEWALK.
5. CURB RAMPS AND LANDINGS SHOULD HAVE A 1:50 (2%) MAX CROSS–SLOPE.
6. CLEAR SPACE OF 48"X48" MINIMUM SHALL BE PROVIDED ABOVE AND BELOW THE CURB RAMP.
7. WATER FLOW IN THE GUTTER SYSTEM SHALL HAVE MINIMAL RESTRICTION.
8. LATERAL JOINTS OR GAPS BETWEEN SURFACES SHALL BE LESS THAN 0.5" WIDTH.
9. CHANGES BETWEEN SURFACE HEIGHTS SHOULD NOT EXCEED 0.5" LATERAL EDGES SHOULD BE VERTICAL UP TO 0.25" HIGH, AND BEVELED AT 1:2 BETWEEN 0.25" AND 0.5" HEIGHT.
10. IF A TEMPORARY PEDESTRIAN RAMP LEADS TO A CROSSWALK. THEN A DETECTABLE WARNING PAD MUST BE ADHERED TO THE BASE OF THE RAMP. IF IT LEADS TO A PROTECTED PEDESTRIAN BYPASS THAT DOES NOT CONFLICT WITH VEHICULAR TRAFFIC, THEN A PAD SHALL NOT BE INSTALLED ON THE RAMP.
11. TEMPORARY CURB RAMP SHALL BE PAID FOR UNDER ITEM 852.1 TEMPORARY PEDESTRIAN MANAGEMENT GUIDANCE SYSTEM.

LEGENDS:

- MEDIAN BARRIER
- MEDIAN BARRIER WITH WARNING LIGHTS
- REFLECTORIZED PLASTIC DRUM
- TYPE III BARRICADE
- SIGN POST
- FIRE HYDRANT
- CHAIN LINK FENCE
- POLICE OFFICER
- PEDESTRIAN FLOW ARROW
- TRAFFIC FLOW ARROW
- ARROW BOARD

TRAFFIC MANAGEMENT PLAN
LOCATED IN
140 LYNNWAY
REVERE, MA

PREPARED FOR
WINTER STREET ARCHITECTS

DATE: 7-21-2021 REV: 1-17-22

SCALE: 1" = 20'

Brennan Consulting
ENGINEERING · TRANSPORTATION · SURVEYING
24 RAY AVENUE, BURLINGTON, MA
PHONE: (781) 273–3434 · FAX: (781) 273–3430

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	12/10/21	RESPONSE TO DOT COMMENTS	CG

CHECKED BY: CE

DRAWN BY: CG

PROJECT 19954B

T-01