TETRA TECH

April 25, 2022

William Ambrosino, Chairman
Town of Mendon Planning Board
18 Main Street
Mendon, MA 01756

Re: **Application for Special Permit and Site Plan Review**
Mixed-Use Development Project
35 Hastings Street (Parcel ID: 11-142-35-0)
37 Hastings Street (Parcel ID: 11-142-37-0)
12 Washington Street (Parcel ID: 8-242-18-0)
20 Washington Street (Parcel ID: 8-242-20-0)

Dear Board Members:

On behalf of Hastings Street Plaza, LLC (the Applicant), Tetra Tech is pleased to submit a request for a Special Permit and Site Plan Review from the Town of Mendon Planning Board, pursuant to Article IV, Section 4.02, of the Zoning Bylaws. The Applicant proposes to construct a smart growth mixed-use development comprised of mutually compatible and connected commercial and residential uses sharing critical infrastructure (the Project) on the 18.3-acre assemblage of land owned by Hastings Street Plaza, LLC (the Site).

Enclosed please find eight (8) copies of the Special Permit and Site Plan Review application materials for the Board's consideration as well as a check for the filing fee. Materials include all applicable information listed in Article I, Section 1.06 and Article IV, Section 4.02, of the Zoning Bylaws.

We respectfully request placement on the next available public hearing agenda to present the Project and address any questions, comments or concerns of the Boards, Town Departments, or interested residents. In the meantime, please don't hesitate to contact us if you have any questions or require additional information.

Very truly yours,

Matthew Moyen, PE
Senior Project Manager
508-786-2348
matthew.moyen@tetratech.com

Marlborough Technology Park
100 Nickerson Road, Marlborough, MA 01752
Tel 508.786.2200 Fax 508.786.2201 tetratech.com

Application for Special Permit and Site Plan Review

Mixed-Use Development Project
35 Hastings Street (Parcel ID: 11-142-35-0)
37 Hastings Street (Parcel ID: 11-142-37-0)
12 Washington Street (Parcel ID: 8-242-18-0)
20 Washington Street (Parcel ID: 8-242-20-0)

Prepared for:

Hastings Street Plaza, LLC
PO Box 444
Mendon, MA 01756

Prepared by:

Tetra Tech, Inc.
100 Nickerson Road
Marlborough, MA 01752

TETRA TECH

April 2022

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LIST OF APPENDICIES

PLANNING BOARD
MENDON, MASSACHUSETTS 01756 FORM N

SITE PLAN APPROVAL APPLICATION X
SPECIAL PERMIT APPLICATION X

To the Mendon Planning Board:

The undersigned desires to submit a Site Plan Review or Special Permit for review as required by Section F.11 of the Town of Mendon Zoning Bylaws.

Applicant's Name Kevin Meehan Company Hastings Street Plaza, LLC

Address PO Box 444

Town Mendon State/Zip MA Phone (508) 422-1050

Property Location 35-37 Hastings Street, 12 Washington Street, and 20 Washington Street
Assessor's Map 11 & 8 Block 142 / 242 Lot 35 / 37 / 18 / 20 Zoning District GB and RR
Owner's Name Hastings Street Plaza, LLC
Address PO Box 444
Town Mendon State/Zip MA Phone (508) 422-1050
Lienholder/Mortgagee: Name
Address Town State/Zip Phone

Applicant's interest: (leasee, option to buy, P&S,etc): Owner

This application is for (Circle the applicable paragraph number below)

1. Any new building to be constructed or externally enlarged.
2. Any existing use to be expanded in ground area.
3. Any new use to be established in an existing building.
[✓ 4. Plan dated April 25, 2022]

Summary of work to be done Smart growth mixed-use development comprised of mutually compatible and connected commercial and residential uses sharing critical infrastructure. Refer to enclosed Project Narrative for additional detail

Estimated cost $ 22,000,000 Starting Date Fall 2022 Completion Date Fall 2024

Signature of Applicant Kevin Meehan Date 04-22-2022

Signature of Land Owner Kevin Meehan Date 04-22-2022

Applicant's signature indicates his/her agreement to pay all filing and review costs.

THIS CHECK IS VOID WITHOUT A BLUE & GREEN BACKGROUND AND AN ARTIFICIAL WATERMARK ON THE BACK - HOLD AT AN ANGLE TO VIEW

Hastings Street Plaza LLC
8 Uxbridge Road
P.O. Box 444
Mendon, MA 01756

Rockland Trust
Milford, MA 01757

10163

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DATE: 4/25/2022

PAY ONLY 8,000 00 CENTS
Eight Zero Zero Zero

$ 8,000.00

Job No. 932997

PAY Eight Thousand and 00/100 Dollars

TO THE ORDER OF
Town of Mendon
P.O. Box 11
Mendon, MA 01756

MEMO: 35-37 Hastings St., Mendon

Kathleen R [illegible]

SIGNATURE HAS A COLORED BACKGROUND • BORDER CONTAINS MICROPRINTING

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Hastings Street Plaza LLC **10163**

NAME: Town of Mendon CHECK DATE: 4/25/2022

Date	Type	Reference	Original Amt.	Balance Due	Discount	Payment
4/25/2022	Bill		8,000.00	8,000.00		8,000.00
					Check Amount	8,000.00

Rockland Trust Check 35-37 Hastings St., Mendon 8,000.00

Hastings Street Plaza LLC
8 Uxbridge Road
P.O. Box 444
Mendon, MA 01756

Rockland Trust
Milford, MA 01757

10163

Printed>WinUser-kathya: 04/25/22 09:35:21 am

DATE: 4/25/2022

PAY ONLY 8,000 00 CENTS
Eight Zero Zero Zero

$ 8,000.00

PAY Eight Thousand and 00/100 Dollars

TO THE ORDER OF
Town of Mendon
P.O. Box 11
Mendon, MA 01756

MEMO: 35-37 Hastings St., Mendon

COPY

Hastings Street Plaza LLC **10163**

NAME: Town of Mendon CHECK DATE: 4/25/2022

Date	Type	Reference	Original Amt.	Balance Due	Discount	Payment
4/25/2022	Bill		8,000.00	8,000.00		8,000.00
					Check Amount	8,000.00

Rockland Trust Check 35-37 Hastings St., Mendon 8,000.00

1.0 APPLICANT

The Project is proposed by Hastings Street Plaza, LLC who has a longstanding history within the community and seeks to incorporate Smart Growth and Sustainable Development principles into a mixed-use development that will boost the economy, protect the environment and public health, and enhance community vitality.

2.0 PROJECT SITE

The Project Site is located within the General Business (GB) and Rural Residential (RR) zoning districts and includes 18.3-acres of applicant-owned land with frontage and access along Hastings Street (Route 16) and Washington Street. The parcel assemblage is currently occupied by Barry's Place (closed) at 35 Hastings Street, the Mendon Driving Range at 37 Hastings Street, and single-family residences at 12 Washington Street and 20 Washington Street. Commercial improvements on the Project Site include a small restaurant structure, three support structures, a driving range facility, and miniature golf course served by an approximately 60-space parking lot. Residential improvements on the Project Site include two single-family homes and a large barn structure served by driveways.

The Project Site and surrounding features are shown on Figure 1 – USGS Locus Map in Appendix A.

The Project Site is mostly vegetated with large areas of mowed and maintained grass at the driving range and adjacent residence as well as woodland to the north. Topography generally slopes from east to west ranging from a high elevation of 447 near Hastings Street to a low elevation of 417 at a wetland resource area within the woods downgradient of the 220-yard-long driving range, referenced to the North American Vertical Datum of 1988 (NAVD 88). Stormwater runoff from the site flows predominantly to the northwest where it discharges overland to a wetland resource area. Only a small portion of the site flows overland to the east towards Washington Street.

Existing conditions are depicted on Sheet V-100 of the Special Permit and Site Plan Review Plans included with the application. A reduced version is provided in Appendix B.

3.0 PROJECT SUMMARY

The Project will construct a smart growth mixed-used development comprised of mutually compatible and connected commercial and residential uses sharing critical infrastructure that is consistent with the Mendon Master Plan Vision through its investments in improving infrastructure and environmental resiliency, strengthening the economy, and preserving open spaces and the small-town feel. Located along a densely developed stretch of the Route 16 corridor with access to existing infrastructure and adjacent to the Mendon Center District, the Project Site is an ideal candidate for a smart growth mixed-use development.

3.1 BUILDING PROGRAM

The building program consists of a 66,600 gross-square-foot shopping center and 27 single-family homes that will be designed to incorporate architectural elements that are consistent with the character of the surrounding area.

The shopping center includes a 3,600 square foot standalone drive-thru bank, an L-shaped building program that is comprised of a 31,000 square foot market, 15,000 square foot outdoor retail space, 17,000 square foot indoor retail space, as well as a 1,500 square foot accessory carousel structure that each incorporate at least one dedicated off-street loading space. The shopping center will incorporate architectural building, structure, and screening elements that are consistent with similar uses and the surrounding area.

The residential neighborhood includes the exterior restoration and interior renovation of the existing historical residence at 12 Washington Street, construction of one new barn-style home along the 12 Washington Street frontage to maintain its historical character, and construction of 25 new single-family two-bedroom homes with a one-car garage that will incorporate New England style architecture. Only three residences will be located along the Washington Street frontage, consistent with existing conditions, while pushing the more densely develop area towards the site interior and incorporating screening elements consistent with the use.

Building layouts are depicted on Sheet C-120, C-131, and C-132 of the Special Permit and Site Plan Review Plans included with the application. A reduced version is provided in Appendix B. A reduced version of architectural elevations and renderings are provided in Appendix C.

3.2 SITE ACCESS AND CIRCULATION

Vehicular access to the Project Site will be along Route 16 and Washington Street. A two-lane roundabout at the intersection of Route 16 and Millville Road is proposed to improve operations along Route 16 and provide primary access to the shopping center, with secondary access for delivery and service vehicles occurring at an access point east of the roundabout. Two access points along Washington Street will provide dedicated vehicular access to the residential neighborhood.

Two-way vehicular circulation is provided around the Project Site. The lone exception being a short stretch of one-way circulation for the bank drive thru. Accommodations for large delivery trucks and fire-fighting equipment are incorporated where appropriate.

Pedestrian access to the Project Site will be via new sidewalks along Route 16. Pedestrian circulation around the Project Site is comprised of interconnected sidewalks with accessible ramps and striped pedestrian pathways that provide connectivity between the shopping center and residential neighborhood. The new roundabout and interconnected share-use sidewalks will also provide connectivity between the Project Site and existing residences, community goods, services, and recreational activities in and around the downtown area.

The Project will comply with applicable requirements of the Americans with Disabilities Act (ADA) and the Massachusetts Architectural Access Board (MAAB).

Site access, circulation, and layout are depicted on Sheets C-120, C-131, and C-132 of the Special Permit and Site Plan Review Plans included with the application. A reduced version is provided in Appendix B.

3.3 UTILITIES

The Project Site has access to electric, telephone and data services located along the Route 16 and Washington Street corridors that serve existing uses. Access to natural gas is also available within the Route 16 corridor. The Project will require a new public water supply, fire protection cisterns, and subsurface sewage disposal systems to serve the proposed uses. Existing water wells will be reused for landscape irrigation and existing wastewater disposal systems will be retired.

Utilities are depicted on Sheets C-141, C-142, C-151, and C-152 of the Special Permit and Site Plan Review Plans included with the application. A reduced version is provided in Appendix B.

Domestic Water

A public water supply serving the Project's commercial and residential uses will be designed in compliance with Massachusetts Drinking Water Regulations (310 CMR 22) and the MassDEP Guidelines and Policies for Public Water Systems.

A Request for Site Exam and Pumping Test Proposal was submitted to MassDEP on May 26, 2021. An Approval to Site a Source and Conduct Pumping Test for Source <70 GPM was granted by MassDEP on September 16, 2021 and copied the Town of Mendon Board of Health.

Firefighting Water

The Project will incorporate fire cisterns, or equivalent, sized and located to comply with the Town of Mendon Fire Department requirements.

Sewer

The Project's commercial and residential uses are served by independent subsurface sewage disposal systems that will be designed in compliance with Title 5 of the State Environmental Code (310 CMR 15) and all applicable requirements of the Town of Mendon Board of Health and Zoning Bylaws.

Soil Suitability Assessments and Percolation Tests were performed by a Certified Soil Evaluator and observed by the Board of Health on September 13 and September 14, 2021. Soil Suitability Assessments for On-Site Sewage Disposal, Percolation Test Results, and a Sewage Disposal Deep Observation Hole and Percolation Test Location Plan were submitted to the Board of Health on November 10, 2021.

Drain

Stormwater management systems for the Project will include closed drainage infrastructure for collection and conveyance as well as surface and subsurface best management practices for peak rate attenuation, recharge, and treatment. Stormwater management systems will be designed in compliance with the Massachusetts Stormwater Management Standards, Massachusetts Wetlands Protection Regulations (310 CMR 10), and all applicable requirements of the Town of Mendon General Bylaws and Zoning Bylaws.

Exploratory Test Pits were performed by a Certified Soil Evaluator on September 13 and 14, 2021.

Electric, Telephone, and Data

The Project will connect to an existing utility pole along the Route 16 corridor. Electric, telephone, and data will be routed underground where physically and environmentally feasible and will comply with applicable requirements of the Town of Mendon Zoning Bylaws.

Exterior Lighting

Exterior lighting for the Project will be designed consistent with similar uses to provide safe and secure access and circulation, minimize unnecessary light sources, avoid off-site lighting and night sky pollution, and will comply with applicable requirements of the Town of Mendon Zoning Bylaws. A reduced version of the site lighting photometric plan is provided in Appendix D.

Natural Gas

The Project will connect to an existing natural gas line that is located within, and currently serves, the Route 16 corridor and surrounding area.

3.4 LANDSCAPING

Landscaping for the Project will include interior parking lot islands and perimeter screening designed consistent with similar uses, preserve existing vegetation, where feasible, which includes a large area of open space to the rear of the development that is contiguous with off-site woodland and wetlands, and comply with applicable requirements of the Town of Mendon Zoning Bylaws.

Landscaping is depicted on Sheets C-161 and C-162 of the Special Permit and Site Plan Review Plans included with the application. A reduced version is provided in Appendix B.

3.5 MASSACHUSETTS SUSTAINABLE DEVELOPMENT PRINCIPLES

The Project is aligned with all applicable Commonwealth of Massachusetts' Sustainable Development (MSD) Principles that were released to express desirable smart growth goals as a basic guide to local officials, developers, and citizens. The Commonwealth uses these Principles to guide the creation and implementation of state agency policies and programs, as well as investments in land and infrastructure. Furthermore, the Commonwealth has asked municipalities to modify their planning, regulatory, and funding actions to achieve consistency with these Principles. Alignment with these Principles is described below.

MSD Principle 1: Concentrate Development and Mix Uses

The Project supports this principle by (1) proposing a development that is compact, conserves a large area of open space to the rear of the development that is contiguous with off-site woodland and wetlands, protects the historic Rawson-Whiting-Congdon House, and integrates commercial and residential uses; (2) increasing efficiency of previously developed land and infrastructure; and (3) locating housing, offices, and retail within proximity to one another and providing pedestrian-friendly connectivity to existing residences, open spaces, community goods, services, and recreational activities in and around the downtown area.

MSD Principle 2: Advance Equity

The Project supports this principle by promoting equitable sharing of the social, economic, and environmental benefits and burdens of development as further detailed within the project narrative. The Applicants longstanding history living and working within the community, as well as the local and state public review processes, will also help ensure that the interests of future generations are not compromised.

MSD Principle 3: Make Efficient Decisions

The focus of this principle is to make local and state regulatory and permitting processes for development clear, predictable, coordinated, and timely in accordance with smart growth and environmental stewardship. By providing accurate, complete, and thorough documentation to local, state, and federal agencies the Applicant is indirectly supporting this principle.

MSD Principle 4: Protect Land and Ecosystems

The Project supports this principle by (1) protecting on-site wetland resource areas; (2) preserving a large area of open space to the rear of the development that is contiguous with off-site woodland and wetlands; (3) increasing the quantity, quality and accessibility of open spaces and recreational opportunities through the incorporation of a walking trail; and (4) reducing development pressure and sprawl, defined as low-density, single-use (only residential or commercial with no mix of uses), and auto-dependent development, on the urban fringe that preserves open space, minimizes fragmentation of animal habitat, increased stormwater runoff, and loss of biodiversity.

MSD Principle 5: Use Natural Resources Wisely

The Project supports this principle through efficient use of land, energy, water, and materials. Previously developed land and infrastructure along Washington Street and a dense stretch of the Route 16 corridor is being reused efficiently by the compact, mixed-use development. Energy and water efficiency are being incorporated into the building design and construction. The compact site design reduces construction materials needed to support parking demand, roadways, and utility infrastructure that would otherwise be required for low-density, single-use, and auto-dependent developments.

MSD Principle 6: Expand Housing Opportunities

The Project supports this principle by fostering the development of housing, particularly two-bedroom single-family homes, that are compatible with the existing neighborhood’s character and located near existing and proposed jobs, community goods, services, and recreational activities.

MSD Principle 7: Provide Transportation Choice

The Project supports this principle by incorporating a roundabout design with interconnected shared-use sidewalks at the intersection of Millville Street and Route 16 that provide connectivity between the Project Site and existing residences, community goods, services, and recreational activities in and around the downtown area, making alternatives to driving, such as walking or biking, viable.

MSD Principle 8: Increase Job and Business Opportunities

The Project supports this principle by attracting local businesses and jobs to locations near existing and proposed housing, infrastructure, and transportation options. Construction of the development will generate short-term construction jobs while operation of the various commercial businesses will require full- and part-time staff that results in a substantial increase over the seasonal positions at the Mendon Driving Range.

MSD Principle 9: Promote Clean Energy

The Project supports this principle by (1) performing a greenhouse gas analysis that quantifies emissions and identifies measures to avoid, minimize and mitigate such emissions in accordance with the Massachusetts Environmental Policy Act Greenhouse Gas Emissions Policy and Protocol; (2) providing electric vehicle charging stations within the commercial parking lot; and (3) incorporating energy efficiency and renewable energy opportunities into the building design and construction.

MSD Principle 10: Plan Regionally

The Project supports this principle by aligning with the Mendon Master Plan Vision through investments in improving infrastructure and environmental resiliency, strengthening the economy, and preserving open spaces and the small-town feel, and by incorporating uses that have multi-community benefits.

3.6 SMART GROWTH PRINCIPLES

The Project is consistent with the ten basic principles developed by the Smart Growth Network (SGN), a network of private, public, and non-government partner organizations seeking to improve development practices in neighborhoods, communities, and regions across the United States. Consistency with these ten basic principles is described below.

SGN Principle 1: Mix Land Uses

Smart growth supports mixed land uses as a critical component of achieving better places to live. The Project supports this principle by (1) developing commercial and residential uses near one another that make alternatives to driving, such as walking or biking, viable; (2) attracting pedestrian activity within the downtown area that helps revitalize a sense of community; and (3) contributing to economic benefits by increasing economic activity and tax revenue.

SGN Principle 2: Take Advantage of Compact Building Design

Smart growth provides a means for communities to incorporate more compact building design as an alternative to conventional, land-consumptive development. The Project supports this principle by incorporating a dense development footprint that preserves more open space and makes more efficient use of land and resources.

SGN Principle 3: Create a Range of Housing Opportunities and Choices

Smart growth represents an opportunity to increase housing choices through modified land-use patterns, offering proximity to community goods, services, and recreational activities, and increasing housing supply in existing neighborhoods. The Project supports this principle by (1) increasing housing supply in an existing neighborhood; (2) locating housing near existing and proposed jobs, community goods, services, and recreational activities; and (3) modifying existing land-use patterns to minimize residential sprawl and help protect resources that characterize the community.

SGN Principle 4: Create Walkable Neighborhoods

Walkable communities that are desirable places to live, work, learn and play are a key component of smart growth. The Project supports this principle by locating housing, offices, and retail within proximity to one another and providing walkable connectivity to existing residences, open spaces, community goods, services, and recreational activities in and around the downtown area.

SGN Principle 5: Foster Distinctive, Attractive Communities with a Strong Sense of Place

Smart growth seeks to create interesting, unique communities that reflect the values and cultures of the people who reside there, and foster physical environments that support a more cohesive community fabric. The Project supports this principle by incorporating thoughtful architectural designs that are consistent with the character of the surrounding area.

SGN Principle 6: Preserve Open Space, Farmland, Natural Beauty and Critical Environmental Areas

Open space preservation through smart growth provides significant environmental quality and health benefits, protects animal and plant habitat, places of natural beauty, and working lands by removing development pressure and redirecting new growth to existing communities. The Project supports this principle by redeveloping existing commercial properties along a densely developed stretch of the Route

16 corridor while preserving a large area of open space to the rear of the development that is contiguous with off-site woodland and wetlands.

SGN Principle 7: Strengthen and Direct Development Towards Existing Communities

Smart growth directs development towards existing communities already served by infrastructure, seeking to utilize the resources that existing neighborhoods offer, and conserve open space and irreplaceable natural resources on the urban fringe. The Project supports this by (1) increasing economic activity and strengthening tax revenue; (2) providing accessibility to a range of goods, services, and recreational activities in and around the downtown area; (3) increasing efficiency of previously developed land and infrastructure; and (4) reducing development pressure and sprawl, defined as low-density, single-use (only residential or commercial with no mix of uses), and auto-dependent development, on the urban fringe that preserves open space, minimizes fragmentation of animal habitat, increased stormwater runoff, and loss of biodiversity.

SGN Principle 8: Provide a Variety of Transportation Choices

Smart growth aims to maintain and expand transportation options that maximize mobility, reduce congestion, conserve fuel, and improve air quality. The Project supports this principle by incorporating a roundabout design with interconnected shared-use sidewalks at the intersection of Millville Street and Route 16 that provide connectivity between the Project Site and existing residences, community goods, services, and recreational activities in and around the downtown area, making alternatives to driving, such as walking or biking, viable.

SGN Principle 9: Make Development Decisions Predictable, Fair, and Cost Effective

The success of smart growth relies heavily on the private sector to meet the growing demand for development and the state and local governments to make regulatory and permitting processes for development more clear, predictable, cost-effective, and timely. The Project supports this principle by embracing the growing demand for smart growth developments that boost the economy, protect the environment and public health, and enhance community vitality.

SGN Principle 10: Encourage Community and Stakeholder Collaboration in Development Decisions

Community needs will generally dictate which smart growth principles are emphasized over others, and addressing these needs are best defined by the people who live and work there. The Applicants longstanding history living and working within the community, as well as the local and state public review processes, support this principle.

4.0 DEVELOPMENT IMPACT ASSESSMENTS

The Project has performed the following Development Impact Assessments:

4.1 TRAFFIC IMPACT ASSESSMENT

A Traffic Impact and Access Study (TIAS), which provides detailed analysis of existing and future traffic operations during the weekday morning, weekday evening, and Saturday midday peak hours within the study area, was prepared for the Project and is provided in Appendix E. Methodology, scope, and study area for the TIAS was developed in consultation with representatives from MassDOT's District 3 Office at a traffic scoping meeting held on September 22, 2021. A summary of the TIAS results is provided below.

Potential traffic increases associated with the Project can be safely accommodated with no significant impact to future traffic operations on surrounding area roadways. Vehicular access to the Project Site will be along Route 16 and Washington Street. A two-lane roundabout at the intersection of Route 16 and Millville Road is proposed to improve operations along Route 16 and provide primary access to the shopping center, with secondary access for delivery and service vehicles occurring at an access point east of the roundabout. Two access points along Washington Street will provide dedicated vehicular access to the residential neighborhood. A Vehicular Access Permit will be required from MassDOT for proposed improvements along the Route 16 corridor.

In addition to access improvements, the Project will develop a Transportation Demand Management (TDM) program to encourage the use of alternative modes of transportation and reduce single occupancy vehicle trips to and from the Project Site. The TDM program will, at a minimum, incorporate preferential parking for rideshare and bicycle racks to encourage biking to and from the shopping center. Additional measures to further reduce single occupancy vehicle trips will be explored with future tenants.

Existing traffic volume along this segment of Route 16 is roughly 24,175 Vehicles Per Day (VPD) on a typical weekday and 19,125 VPD on a typical Saturday. Existing peak hour traffic volume along this segment of Route 16 is roughly 2,045 VPD on a typical weekday morning, 2,081 VPD on a typical weekday evening, and 1,533 VPD on a typical Saturday midday.

The Route 16 corridor in Mendon, from Taft Avenue to the Mendon-Hopedale Townline, is scheduled for reconstruction as part of Massachusetts Department of Transportation (MassDOT) Project No. 608491. The MassDOT project proposes to signalize the Route 16 / Hartford Avenue West intersection as well as the Route 16 / Maple Street intersection, upgrade signals at the Route 16 / Main Street / North Avenue intersection, reconfigure the Route 16 / Millville Street intersection, and reconfigure lane striping. These planned roadway improvements have been accounted for in the future conditions and the Project is actively working with MassDOT to coordinate site access with their ongoing design work.

The Project is projected to generate 3,721 new trips on a typical weekday, including 164 new trips during the weekday morning peak hour and 330 new trips during the weekday evening peak hour. The Project is projected to generate 5,472 new trips on a typical Saturday, including 377 new trips during the Saturday midday peak hour. Total new trips incorporate a 25% pass-by rate to account for vehicle trips drawn from existing vehicles traveling past the Project Site.

4.2 ENVIRONMENTAL IMPACT ASSESSMENT

All forms of development have an impact on the natural environment. The Project minimizes these on- and off-site impacts through the incorporation of Massachusetts Sustainable Development Principles and Smart Growth Principles as well as compliance with applicable state and local environmental regulations.

The Project protects land and ecosystems by reducing development pressure and sprawl on the urban fringe to preserve open space, minimize fragmentation of animal habitat, stormwater runoff, and loss of biodiversity. The Project also avoids impact to on-site wetland resource areas and preserves a large area of open space to the rear of the development that is contiguous with off-site woodland and wetlands.

The Project uses natural resources wisely through efficient use of land, energy, water, and materials. Previously developed land and infrastructure along Washington Street and a dense stretch of the Route 16 corridor is being reused efficiently by the compact, mixed-use development. Energy and water efficiencies are being incorporated into the building design and construction. The compact site design also reduces construction materials needed to support parking demand, roadways, and utility infrastructure that would otherwise be required for low-density, single-use, and auto-dependent developments.

The Project promotes clean energy by providing electric vehicle charging stations within the commercial parking lot and incorporating energy efficiency and renewable energy opportunities into the building design and construction. The Project will also perform a greenhouse gas analysis that quantifies emissions and identifies measures to avoid, minimize and mitigate such emissions in accordance with the Massachusetts Environmental Policy Act Greenhouse Gas Emissions Policy and Protocol.

Stormwater management systems for the Project includes closed drainage infrastructure for collection and conveyance as well as surface and subsurface best management practices for peak rate attenuation, recharge, and treatment of stormwater runoff from impervious surfaces. These systems are designed in compliance with the Massachusetts Stormwater Management Standards, Massachusetts Wetlands Protection Regulations (310 CMR 10), and all applicable requirements of the Town of Mendon General Bylaws and Zoning Bylaws. A Stormwater Management Report, which provides a comprehensive framework for the long-term protection of natural resources on and around the Project Site from degradation as a result of stormwater discharges, was prepared for the Project and is provided in Appendix F.

Exterior lighting for the Project will be designed to provide safe and secure access and circulation, minimize unnecessary light sources, avoid off-site lighting and night sky pollution, and will comply with applicable requirements of the Town of Mendon Zoning Bylaws. Noise generating mechanical components that are typical for the use will be screened from abutters and will not generate a noise level that exceeds Air Pollution Control Regulations (310 CMR 7.00) or the MassDEP Noise Policy. Orientation of the Project Site as well as location and height of the proposed buildings will have no adverse impact on solar access for existing structures on adjacent properties. Temperature will change insignificantly from existing conditions based on the already densely developed Route 16 corridor. Wind conditions will remain consistent with existing conditions based on the surrounding land uses to remain and conversion of the wide-open Mendon Driving Range facility to a shopping center with proposed structures and landscaping.

A proposed public water supply will be constructed and maintained to prevent pollution and secure sanitary protection of all waters used as source of water supply and ensure that user drinking water is safe, fit and pure to drink. The public water supply will be designed in compliance with Massachusetts Drinking Water Regulations (310 CMR 22) and the MassDEP Guidelines and Policies for Public Water Systems. A Request for Site Exam and Pumping Test Proposal was submitted to MassDEP on May 26, 2021. An Approval to Site a Source and Conduct Pumping Test for Source <70 GPM was granted by MassDEP on September 16, 2021 and copied the Town of Mendon Board of Health.

Proposed subsurface sewage disposal systems will be sited, constructed, and maintained to provide for the protection of public health, safety, and welfare of the environment. These systems will be designed in compliance with Title 5 of the State Environmental Code (310 CMR 15) and all applicable requirements of the Town of Mendon Board of Health and Zoning Bylaws. Soil Suitability Assessments and Percolation Tests were performed by a Certified Soil Evaluator and observed by the Board of Health on September 13 and September 14, 2021. Soil Suitability Assessments for On-Site Sewage Disposal, Percolation Test Results, and a Sewage Disposal Deep Observation Hole and Percolation Test Location Plan were submitted to the Board of Health on November 10, 2021.

4.3 FISCAL IMPACT ASSESSMENT

The Project will result in net fiscal and economic benefits to the Town by attracting local businesses and jobs to locations near existing and proposed housing, infrastructure, and transportation options.

A public water supply, subsurface sewage disposal systems, and stormwater management systems will be constructed to meet the Project demands. Increased economic activity and generation of annual real estate tax income will offset increased demand, in line with similar uses, on public services and infrastructure.

Construction of the development will generate short-term construction jobs while operation of the various commercial businesses will require full- and part-time staff that results in a substantial increase over the seasonal positions at the Mendon Driving Range.

The Project will spend more than $2,500,000 to construct a two-lane roundabout with interconnected shared-use sidewalks at the intersection of Route 16 and Millville Road that is proposed to improve operations along Route 16, provide primary access to the shopping center, and improve connectivity between the Project Site and existing residences, community goods, services, and recreational activities in and around the Mendon Center District. These specific improvements, and the smart growth mixed-use development as a whole, are projected to enhance the value of adjoining properties.

A fiscal impact assessment memo, which details quantified fiscal projections of Town revenues and costs resulting from the Project, is provided in Appendix G.

4.4 COMMUNITY IMPACT ASSESSMENT

The Project is consistent with the Mendon Master Plan Vision through its investments in improving infrastructure and environmental resiliency, strengthening the economy, and preserving open spaces and the small-town feel. The Project also strengthens and directs development towards an existing community already served by infrastructure, seeks to utilize resources that the surrounding neighborhoods offer, incorporates commercial and residential uses that are consistent with neighboring properties, and aims to attract more pedestrian activity within the downtown area that helps revitalize a sense of community.

Existing commercial properties located along a densely develop stretch of the Route 16 corridor will be redeveloped as a 66,600 gross-square-foot shopping center that is configured consistent with surrounding commercial developments. A two-lane roundabout with interconnected shared-use sidewalks at the intersection of Route 16 and Millville Road is proposed to provide primary access to the shopping center and improve connectivity between the Project Site and existing residences, community goods, services, and recreational activities in and around the Mendon Center District, making alternatives to driving, such as walking or biking, viable. Landscape design includes interior parking lot islands and perimeter screening designed consistent with similar uses, and preserves existing vegetation, where feasible, including a large area of open space to the rear of the development that is contiguous with off-site woodland and wetlands.

Three residences are proposed along the Washington Street frontage, consistent with existing conditions, to maintain historical character while pushing the more densely develop residential area towards the site interior. The historic Rawson-Whiting-Congdon House at 12 Washington Street will remain, a new two-bedroom barn-style home will replace the existing accessory barn structure, and a two-bedroom home with a one-car garage that incorporates New England style architecture will be constructed in a new location to replace the existing single-family cape-style home at 20 Washington Street. Landscape elements, consistent with the use, are incorporated into the design to screen the 24 single-family two-bedroom homes with a one-car garage at the site interior from Washington Street and direct abutters of the residential use.

The Project includes numerous Low Impact Development Measures. The clustered development efficiently uses land, infrastructure, energy, water, and materials. There will be no disturbance to wetland resource areas and disturbances to existing trees and shrubs will be minimized. Use of “country drainage”, versus curb and gutter conveyance and pipe, as well as rain gardens and grass channels are proposed for the residential neighborhood.

5.0 ZONING BYLAWS COMPLIANCE

The Project Site is located within the General Business (GB) and Rural Residential (RR) zoning districts. The Project is a smart growth mixed-used development comprised of a Shopping Center, which is allowed by Special Permit from the Planning Board in the General Business zoning district, and Single-Family Dwellings, which are allowed in the Rural Residential zoning district under Section 3.01 of the Town of Mendon Zoning Bylaws.

Special Permit Request 1 – Shopping Center

The Project requests the Planning Board grant a Special Permit for a shopping center located within the General Business zoning district as part of the smart growth mixed-use development.

Justification: The 35 Hastings Street, 37 Hastings Street, and a portion of the 12 Washington Street parcel support existing commercial uses including Barry’s Place (closed) and the Mendon Driving Range. Commercial improvements on the Project Site include a small restaurant structure, three support structures, a driving range facility, and miniature golf course served by an approximately 60-space parking lot.

The Project will continue the historical commercial use of land along a densely developed stretch of the Route 16 corridor through the development of a proposed shopping center that includes a standalone drive-thru bank, an L-shaped building program comprised of a market, indoor and outdoor retail space, as well as an accessory carousel structure.

The Project is also consistent with the Mendon Master Plan Vision through its investments in improving infrastructure and environmental resiliency, strengthening the economy, and preserving open spaces and the small-town feel.

Special Permit Request 2 – Multiple Single-Family Dwellings

The Project requests the Planning Board grant a Special Permit for multiple single-family dwellings on a lot located in the Rural Residential zoning district as part of the smart growth mixed-use development.

Justification: The smart growth techniques employed by the Project are aligned with all applicable Commonwealth of Massachusetts’ Sustainable Development Principles and consistent with the ten basic principles developed by the Smart Growth Network to use land as efficiently as possible, minimize sprawl, meet development needs, and keep Mendon economically and socially vibrant.

Massachusetts is currently consuming far more land than necessary to accommodate our growth needs. According to the Massachusetts Executive Office of Energy and Environmental Affairs, almost 9 out of every 10 acres developed go to residential growth, with 65% of that used for low-density, large-lot development. This type of suburban expansion, sometimes referred to as sprawl, consists of low-density, auto-oriented, single-use developments lacking in context and distinction as a unique community. Sprawling developments also require increased infrastructure investments, a reliance on a single form of transportation, and result in heavy environmental impacts such as fragmentation of animal habitat, loss of biodiversity, increased stormwater runoff, decreased stormwater quality, and a reduction in air quality.

The Project also only proposes three residences along its Washington Street frontage, consistent with existing conditions, to maintain historical character while pushing the more densely develop area towards the site interior. The historic Rawson-Whiting-Congdon House at 12 Washington Street will remain, a new two-bedroom barn-style home will replace the existing accessory barn structure, and a two-bedroom home with a one-car garage that incorporates New England style architecture will be constructed in a new location to replace the existing single-family cape-style home at 20 Washington Street. Landscape elements, consistent with the use, are incorporated into the design to screen single-family dwellings at the site interior from Washington Street and direct abutters of the residential use.

Waiver Request 1 – Minimum Number of Parking Spaces

The Project requests the Planning Board grant a Waiver of up to 20% of the parking required, as allowed under Section 2.03 of the Town of Mendon Zoning Bylaw. Specifically, the Project requests the Planning Board grant a Waiver reducing the required parking from 267 spaces to 230 spaces, a 14% reduction from the minimum number of parking spaces for a shopping center under Section 2.03 of the Town of Mendon Zoning Bylaw.

Justification: The Massachusetts Executive Office of Energy and Environmental Affairs has developed a Smart Parking Model Bylaw that recommends a required minimum of 3 spaces, and maximum of 4 spaces, per 1,000 square feet of gross floor area for shopping centers. Following the Smart Parking Model Bylaw would result in a required minimum of 200 spaces, and maximum of 267 spaces, for the proposed 66,600 square feet the shopping center. A total of 230 spaces was selected to meet anticipated demand for the shopping center while also providing a 30-space buffer from the State's guidance for minimum spaces.

The Project will develop a Transportation Demand Management program that incorporates preferential parking for rideshare and bicycle racks to encourage the use of alternative modes of transportation and reduce single occupancy vehicle trips to and from the Project Site. The Project is also located within convenient biking and walking distance from nearby neighborhoods further reducing vehicle trips to and from the Project Site.

Construction of unnecessary pavement increases the potential impacts of stormwater runoff, such as reductions in water quality and increases in flooding, exacerbates heat island effect, and reduces the land available for greenspace that provides wildlife habitat, air quality benefits, and is aesthetically desirable.

6.0 SPECIAL PERMIT DECISION CRITERIA

The Project meets all Special Permit considerations described in Section 1.06 of the Town of Mendon Zoning Bylaws. Compliance with specific criteria is described below.

(i) Compliance with the requirements for parking, lot size, frontage, yards, and heights and coverage of buildings and all other provisions of this by-law.

The Project complies with the requirements for parking, lot size, frontage, yards, and heights and coverage of buildings. Provided off-street parking spaces meet the minimum quantity and dimensional requirements for each proposed use within the shopping center as well as for each residential dwelling. A total of 234 spaces are provided for the shopping center and a minimum of two spaces per dwelling, which totals 54 spaces, are provided for the residential neighborhood. An easement, or similar instrument, will be obtained from the direct abutter at 1 Uxbridge Street for consistency with the underlying minimum parking setback. The 18.3-acre project assemblage easily exceeds the minimum requirements for lot size, frontage along Route 16 and Washington Street, lot and yard depths and widths. Building coverage and height are less than the maximums of 30% and 35 feet, respectively.

(ii) Convenience and safety of vehicular and pedestrian movement within the site and in relation to adjacent streets, properties, or improvements.

Pedestrian and vehicular access and circulation has been designed to be safe, convenient, and appropriate for the use and provides connectivity to adjacent streets, properties, and improvements. The Project includes a proposed two-lane roundabout at the intersection of Route 16 and Millville Road that will improve operations along Route 16 and provide primary access to the shopping center parking areas. Secondary access for delivery and service vehicles will be via a dedicated service drive east of the roundabout. Two access points along Washington Street will provide dedicated vehicular access to the residential neighborhood. Pedestrian access to the Project Site will be via new sidewalks along Route 16. Pedestrian circulation around the Project Site is comprised of interconnected sidewalks with accessible ramps and striped pedestrian pathways that provide connectivity between the shopping center and residential neighborhood. The new roundabout and interconnected share-use sidewalks will also provide connectivity between the Project Site and existing residences, community goods, services, and recreational activities in and around the downtown area.

(iii) Adequacy of arrangement and the number of parking and loading spaces in relation to the proposed use of the premises.

The Project provides adequate off-street parking and loading spaces for the proposed uses. Parking areas for the shopping center are centrally located to support demand for the proposed commercial uses, include two-way vehicular circulation, provide accommodations for fire-fighting equipment, incorporate interior landscape islands and perimeter landscaping areas. Dedicated loading areas for non-residential uses are provided along the rear of each building. A minimum of two parking spaces are provided for each dwelling. The arrangement and quantity of off-street parking and loading spaces for the shopping center and residential neighborhood comply with applicable requirements of the Town of Mendon Zoning Bylaws.

(iv) Provisions for off-street loading and unloading of vehicles incidental to the servicing of the buildings, and related uses on the lot or tract.

The Project has made provisions for at least one dedicated off-street loading and unloading space along the rear of the building for each non-residential use that accommodates servicing of the building and complies with applicable requirements of the Town of Mendon Zoning Bylaws.

(v) Arrangement and appearances of proposed buildings, structures, signs, screening, and landscaping.

The Project incorporates thoughtful and compatible architectural designs, structures, signs, screening, and landscaping that comply with applicable requirements of the Town of Mendon Zoning Bylaws. The shopping center buildings integrate architectural building, structure, and screening elements that are consistent with similar uses and the surrounding area. Each new residence incorporates New England style architecture. Exterior restoration of the existing historical residence and construction of a barn-style home have been incorporated into the residential neighborhood design to maintain the historical character of the 12 Washington Street frontage. Signage will be affixed to each non-residential building and a free-standing sign will be located along the Route 16 frontage. Landscaping includes interior parking lot islands and perimeter screening, and existing vegetation will be preserved, where feasible, which includes a large area of open space to the rear of the development that is contiguous with off-site woodland and wetlands.

(vi) Adequacy of methods for waste disposal, surface and subsurface drainage, and lighting.

Preliminary subsurface investigations have been performed to support adequacy of methods for waste disposal, surface, and subsurface drainage at the Project Site. Information obtained and evaluated supported initial design and confirms final design of the subsurface sewage disposal systems will comply with Title 5 of the State Environmental Code (310 CMR 15) and all applicable requirements of the Town of Mendon Board of Health, General Bylaws and Zoning Bylaws. The stormwater management system is designed in compliance with the Massachusetts Wetlands Protection Regulations (310 CMR 10), Massachusetts Stormwater Management Standards, and all applicable requirements of the General Bylaws and Zoning Bylaws. Exterior lighting for the Project is designed consistent with similar uses and complies with applicable requirements of the Town of Mendon Zoning Bylaws.

(vii) Protection of adjoining premises and the general neighborhood from any detrimental use of the lot or tract.

The Project uses are consistent with the adjoining premises and the general neighborhood. The Project’s commercial component will redevelop existing commercial properties located along a densely developed stretch of the Route 16 corridor. The Project’s residential neighborhood will maintain Washington Street’s rural residential character by (1) restoring the exterior of the existing historical residence at 12 Washington Street; (2) including a new barn-style home adjacent to the historical residence to maintain the historical character of the 12 Washington Street frontage; (3) locating only three residences along the Washington Street frontage, consistent with existing conditions, while pushing the more densely develop area towards the site interior; and (4) incorporating thoughtful and consistent architectural design for the new residences.

7.0 SITE PLAN REVIEW PERFORMANCE CRITERIA

The Project meets all Site Plan Review performance criteria described in Section 4.02 of the Town of Mendon Zoning Bylaws. Compliance with specific criteria is described below.

(i) Nuisances.

The Project will not create any undue disturbances to abutting properties upon completion of temporary construction activities. No fire and explosion hazards that produce dangerous exposure to abutting properties will exist. No objectionable odors will be observable beyond the property line to a degree greater than those generally existing in the community. No noxious, toxic, or corrosive fumes of gases will be emitted. No residue of dust or smoke will be detectable beyond the property line. No dangerous radiation will be detectable at the property line. No persistent noise will be detectable beyond the property line in excess of the average level of street and traffic noise generally hear at the point of observation, the Air Pollution Control Regulations (310 CMR 7.00), or the MassDEP Noise Policy, whichever is greater. No noise below such level will be objectionable with respect to intermittence, beat frequency, or shrillness, and no inherent or recurrently generated vibration will be perceptible beyond the property line.

(ii) Exterior Lighting.

The Project includes exterior lighting that provides safe and secure access and circulation, minimizes unnecessary light sources, avoids off-site lighting and night sky pollution, and complies with applicable requirements of the Town of Mendon Zoning Bylaws.

(iii) Utilities.

The Project places site utility line underground where physically and environmental feasible.

(iv) Screening.

The Project uses adequate setbacks, landscape screening, architectural screening, or a combination thereof for exposed storage areas, mechanical equipment, service areas, and loading areas to mitigate visual impacts on abutting properties.

(v) Stormwater Management System.

The stormwater management system is designed in compliance with the Massachusetts Wetlands Protection Regulations (310 CMR 10), Massachusetts Stormwater Management Standards, and all applicable requirements of the General Bylaws and Zoning Bylaws.

(vi) Low Impact Development Best Management Practices.

The Project utilizes numerous Low Impact Development Measures. Clustered development efficiently uses land, infrastructure, energy, water, and materials. On-site wetland resource areas are being avoided and a large area of existing woodland containing mature and native vegetation is being preserved. Use of "country drainage", versus curb and gutter conveyance and pipe, as well as rain gardens and grass channels are proposed for the residential neighborhood.

(vii) Groundwater Recharge.

Groundwater recharge is provided in compliance with the Massachusetts Wetlands Protection Regulations (310 CMR 10), Massachusetts Stormwater Management Standards, and all applicable requirements of the General Bylaws and Zoning Bylaws. Wastewater disposal is provided in compliance with Title 5 of the State Environmental Code (310 CMR 15) and all applicable requirements of the Town of Mendon Board of Health, General Bylaws and Zoning Bylaws. A Long-Term Pollution Prevention Plan and Operation and Maintenance Plan has been developed to ensure long-term functioning of the stormwater management system and to provide suitable practices for source control of pollutants. A Stormwater Pollution Prevention Plan will be prepared to describe the specific practices, installation methods and inspection requirements for temporary and permanent erosion prevention and sediment control practices.

(viii) Snow Storage Areas.

Short-term snow storage areas are located to avoid interference with sight distances at points of access and egress to the Project Site, interference with interior pedestrian and vehicular circulation, and adverse impacts on surrounding wetland resource areas.

(ix) Harmony with Surrounding Area.

The Project strengthens development in a densely developed area already served by infrastructure, seeks to utilize resources that the surrounding neighborhoods offer, and incorporates commercial and residential uses that are consistent with neighboring properties. Thoughtful and compatible architectural designs, structures, signs, screening, and landscaping are incorporated into the design to maintain harmony with the natural landscape and surrounding townscape.

(x) Preservation of Natural Landscape.

The Project preserves existing vegetation, where feasible, which includes a large area of open space to the rear of the development that is contiguous with off-site woodland and wetlands. Soil disturbance will be minimized grade changes are in keeping with the general appearance of the existing Project Site and neighboring developed areas.

(xi) Landscaping.

Landscaping includes interior parking lot islands, perimeter screening, and complies with all applicable requirements of the Town of Mendon Zoning Bylaws.

(xii) Vehicular and Pedestrian Circulation.

Pedestrian and vehicular access and circulation has been designed to be safe, convenient, and appropriate for the use and provides connectivity to adjacent streets, properties, and improvements. The Project includes a proposed two-lane roundabout at the intersection of Route 16 and Millville Road that will improve operations along Route 16 and provide primary access to the shopping center parking areas. Secondary access for delivery and service vehicles will be via a dedicated service drive east of the roundabout. Two access points along Washington Street will provide dedicated vehicular access to the residential neighborhood. Pedestrian access to the Project Site will be via new sidewalks along Route 16. Pedestrian circulation around the Project Site is comprised of interconnected sidewalks with accessible ramps and striped pedestrian pathways that provide connectivity between the shopping center and residential neighborhood. The new roundabout and interconnected share-use sidewalks will also provide connectivity between the Project Site and existing residences, community goods, services, and recreational activities in and around the downtown area.

(xiii) Conformance with applicable Local Bylaws, General Laws of Massachusetts, and Local, State, and Federal Agency Rules and Regulations.

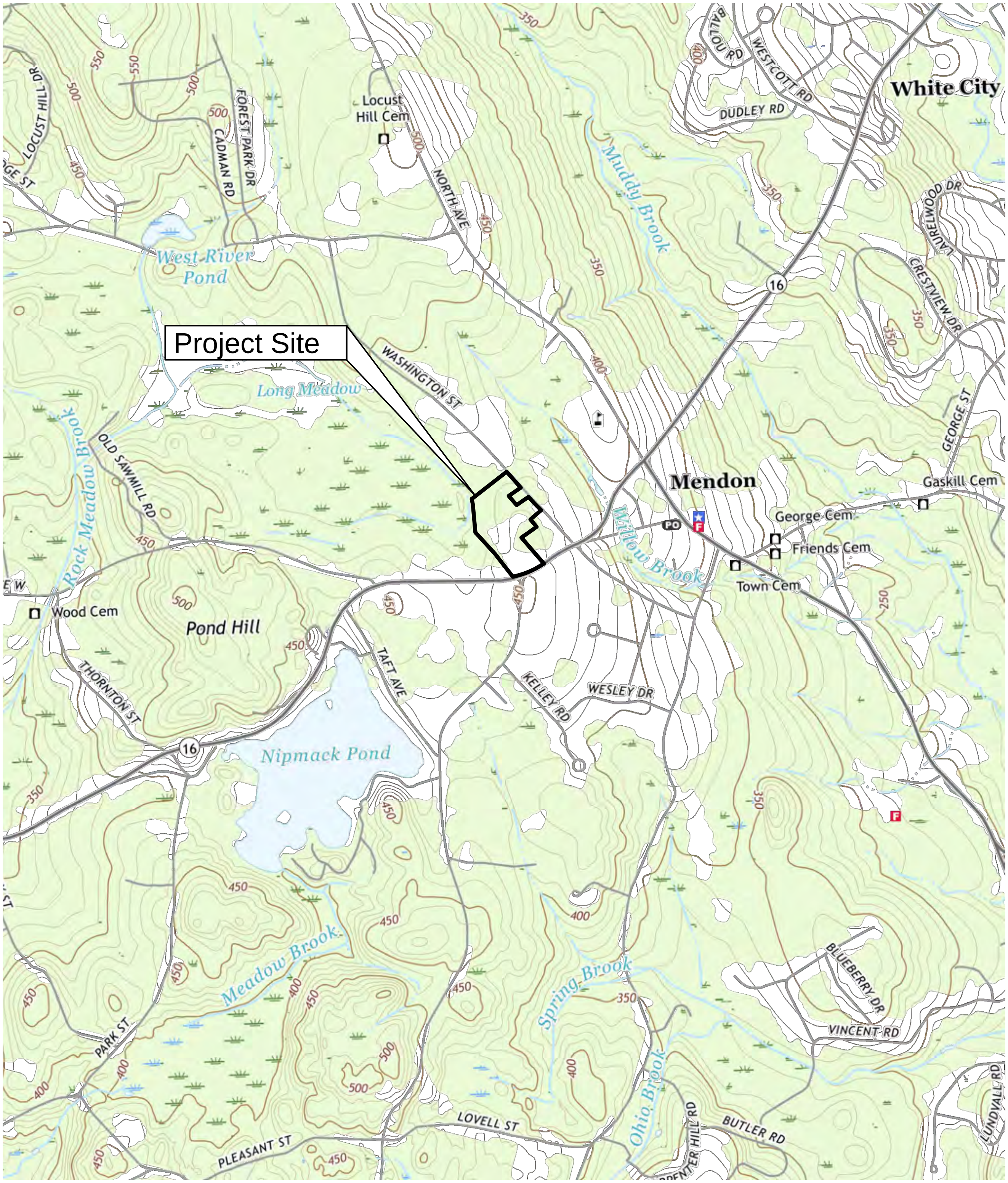
The Project will conform with applicable provisions of the Town of Mendon Bylaws, the General Laws of Massachusetts, and the rules and regulations of local, state, and federal agencies.

Appendix A

Figures

INFORMATION BASED ON:

1. USGS MAP OF BLACKSTONE, MASSACHUSETTS, DATED 2018



TETRA TECH

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Marlborough, MA 01752
Phone: 1 (508) 786-2200 | Fax: 1 (508) 786-2201

Mehan Group

Hastings St and Washington St
Mendon, Massachusetts

0 1000' 2000'

SCALE: 1" = 2000'

Site Locus Map

N

Project No.: 143-305225-20004

Date: April 21, 2022

Designed By: MDC

Figure

1

Bar Measures 1 inch

4/21/2022 3:55:57 PM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\CONCEPTUAL\FIGURE 1 - SITE LOCUS.DWG - DOCANTO, MARCOS

Appendix B

Special Permit and Site Plan Review Plans

Special Permit and Site Plan Review
Hastings Street Plaza, LLC
Hastings Street and Washington Street, Mendon, MA

100 Nickerson Road
Marlborough, MA 01752
(508) 786-2200

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SHEET NO.	SHEET TITLE
- - -	COVER SHEET
V-100	EXISTING CONDITIONS PLAN
C-100	DEMOLITION PLAN
C-110	EROSION AND SEDIMENT CONTROL PLAN
C-120	OVERALL SITE PLAN
C-131 - 132	LAYOUT AND MATERIAL PLANS
C-141 - 142	GRADING AND DRAINAGE PLANS
C-151 - 152	UTILITY PLANS
C-161 - 162	LANDSCAPE PLANS
C-501 - 510	CONSTRUCTION DETAILS

SEAN PATRICK REARDON
CIVIL
NO. 41062

PROJECT LOCATION:

35 Hastings Street (Parcel ID 11-142-35-0)
37 Hastings Street (Parcel ID 11-142-37-0)
18 Washington Street (Parcel ID 8-242-18-0)
20 Washington Street (Parcel ID 8-242-20-0)
Mendon, Massachusetts 01756

PROJECT SURVEYOR:

Guerriere & Halnon, Inc.
333 West Street
Milford, Massachusetts 01757
(508) 473-6630

LAND OWNERS:

Hastings Street Plaza, LLC
PO Box 444
Mendon, Massachusetts 01747

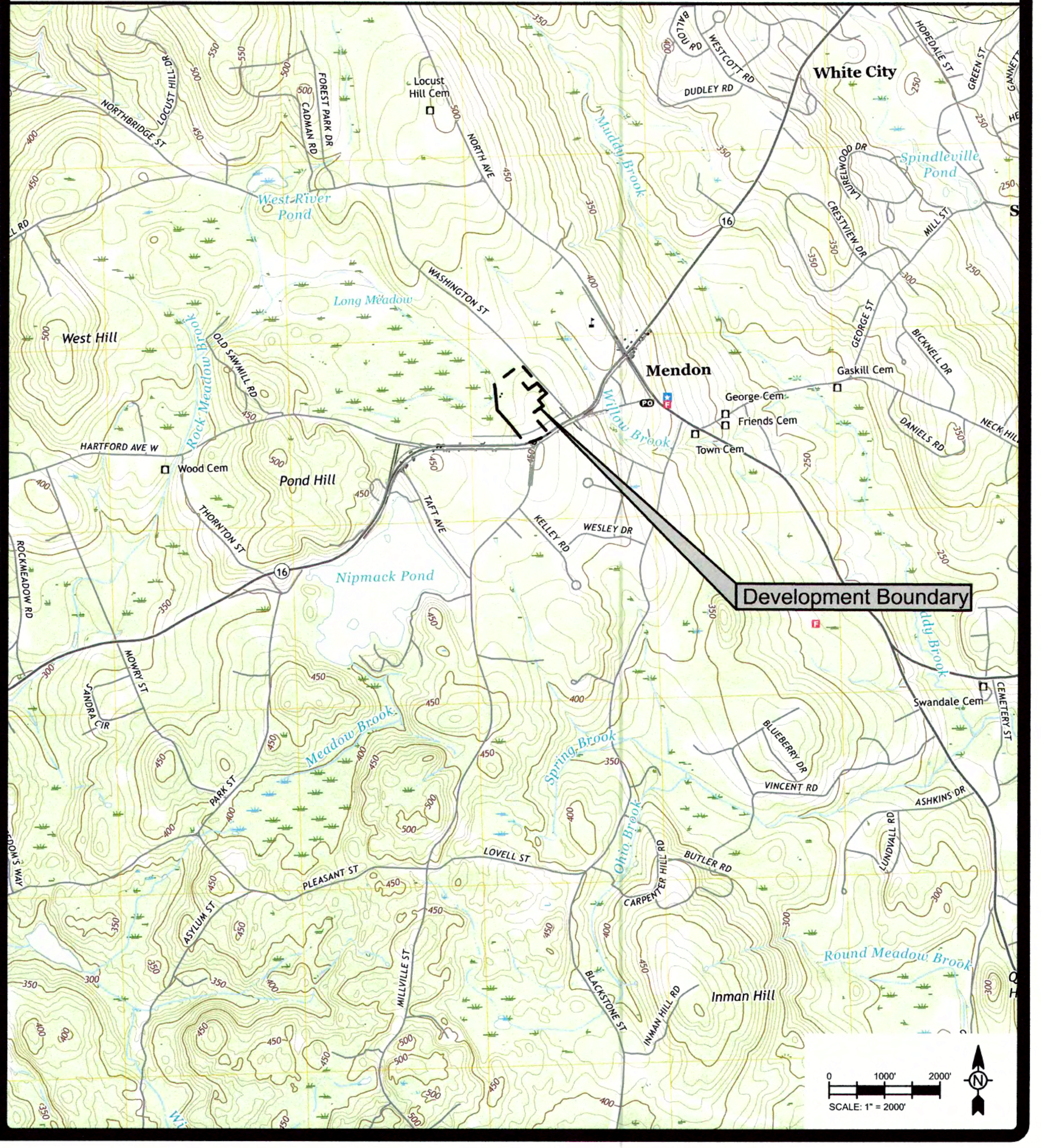
APPLICANT:

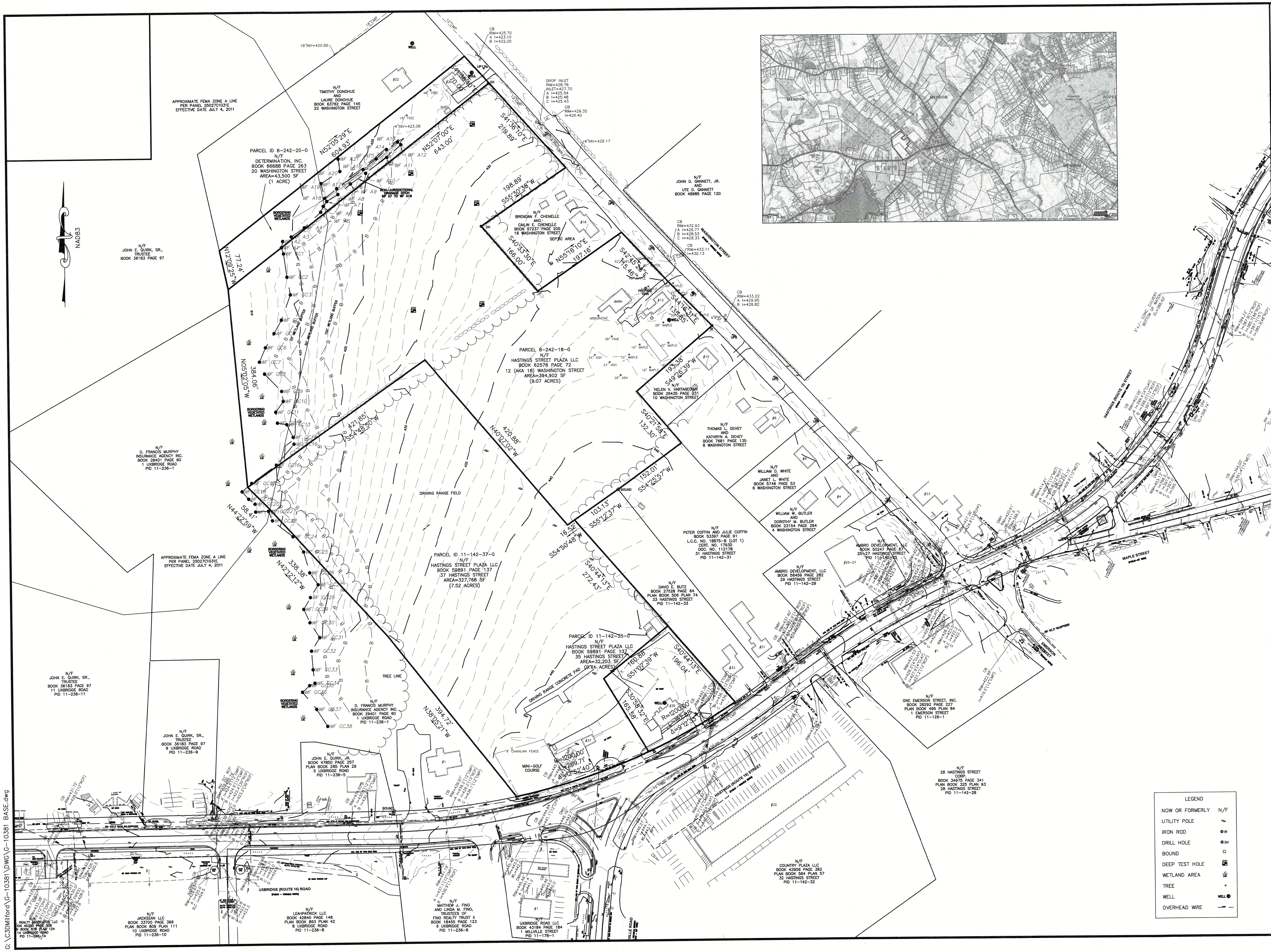
Hastings Street Plaza, LLC
PO Box 444
Mendon, Massachusetts 01747

ISSUED:

APRIL 25, 2022 - SPECIAL PERMIT AND SITE PLAN REVIEW

LOCUS MAP:





LEGEND	
NOW OR FORMERLY	N/F
UTILITY POLE	⊸
IRON ROD	● IR
DRILL HOLE	● DH
BOUND	□
DEEP TEST HOLE	▨
WETLAND AREA	ѱ
TREE	•
WELL	WELL ●
OVERHEAD WIRE	——

I HEREBY CERTIFY THAT THE PROPERTY LINES DEPICTED ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED, AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

APRIL 19, 2022

JEFFREY J. STEFANIK PLS DATE

JEFFREY J. STEFANIK No. 53070

NOTES

1) SEE THE FOLLOWING PLANS RECORDED AT THE WORCESTER DISTRICT REGISTRY OF DEEDS–

PLAN BOOK 813 PLAN 29 AUGUST 2004
PLAN BOOK 340 PLAN 25 OCTOBER 1966
PLAN BOOK 303 PLAN 111 OCTOBER 1966
PLAN BOOK 164 PLAN 33 DECEMBER 1949
(ROUTE 16 LAYOUT)

LC PLAN 18875B APRIL 1951
LC PLAN 18875A FEBRUARY 1946

2) THE VERTICAL DATUM IS NAVD88

3) THE HORIZONTAL DATUM IS NAD83

4) THE WETLANDS DEPICTED HEREON WERE DELINEATED IN THE FIELD BY GODDARD CONSULTING, LLC NORTHBORO MA.

5) UNDERGROUND FEATURES DEPICTED HEREON HAVE BEEN COMPILED FROM VARIOUS SOURCES AND MUST BE CONSIDERED APPROXIMATE IN NATURE. CONTACT "DIG-SAFE" AT 811 BEFORE ANY EXCAVATION WORK.

OWNER:

HASTINGS STREET PLAZA LLC
BOOK 59891 PAGE 137 (35–37 HASTINGS ST)
BOOK 62576 PAGE 72 (12 WASHINGTON ST)

DETERMINATION, INC.
BOOK 66688 PAGE 263 (20 WASHINGTON ST)

EXISTING CONDITIONS
PLAN OF LAND
HASTINGS STREET (ROUTE 16)
AND WASHINGTON STREET

MENDON, MASS.

SCALE: 1"=80'
DATE: APRIL 14, 2022

GRAPHIC SCALE: 1"=80'

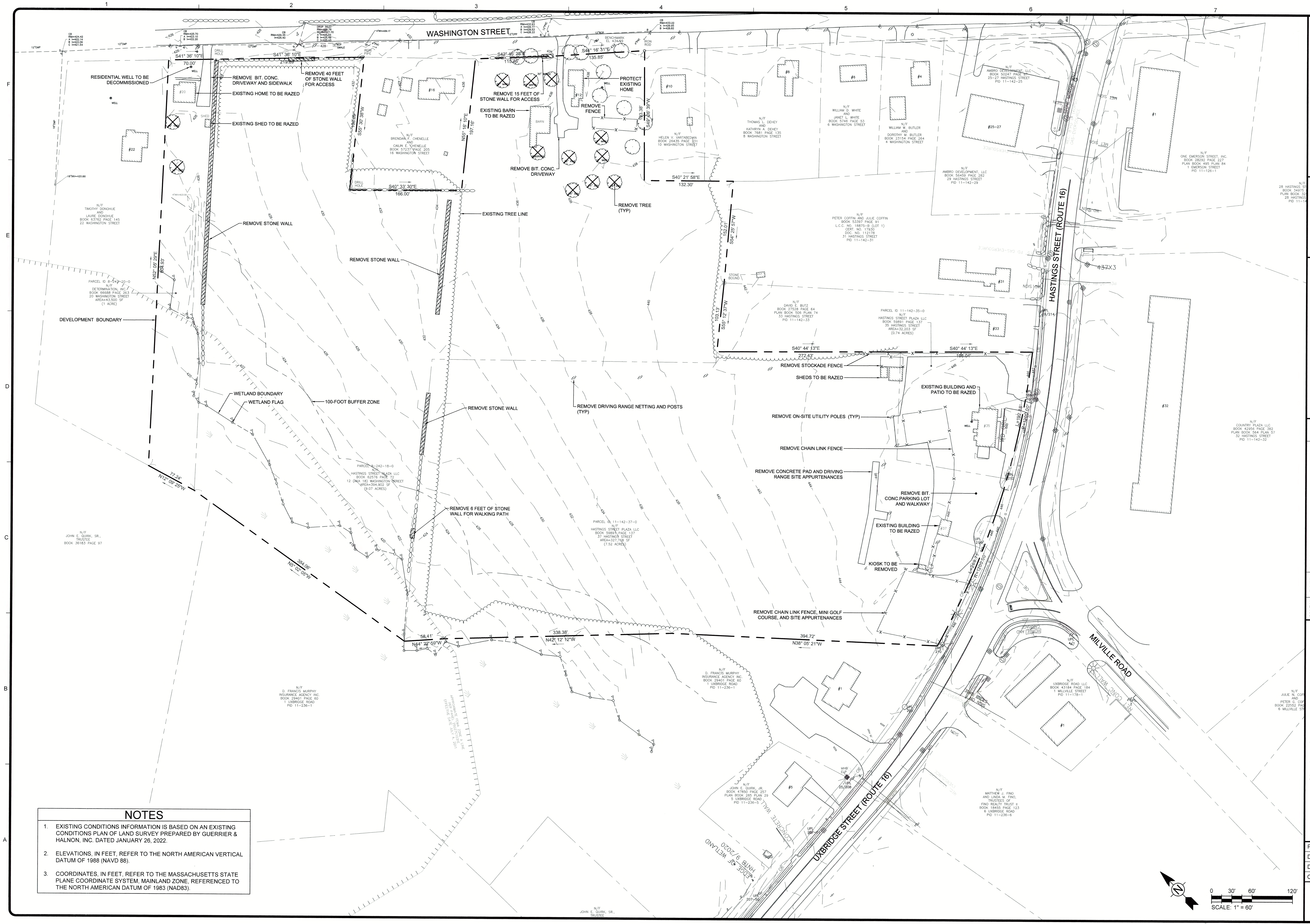
FEET: 0 20 40 60 80 100 150 200
METERS: 0 10 20 30 40 60 80

Guerriere & Halnon, Inc.
ENGINEERING & LAND SURVEYING
333 WEST STREET
MILFORD, MA 01757
PH. (508) 473-6630
FX. (508) 473-8243
www.gandhengineering.com

SHEET 1 OF 1

V-100

G:\C3DMilford\G-10381\DWG\G-10381 BASE.dwg



NOTES

1. EXISTING CONDITIONS INFORMATION IS BASED ON AN EXISTING CONDITIONS PLAN OF LAND SURVEY PREPARED BY GUERRIER & HALNON, INC. DATED JANUARY 26, 2022.
2. ELEVATIONS, IN FEET, REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
3. COORDINATES, IN FEET, REFER TO THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, MAINLAND ZONE, REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83).

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SEAN PATRICK REARDON

MARK	DATE	DESCRIPTION	BY
-	4/25/22	Special Permit and Site Plan Review	NRK

Hastings Street Plaza LLC

Hastings Street and Washington Street
Mendon, Massachusetts

Demolition Plan

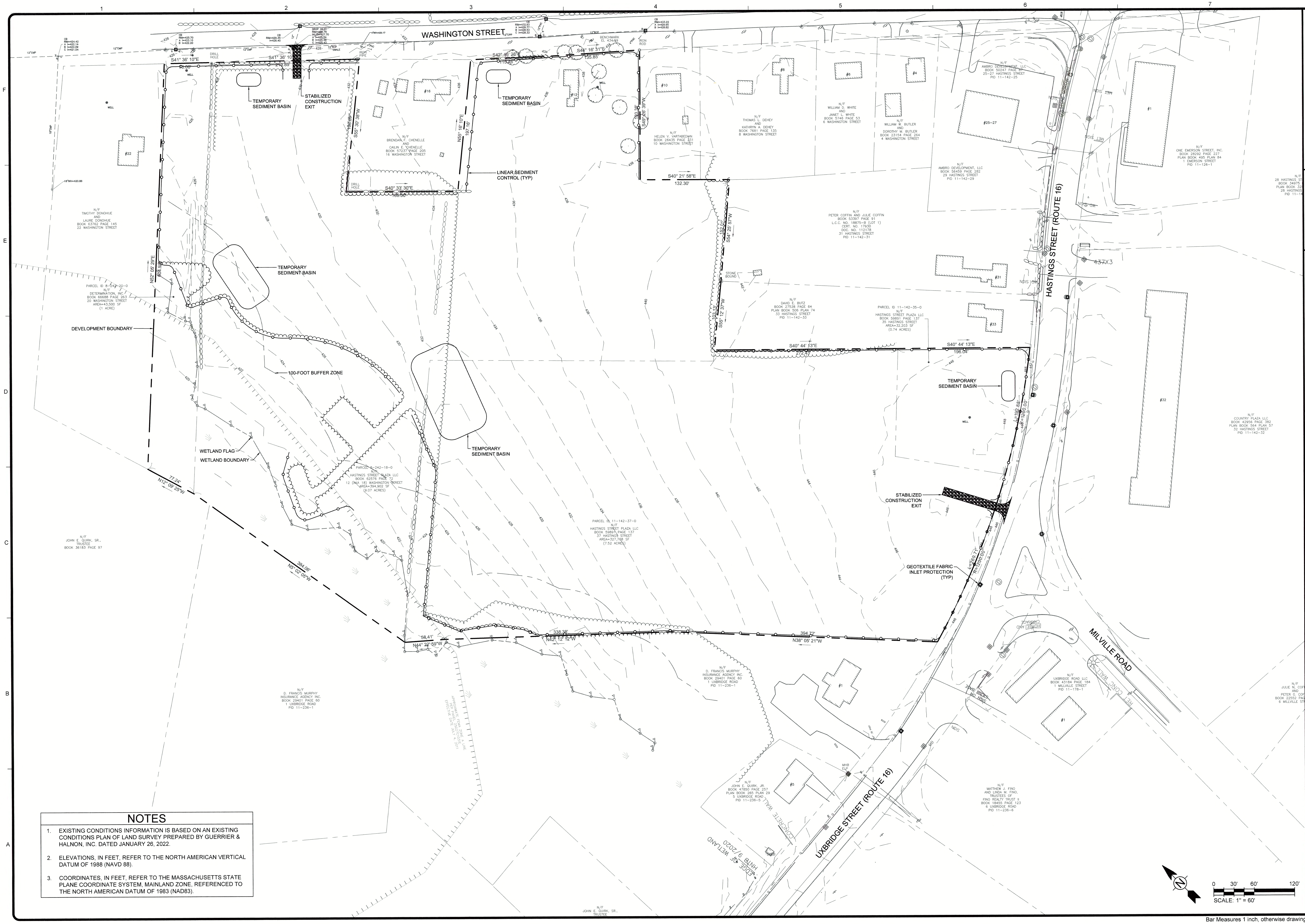
PROJ: 143-305225-20004
DESN: BMP
DRWN: BMP
CHKD: SPR

C-100

Bar Measures 1 inch, otherwise drawing not to scale

4/25/2022 11:48:46 AM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SHEETFILES\SITE PLANS\SPECIAL PERMIT SET\C-100 DEMOLITION PLAN.DWG - DOCANTO, MARCOS

4/25/2022 11:49:11 AM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SHEETFILES\SITE PLANS\SPECIAL PERMIT SET\C-110 EROSION AND SEDIMENT CONTROL PLAN.DWG - DOCANTO, MARCOS



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2. ELEVATIONS, IN FEET, REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
3. COORDINATES, IN FEET, REFER TO THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, MAINLAND ZONE, REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83).

Bar Measures 1 inch, otherwise drawing not to scale

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COMMONWEALTH OF MASSACHUSETTS
SEAN PATRICK REARDON
CIVIL
No. 41062
REGISTERED PROFESSIONAL ENGINEER

MARK	DATE	DESCRIPTION	BY
-	4/25/22	Special Permit and Site Plan Review	NRK

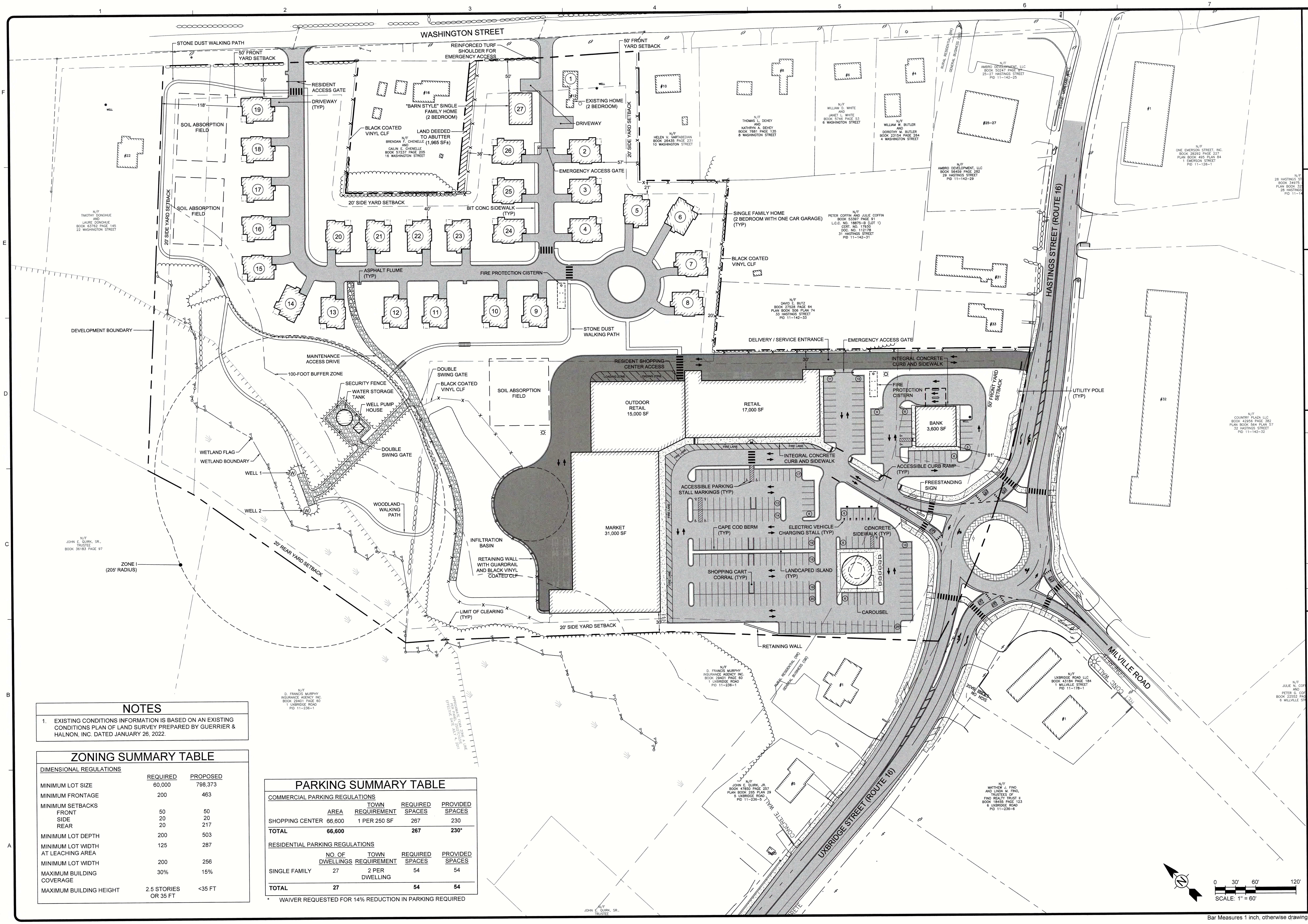
Hastings Street Plaza LLC

Hastings Street and Washington Street
Mendon, Massachusetts

Erosion and Sediment Control Plan

PROJ:	143-305225-20004
DESN:	BMP
DRWN:	BMP
CHKD:	SPR

C-110



NOTES

1. EXISTING CONDITIONS INFORMATION IS BASED ON AN EXISTING CONDITIONS PLAN OF LAND SURVEY PREPARED BY GUERRIER & HALNON, INC. DATED JANUARY 26, 2022.

ZONING SUMMARY TABLE

DIMENSIONAL REGULATIONS

	REQUIRED	PROPOSED
MINIMUM LOT SIZE	60,000	798,373
MINIMUM FRONTAGE	200	463
MINIMUM SETBACKS		
FRONT	50	50
SIDE	20	20
REAR	20	217
MINIMUM LOT DEPTH	200	503
MINIMUM LOT WIDTH AT LEACHING AREA	125	287
MINIMUM LOT WIDTH	200	256
MAXIMUM BUILDING COVERAGE	30%	15%
MAXIMUM BUILDING HEIGHT	2.5 STORIES OR 35 FT	<35 FT

PARKING SUMMARY TABLE

COMMERCIAL PARKING REGULATIONS

	AREA	TOWN REQUIREMENT	REQUIRED SPACES	PROVIDED SPACES
SHOPPING CENTER	66,600	1 PER 250 SF	267	230
TOTAL	**66,600**		**267**	**230***

RESIDENTIAL PARKING REGULATIONS

	NO. OF DWELLINGS	TOWN REQUIREMENT	REQUIRED SPACES	PROVIDED SPACES
SINGLE FAMILY	27	2 PER DWELLING	54	54
TOTAL	**27**		**54**	**54**

* WAIVER REQUESTED FOR 14% REDUCTION IN PARKING REQUIRED

4/25/2022 12:37:35 PM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SHEETFILES\SITE PLANS\SPECIAL PERMIT SET\C-120 OVERALL SITE PLAN.DWG - DOCANTO, MARCOS

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MARK	DATE	DESCRIPTION	BY
-	4/25/22	Special Permit and Site Plan Review	NRK

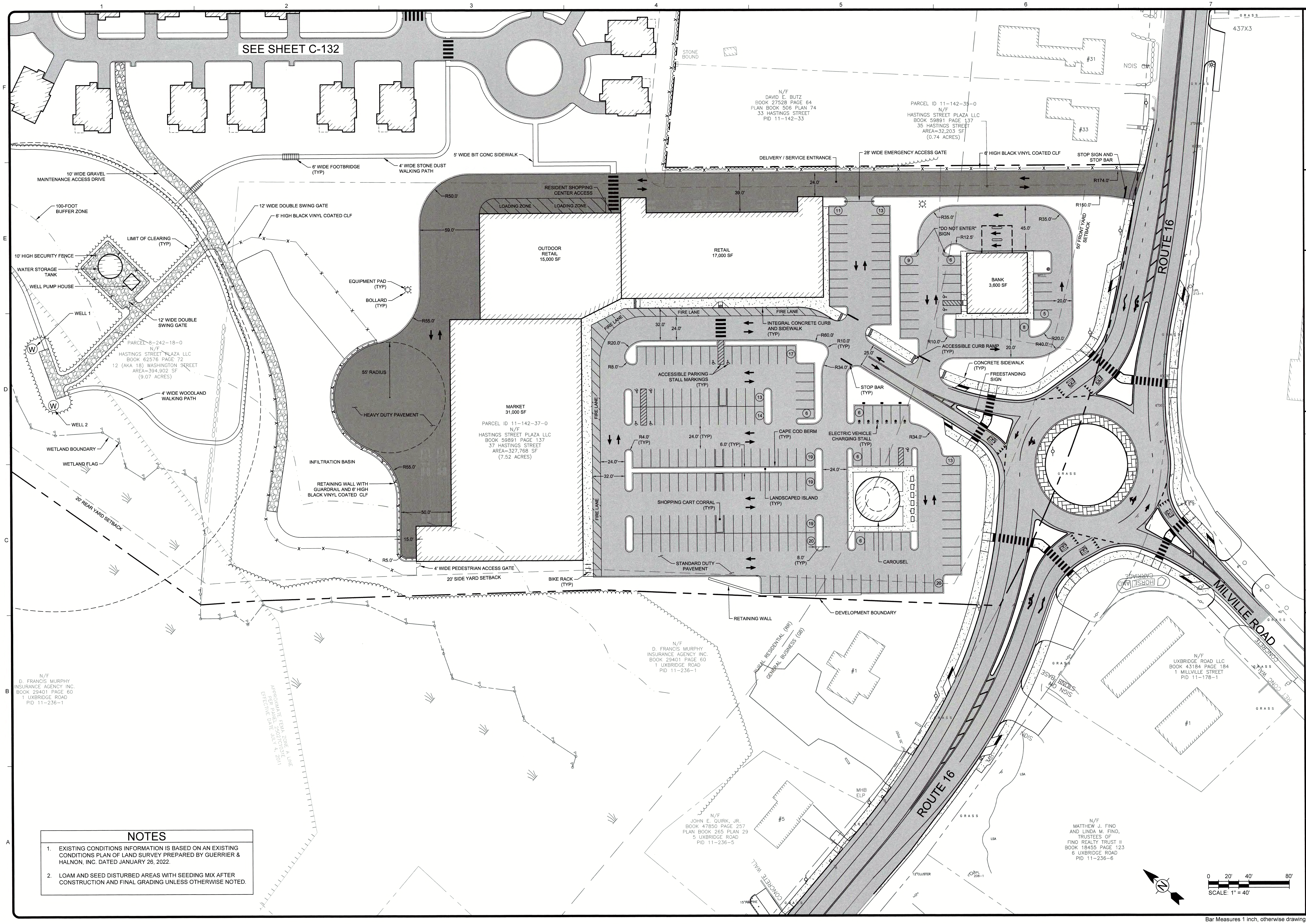
Hastings Street Plaza LLC
Hastings Street and Washington Street
Mendon, Massachusetts

Overall Site Plan

PROJ:	143-305225-20004
DESN:	BMP
DRWN:	BMP
CHKD:	SPR

C-120

Bar Measures 1 inch, otherwise drawing not to scale



NOTES

1. EXISTING CONDITIONS INFORMATION IS BASED ON AN EXISTING CONDITIONS PLAN OF LAND SURVEY PREPARED BY GUERRIER & HALNON, INC. DATED JANUARY 26, 2022.
2. LOAM AND SEED DISTURBED AREAS WITH SEEDING MIX AFTER CONSTRUCTION AND FINAL GRADING UNLESS OTHERWISE NOTED.

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MARK	DATE	DESCRIPTION	BY
-	4/25/22	Special Permit and Site Plan Review	NRK

Hastings Street Plaza LLC

Hastings Street and Washington Street
Mendon, Massachusetts

Layout and Materials Plan

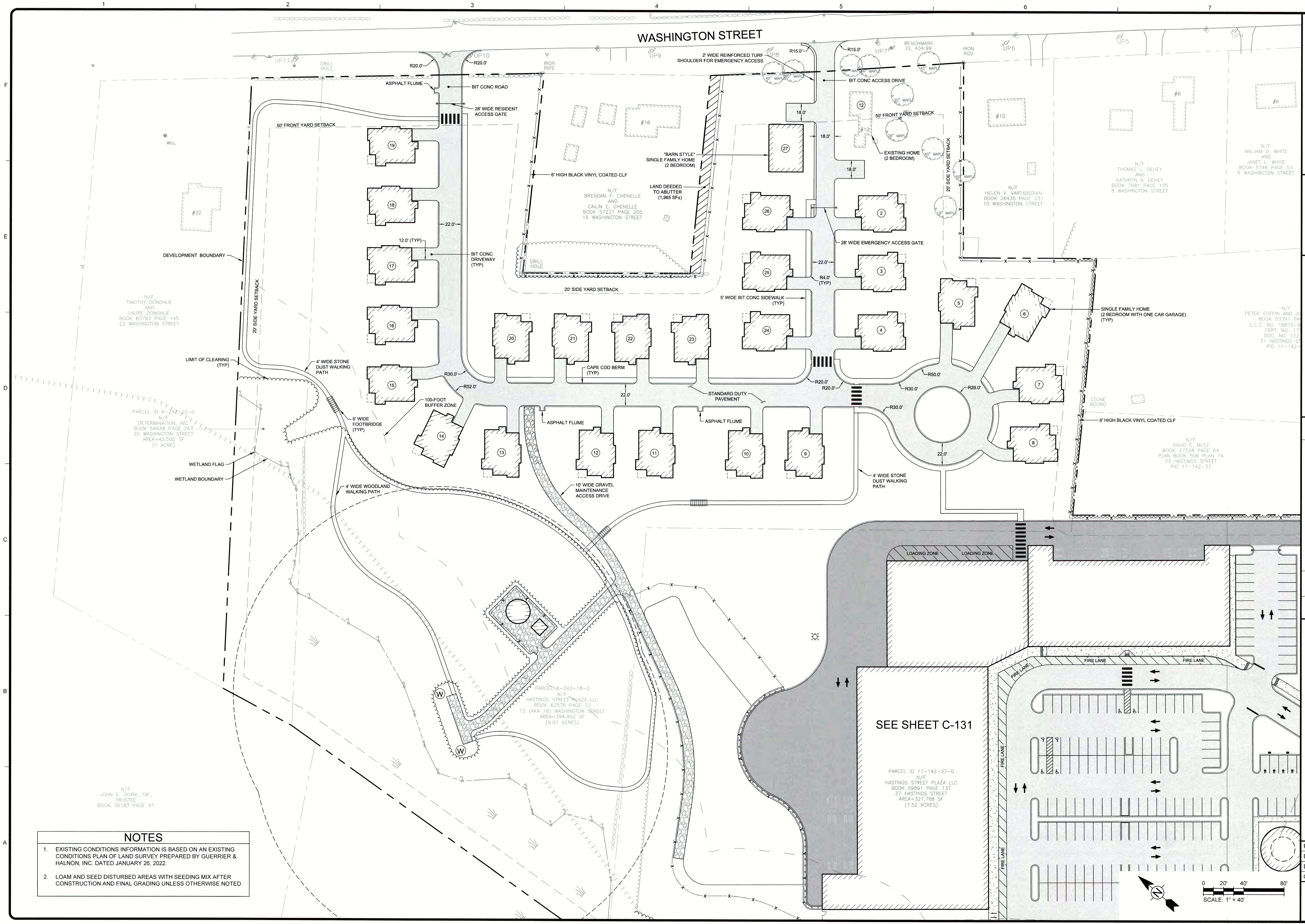
(Sheet 1 of 2)

PROJ:	143-305225-20004
DESN:	MWM
DRWN:	NRK
CHKD:	SPR

C-131

Bar Measures 1 inch, otherwise drawing not to scale

4/25/2022 12:21:00 PM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SHEETFILES\SITE PLANS\SPECIAL PERMIT SET\C-131 LAYOUT AND MATERIALS.DWG - DOCANTO, MARCOS



NOTES

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MARK	DATE	DESCRIPTION	BY
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Hastings Street Plaza LLC
Hastings Street and Washington Street
Mendon, Massachusetts

Layout and Materials Plan
(sheet 2 of 2)

PROJ:	143-305225-20004
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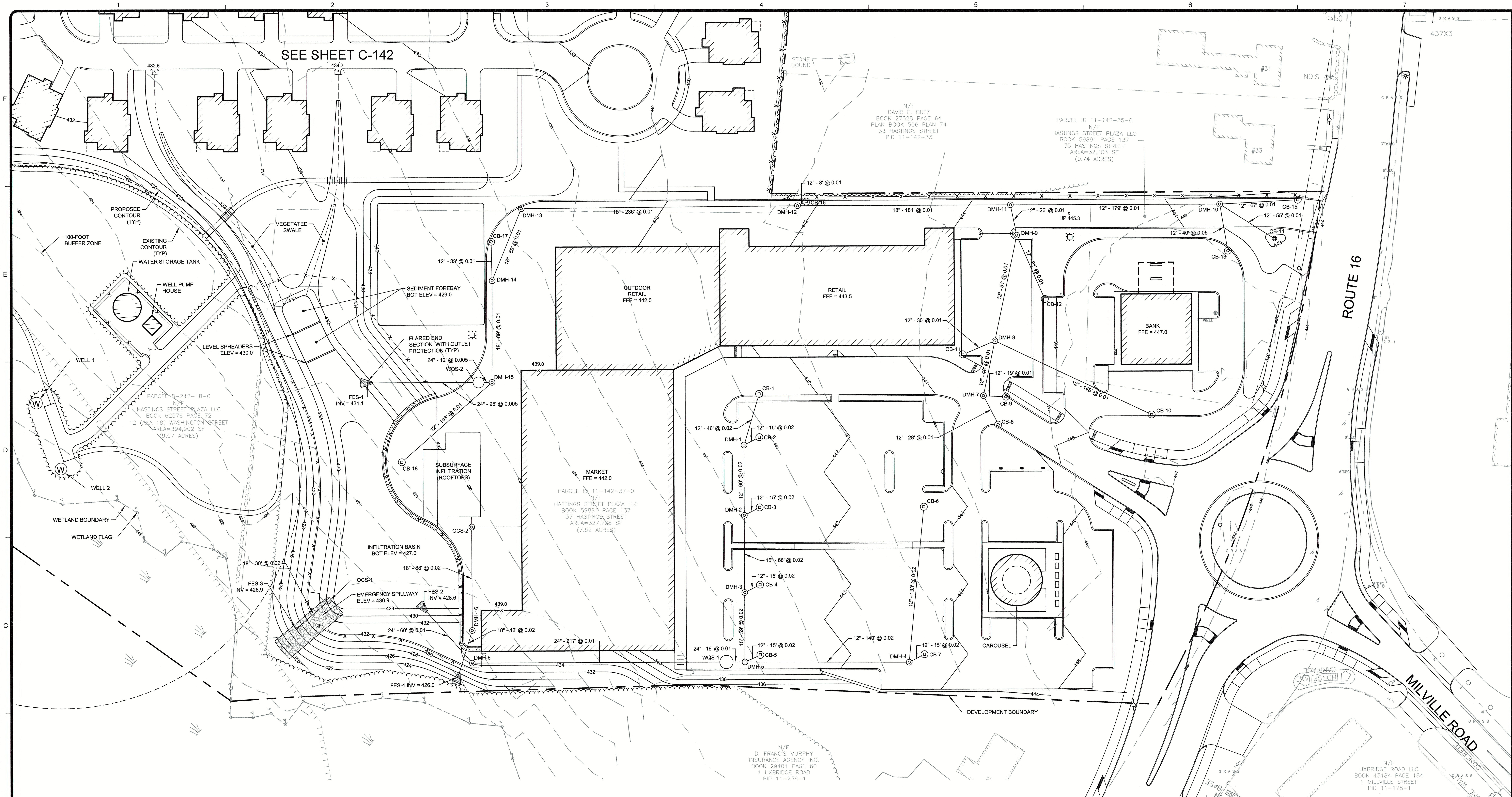
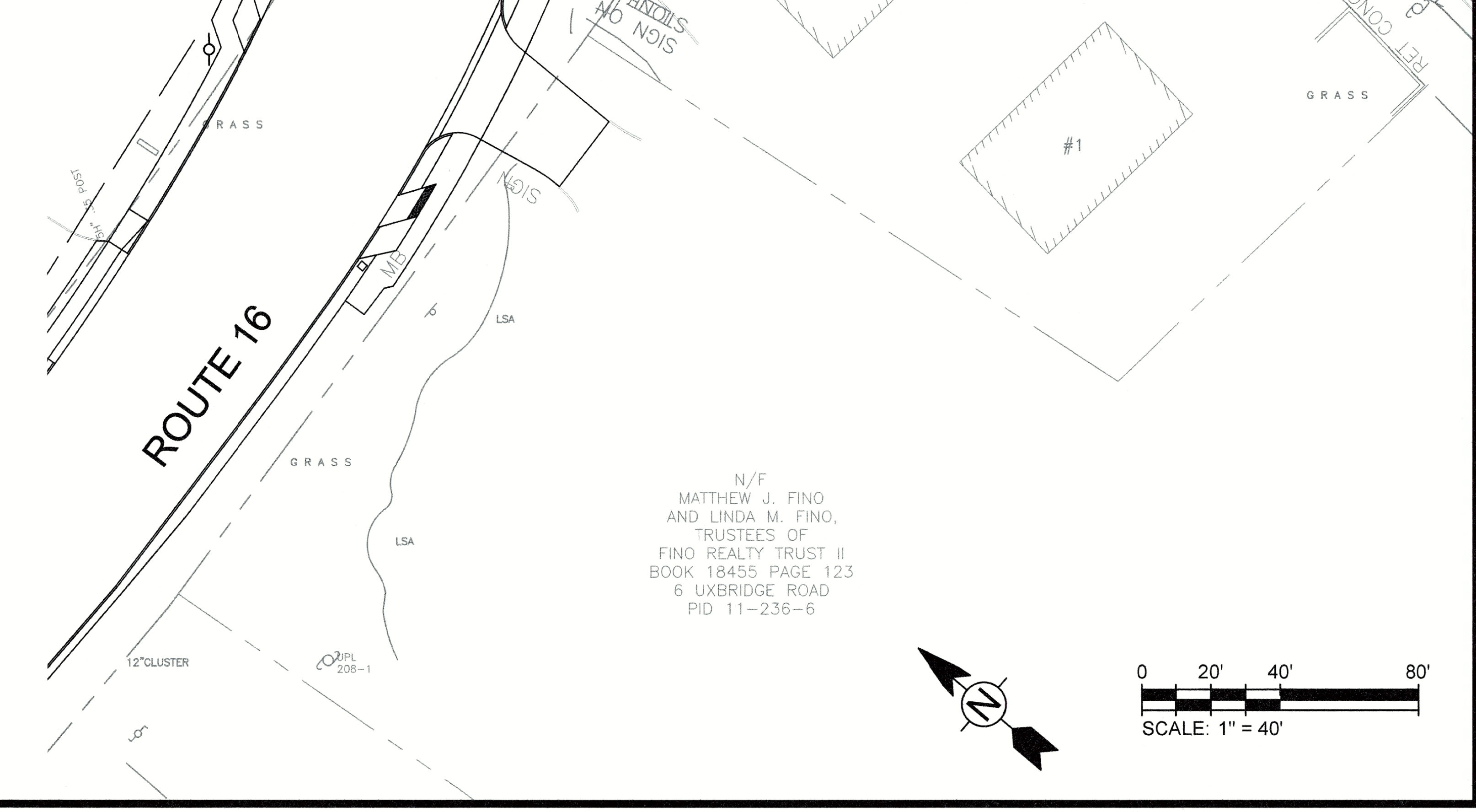
C-132

Bar Measures 1 inch, otherwise drawing not to scale





CATCH BASIN SCHEDULE

STRUCTURE	RIM	INVERTS
CB-1	440.4	INV OUT= 437.4 (DMH-1)
CB-2	440.4	INV OUT= 437.4 (DMH-1)
CB-3	440.4	INV OUT= 437.4 (DMH-2)
CB-4	440.4	INV OUT= 437.4 (DMH-3)
CB-5	440.4	INV OUT= 437.4 (DMH-5)
CB-6	443.3	INV OUT= 440.3 (DMH-4)
CB-7	443.3	INV OUT= 440.3 (DMH-4)
CB-8	445.4	INV OUT= 442.4 (DMH-7)
CB-9	445.0	INV OUT= 442.0 (DMH-7)
CB-10	446.0	INV OUT= 443.0 (DMH-8)
CB-11	444.7	INV OUT= 441.7 (DMH-8)
CB-12	445.5	INV OUT= 442.5 (DMH-9)
CB-13	446.0	INV OUT= 443.0 (DMH-10)
CB-14	441.5	INV OUT= 438.5 (DMH-10)
CB-15	442.4	INV OUT= 439.4 (DMH-10)
CB-16	441.8	INV OUT= 438.8 (DMH-12)
CB-17	438.1	INV OUT= 435.1 (DMH-14)
CB-18	437.5	INV OUT= 434.4 (DMH-15)

DRAIN MANHOLE SCHEDULE

STRUCTURE	RIM	INVERTS	STRUCTURE	RIM	INVERTS	STRUCTURE	RIM	INVERTS
DMH-1	440.7	INV IN = 436.48 (CB-1)	DMH-6	434.0	INV IN = 429.20 (WQS-1)	DMH-11	444.6	INV IN = 440.16 (DMH-9)
		INV IN = 437.10 (CB-2)			INV OUT= 429.20 (FES-2)			INV IN = 436.16 (DMH-10)
		INV OUT= 436.48 (DMH-2)	DMH-7	444.8	INV IN = 442.12 (CB-8)			INV OUT= 435.66 (DMH-13)
DMH-2	440.7	INV IN = 435.28 (DMH-1)			INV IN = 441.81 (CB-9)	DMH-12	441.8	INV IN = 434.76 (CB-11)
		INV IN = 437.10 (CB-3)			INV OUT= 441.81 (DMH-8)			INV IN = 438.72 (CB-16)
		INV OUT= 435.03 (DMH-3)	DMH-8	445.0	INV IN = 441.33 (DMH-7)			INV OUT= 434.76 (DMH-13)
DMH-3	440.7	INV IN = 433.71 (DMH-2)			INV IN = 441.52 (CB-10)	DMH-13	438.2	INV IN = 433.58 (DMH-12)
		INV IN = 437.10 (CB-4)			INV IN = 441.40 (CB-11)			INV OUT= 433.58 (DMH-14)
		INV OUT= 433.71 (DMH-5)			INV OUT= 441.33 (DMH-9)	DMH-14	438.2	INV IN = 433.25 (DMH-13)
DMH-4	443.1	INV IN = 437.59 (CB-6)	DMH-9	445.5	INV IN = 440.42 (DMH-8)			INV IN = 434.77 (CB-17)
		INV IN = 439.95 (CB-7)			INV IN = 441.90 (CB-12)			INV OUT= 433.25 (DMH-15)
		INV OUT= 437.59 (DMH-5)			INV OUT= 440.42 (DMH-11)	DMH-15	438.7	INV IN = 432.36 (DMH-14)
DMH-5	440.7	INV IN = 432.53 (DMH-3)	DMH-10	443.4	INV IN = 440.30 (CB-13)			INV IN = 433.47 (CB-18)
		INV IN = 434.79 (DMH-4)			INV IN = 437.95 (CB-14)			INV OUT= 431.86 (WQS-2)
		INV IN = 437.08 (CB-5)			INV IN = 438.73 (CB-15)	DMH-16	438.8	INV IN = 430.24 (OCS-2)
		INV OUT= 431.78 (WQS-1)			INV OUT= 437.95 (DMH-11)			INV OUT= 426.84 (FES-4)

OUTLET CONTROL STRUCTURE SCHEDULE

STRUCTURE	RIM	INVERTS
OCS-1	429.9	INV IN (ORIFICE) = 428.90
		INV OUT = 427.50 (FES-3)
OCS-2	438.5	INV IN = 433.00 (ROOF)
		INV OUT= 432.75 (RECHARGE)
		WEIR ELEV = 435.50
		INV OUT= 432.00 (DMH-16)

WATER QUALITY STRUCTURE SCHEDULE

STRUCTURE	RIM	INVERTS
WQS-1	441.0	INV IN = 431.62 (DMH-5)
		INV OUT= 431.37 (DMH-6)
WQS-2	438.5	INV IN = 431.80 (DMH-15)
		INV OUT= 431.55 (FES-1)

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MARK	DATE	DESCRIPTION	BY
-	4/25/22	Special Permit and Site Plan Review	NRK

Hastings Street Plaza LLC
Hastings Street and Washington Street
Mendon, Massachusetts

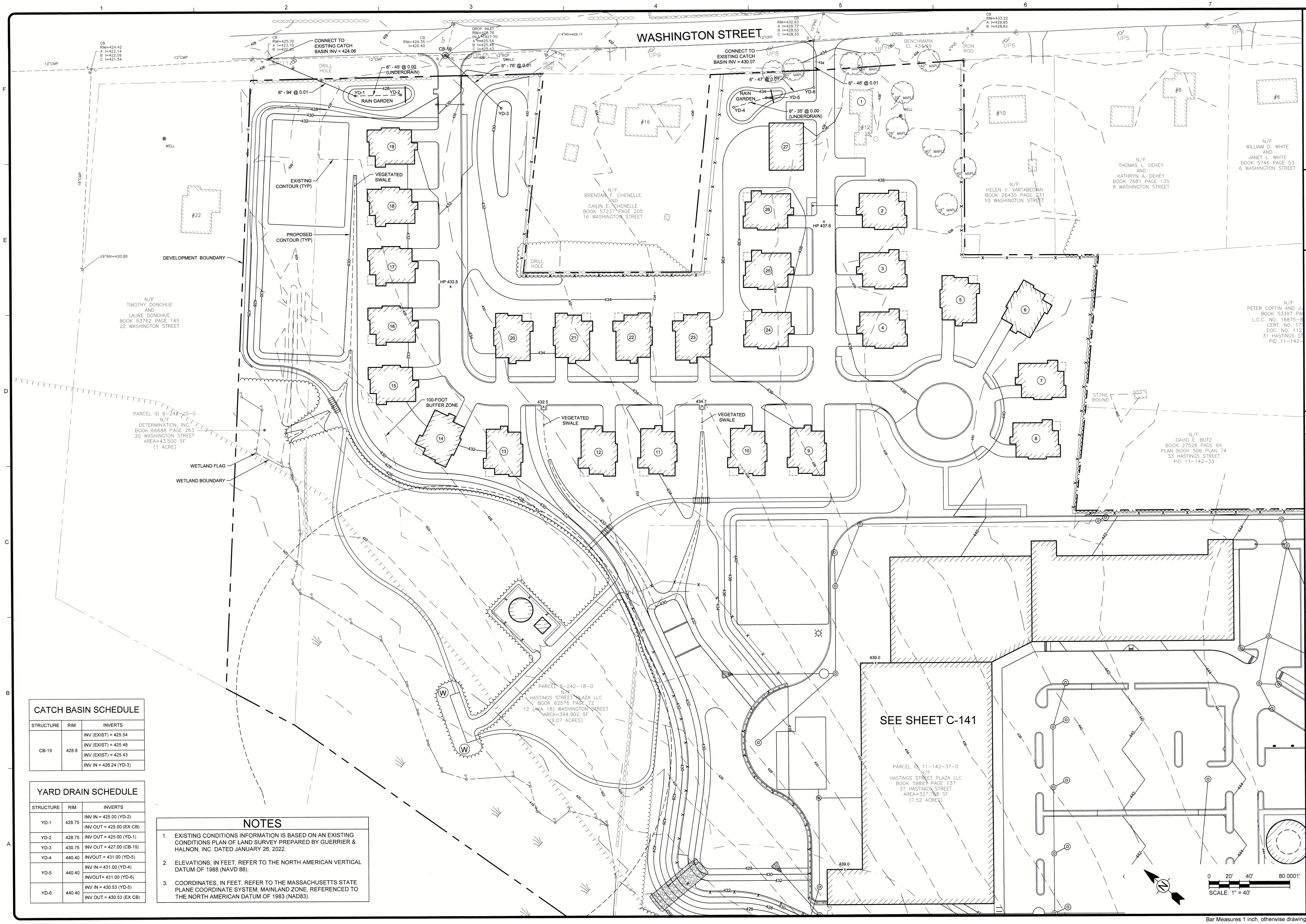
Grading and Drainage Plan
(sheet 1 of 2)

PROJ:	143-305225-20004
DESN:	MWM
DRWN:	NRK
CHKD:	SPR

C-141

Bar Measures 1 inch, otherwise drawing not to scale

4/25/2022 11:51:10 AM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SHEETFILES\SITE PLANS\SPECIAL PERMIT SET\C-141 GRADING AND DRAINAGE.DWG - DOCANTO, MARCOS



CATCH BASIN SCHEDULE

STRUCTURE	RIM	INVERTS
CB-19	428.8	INV (EXIST) = 425.54
		INV (EXIST) = 425.48
		INV (EXIST) = 425.43
		INV IN = 426.24 (YD-3)

YARD DRAIN SCHEDULE

STRUCTURE	RIM	INVERTS
YD-1	428.75	INV IN = 425.00 (YD-2)
		INV OUT = 425.00 (EX CB)
YD-2	428.75	INV OUT = 425.00 (YD-1)
YD-3	430.75	INV OUT = 427.00 (CB-19)
YD-4	440.40	INVOUT = 431.00 (YD-5)
YD-5	440.40	INV IN = 431.00 (YD-4)
		INVOUT= 431.00 (YD-6)
YD-6	440.40	INV IN = 430.53 (YD-5)
		INV OUT = 430.53 (EX CB)

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Hastings Street Plaza LLC
Hastings Street and Washington Street
Mendon, Massachusetts

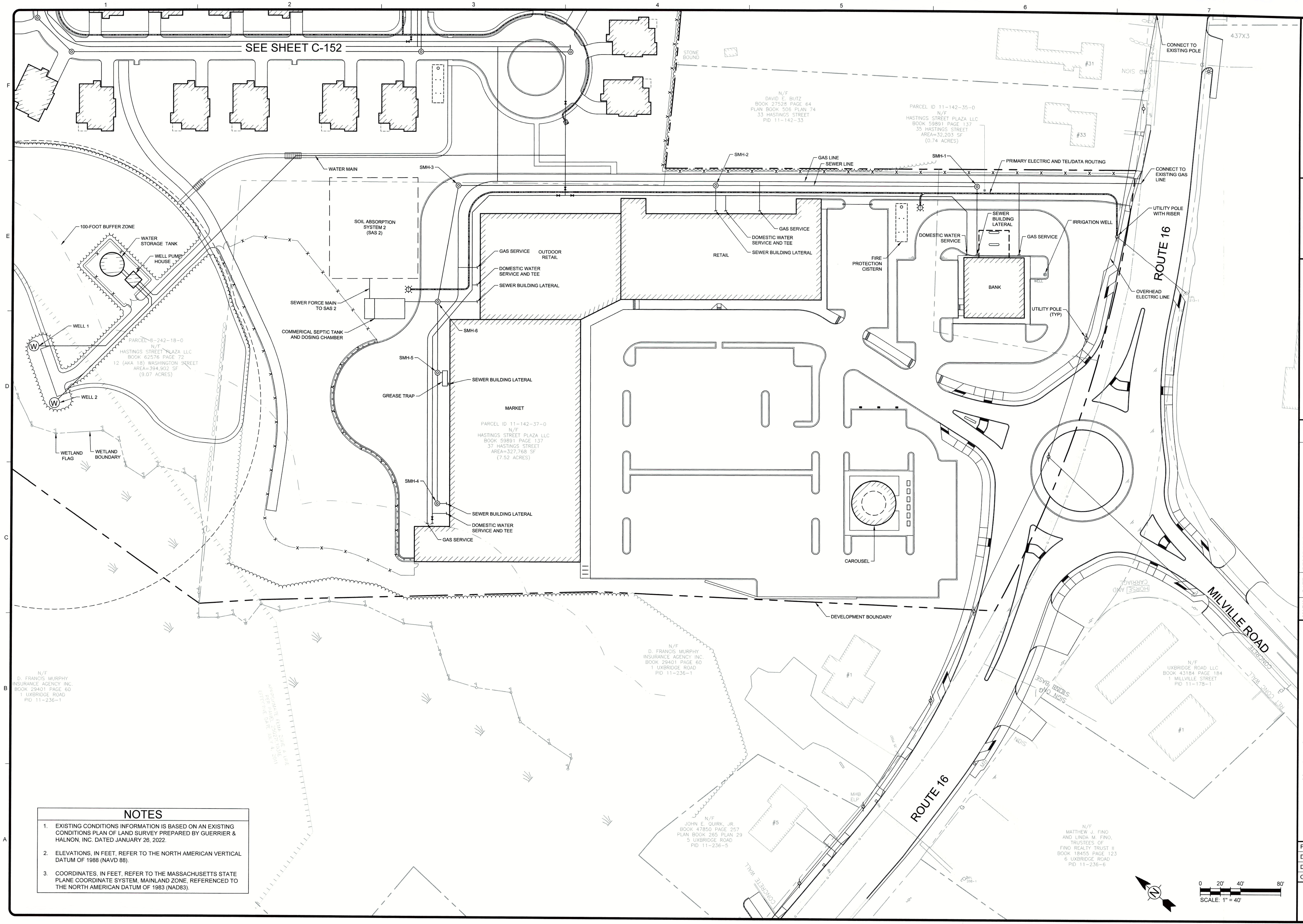
Grading and Drainage Plan

(sheet 2 of 2)

PROJ:	143-305225-20004
DESN:	MWM
DRWN:	NRK
CHKD:	SPR

C-142

Bar Measures 1 inch, otherwise drawing not to scale



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Hastings Street Plaza LLC

Hastings Street and Washington Street
Mendon, Massachusetts

Utility Plan
(sheet 1 of 2)

PROJ:	143-305225-20004
DESN:	MWM
DRWN:	NRK
CHKD:	SPR

C-151

Bar Measures 1 inch, otherwise drawing not to scale

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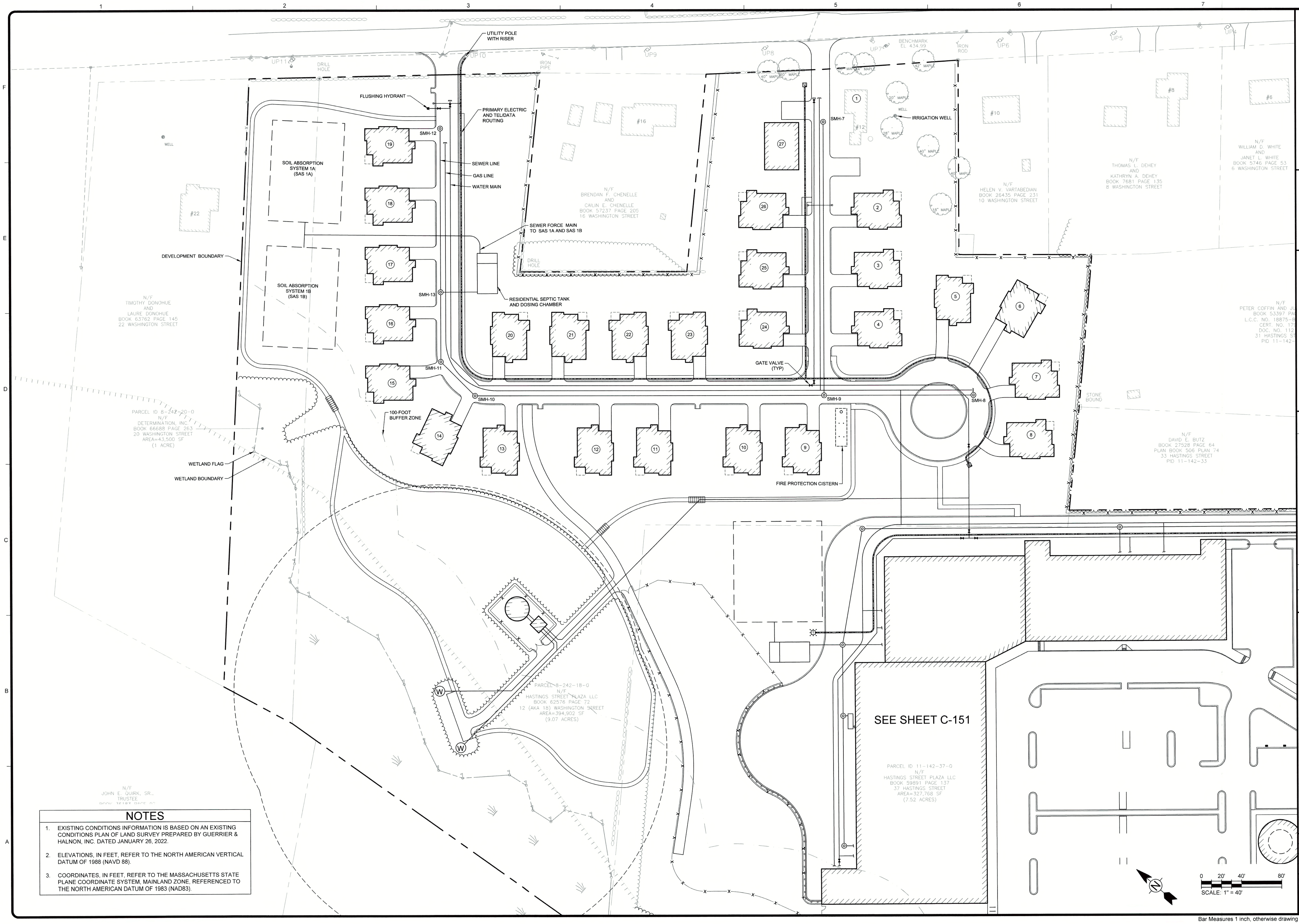

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Hastings Street Plaza LLC
Hastings Street and Washington Street
Mendon, Massachusetts

Utility Plan
(sheet 2 of 2)

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C-152

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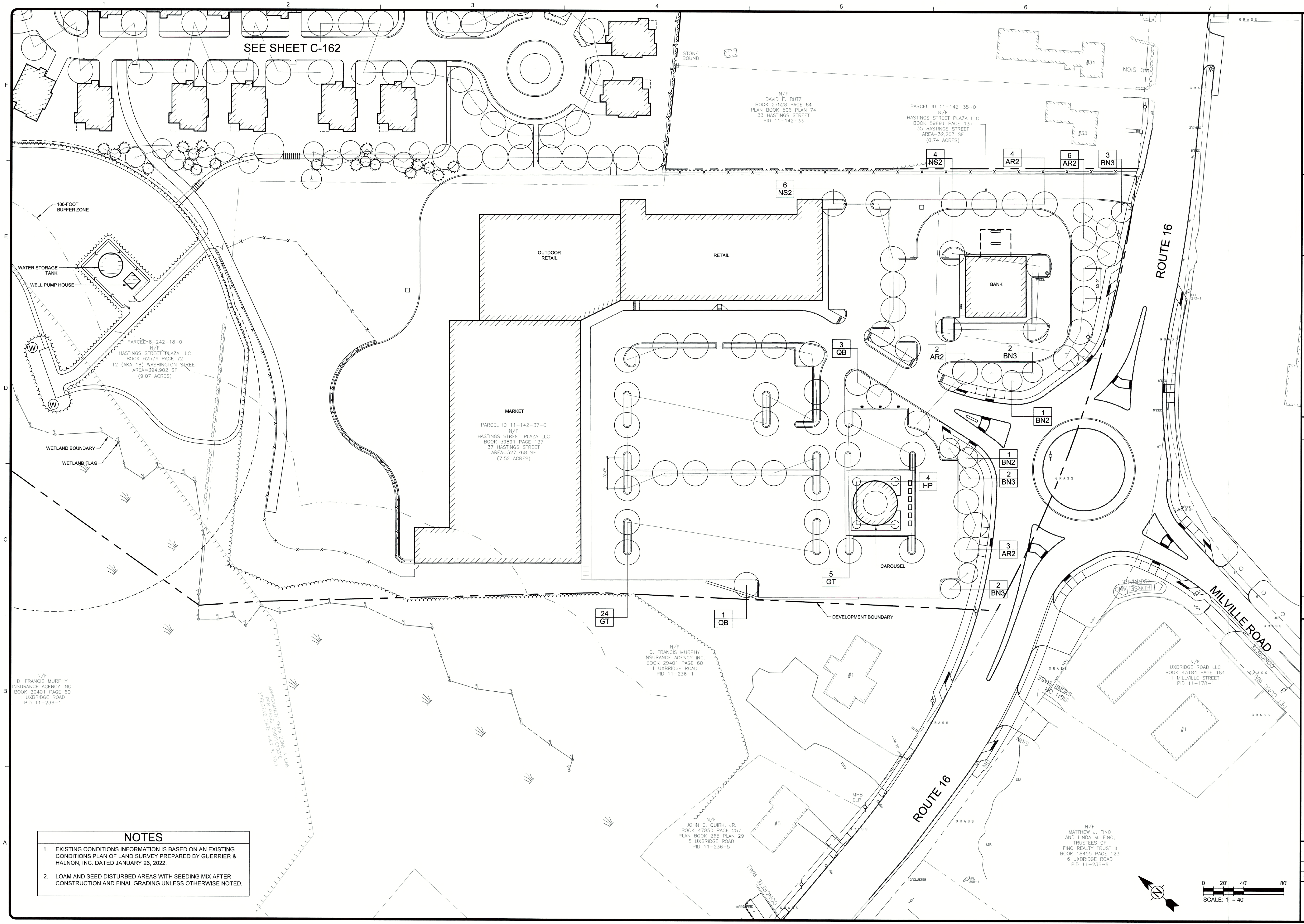

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Hastings Street Plaza LLC
Hastings Street and Washington Street
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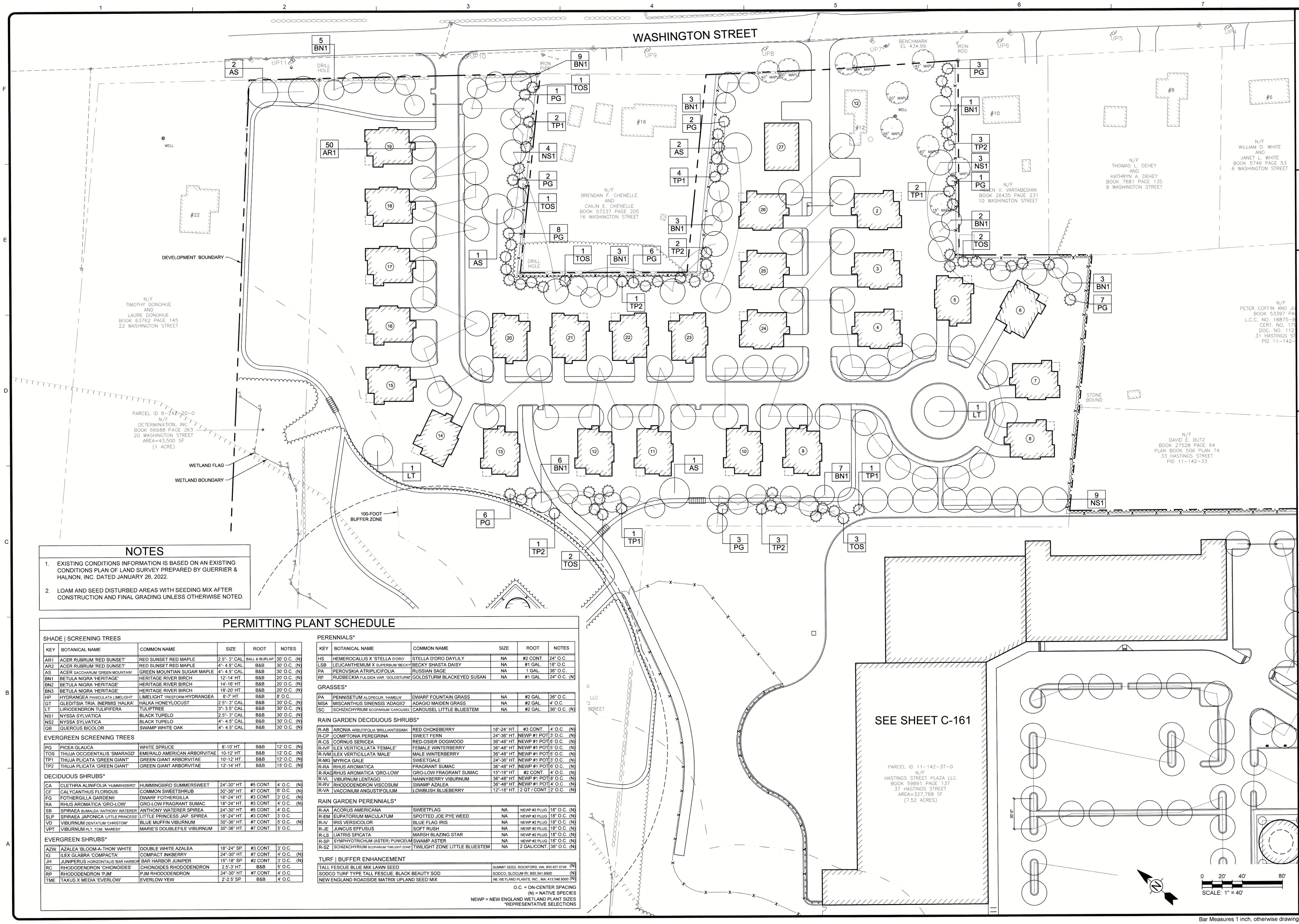
Landscape Plan
(sheet 1 of 2)

PROJ: 143-305225-20004
DESN: KAC
DRWN: JW
CHKD: KA

C-161

Bar Measures 1 inch, otherwise drawing not to scale

4/25/2022 12:37:55 PM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SHEETFILES\SITE PLANS\SPECIAL PERMIT SET\C-161 LANDSCAPE PLAN.DWG - DOCANTO, MARCOS



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PERMITTING PLANT SCHEDULE

SHADE | SCREENING TREES

KEY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	NOTES
AR1	ACER RUBRUM 'RED SUNSET'	RED SUNSET RED MAPLE	2.5"- 3" CAL.	BALL & BURLAP	30' O.C. (N)
AR2	ACER RUBRUM 'RED SUNSET'	RED SUNSET RED MAPLE	4"- 4.5" CAL.	B&B	30' O.C. (N)
AS	ACER SACCHARUM 'GREEN MOUNTAIN'	GREEN MOUNTIAN SUGAR MAPLE	4"- 4.5" CAL.	B&B	30' O.C. (N)
BN1	BETULA NIGRA 'HERITAGE'	HERITAGE RIVER BIRCH	12'-14' HT.	B&B	20' O.C. (N)
BN2	BETULA NIGRA 'HERITAGE'	HERITAGE RIVER BIRCH	14'-16' HT.	B&B	20' O.C. (N)
BN3	BETULA NIGRA 'HERITAGE'	HERITAGE RIVER BIRCH	18'-20' HT.	B&B	20' O.C. (N)
HP	HYDRANGEA PANICULATA LIMELIGHT'	LIMELIGHT TREEFORM HYDRANGEA	6'-7' HT.	B&B	8' O.C.
GT	GLEDITSIA TRIA. INERMIS 'HALKA'	HALKA HONEYLOCUST	2.5"- 3" CAL.	B&B	30' O.C. (N)
LT	LIRIODENDRON TULIPIFERA	TULIPTREE	3"- 3.5" CAL.	B&B	30' O.C. (N)
NS1	NYSSA SYLVATICA	BLACK TUPELO	2.5"- 3" CAL.	B&B	30' O.C. (N)
NS2	NYSSA SYLVATICA	BLACK TUPELO	4"- 4.5" CAL.	B&B	30' O.C. (N)
QB	QUERCUS BICOLOR	SWAMP WHITE OAK	4"- 4.5" CAL.	B&B	30' O.C. (N)

EVERGREEN SCREENING TREES

PG	PICEA GLAUCA	WHITE SPRUCE	8'-10' HT.	B&B	12' O.C. (N)
TOS	THUJA OCCIDENTALIS 'SMARAGD'	EMERALD AMERICAN ARBORVITAE	10-12' HT.	B&B	12' O.C. (N)
TP1	THUJA PLICATA 'GREEN GIANT'	GREEN GIANT ARBORVITAE	10'-12' HT.	B&B	12' O.C. (N)
TP2	THUJA PLICATA 'GREEN GIANT'	GREEN GIANT ARBORVITAE	12'-14' HT.	B&B	15' O.C. (N)

DECIDUOUS SHRUBS*

CA	CLETHRA ALINIFOLIA 'HUMMINGBIRD'	HUMMINGBIRD SUMMERSWEET	24"-30" HT.	#5 CONT.	4' O.C. (N)
CF	CALYCANTHUS FLORIDUS	COMMON SWEETSHRUB	30"-36" HT.	#7 CONT.	6' O.C. (N)
FG	FOTHERGILLA GARDENII	DWARF FOTHERGILLA	18"-24" HT.	#3 CONT.	3' O.C. (N)
RA	RHUS AROMATICA 'GRO-LOW'	GRO-LOW FRAGRANT SUMAC	18"-24" HT.	#3 CONT.	4' O.C. (N)
SB	SPIRAEA BUMALDA 'ANTHONY WATERER'	ANTHONY WATERER SPIREA	24"-30" HT.	#5 CONT.	4' O.C.
SLP	SPIRAEA JAPONICA 'LITTLE PRINCESS'	LITTLE PRINCESS JAP. SPIREA	18"-24" HT.	#3 CONT.	3' O.C.
VD	VIBURNUM DENTATUM 'CHRISTOM"	BLUE MUFFIN VIBURNUM	30"-36" HT.	#7 CONT.	5' O.C. (N)
VPT	VIBURNUM PLT. TOM. 'MARESII'	MARIE'S DOUBLEFILE VIBURNUM	30"-36" HT.	#7 CONT.	5' O.C.

EVERGREEN SHRUBS*

AZW	AZALEA 'BLOOM-A-THON' WHITE	DOUBLE WHITE AZALEA	18"-24" SP.	#3 CONT.	3' O.C.
IG	ILEX GLABRA 'COMPACTA'	COMPACT INKBERRY	24"-30" HT.	#7 CONT.	4' O.C. (N)
JH	JUNIPERUS HORIZONTALIS 'BAR HARBOR'	BAR HARBOR JUNIPER	15"-18" SP.	#2 CONT.	3' O.C. (N)
RC	RHODODENDRON 'CHIONOIDES'	CHIONOIDES RHODODENDRON	2.5'-3' HT.	B&B	5' O.C.
RP	RHODODENDRON 'PJM'	PJM RHODODENDRON	24"-30" HT.	#7 CONT.	4' O.C.
TME	TAXUS X MEDIA 'EVERLOW'	EVERLOW YEW	2'-2.5' SP.	B&B	4' O.C.

PERENNIALS*

KEY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	NOTES
HS	HEMEROCALLIS X 'STELLA D'ORO'	STELLA D'ORO DAYLILY	NA	#2 CONT.	24" O.C.
LSB	LEUCANTHEMUM X SUPERBUM 'BECKY'	BECKY SHASTA DAISY	NA	#1 GAL.	18" O.C.
PA	PEROVSKIA ATRIPLICIFOLIA	RUSSIAN SAGE	NA	1 GAL.	36" O.C.
RF	RUDBECKIA FULGIDA VAR. 'GOLDSTURM'	GOLDSTURM BLACKEYED SUSAN	NA	#1 GAL.	24" O.C. (N)

GRASSES*

PA	PENNISETUM ALOPECUR. 'HAMELN'	DWARF FOUNTAIN GRASS	NA	#2 GAL.	36" O.C.
MSA	MISCANTHUS SINENSIS 'ADAGIO'	ADAGIO MAIDEN GRASS	NA	#2 GAL.	4' O.C.
SC	SCHIZACHYRIUM SCOPARIUM 'CAROUSEL'	CAROUSEL LITTLE BLUESTEM	NA	#2 GAL.	36" O.C. (N)

RAIN GARDEN DECIDUOUS SHRUBS*

R-AB	ARONIA ARBUTIFOLIA 'BRILLIANTISSIMA'	RED CHOKEBERRY	18"-24" HT.	#3 CONT.	4' O.C. (N)
R-CP	COMPTONIA PEREGRINA	SWEET FERN	24"-36" HT.	NEWP #1 POT	3' O.C. (N)
R-CS	CORNUS SERICEA	RED-OSIER DOGWOOD	36"-48" HT.	NEWP #1 POT	5' O.C. (N)
R-IVF	ILEX VERTICILLATA 'FEMALE'	FEMALE WINTERBERRY	36"-48" HT.	NEWP #1 POT	5' O.C. (N)
R-IVM	ILEX VERTICILLATA 'MALE'	MALE WINTERBERRY	36"-48" HT.	NEWP #1 POT	5' O.C. (N)
R-MG	MYRICA GALE	SWEETGALE	24"-36" HT.	NEWP #1 POT	3' O.C. (N)
R-RA	RHUS AROMATICA	FRAGRANT SUMAC	36"-48" HT.	NEWP #1 POT	6' O.C. (N)
R-RAG	RHUS AROMATICA 'GRO-LOW'	GRO-LOW FRAGRANT SUMAC	15"-18" HT.	#2 CONT.	4' O.C. (N)
R-VL	VIBURNUM LENTAGO	NANNYBERRY VIBURNUM	36"-48" HT.	NEWP #1 POT	8' O.C. (N)
R-RV	RHODODENDRON VISCOSUM	SWAMP AZALEA	36"-48" HT.	NEWP #1 POT	4' O.C. (N)
R-VA	VACCINIUM ANGUSTIFOLIUM	LOWBUSH BLUEBERRY	12"-18" HT.	2 QT / CONT.	2' O.C. (N)

RAIN GARDEN PERENNIALS*

R-AA	ACORUS AMERICANA	SWEETFLAG	NA	NEWP #2 PLUG	18" O.C. (N)
R-EM	EUPATORIUM MACULATUM	SPOTTED JOE PYE WEED	NA	NEWP #2 PLUG	18" O.C. (N)
R-IV	IRIS VERSICOLOR	BLUE FLAG IRIS	NA	NEWP #2 PLUG	18" O.C. (N)
R-JE	JUNCUS EFFUSUS	SOFT RUSH	NA	NEWP #2 PLUG	18" O.C. (N)
R-LS	LIATRIS SPICATA	MARSH BLAZING STAR	NA	NEWP #2 PLUG	18" O.C. (N)
R-SP	SYMPHYOTRICHUM (ASTER) PUNICEUM	SWAMP ASTER	NA	NEWP #2 PLUG	18" O.C. (N)
R-SZ	SCHIZACHYRIUM SCOPARIUM 'TWILIGHT ZONE'	TWILIGHT ZONE LITTLE BLUESTEM	NA	2 GAL/CONT.	36" O.C. (N)

TURF | BUFFER ENHANCEMENT

TALL FESCUE BLUE MIX LAWN SEED	SUMMIT SEED, ROCKFORD, WA; 800.457.6748 (N)
SODCO TURF TYPE TALL FESCUE; BLACK BEAUTY SOD	SODCO; SLOCUM RI; 800.341.6900 (N)
NEW ENGLAND ROADSIDE MATRIX UPLAND SEED MIX	NE WETLAND PLANTS, INC., MA; 413.548.8000 (N)

O.C. = ON-CENTER SPACING
(N) = NATIVE SPECIES
NEWP = NEW ENGLAND WETLAND PLANT SIZES
*REPRESENTATIVE SELECTIONS

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Marlborough, Massachusetts 01752
Phone: (508) 786-2200 Fax: (508) 786-2201

SEAN PATRICK REARDON
CIVIL
NO. 41062

MARK	DATE	DESCRIPTION	BY
-	4/25/22	Special Permit and Site Plan Review	NRK

Hastings Street Plaza LLC

Hastings Street and Washington Street
Mendon, Massachusetts

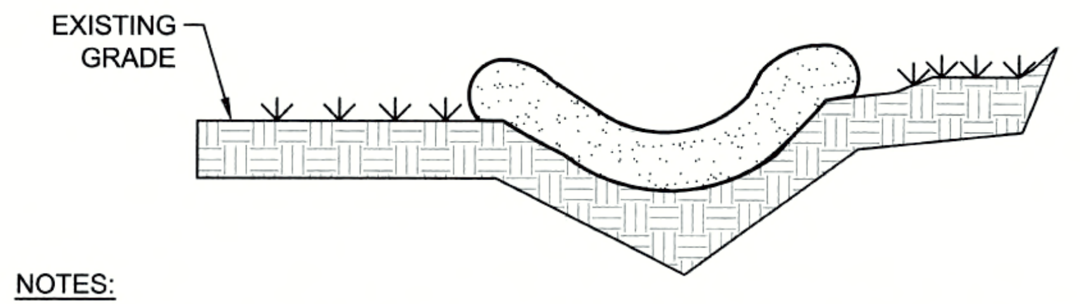
Landscape Plan
(sheet 2 of 2)

PROJ:	143-305225-20004
DESN:	KAC
DRWN:	JW
CHKD:	KA

C-162

4/25/2022 12:38:15 PM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SHEETFILES\SITE PLANS\SPECIAL PERMIT SET\C-162 LANDSCAPE PLAN.DWG - DOCANTO, MARCOS

Bar Measures 1 inch, otherwise drawing not to scale

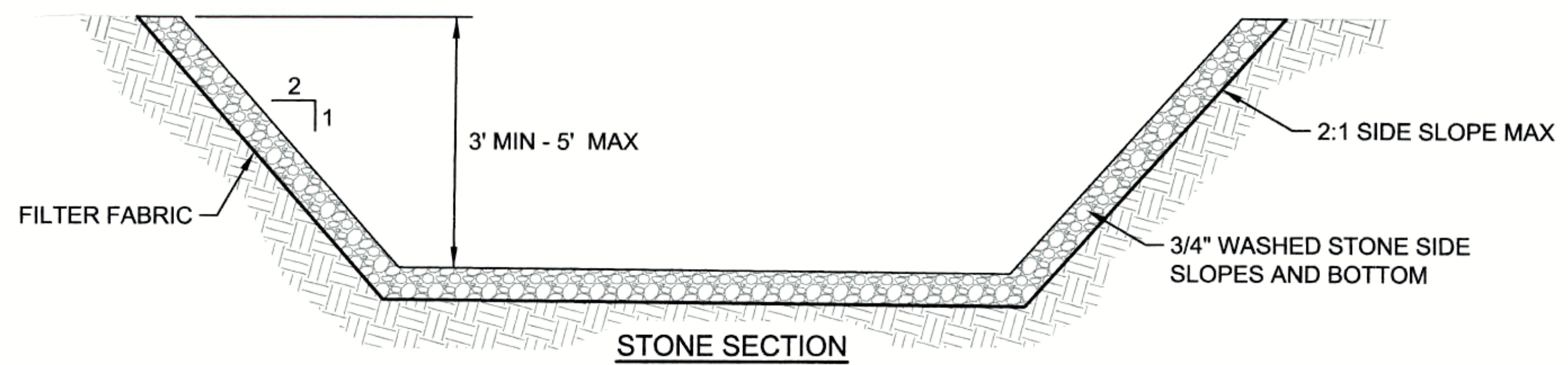


NOTES:

1. FILTER SOCK TO BE PLACED WITHIN EXISTING DITCHES AND TEMPORARY CONVEYANCE CHANNELS AS NEEDED TO PREVENT EROSION.
2. CENTER 6" LOWER THAN BANKS SPAN; EXTEND ENDS TO PREVENT BYPASS AROUND EDGES.

COMPOST FILTER SOCK FOR CHECK DAMS

NOT TO SCALE



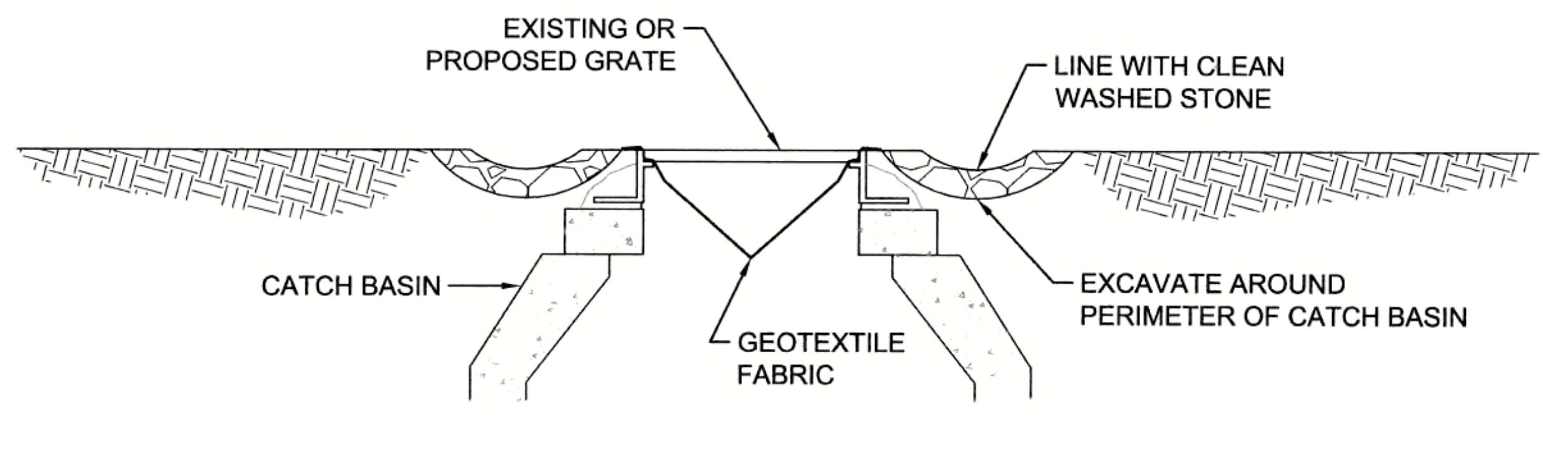
STONE SECTION

NOTES:

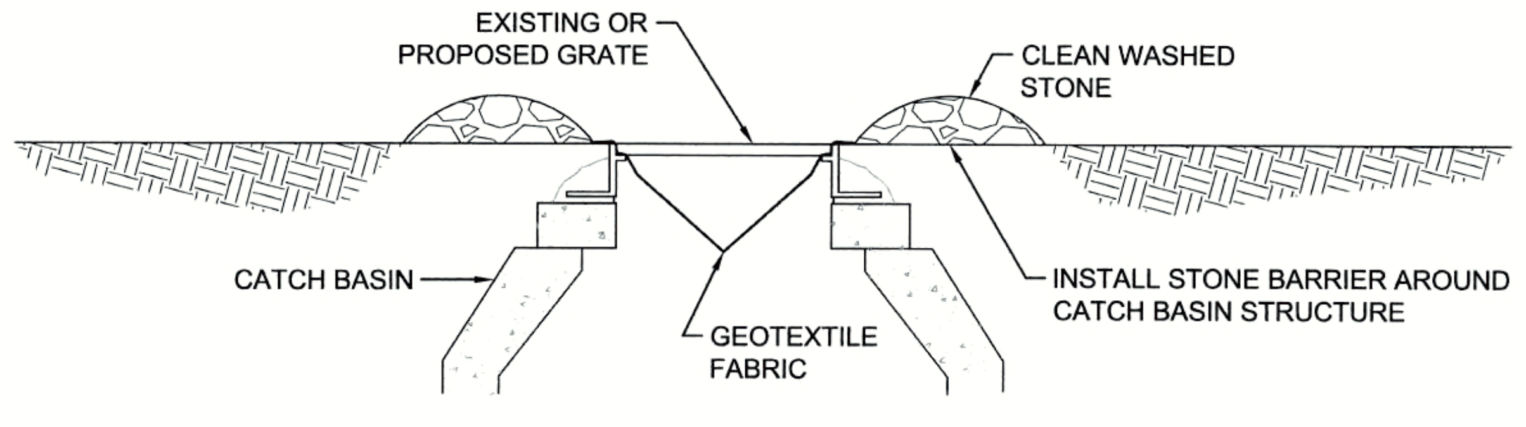
CONTRACTOR TO DEWATER THE SEDIMENT TRAP WITHIN 72 HOURS. PUMP INTAKE SHALL BE LOCATED AS CLOSE TO THE TOP OF THE WATER COLUMN AS POSSIBLE AND WATER SHALL NOT BE DRAWN FROM THE BOTTOM OF THE BASIN. DEWATERING FLUIDS MUST BE VISIBLY CLEAR OF SEDIMENT, OTHERWISE CONTRACTOR MUST TREAT DISCHARGES WITH A SEDIMENT CONTROL MEASURE PRIOR TO DISCHARGE.

TEMPORARY SEDIMENT TRAP

NOT TO SCALE

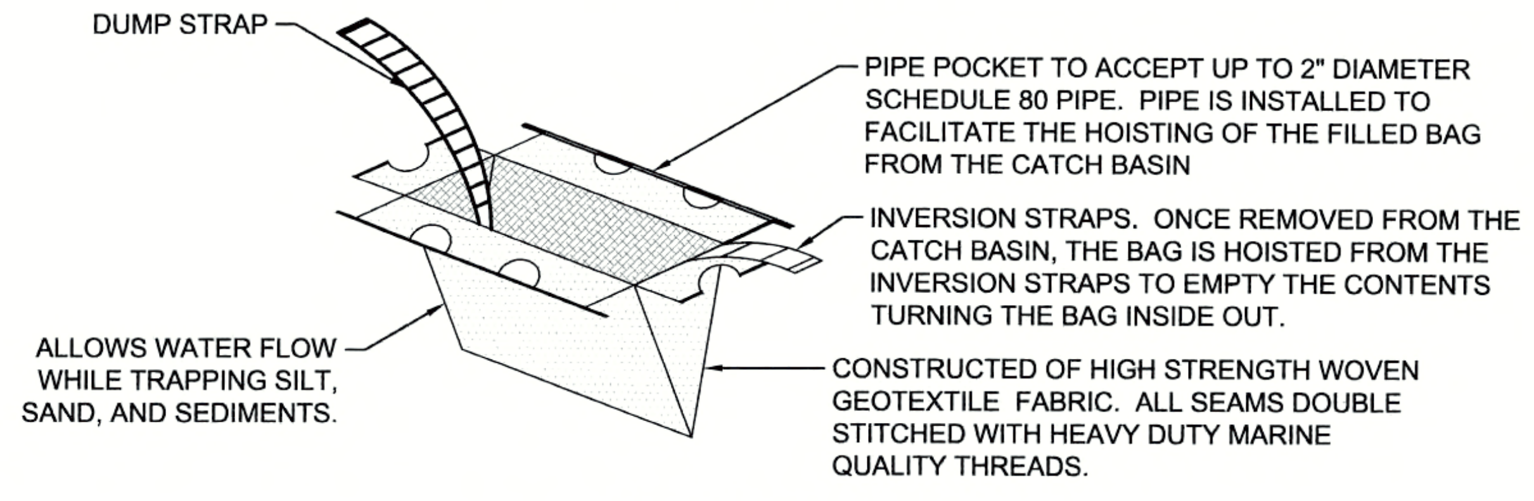


EXCAVATION



GRAVEL/STONE BARRIER

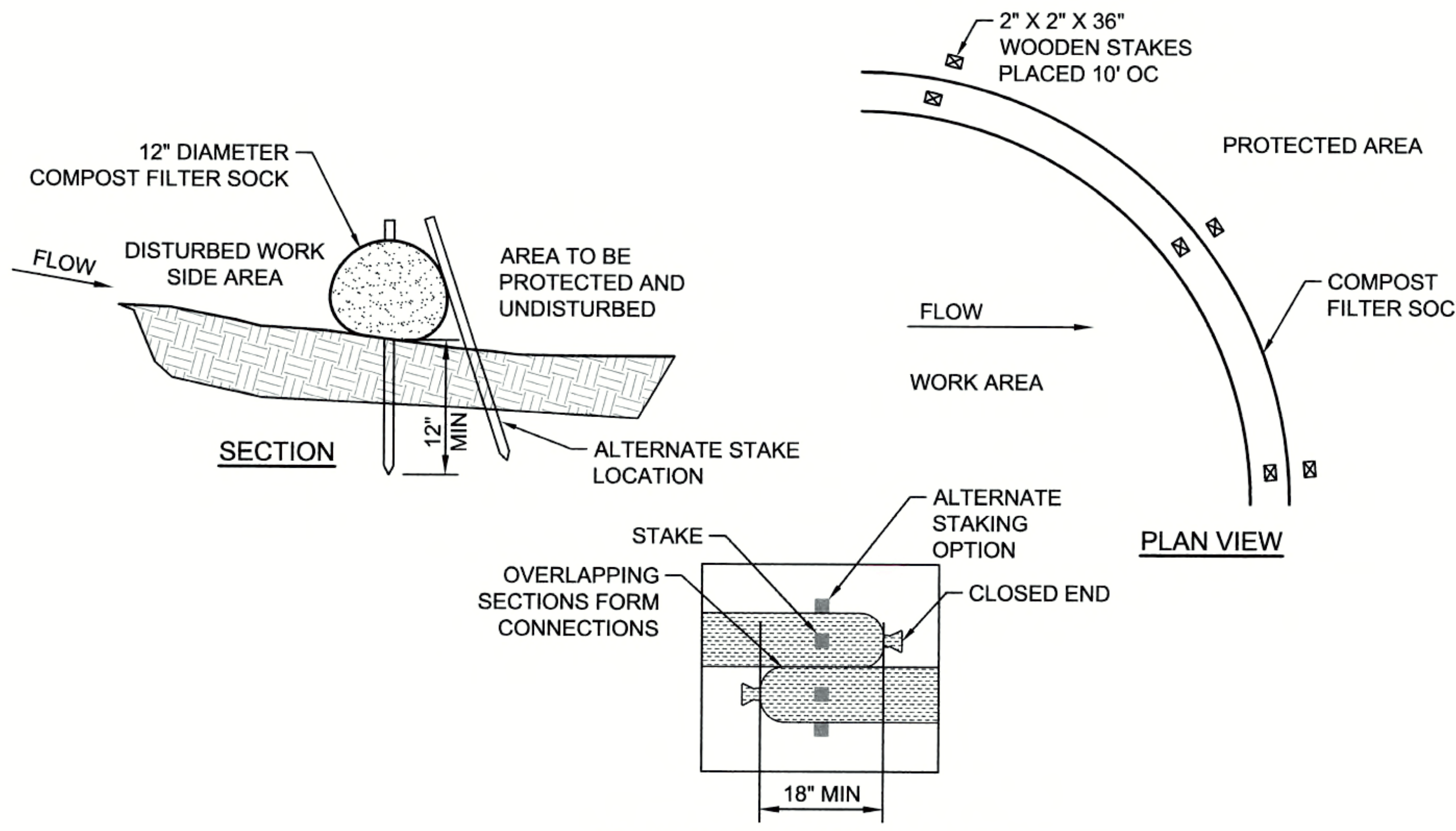
COMBINATION INLET PROTECTION FOR USE WHERE CONTRIBUTING AREAS ARE UN-STABLIZED



FOR USE WHERE CONTRIBUTING AREAS ARE PAVED

GEOTEXTILE INLET PROTECTION

NOT TO SCALE



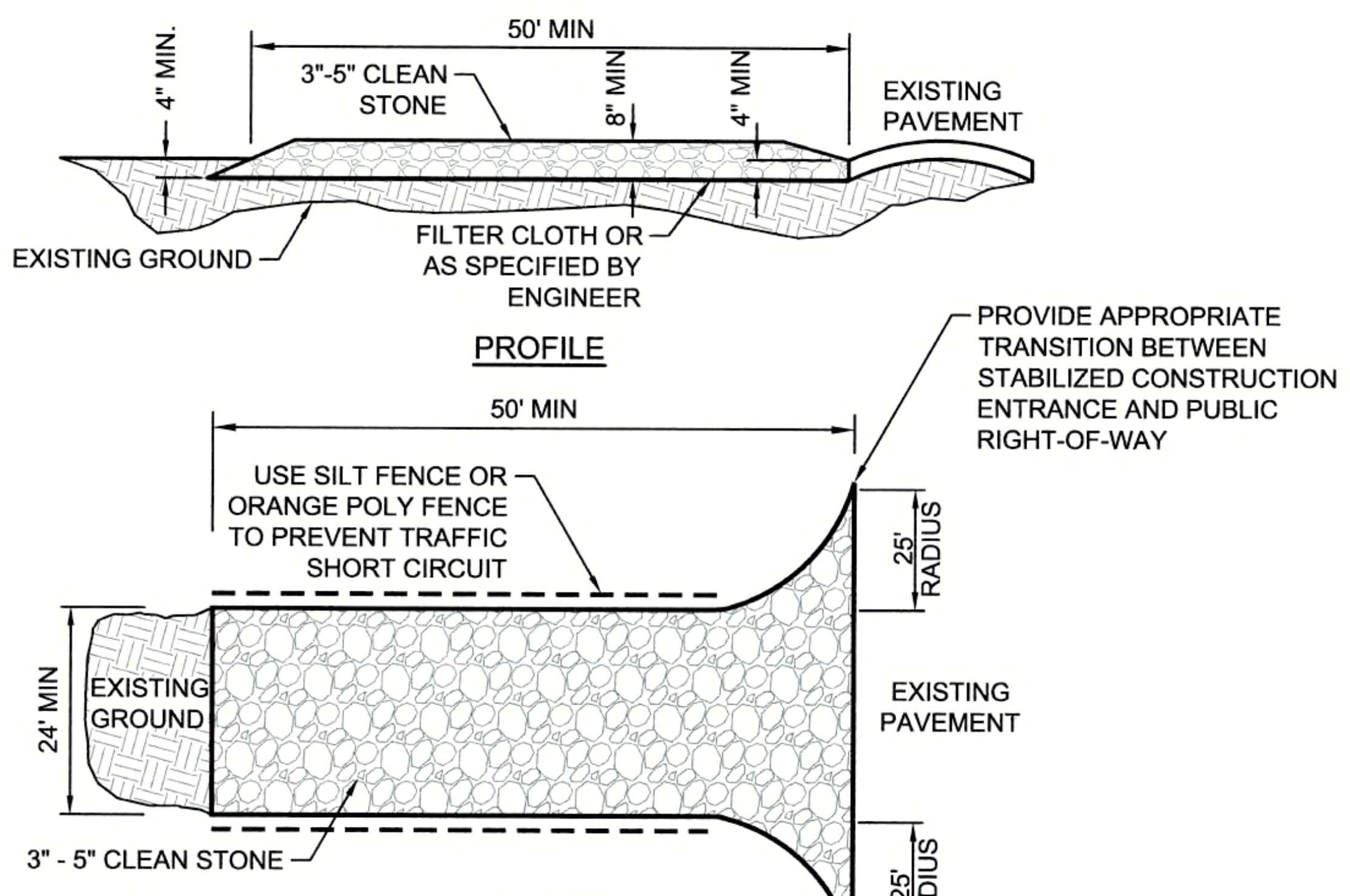
CONNECTION/ATTACHMENT DETAIL

NOTES:

1. PREFABRICATED COMPOST FILTER SOCK SHALL BE FILTREXX SOXX OR APPROVED EQUAL.
2. MATERIAL FOR SOCKS SHALL CONSIST OF SANITIZED MATURE COMPOST, FREE OF VIABLE WEED SEEDS AND FOREIGN DEBRIS SUCH AS GLASS AND PLASTIC. COMPOST SHALL BE IN SHREDDED OR GRANULAR FORM AND FREE FROM HARD LUMPS. IN ADDITION, NO KILN-DRIED WOOD OR CONSTRUCTION DEBRIS SHALL BE ALLOWED. CONTRACTOR SHALL REFER TO MASSDOT SPECIFICATIONS M1.06.0 FOR MATERIAL SPECIFICATIONS.
3. SOCK SHALL CONSIST OF JUTE MESH OR OTHER APPROVED BIODEGRADABLE MATERIAL.

COMPOST FILTER SOCK

NOT TO SCALE



PLAN VIEW

NOTES:

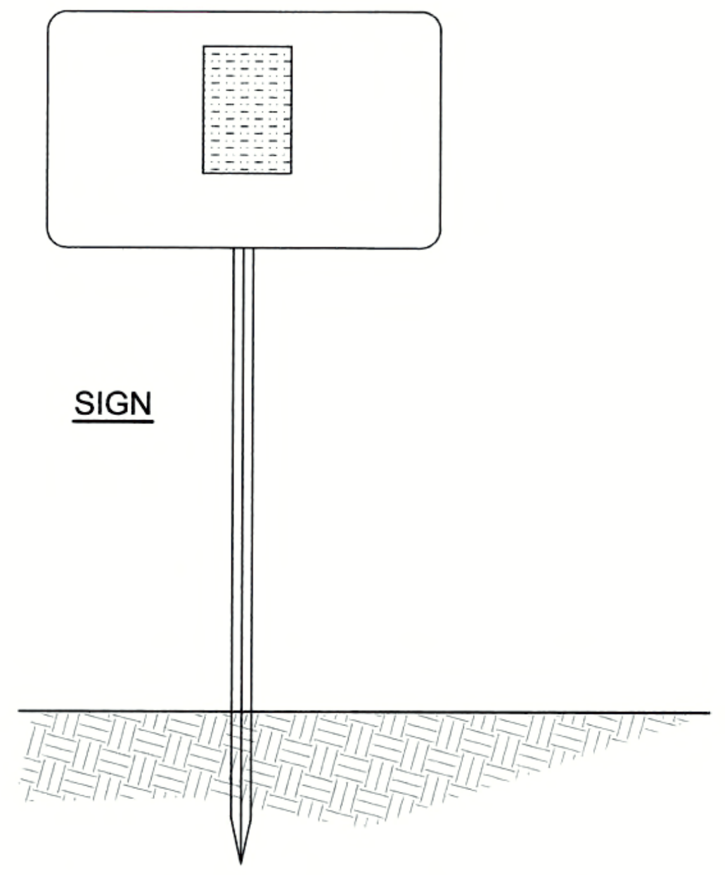
1. STONE - USE COARSE AGGREGATE (3"-5" STONE).
2. LENGTH - AS EFFECTIVE, BUT NOT LESS THAN 50 FEET.
3. THICKNESS - NOT LESS THAN EIGHT (8) INCHES.
4. WIDTH - NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS OR EGRESS.
5. WASHING - WHEN NECESSARY, WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH, OR WATERCOURSE THROUGH USE OF SAND BAGS, GRAVEL, BOARDS OR OTHER APPROVED METHODS.
6. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO ADJACENT PAVED ROAD SURFACES MUST BE REMOVED IMMEDIATELY.

STABILIZED CONSTRUCTION EXIT

NOT TO SCALE

EROSION PREVENTION AND SEDIMENT CONTROL NOTES

1. THE BEST MANAGEMENT PRACTICES PROVIDED HEREIN REPRESENTS THE MINIMUM MEASURES TO BE EMPLOYED DURING EACH PHASE OF CONSTRUCTION. SPECIFIC SEQUENCING PLANS WILL BE DEVELOPED FOR EACH PHASE OF CONSTRUCTION AS DESIGN IS ADVANCED.
2. THE CONTRACTOR MUST PERFORM ACTIVITIES IN ACCORDANCE WITH THE REQUIREMENTS OF THE GENERAL PERMIT FOR DISCHARGES FROM CONSTRUCTION ACTIVITIES.
3. THESE EROSION AND SEDIMENTATION PLANS ARE PART OF THE STORMWATER POLLUTION PREVENTION PLAN.
4. NO LAND CLEARING, GRUBBING OR GRADING ACTIVITIES, EXCEPT THAT REQUIRED FOR INSTALLATION OF THE CONSTRUCTION EXIT, SHALL BEGIN UNTIL PERIMETER SEDIMENT CONTROL MEASURES AND STORMWATER MANAGEMENT PRACTICES ARE CONSTRUCTED AND STABILIZED.
5. TEMPORARY STABILIZATION PRACTICES MUST BE INITIATED AS SOON AS PRACTICABLE IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED, BUT IN NO CASE MORE THAN 14 DAYS AFTER CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED.
6. SEDIMENT MUST BE REMOVED FROM TRAPS OR PONDS WHEN THE DESIGN CAPACITY HAS BEEN REDUCED BY 50%.
7. SEDIMENT MUST BE REMOVED FROM A SILT FENCE, COMPOST FILTER SOCK OR STRAW WATTLE WHEN IT REACHES 50% OF THE ABOVE-GROUND HEIGHT.
8. ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSTALLED BY THE CONTRACTOR IF DEEMED NECESSARY BY ON- SITE INSPECTION.
9. IF ADDITIONAL EROSION OR SEDIMENT CONTROL MEASURES ARE NECESSARY, THEY MUST BE IMPLEMENTED BEFORE THE NEXT STORM EVENT WHENEVER PRACTICABLE. IF NOT PRACTICABLE BEFORE THE NEXT STORM EVENT, THEY MUST BE IMPLEMENTED AS SOON AS POSSIBLE.
10. OFF SITE SEDIMENT TRACKING MUST BE MINIMIZED. SEDIMENT TRACKED ONTO ADJACENT PUBLIC WAYS MUST BE SWEPT BY THE END OF THE SAME WORK DAY.
11. STORMWATER RUNOFF FROM EXPOSED SURFACES MUST BE DIVERTED, RETAINED/DETAINED TO MINIMIZE THE DISCHARGE OF POLLUTANTS.
12. VELOCITY DISSIPATION DEVICES MUST BE INSTALLED AT DISCHARGE LOCATIONS OF ANY OUTFALL TO PROVIDE NON-EROSIVE FLOW VELOCITY.
13. PREVENT LITTER, CONSTRUCTION DEBRIS AND CONSTRUCTION CHEMICALS THAT COULD BE EXPOSED TO STORMWATER FROM BECOMING A POLLUTANT SOURCE IN STORMWATER DISCHARGES.



NOTES:

1. CONSTRUCTION SITE NOTICES MUST BE POSTED.
2. POSTING IS TO BE AT JOB SITE ENTRANCE WHERE IT WILL BE VISIBLE AND LEGIBLE FROM THE PUBLIC WAY.
3. POSTING IS REQUIRED FROM THE DAY CONSTRUCTION ACTIVITIES START UNTIL THE NOTICE OF TERMINATION (NOT) IS FILED.

JOB SITE PERMIT POSTING DETAIL

NOT TO SCALE

TETRA TECH

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-	4/25/22	Special Permit and Site Plan Review	NRK

Hastings Street Plaza LLC

Hastings Street and Washington Street
Mendon, Massachusetts

Construction Details
(sheet 1 of 10)

PROJ: 143-305225-20004
DESN: MWM
DRWN: NRK
CHKD: SPR

C-501

Copyright: Tetra Tech

Bar Measures 1 inch, otherwise drawing not to scale

4/25/2022 10:40:18 AM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SHEETFILES\SITE PLANS\SPECIAL PERMIT SET\C-500 CONSTRUCTION DETAILS.DWG - DOCANTO, MARCOS

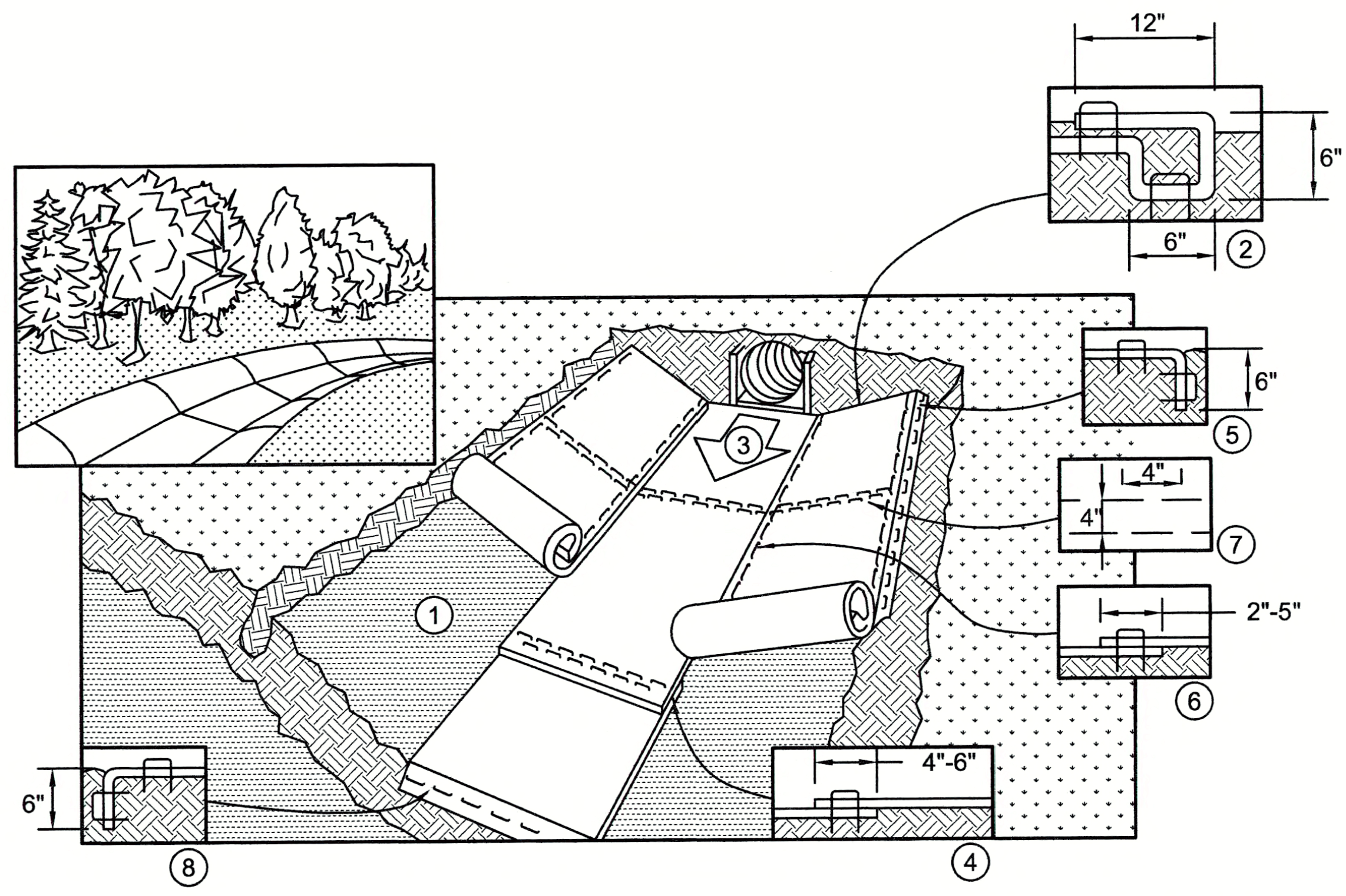
SEEDING

SEEDING RATES			
SPECIES	LBS/1000 S.F.	LBS/ACRE	RECOMMENDED SEEDING DATES
ANNUAL RYEGRASS	1	40	APRIL 1 TO JUNE 1 AUG 1 TO SEPT 15
FOXTAIL MILLET	0.7	30	MAY 1 TO JUNE 30
OATS	2	80	APRIL 1 TO JULY 1 AUG 15 TO SEPT 15
WINTER RYE	3	120	AUG 15 TO OCT 15

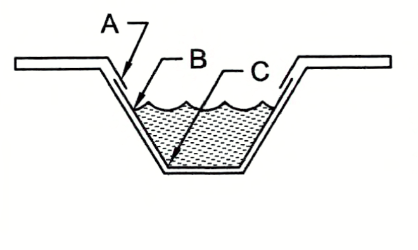
MULCHING

MULCH APPLICATION RATES:
HAY OR STRAW MULCH SHALL BE AIR-DRIED, FREE OF UNDESIRABLE SEEDS AND COARSE MATERIALS. APPLICATION RATE MUST BE 2 BALES (70-90 LBS) PER 1,000 SQUARE FEET OR 1.5 TO 2 TONS PER ACRE. NO BARE SPOTS SHOWING AND SHALL ONLY BE APPLIED TO SLOPES 3:1 OR FLATTER. ANCHORING METHODS INCLUDING NETTING WITH JUTE, WOOD FIBER OR PLASTIC; OR APPLY MULCH AND TRACK SURFACE UP AND DOWN THE SLOPE SO CLEAT MARKS ARE PARALLEL TO THE CONTOURS. FOR OVERWINTER APPLICATION, THE RATE SHALL BE 150 LBS PER 1,000 SQUARE FEET OR 3 TONS/ACRE. MULCH SHALL NOT BE SPREAD ON TOP OF SNOW; SNOW MUST BE REMOVED DOWN TO A ONE-INCH DEPTH OR LESS PRIOR TO APPLICATION.

TEMPORARY STABILIZATION MULCHING & SEEDING



1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE BLANKET IN A 6" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL THE TRENCH AFTER STAPLING. APPLY SEED TO SOIL AND FOLD REMAINING 12" PORTION OF BLANKET BACK OVER SEED AND SOIL. SECURE BLANKET OVER SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" ACROSS THE WIDTH OF THE BLANKET.
3. ROLL CENTER BLANKET IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING THE DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. PLACE CONSECUTIVE BLANKETS END OVER END (SHINGLE STYLE) WITH A 4"-6" OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER TO SECURE BLANKETS.
5. FULL LENGTH EDGE OF BLANKETS AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
6. ADJACENT BLANKETS MUST BE OVERLAPPED APPROXIMATELY 2"-5" (DEPENDING ON BLANKET SIZE) AND STAPLED.
7. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30' TO 40' INTERVALS. USE A DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER OVER ENTIRE WIDTH OF THE CHANNEL.
8. THE TERMINAL END OF BLANKETS MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.



CRITICAL POINTS
A) OVERLAPS AND SEAMS
B) PROJECTED WATER LINE
C) CHANNEL BOTTOM/SIDE SLOPE VERTICES

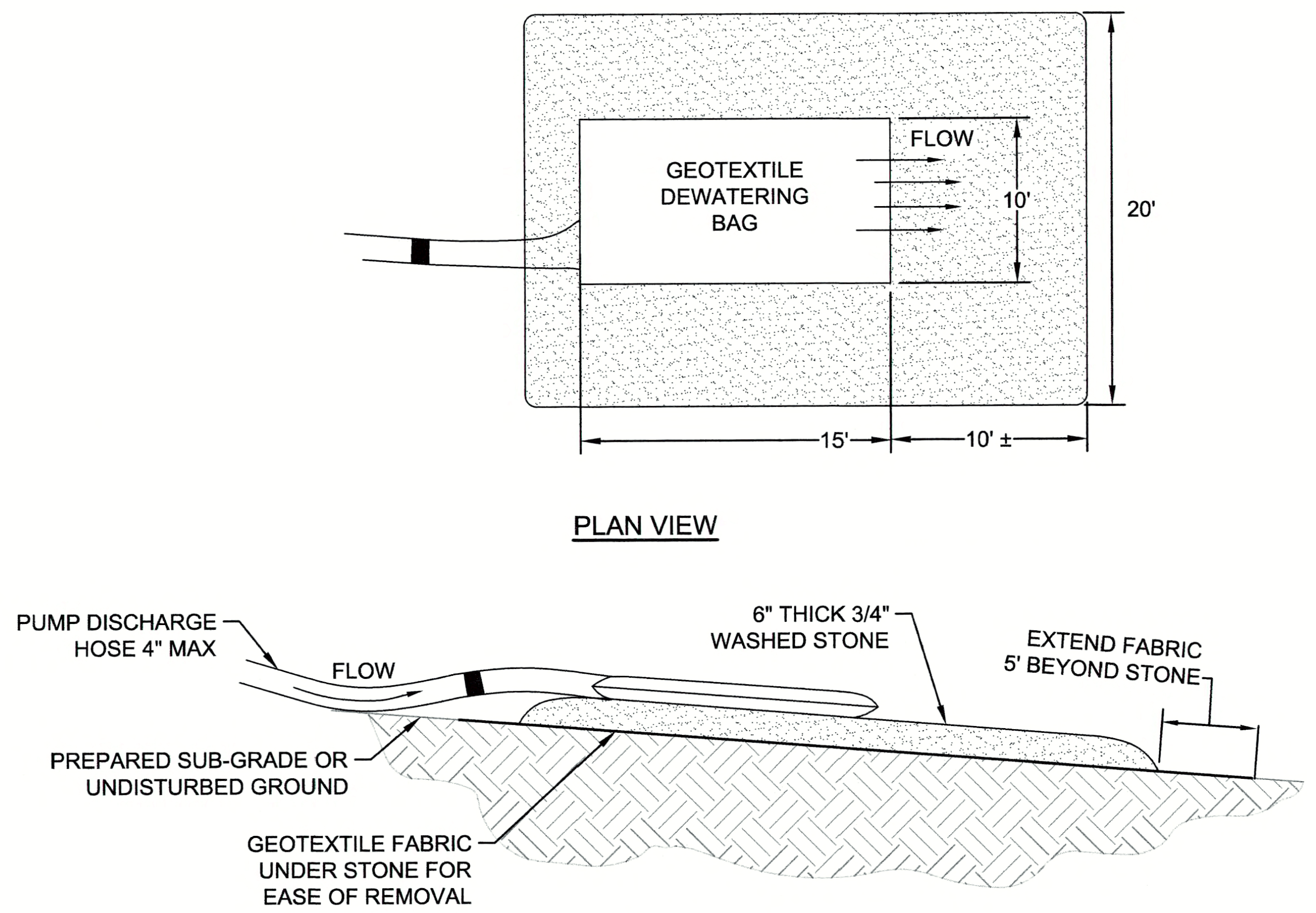
NOTES:

* HORIZONTAL STAPLE SPACING SHOULD BE ALTERED IF NECESSARY TO ALLOW STAPLES TO SECURE THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.

** IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY ANCHOR THE BLANKETS.

EROSION CONTROL BLANKET DETAIL FOR CHANNEL INSTALLATION

NOT TO SCALE



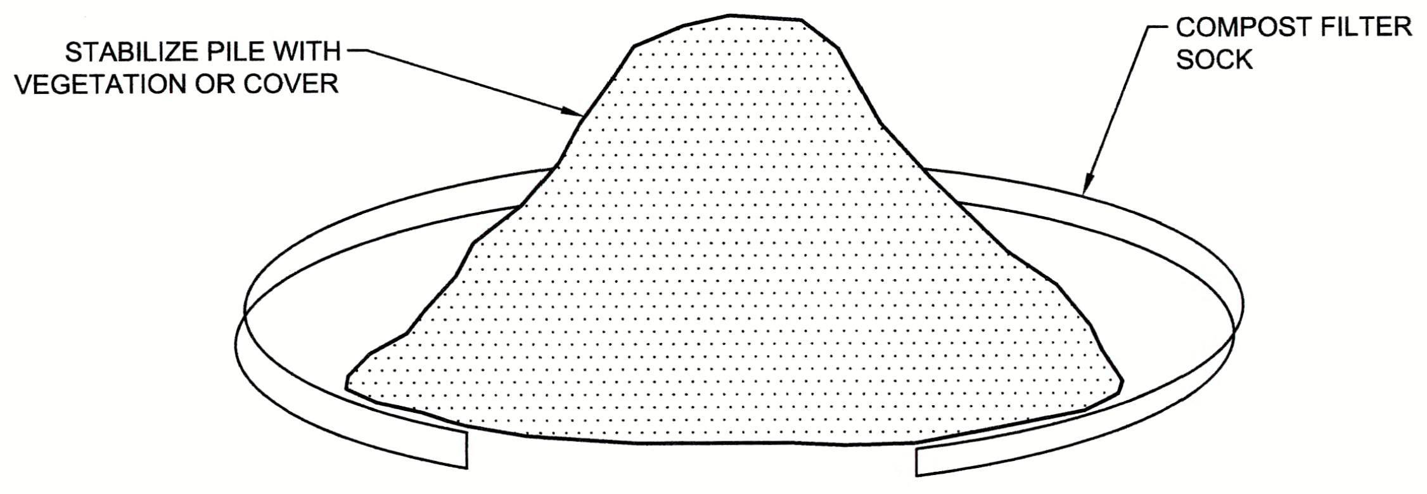
PROFILE

NOTES:

1. GEOTEXTILE BAG MATERIAL BASED ON PARTICLE SIZE IN PUMPED WATER, I.E., FOR COARSE PARTICLES A WOVEN MATERIAL;FOR SILTS/CLAYS A NON-WOVEN MATERIAL
2. DO NOT OVER PRESSURIZE BAG OR USE BEYOND CAPACITY.
3. LOCATE DISCHARGE SITE ON FLAT UPLAND AREAS AS FAR AWAY AS POSSIBLE FROM STREAMS, WETLANDS, OTHER RESOURCES AND POINTS OF CONCENTRATED FLOW.
4. DOWN GRADIENT FROM RECEIVING AREA MUST BE WELL VEGETATED OR OTHERWISE STABLE FROM EROSION, E.G., FOREST FLOOR OR COARSE GRAVEL/STONE.
5. DISCHARGE LOCATION SHALL MEET ALL REGULATORY SETBACKS FROM WETLANDS AND OTHER WATER COURSES.

GEOTEXTILE DEWATERING BAG

NOT TO SCALE



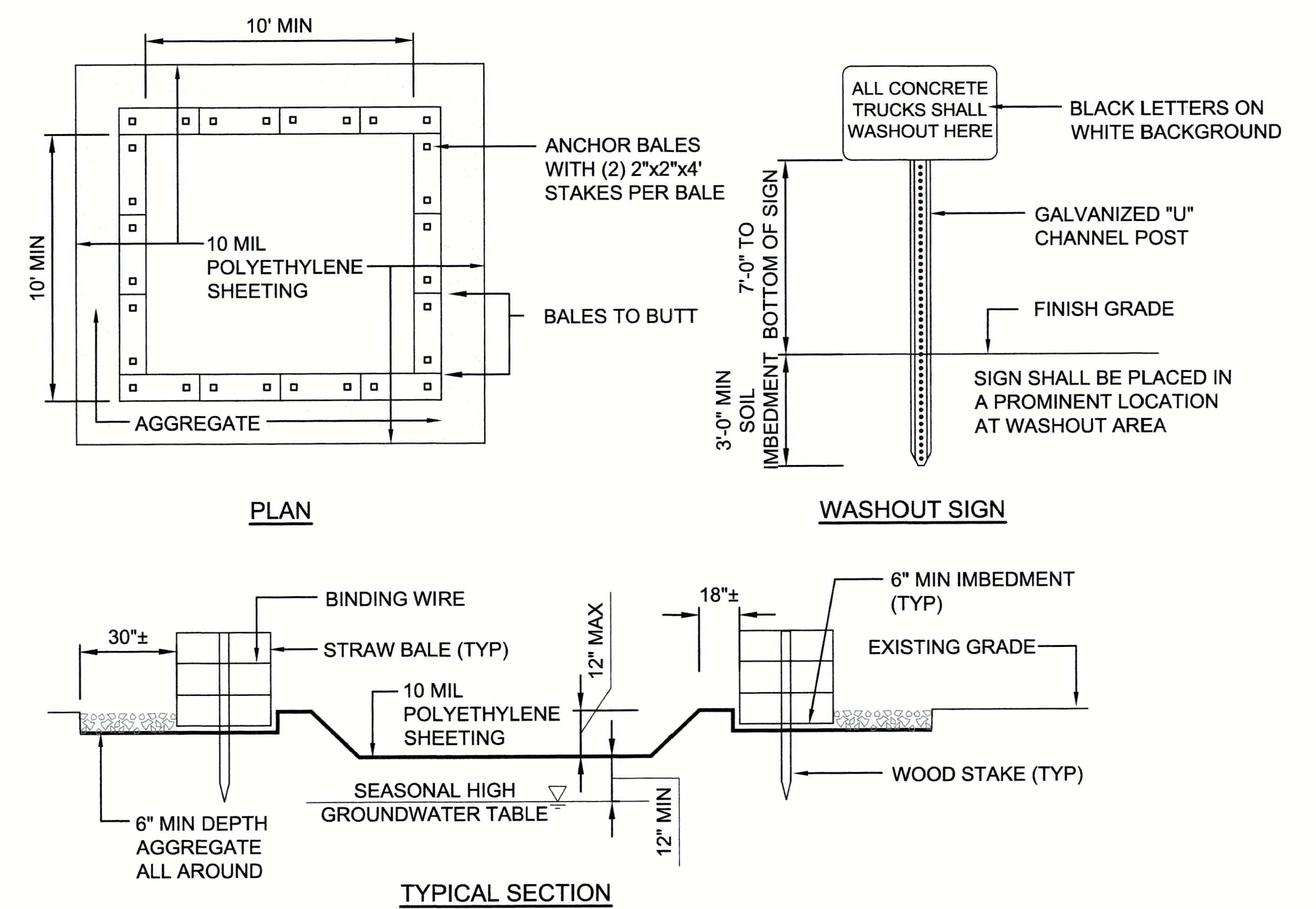
NOTE:
STOCKPILES MUST BE PHYSICALLY SEPARATED FROM OTHER STORMWATER CONTROLS.

NOTE:

1. FOR ANY STOCKPILED OR LAND CLEARING DEBRIS COMPOSED, IN WHOLE OR IN PART, OF SEDIMENT OR SOIL, THE FOLLOWING MEASURES MUST BE FOLLOWED:
   - LOCATE THE PILES 50' OUTSIDE OF ANY RESOURCE AREAS AND PHYSICALLY SEPARATED FROM OTHER STORMWATER CONTROLS;
   - PROTECT FROM CONTACT WITH STORMWATER (INCLUDING RUN-ON) USING A TEMPORARY PERIMETER SEDIMENT BARRIER;
   - PROVIDE COVER OR APPROPRIATE TEMPORARY STABILIZATION TO AVOID DIRECT CONTACT WITH PRECIPITATION OR TO MINIMIZE SEDIMENT DISCHARGE;
   - DO NOT HOSE DOWN OR SWEEP SOIL OR SEDIMENT ACCUMULATED ON PAVEMENT OR OTHER IMPERVIOUS SURFACES INTO ANY STORMWATER CONVEYANCE (UNLESS CONNECTED TO A SEDIMENT BASIN, SEDIMENT TRAP, OR SIMILARLY EFFECTIVE CONTROL), STORM DRAIN INLET, OR SURFACE WATER; AND
   - UNLESS INFEASIBLE, CONTAIN AND SECURELY PROTECT FROM WIND.

SOIL STOCKPILE CONTROL

NOT TO SCALE



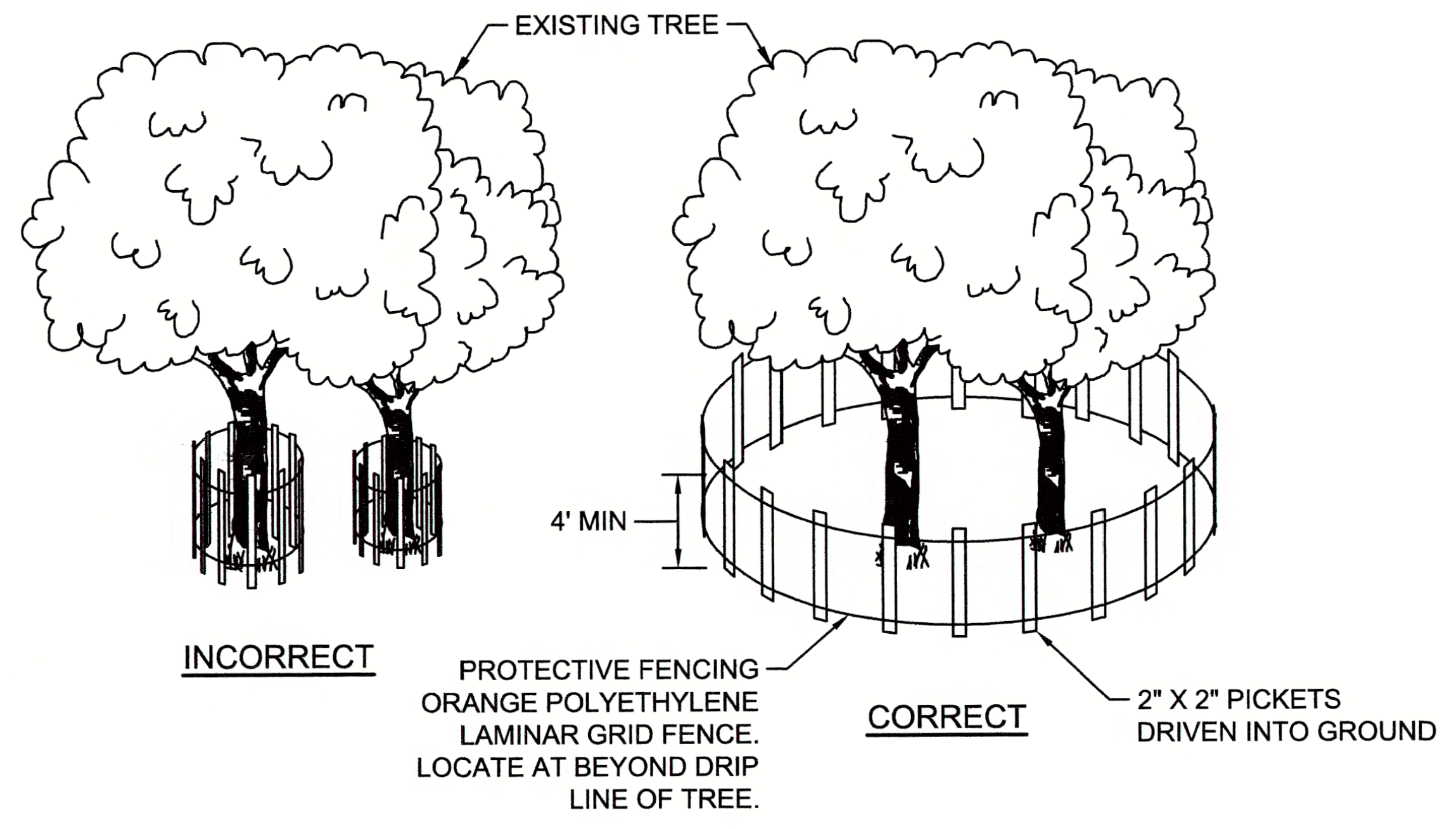
TYPICAL SECTION

NOTES:

1. CONTAINMENT MUST BE STRUCTURALLY SOUND AND LEAK FREE AND CONTAIN ALL LIQUID WASTES.
2. CONTAINMENT DEVICES MUST BE OF SUFFICIENT QUANTITY OR VOLUME TO COMPLETELY CONTAIN THE LIQUID WASTES GENERATED.
3. WASHOUT MUST BE CLEANED OR NEW FACILITIES CONSTRUCTED AND READY TO USE ONCE WASHOUT IS 75% FULL.
4. WASHOUT AREA(S) SHALL BE INSTALLED IN A LOCATION EASILY ACCESSIBLE BY CONCRETE TRUCKS.
5. ONE OR MORE AREAS MAY BE INSTALLED ON THE CONSTRUCTION SITE AND MAY BE RELOCATED AS CONSTRUCTION PROGRESSES.
6. AT LEAST WEEKLY REMOVE ACCUMULATION OF SAND AND AGGREGATE AND DISPOSE OF PROPERLY.

CONCRETE WASHOUT AREA

NOT TO SCALE



NOTES:

1. TREE PROTECTION BARRIERS MUST BE PLACED AROUND TREES TO BE RETAINED WITHIN AN AREA WHERE LAND ALTERATION AND CONSTRUCTION ACTIVITIES WILL OCCUR.
2. TREE PROTECTION BARRIER MUST REMAIN IN PLACE UNTIL GRADING AND CONSTRUCTION ACTIVITY IS COMPLETE OR UNTIL COMMENCEMENT OF FINISH GRADING AND SODDING.
3. BARRIERS SHALL BE PLACED AROUND TREES AT THE DRIPLINE EXCEPT WHERE LAND ALTERATION OR CONSTRUCTION ACTIVITIES ARE APPROVED WITHIN THE DRIPLINE.
4. THE DRIPLINE OF A TREE IS THE IMAGINARY VERTICAL LINE THAT EXTENDS DOWNWARD FROM THE OUTERMOST TIPS OF THE TREE'S BRANCHES TO THE GROUND.
5. AREAS SURROUNDED BY THE TREE PROTECTION BARRIERS SHALL BE PROTECTED FROM VEGETATION REMOVAL, PLACEMENT OF SOIL, DEBRIS, SOLVENTS, CONSTRUCTION MATERIAL, MACHINERY OR OTHER EQUIPMENT OF ANY KIND.
6. ALL TREE ROOTS WITHIN AREA TO BE GRADED AND ORIGINATING FROM A PROTECTED TREE SHALL BE SEVERED CLEANLY AT THE LIMITS OF THE PROTECTED AREA.
7. ALL TREE PRUNING AND TRIMMING ON ANY TREE TO BE RETAINED SHALL BE PERFORMED BY AN ARBORIST CERTIFIED BY THE AMERICAN SOCIETY OF ARBORICULTURE (ASA).
8. 2'x2' TREE PROTECTION SIGNS SPACED A MINIMUM OF ONE SIGN EVERY 300' SHALL CONTAIN THE WORDING "TREE PROTECTION ZONE - KEEP OUT".

TREE PROTECTION BARRIER / ORANGE CONSTRUCTION FENCE

NOT TO SCALE

TETRA TECH
www.tetratech.com
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SEAN PATRICK REARDON
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MARK	DATE	DESCRIPTION	BY
-	4/25/22	Special Permit and Site Plan Review	NRK

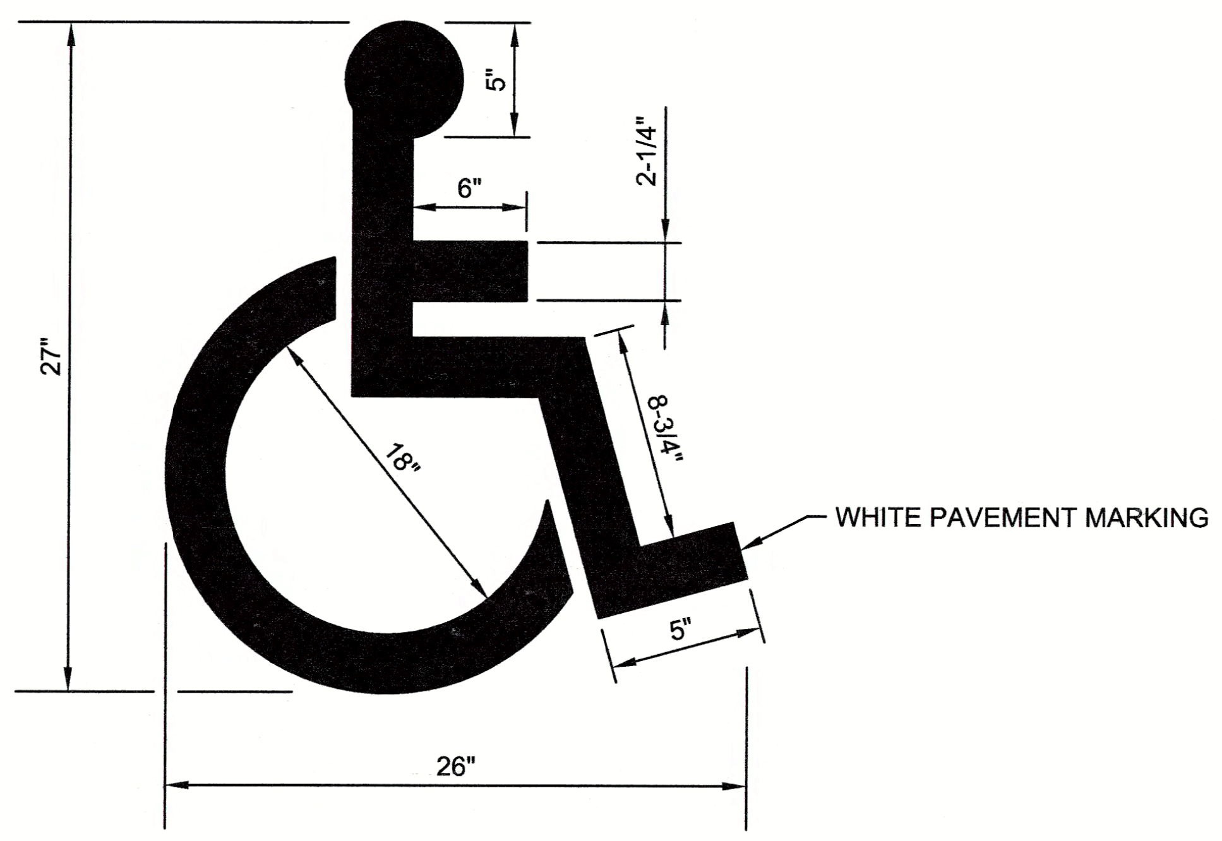
Hastings Street Plaza LLC
Hastings Street and Washington Street
Mendon, Massachusetts

Construction Details
(sheet 2 of 10)

PROJ:	143-305225-20004
DESN:	MWM
DRWN:	NRK
CHKD:	SPR

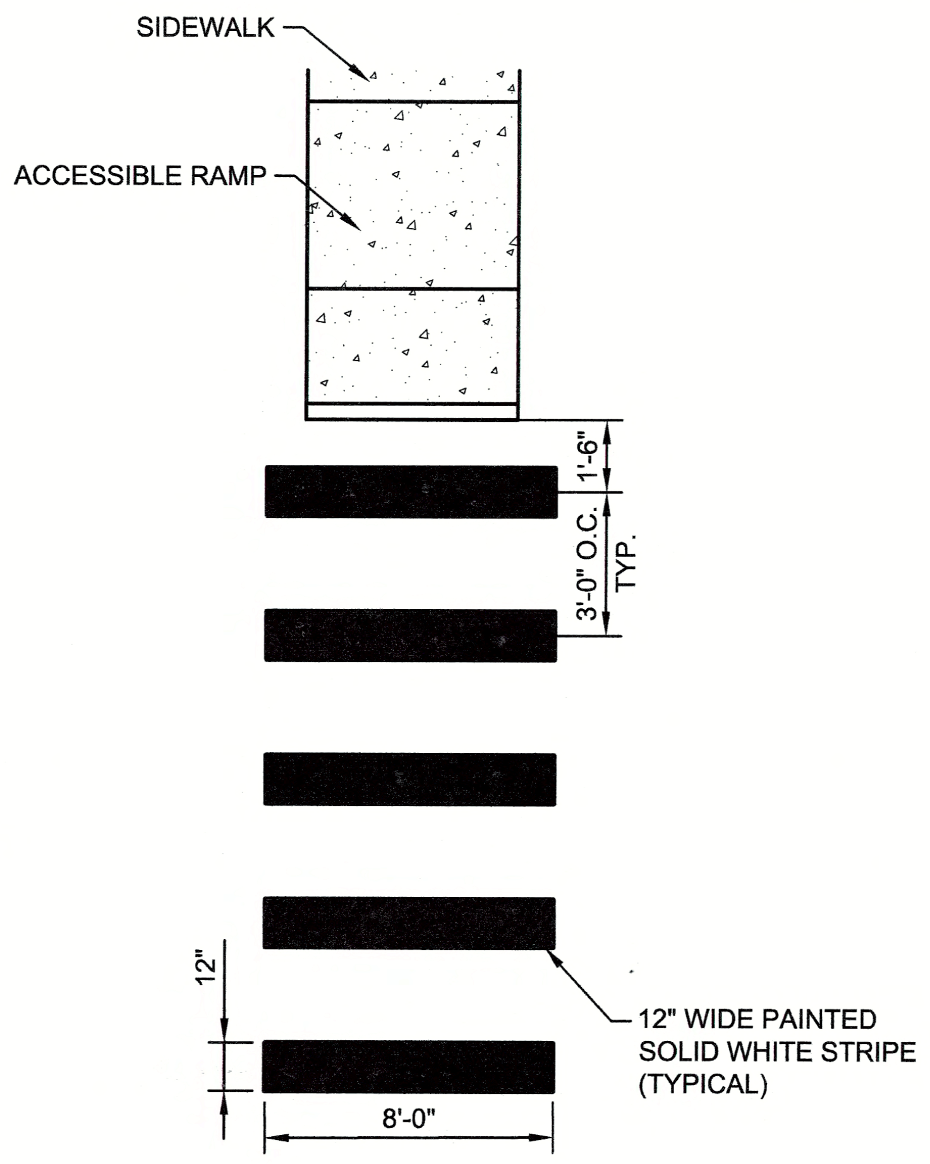
C-502

Bar Measures 1 inch, otherwise drawing not to scale



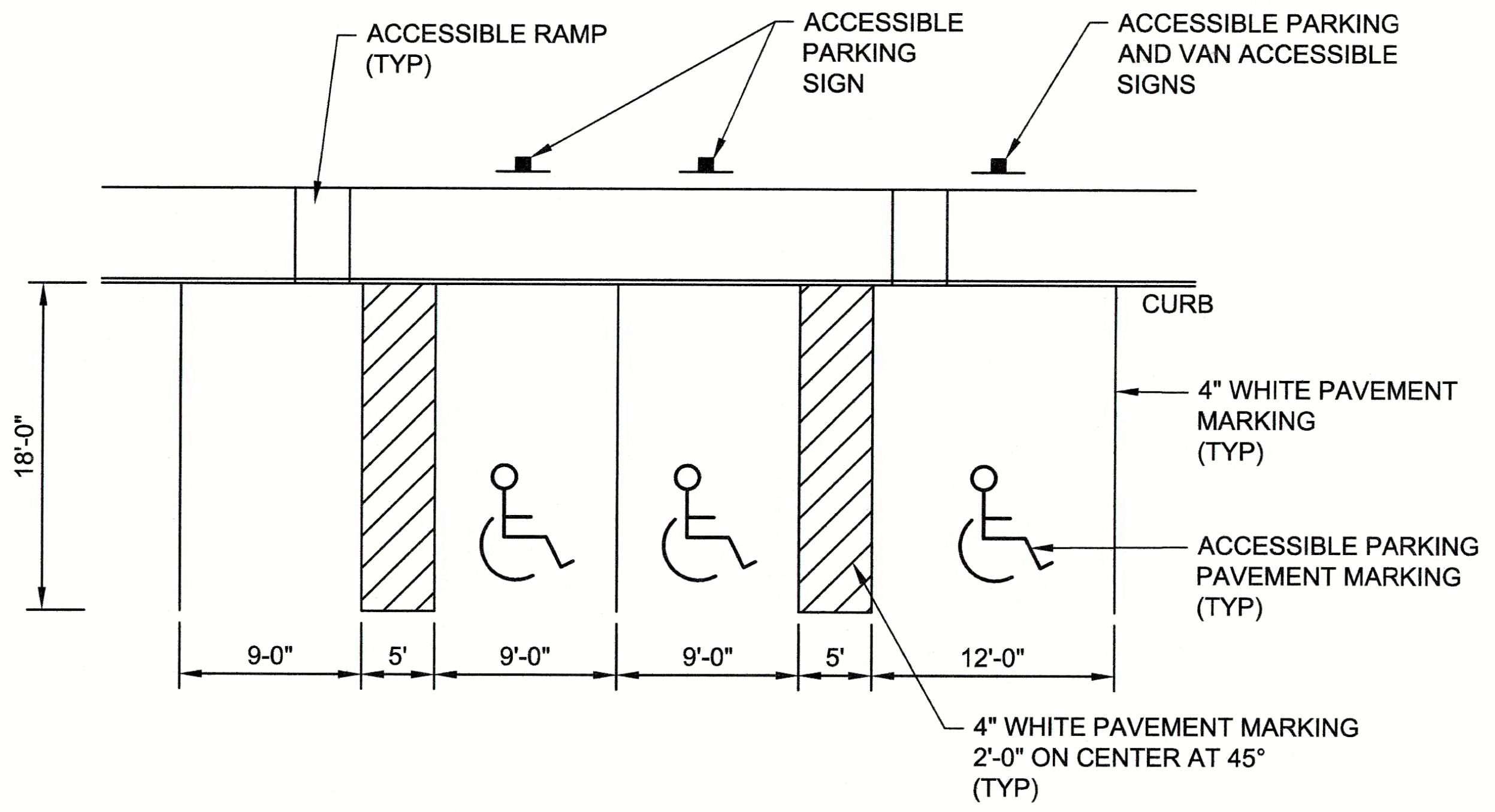
ACCESSIBLE PARKING PAVEMENT MARKING

NOT TO SCALE



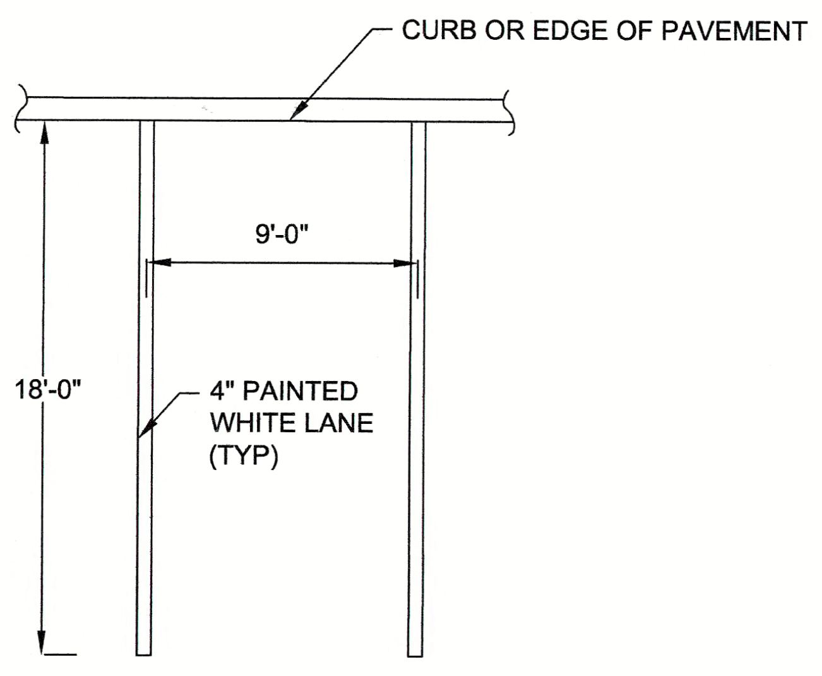
PAINTED CROSSWALK

NOT TO SCALE



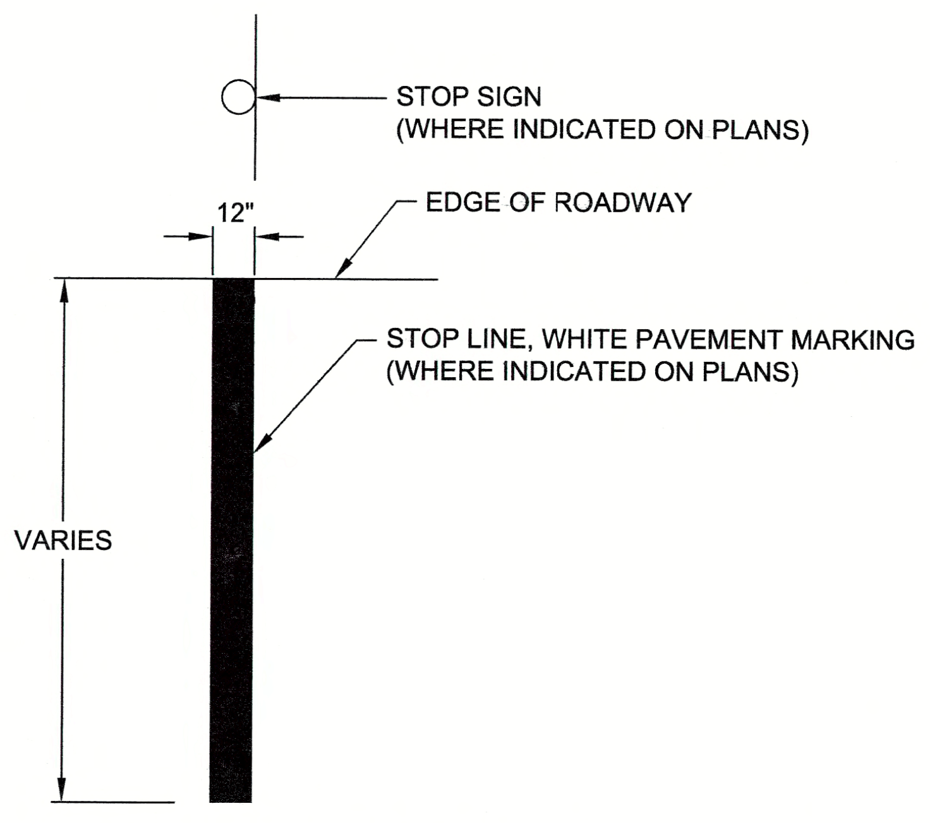
TYPICAL ACCESSIBLE PARKING LAYOUT

NOT TO SCALE



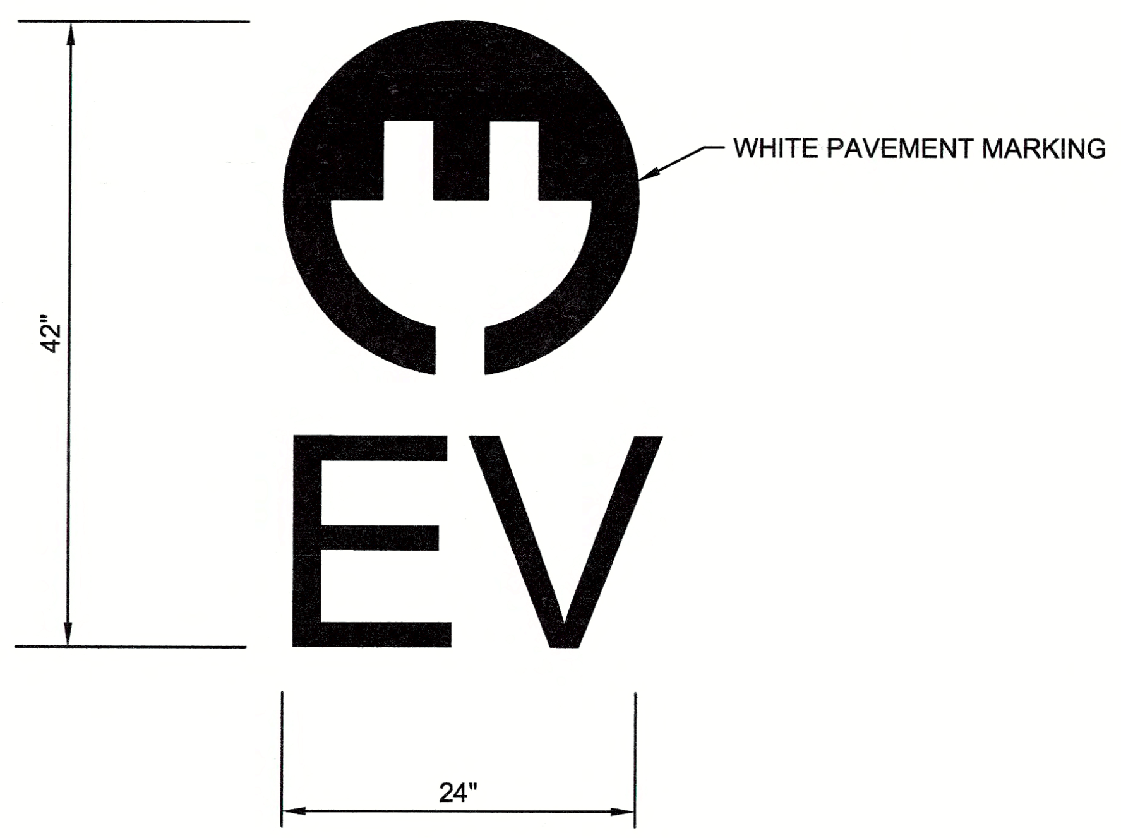
PARKING STALL

NOT TO SCALE



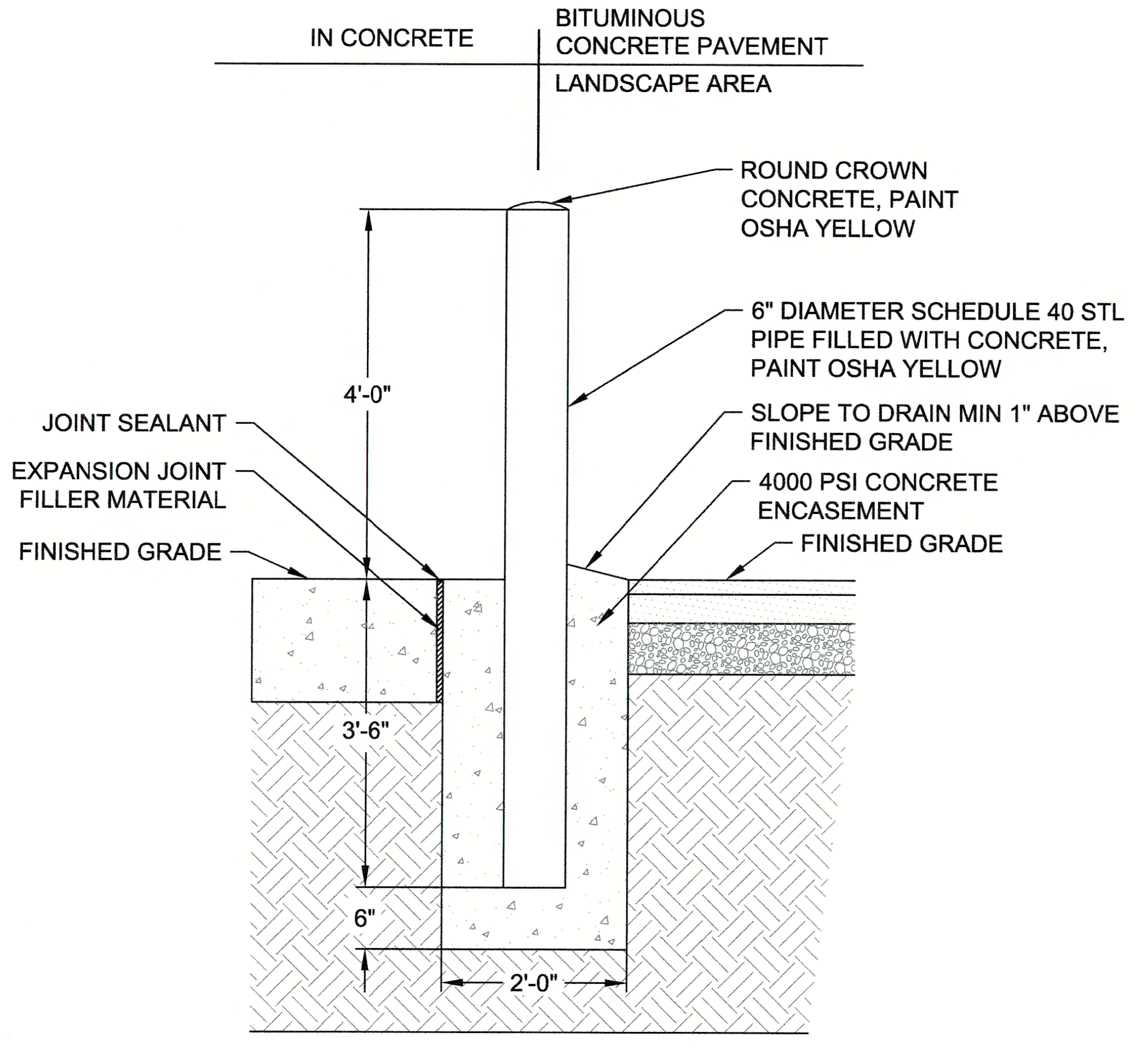
STOP BAR MARKING

NOT TO SCALE



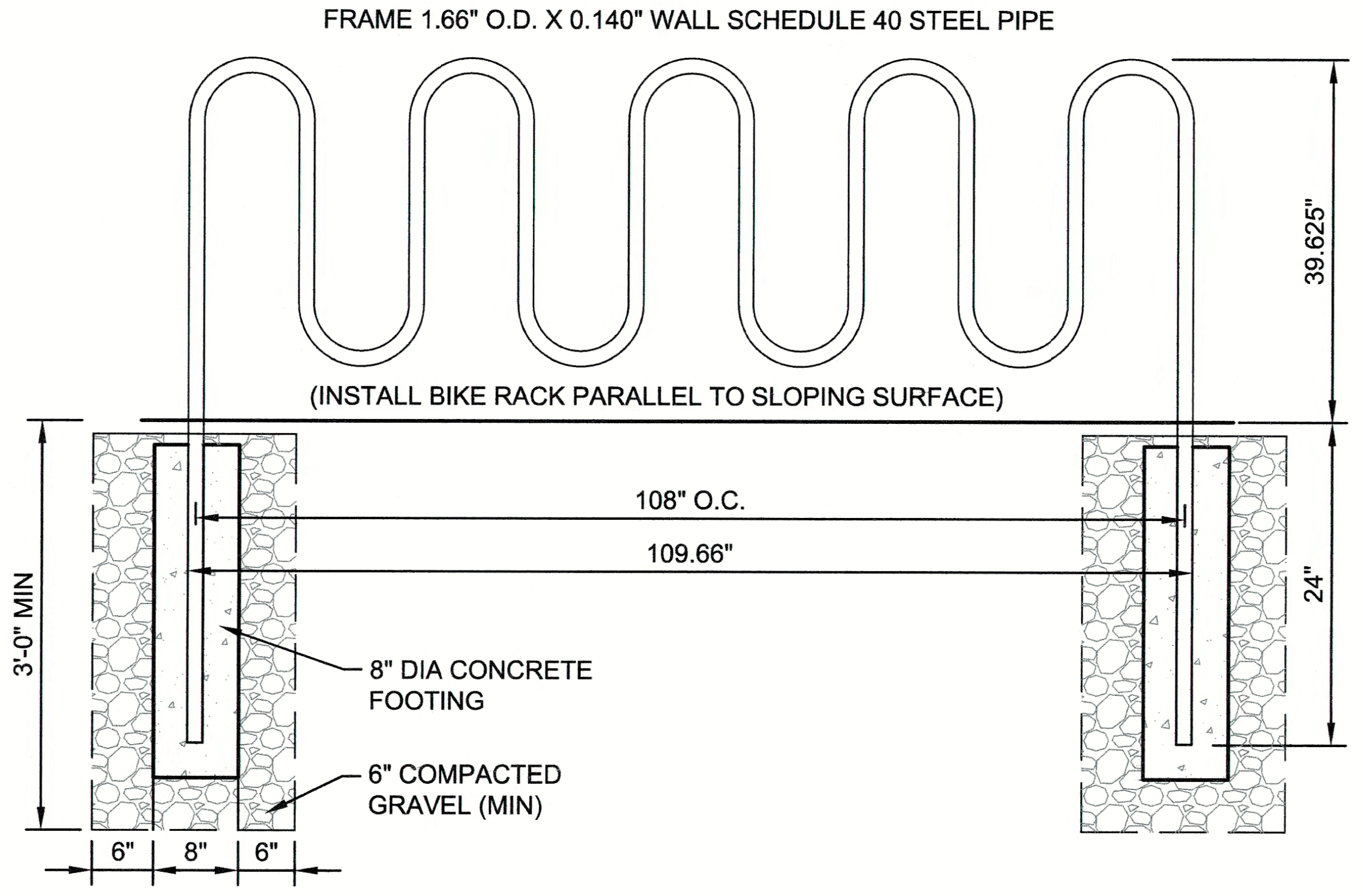
EV CHARGING STALL PAVEMENT MARKING

NOT TO SCALE



BOLLARD

NOT TO SCALE

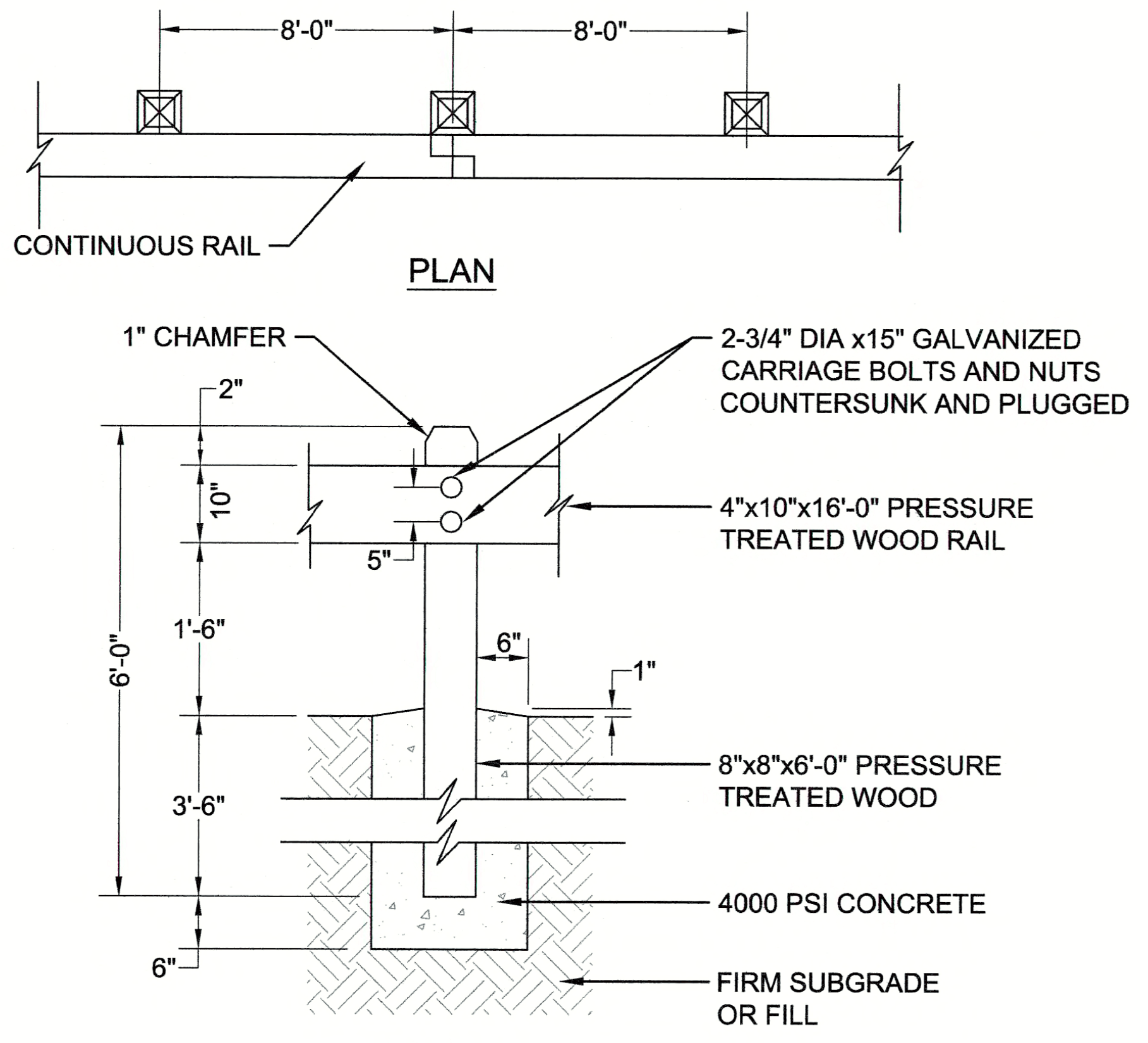


NOTES:

1. BIKE RACK SHALL ACCOMMODATE 10 BICYCLES MINIMUM.

BIKE RACK

NOT TO SCALE

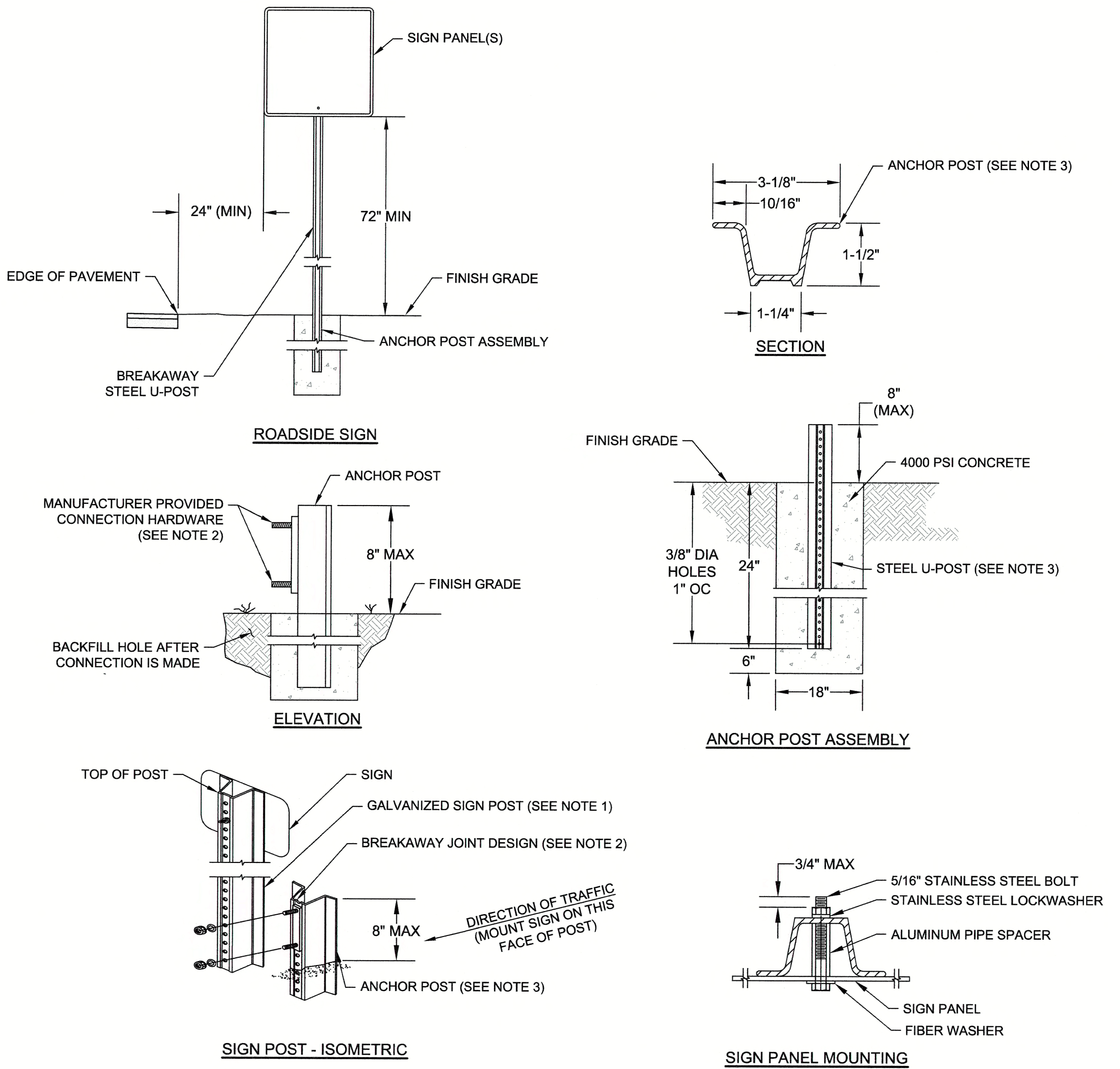


PLAN

ELEVATION

TIMBER GUARD RAIL

NOT TO SCALE



ROADSIDE SIGN

SECTION

ELEVATION

ANCHOR POST ASSEMBLY

SIGN POST - ISOMETRIC

SIGN PANEL MOUNTING

NOTES:

1. SIGN POSTS SHALL BE U-SHAPED, HOT-DIP GALVANIZED STEEL WEIGHING AT LEAST 2.0 lb/ft. POSTS SHALL HAVE PRE-PUNCHED HOLES THAT ALIGN WITH HOLES IN SIGN PANELS. ALL POSTS SHALL HAVE ADEQUATE LENGTH TO MEET THE REQUIRED SIGN PANEL MOUNTING HEIGHTS. NO SPLICES WILL BE ALLOWED IN SIGN POSTS.
2. ALL SIGN POSTS SHALL INCORPORATE A BREAKAWAY DESIGN. ALL FASTENERS, SPACERS, PLATES, OR FITTINGS REQUIRED FOR THE BREAKAWAY JOINT SHALL BE FURNISHED BY THE SIGN POST MANUFACTURER.
3. ANCHOR POSTS SHALL BE U-SHAPED, HOT-DIP GALVANIZED STEEL WEIGHING AT LEAST 2.0 lb/ft. ANCHOR POSTS SHALL HAVE PRE-PUNCHED HOLES THAT ALIGN WITH HOLES IN THE SIGN POST ABOVE. SOIL ANCHOR POST SHALL BE SECURED TO POST AS RECOMMENDED BY MANUFACTURER.

SIGN POST ASSEMBLY

NOT TO SCALE

4/25/2022 10:40:29 AM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SHEETFILES\SITE PLANS\SPECIAL PERMIT SET\C-500 CONSTRUCTION DETAILS.DWG - DOCANTO, MARCOS

TETRA TECH
www.tetratech.com
100 Nickerson Road
Marlborough, Massachusetts 01752
Phone: (508) 786-2200 Fax: (508) 786-2201

SEAN PATRICK REARDON
CIVIL
NO. 41062

MARK	DATE	DESCRIPTION	BY
-	4/25/22	Special Permit and Site Plan Review	NRK

Hastings Street Plaza LLC

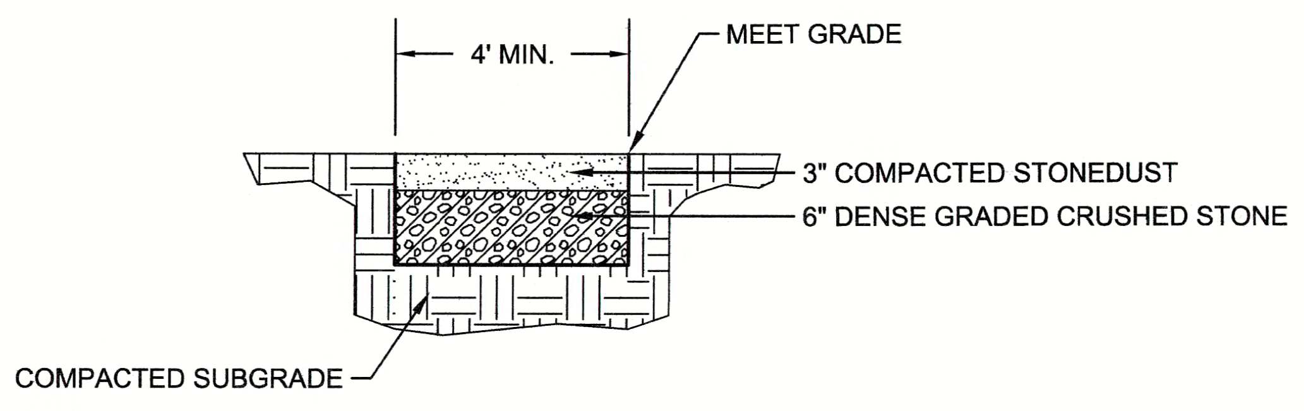
Hastings Street and Washington Street
Mendon, Massachusetts

Construction Details
(sheet 3 of 10)

PROJ: 143-305225-20004
DESN: MWM
DRWN: NRK
CHKD: SPR

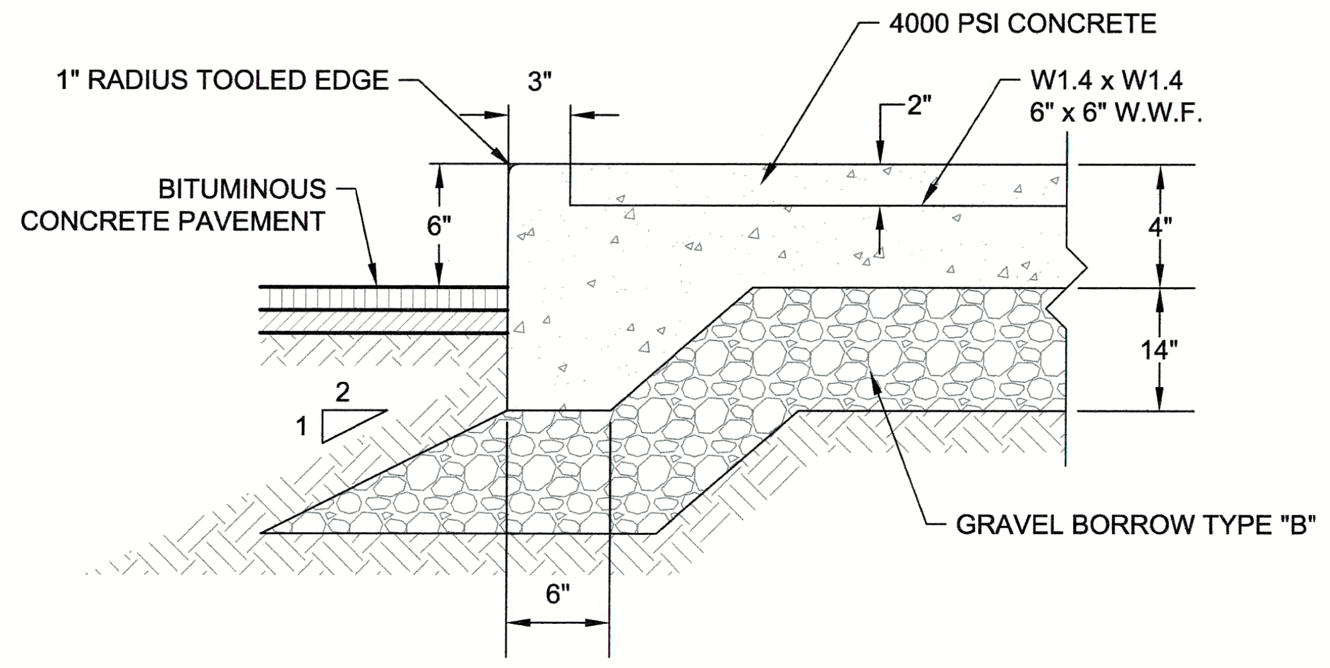
C-503

Bar Measures 1 inch, otherwise drawing not to scale



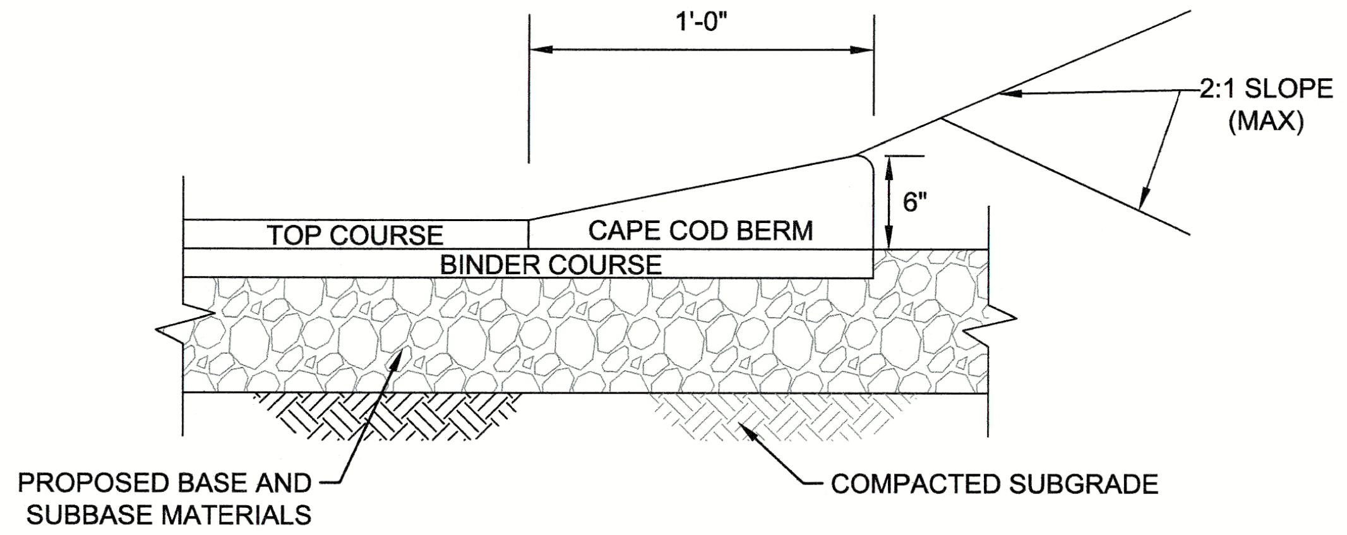
STONEDUST WALKING PATH

NOT TO SCALE



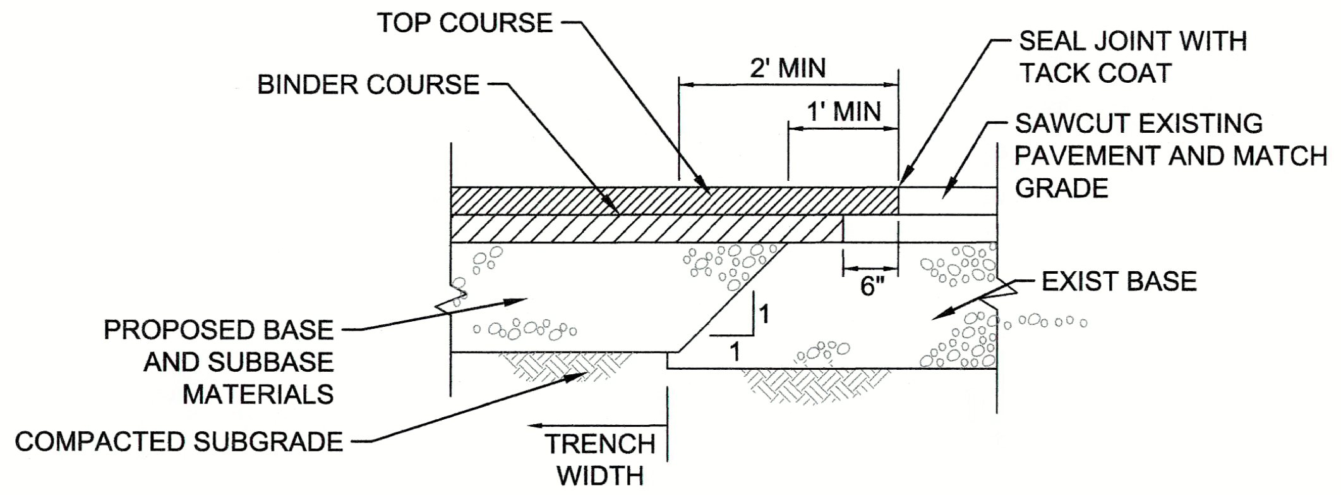
INTEGRAL CONCRETE CURB AND WALK

NOT TO SCALE



CAPE COD BERM

NOT TO SCALE

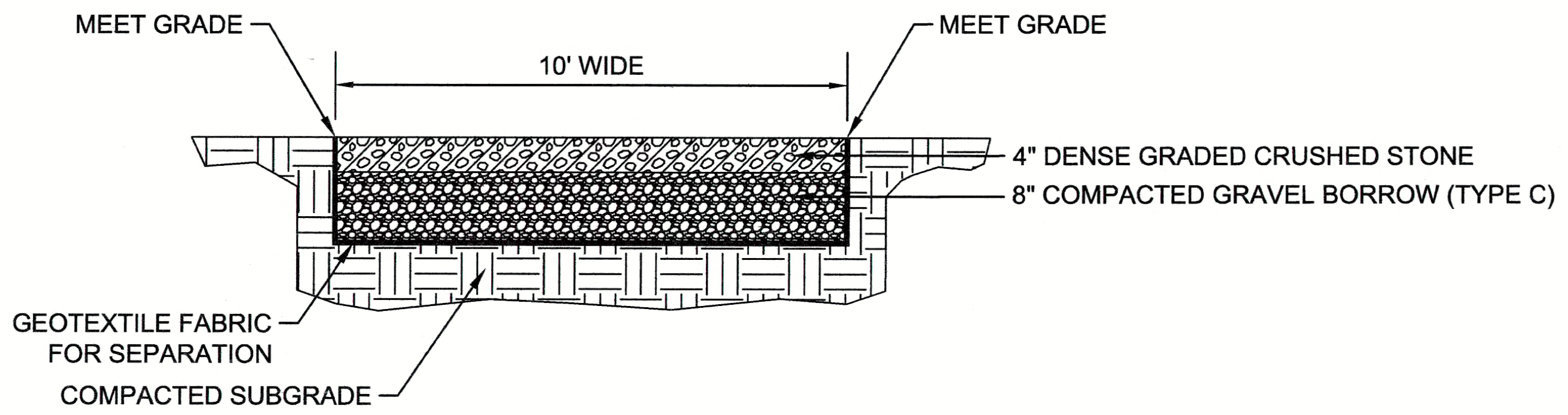


NOTES:

1. SAWCUTS MUST BE MADE PRIOR TO ANY TRENCH EXCAVATION.
2. SUBGRADE PREPARATION MUST BE IN ACCORDANCE WITH GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.

PERMANENT BITUMINOUS CONCRETE MATCHING TO EXISTING

NOT TO SCALE

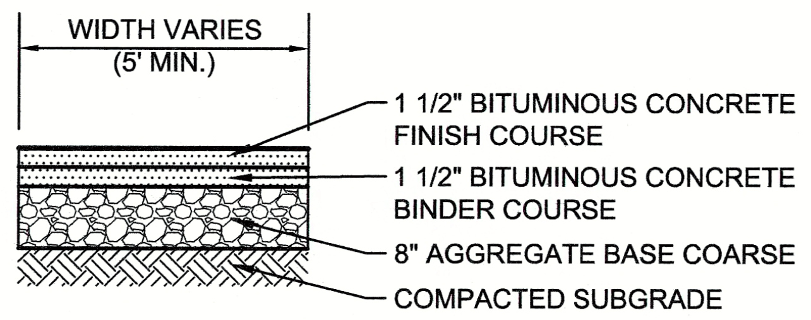


NOTES:

1. FINAL DESIGN AND SUBGRADE PREPARATIONS MUST BE IN ACCORDANCE WITH GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.

GRAVEL MAINTENANCE ACCESS DRIVE

NOT TO SCALE

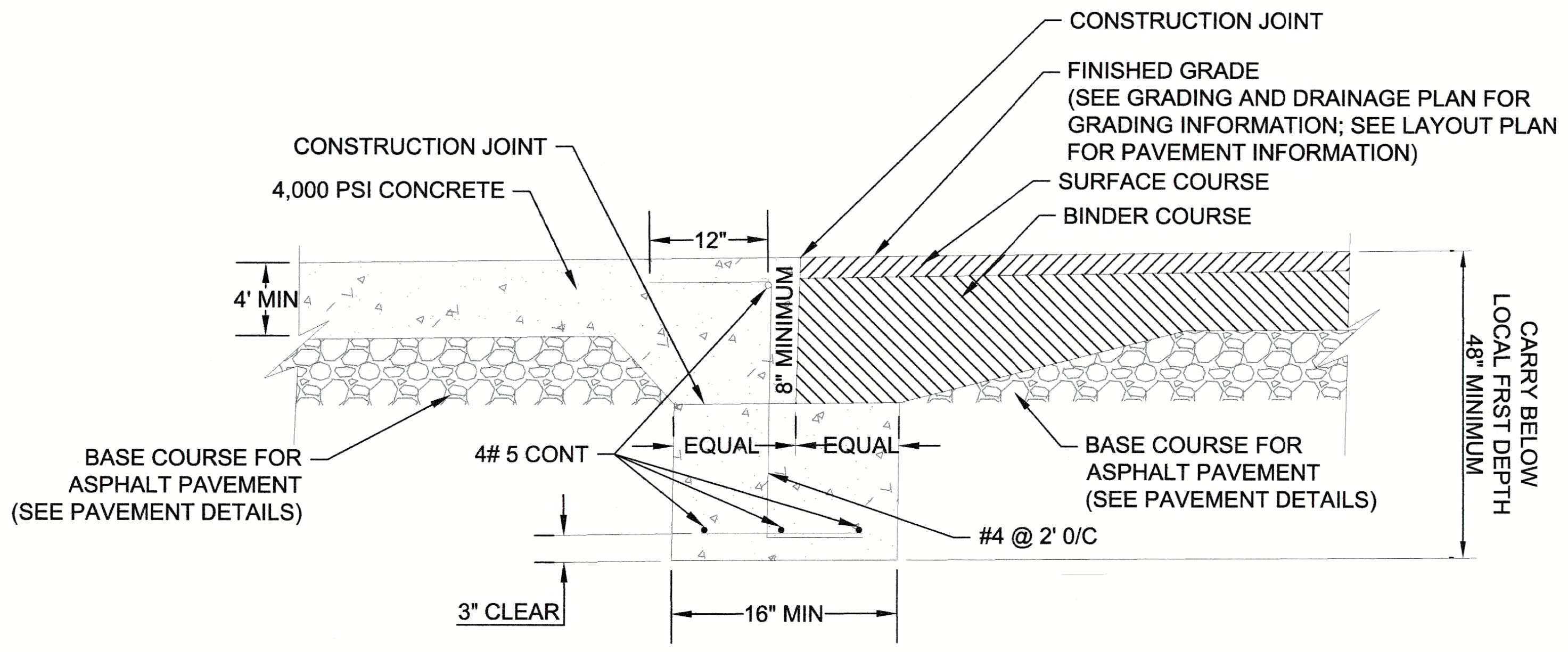


NOTES:

1. FINAL DESIGN AND SUBGRADE PREPARATIONS MUST BE IN ACCORDANCE WITH GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.

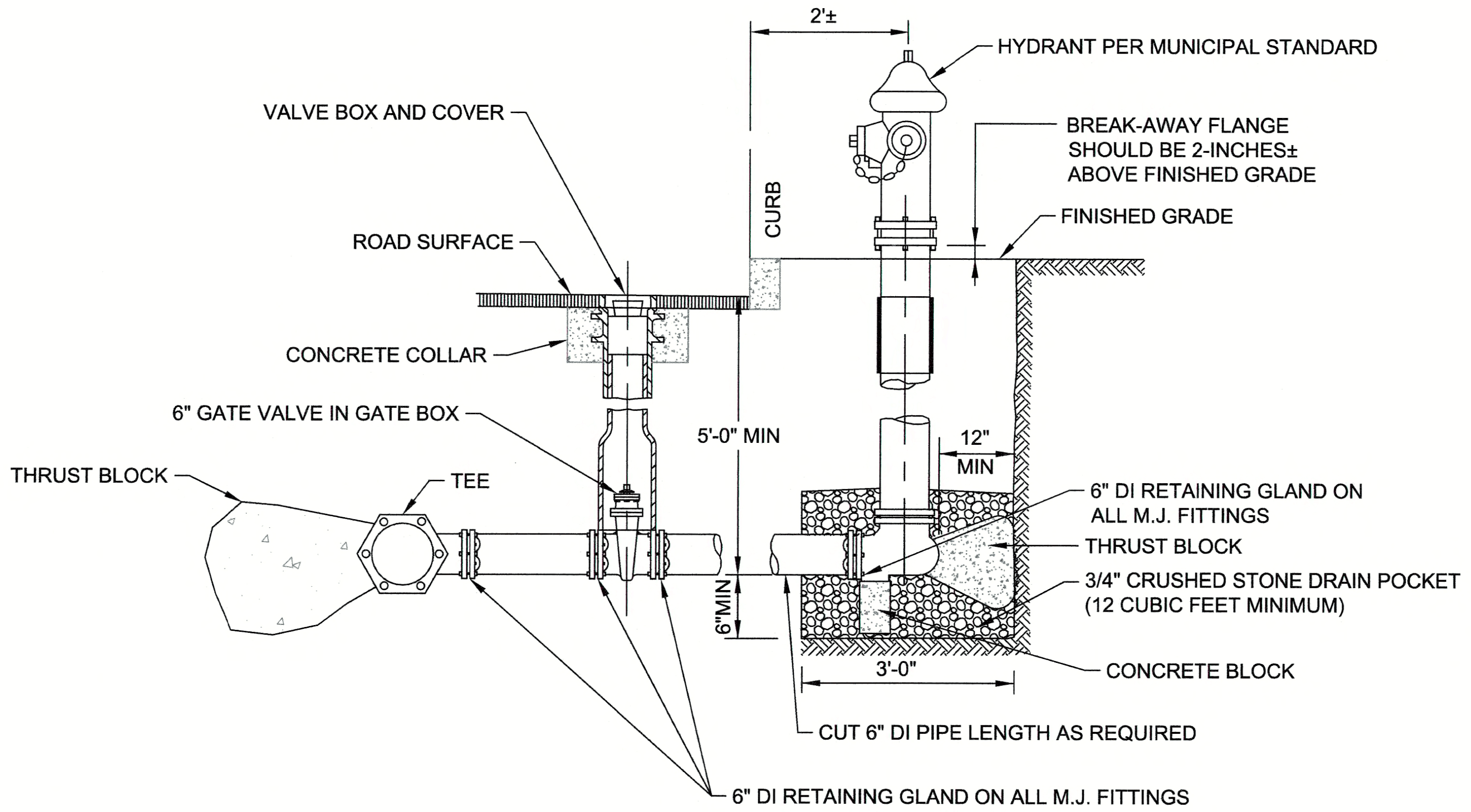
BITUMINOUS CONCRETE SIDEWALK

NOT TO SCALE



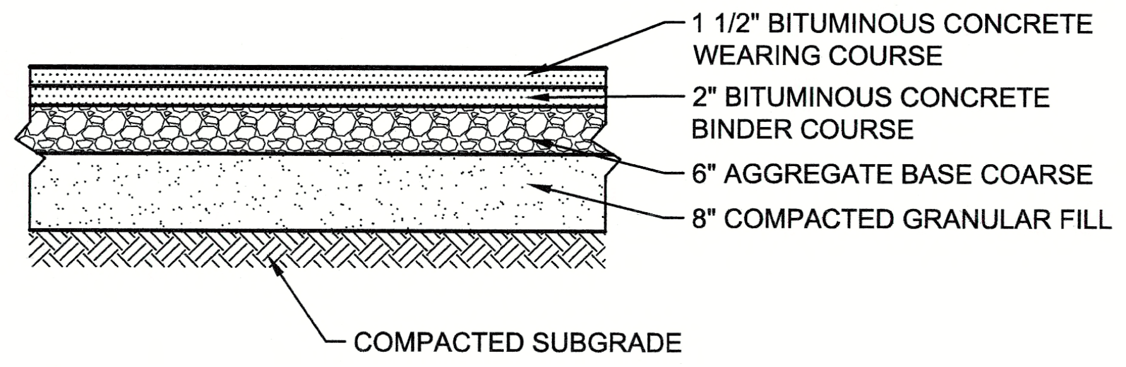
CONCRETE/ASPHALT JOINT DETAIL

NOT TO SCALE



FLUSHING HYDRANT ASSEMBLY

NOT TO SCALE

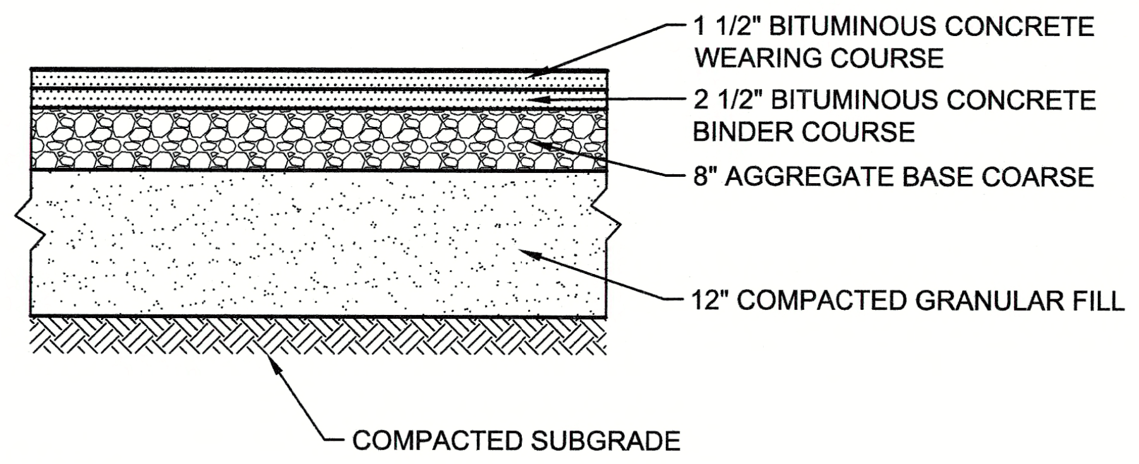


NOTES:

1. FINAL DESIGN AND SUBGRADE PREPARATIONS MUST BE IN ACCORDANCE WITH GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.

STANDARD DUTY PAVEMENT SECTION

NOT TO SCALE

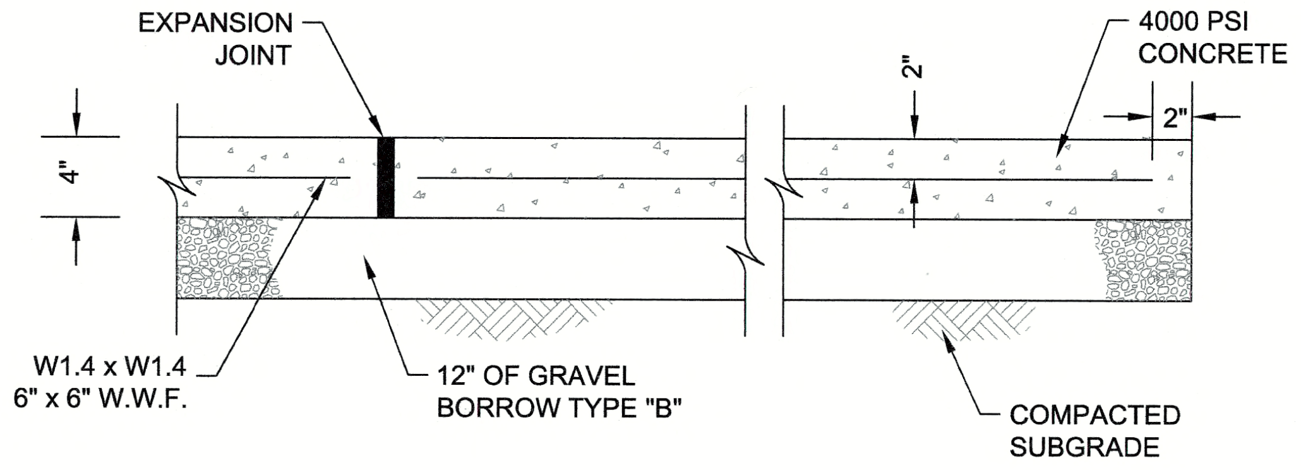


NOTES:

1. FINAL DESIGN AND SUBGRADE PREPARATIONS MUST BE IN ACCORDANCE WITH GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.

HEAVY DUTY PAVEMENT SECTION

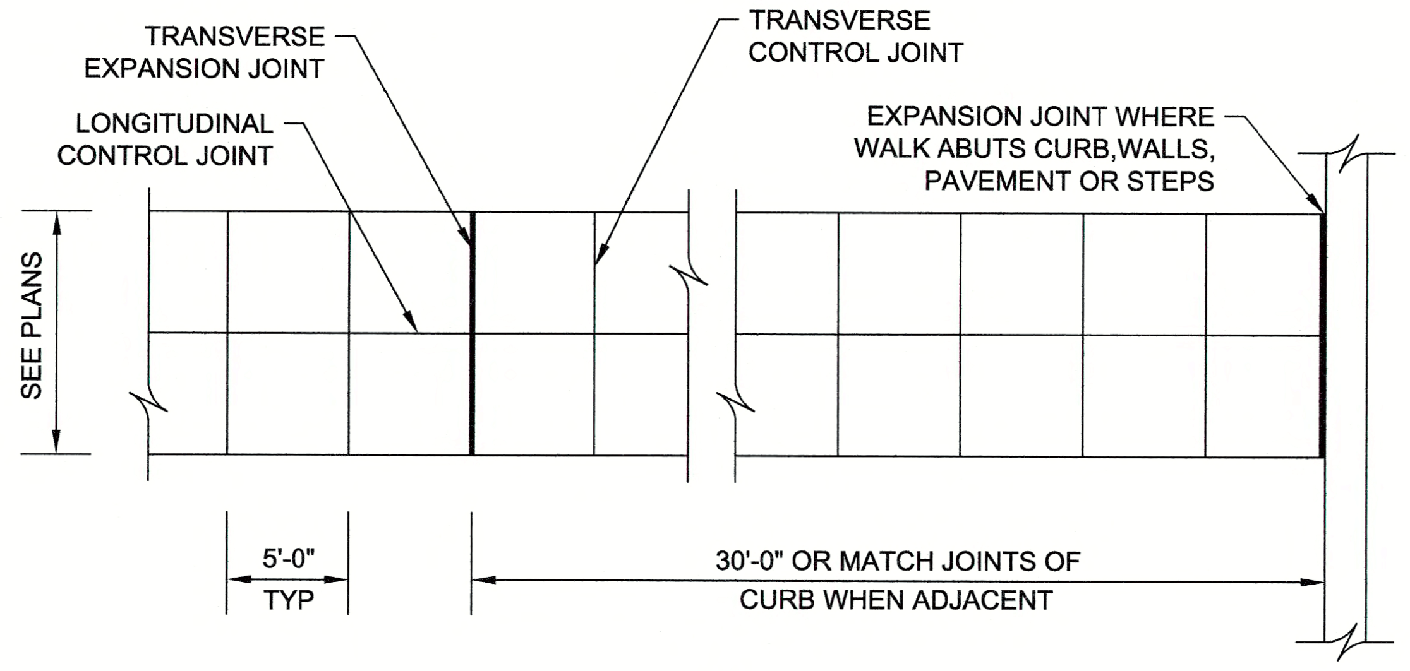
NOT TO SCALE



SECTION

NOTES:

1. SUBGRADE PREPARATION MUST BE IN ACCORDANCE WITH GEOTECHNICAL ENGINEER'S RECOMMENDATIONS



PLAN

WALK WIDTH	LONGITUDINAL CONTROL JOINT
0 - 7 FEET	NONE
8 - 10 FEET	ONE ALONG WALK AT CENTERLINE
11 - 15 FEET	TWO ALONG WALK AT THIRD POINTS

CEMENT CONCRETE WALKWAY

NOT TO SCALE

TETRA TECH

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SEAN PATRICK
41062

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Hastings Street Plaza LLC

Hastings Street and Washington Street
Mendon, Massachusetts

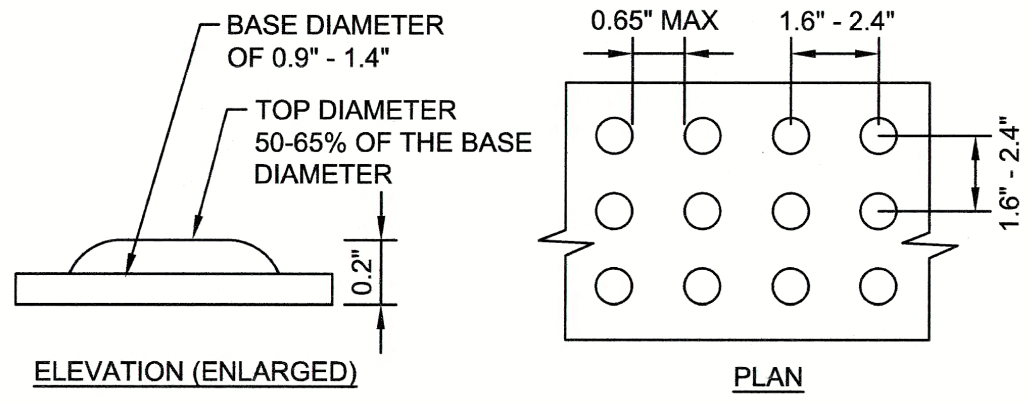
Construction Details

(sheet 4 of 10)

PROJ: 143-305225-20004
DESN: MWM
DRWN: NRK
CHKD: SPR

C-504

Bar Measures 1 inch, otherwise drawing not to scale



ELEVATION (ENLARGED)

PLAN

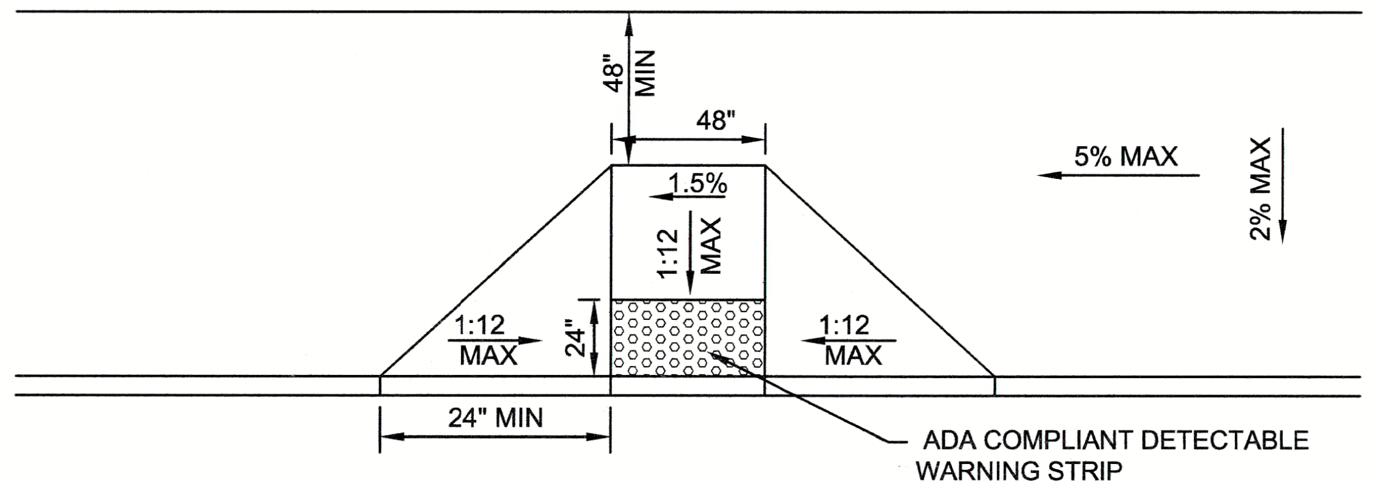
DETECTABLE WARNING STRIP

NOT TO SCALE

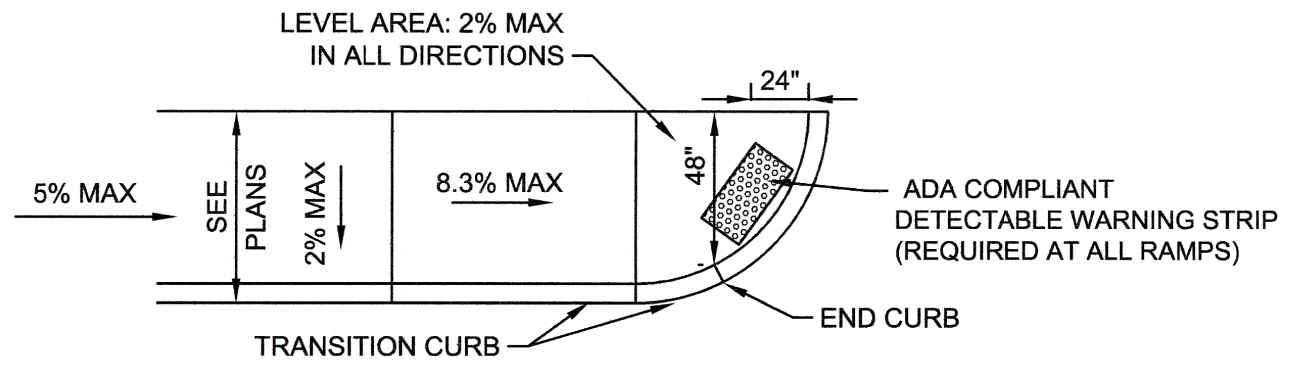
1. THE MAXIMUM ALLOWABLE ROUTE (SIDEWALK) AND CURB RAMP CROSS SLOPES SHALL BE 2.0% MAX.
2. THE MAXIMUM ALLOWABLE SLOPE OF ACCESSIBLE ROUTE CURB RAMPS SHALL NOT EXCEED 1:12
3. A MINIMUM OF 3 FEET CLEAR SHALL BE MAINTAINED AT ANY PERMANENT OBSTACLE IN ACCESSIBLE ROUTE (I.E., HYDRANTS, UTILITY POLES, TREE WELLS, SIGNS, ETC..
4. BASE OF RAMP SHALL BE GRADED TO PREVENT PONDING.
5. SEE TYPICAL SIDEWALK SECTION FOR RAMP CONSTRUCTION.
6. ALL SLOPING SURFACES AT WHEEL CHAIR RAMPS FOR SIDEWALKS SHALL HAVE DETECTABLE WARNING STRIPS AND COLOR CONCRETE
7. DETECTABLE WARNINGS CONTRAST VISUALLY WITH ADJOINING SURFACES, EITHER LIGHT-ON-DARK, OR DARK-ON-LIGHT. THE MATERIAL USED TO PROVIDE CONTRAST SHOULD CONTRAST BY AT LEAST 70%. CONTRAST IN PERCENT IS DETERMINED BY: CONTRAST = [(B1 - B2)/B1] X 100 WHERE B1 = LIGHT REFLECTANCE VALUE (LRV) OF THE LIGHTER AREA AND B2 = LIGHT REFLECTANCE VALUE (LRV) OF THE DARKER AREA. B1 SHALL NEVER EQUAL 100 AND B2 SHALL ALWAYS BE GREATER THAN 0.
8. ALL PROPOSED WHEELCHAIR RAMPS SHALL HAVE A PEDESTRIAN WARNING SURFACE MEETING THE REQUIREMENTS OF THE ADA GUIDELINES. ALL WHEELCHAIR RAMPS SHALL BE CONSTRUCTED WITH COLOR TINTED CONCRETE MEETING THE ADA GUIDELINES FOR CONTRASTING COLOR. FINAL COLOR TO BE DETERMINED BY THE ARCHITECT. ALL CONCRETE SHALL BE 4000 PSI PER ASTM C-260 AND THE PROJECT SPECIFICATIONS.
9. AT NO TIME IS ANY PART OF THE WHEELCHAIR RAMP TO BE LOCATED OUTSIDE OF THE CROSSWALK AND IT IS TO BE CENTERED WHENEVER POSSIBLE, WHERE APPLICABLE.
10. THE ENTRANCE OF THE WHEELCHAIR RAMP SHALL BE WITHIN 1/2" WITH THE PAVEMENT.

ACCESSIBLE CURB RAMP / ROUTE NOTES

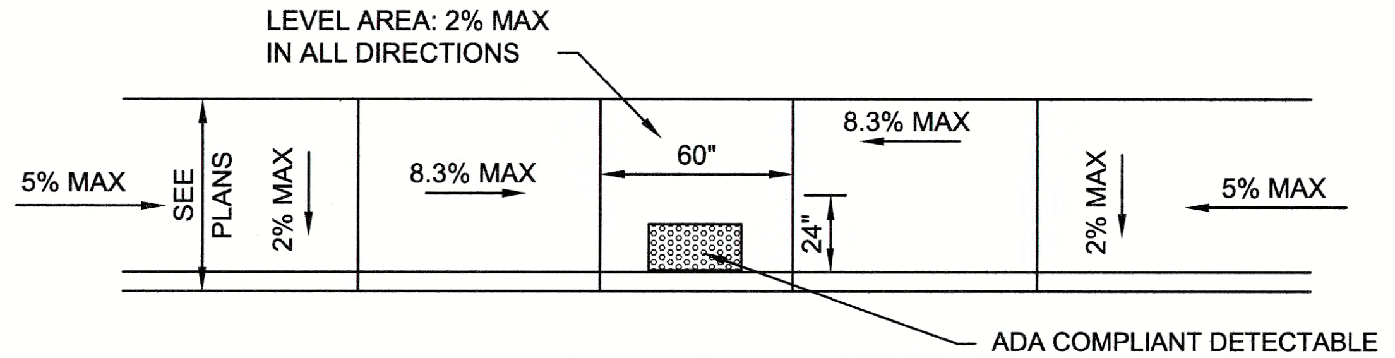
NOT TO SCALE



CURB RAMP, TYPE I



CURB RAMP, TYPE II



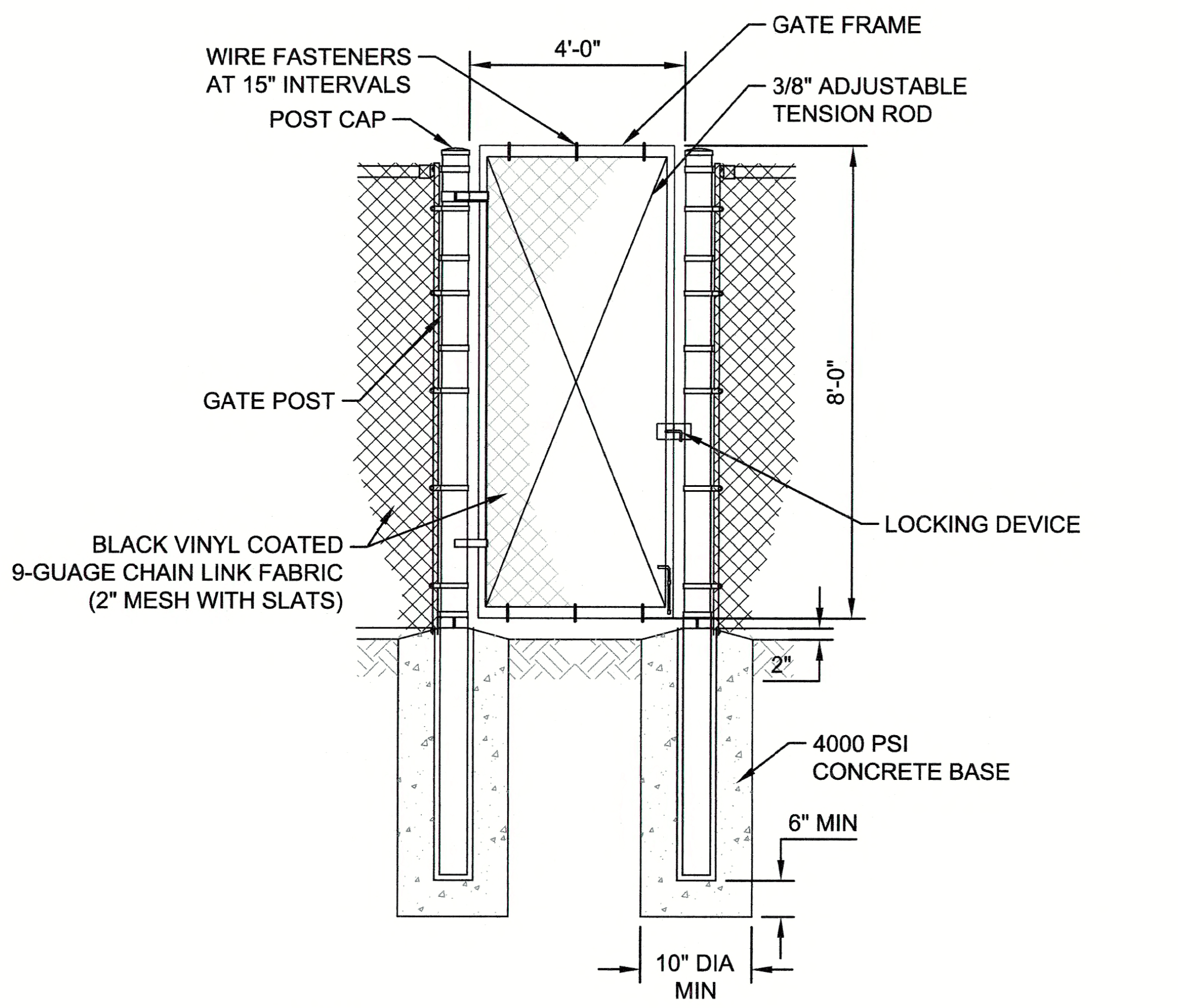
CURB RAMP, TYPE III

NOTES:

1. THE DETECTABLE WARNING SHALL BE A CAST-IN-PLACE COMPOSITE PANEL PAVER SYSTEM AS MANUFACTURED BY ADA SOLUTIONS, INC., OR APPROVED EQUAL.
2. TRANSITIONS FROM CURB CUTS TO WALKS, GUTTERS OR STREETS MUST BE FLUSH.

ACCESSIBLE CURB RAMPS

NOT TO SCALE

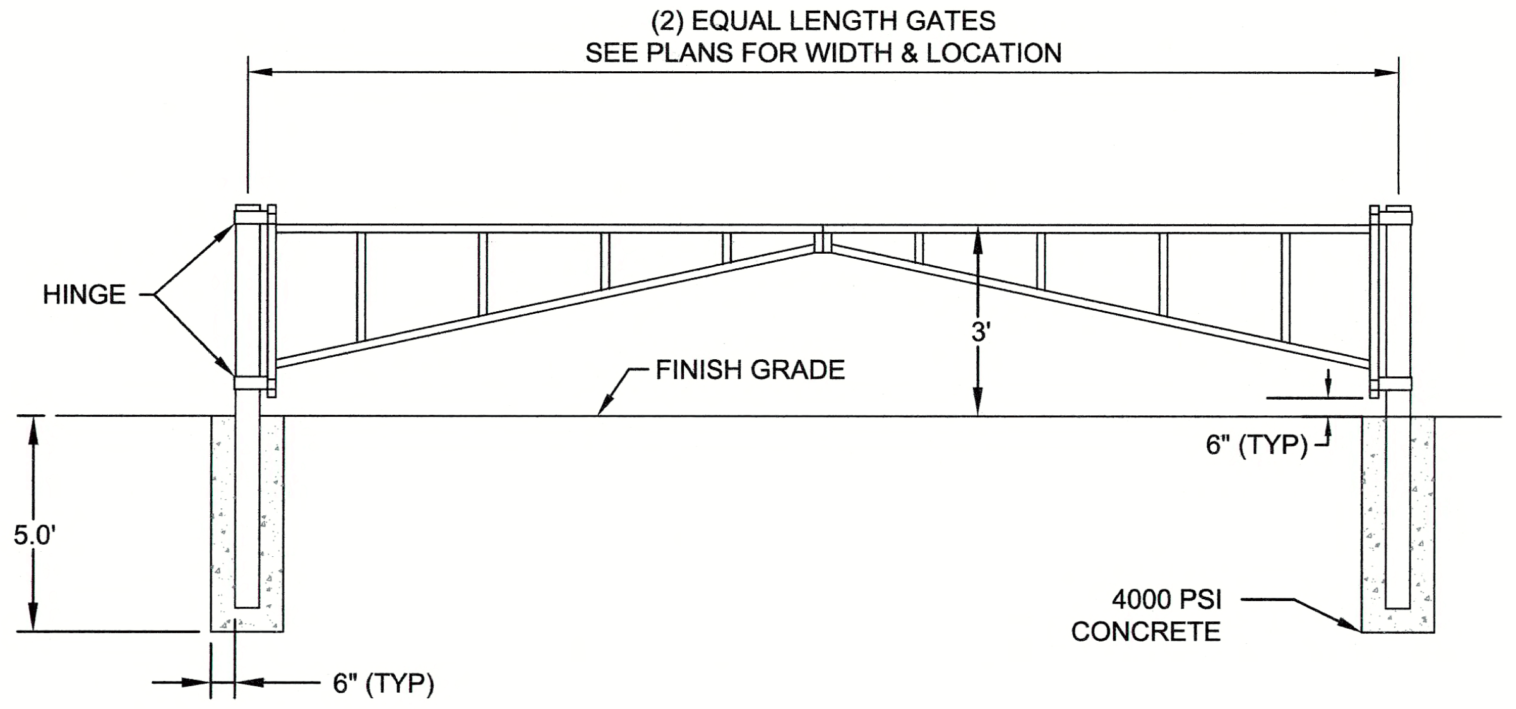


NOTES:

1. THIS DETAIL IS FOR REFERENCE ONLY. CONTRACTOR SHALL COORDINATE WITH MANUFACTURER FOR DESIGN OF GATES AND FENCE.
2. SLAT COLOR TO BE CHOSEN BY ARCHITECT.

PEDESTRIAN ACCESS GATE

NOT TO SCALE



NOTES:

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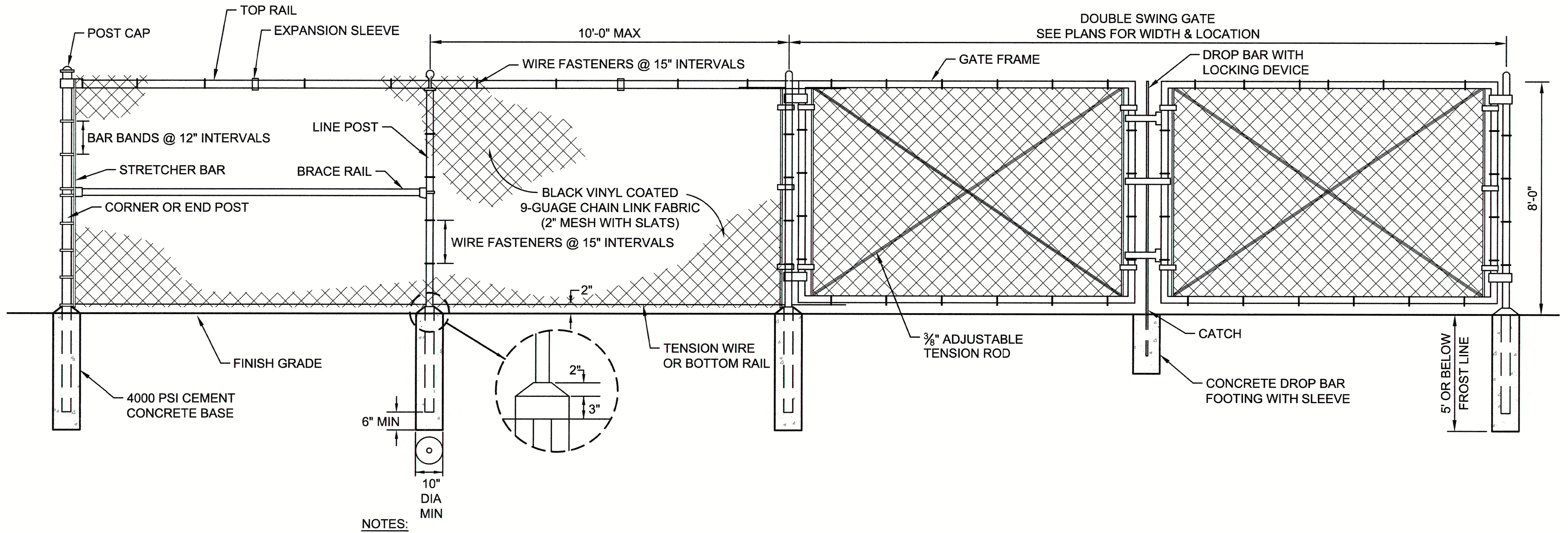
2. ASSEMBLY TO BE PAINTED (COLOR TO BE CHOSEN BY ARCHITECT) OR TO HAVE REFLECTORIZED TAPE ON FRONT AND BACK OF TOP AND BOTTOM RAILS.
3. PROVIDE PADLOCK BY KNOX COMPANY IF REQUIRED BY FIRE DEPARTMENT.

DOUBLE SWING ACCESS GATE

NOT TO SCALE



NOTES:

1. THIS DETAIL IS FOR REFERENCE ONLY. CONTRACTOR SHALL COORDINATE WITH MANUFACTURER FOR DESIGN OF GATES AND FENCE.
2. SLAT COLOR TO BE CHOSEN BY ARCHITECT.

CHAIN LINK FENCE WITH DOUBLE SWING GATE

NOT TO SCALE

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SEAN PATRICK REARDON
CIVIL
NO. 41062

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Hastings Street Plaza LLC

Hastings Street and Washington Street
Mendon, Massachusetts

Construction Details

(sheet 5 of 10)

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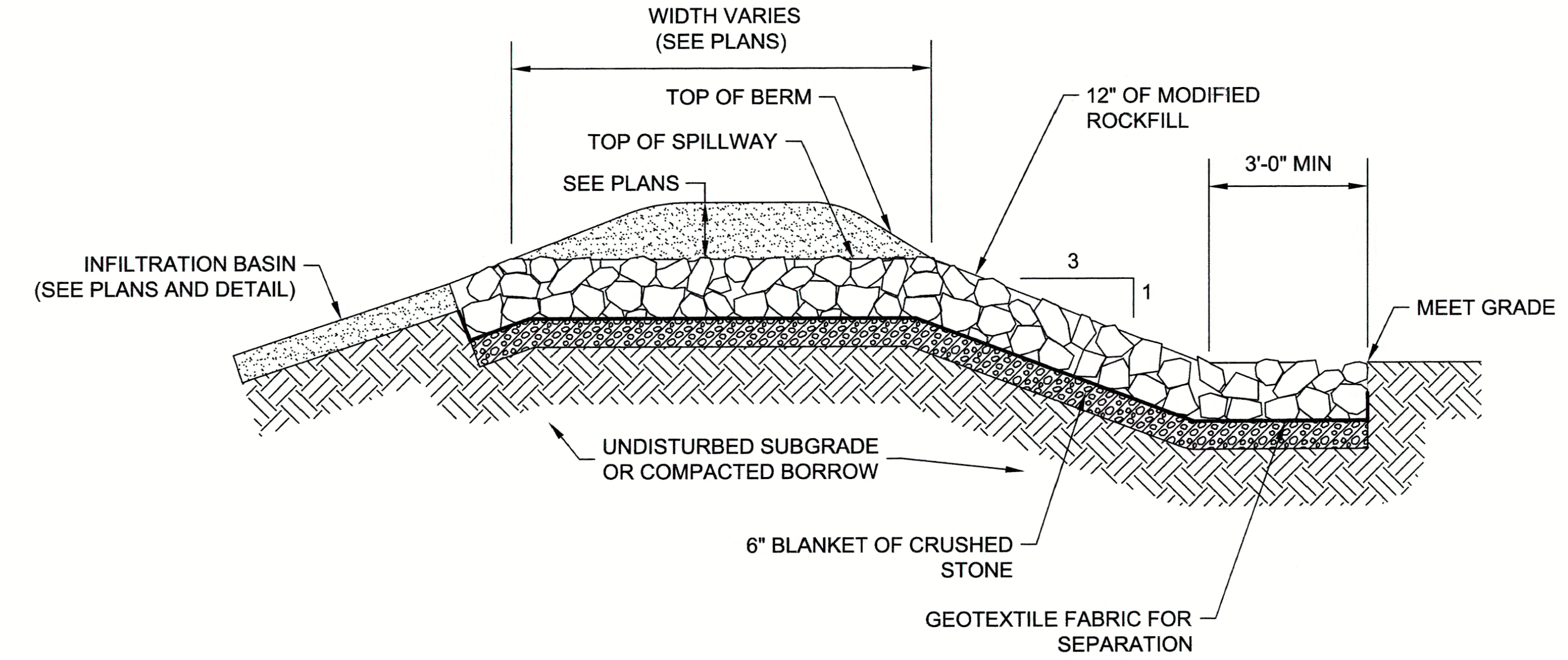
CHKD: SPR

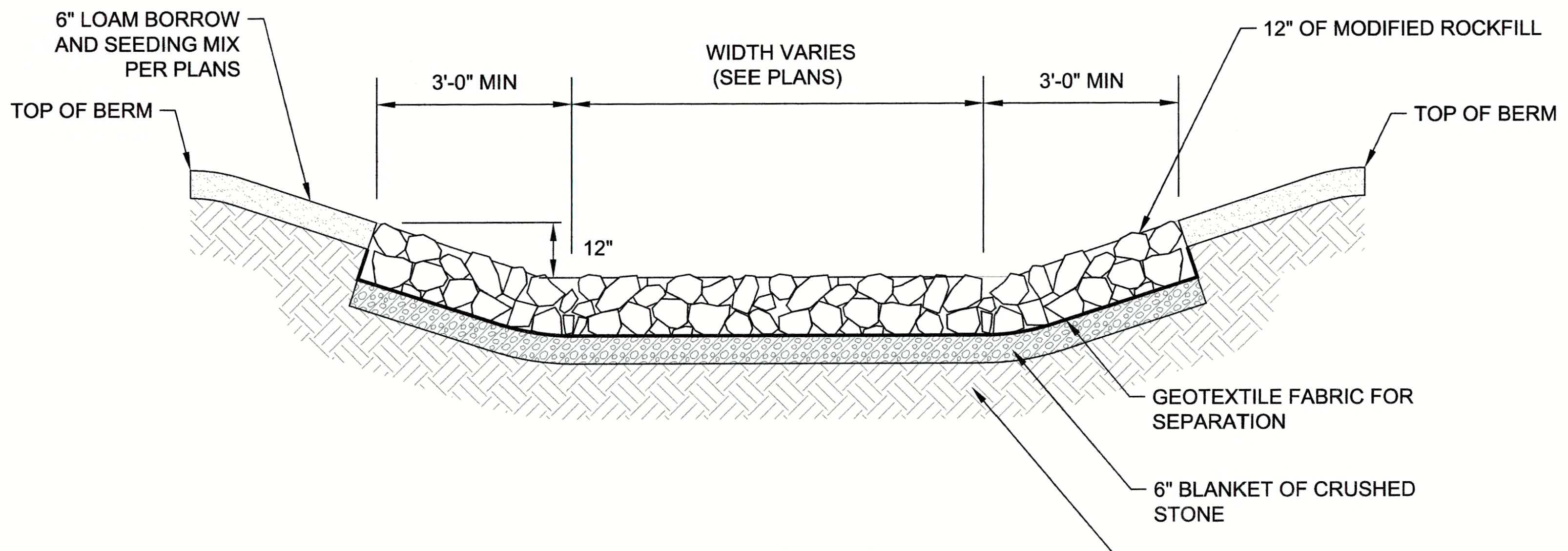
C-505

4/25/2022 10:40:33 AM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SHEETFILES\SITE PLANS\SPECIAL PERMIT SET\C-500 CONSTRUCTION DETAILS.DWG - DOCANTO, MARCOS

Bar Measures 1 inch, otherwise drawing not to scale

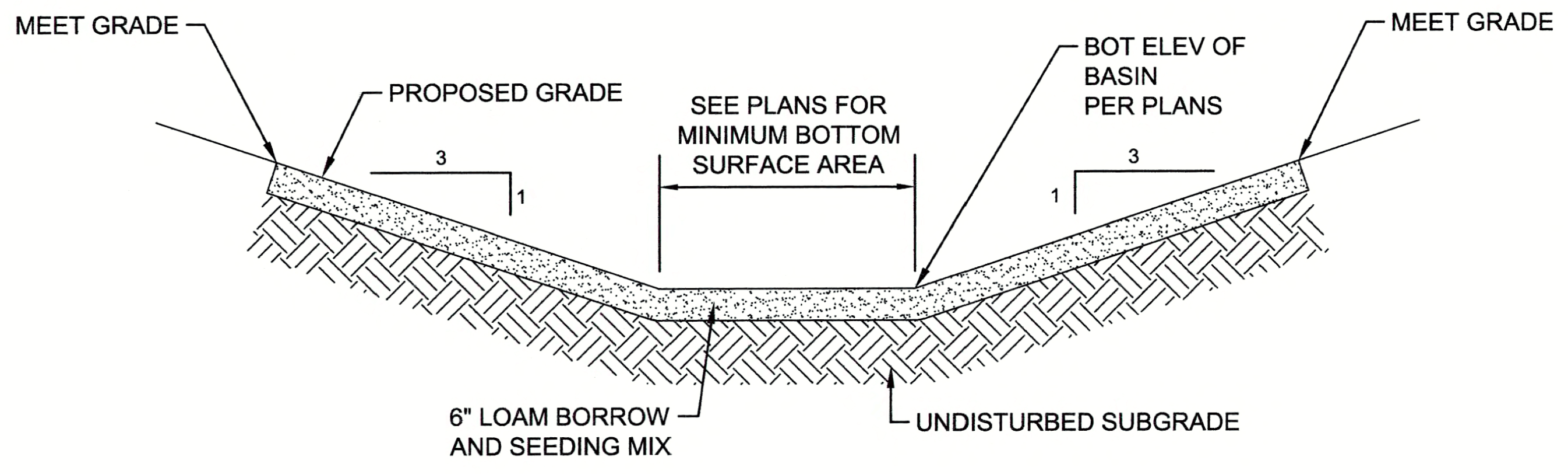


LONGITUDINAL SECTION

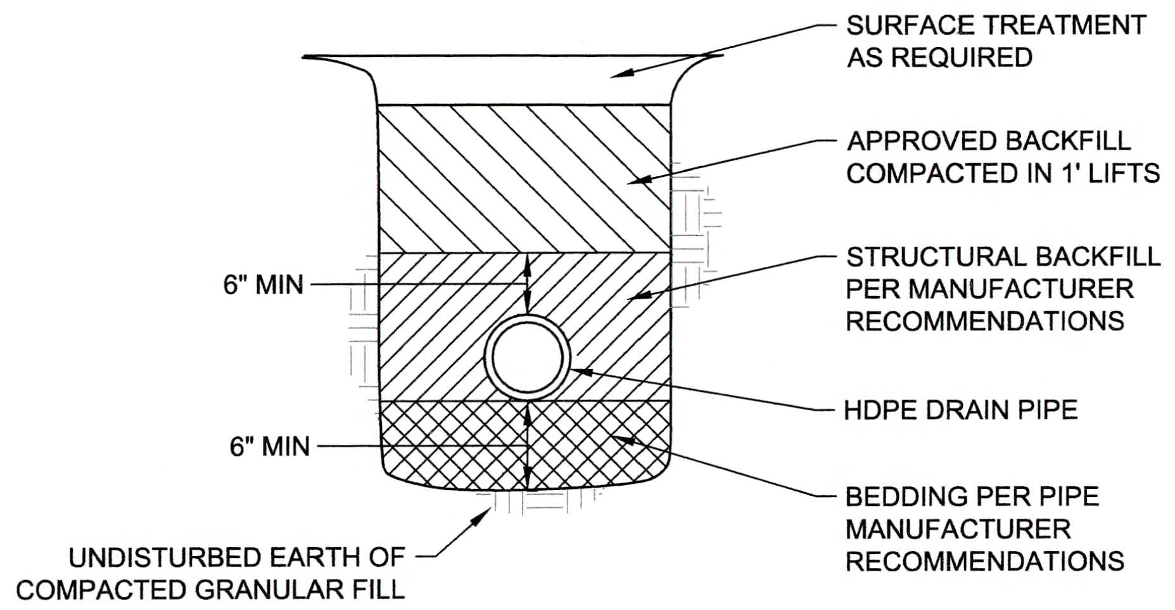


CROSS SECTION

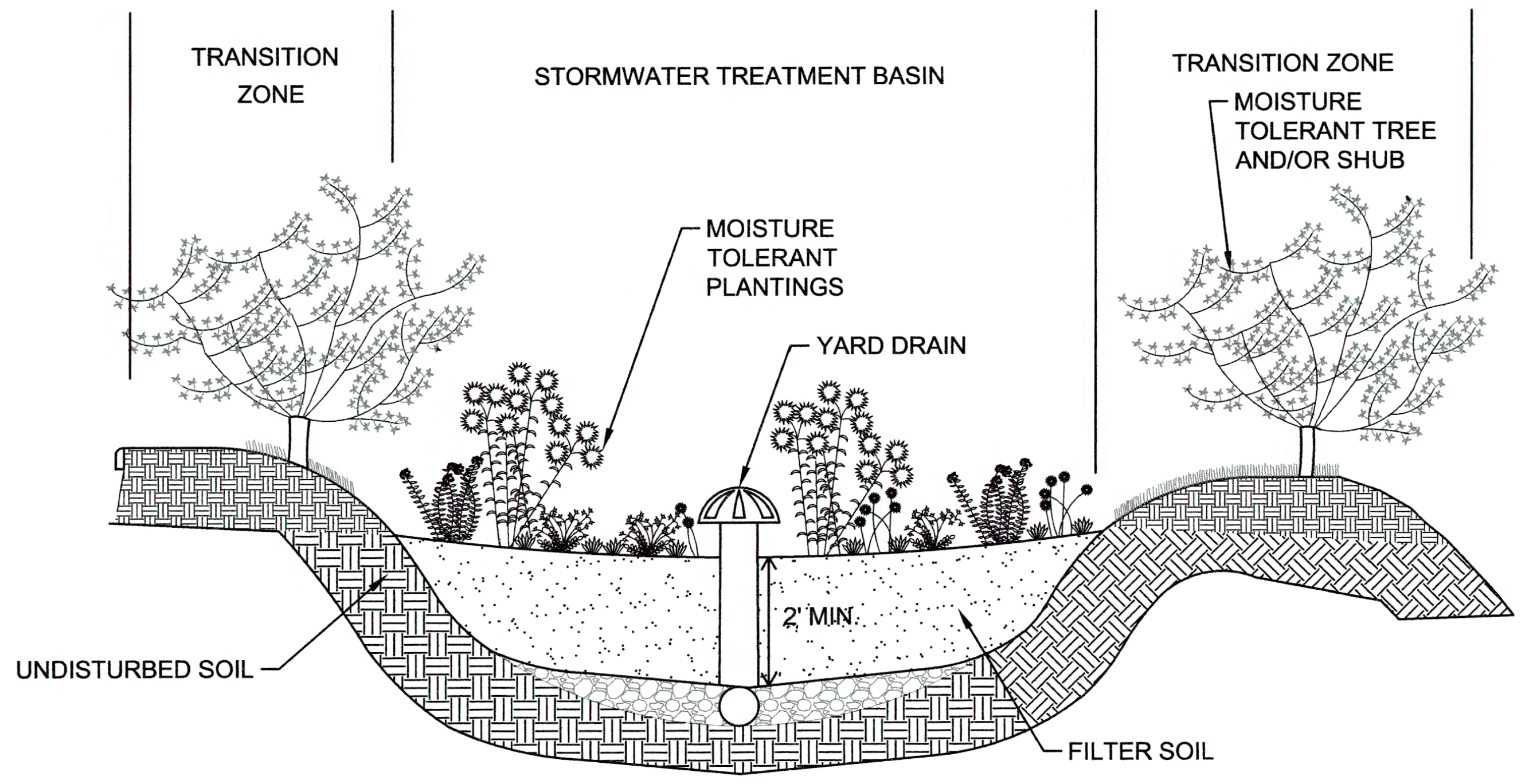
EMERGENCY SPILLWAY
NOT TO SCALE



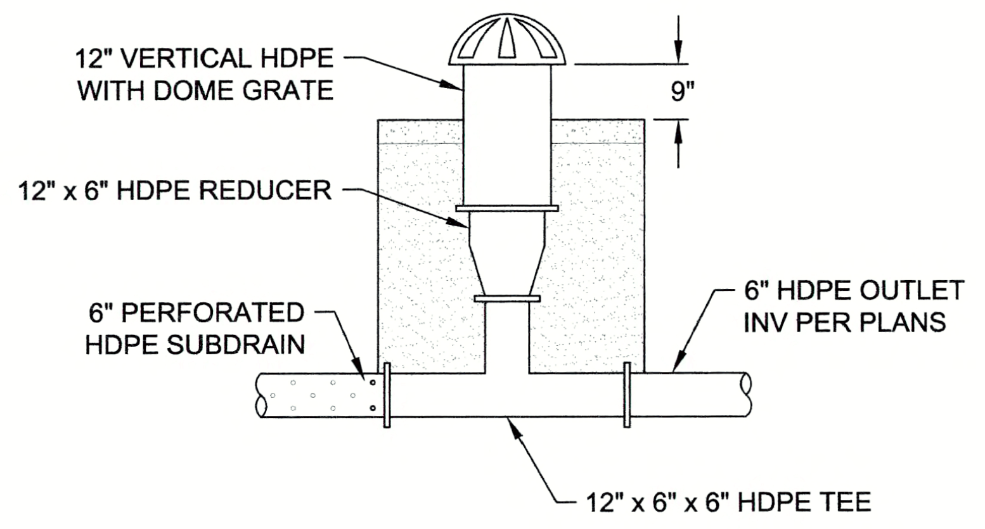
INFILTRATION BASIN SECTION
NOT TO SCALE



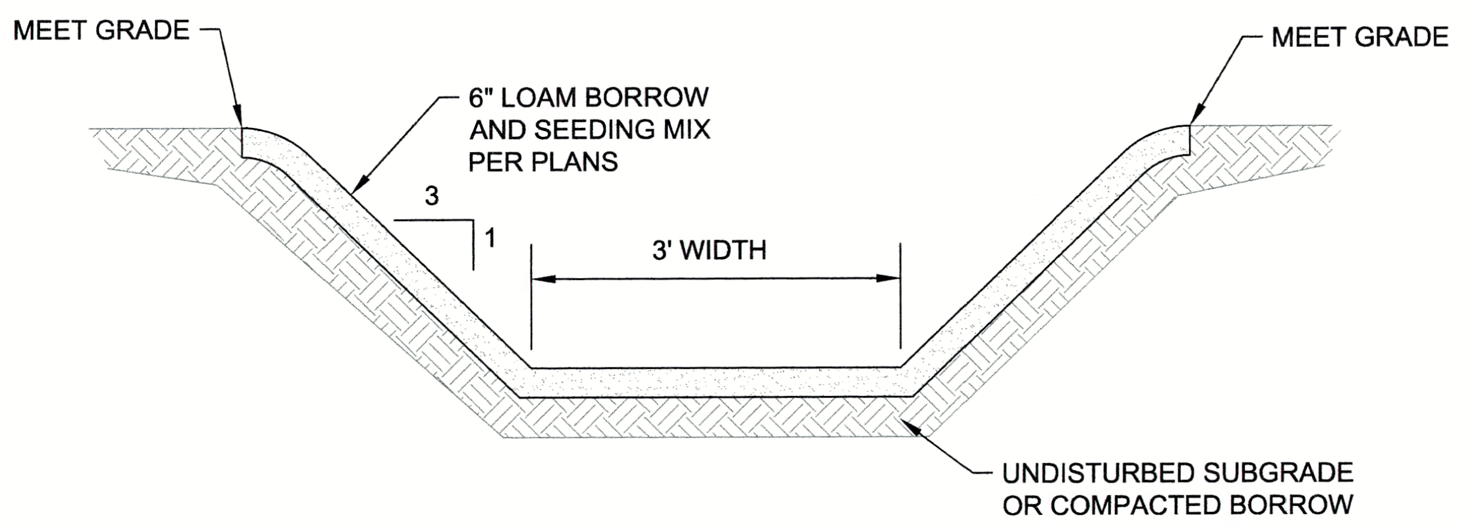
DRAIN PIPE BEDDING
NOT TO SCALE



RAIN GARDEN
NOT TO SCALE

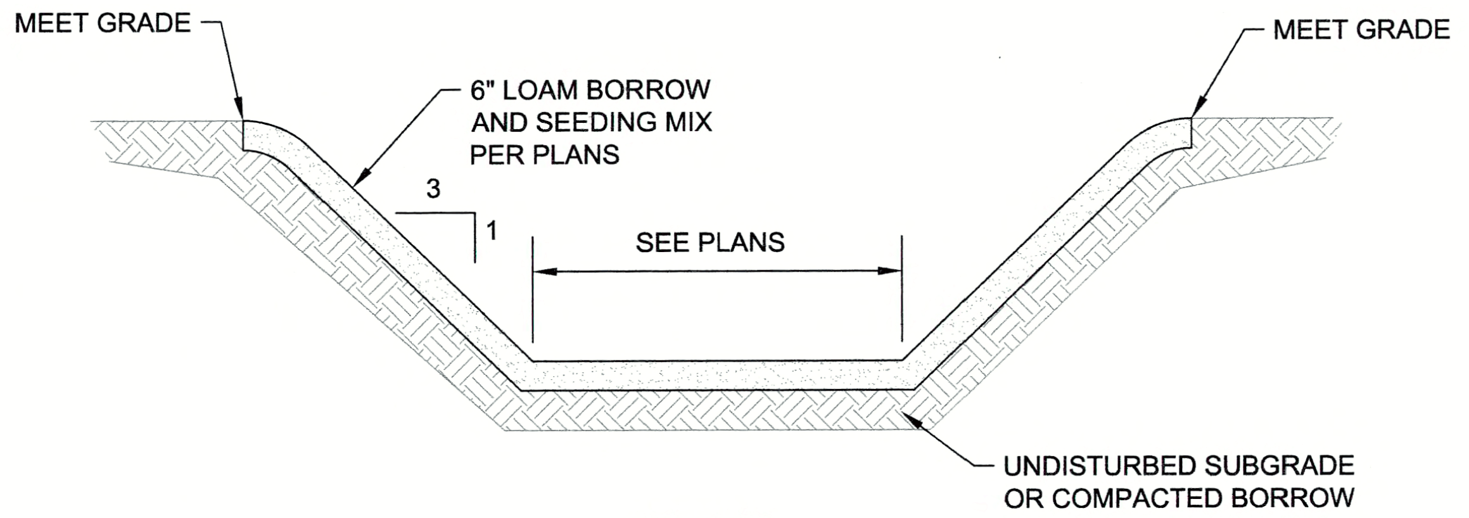


YARD DRAIN
NOT TO SCALE



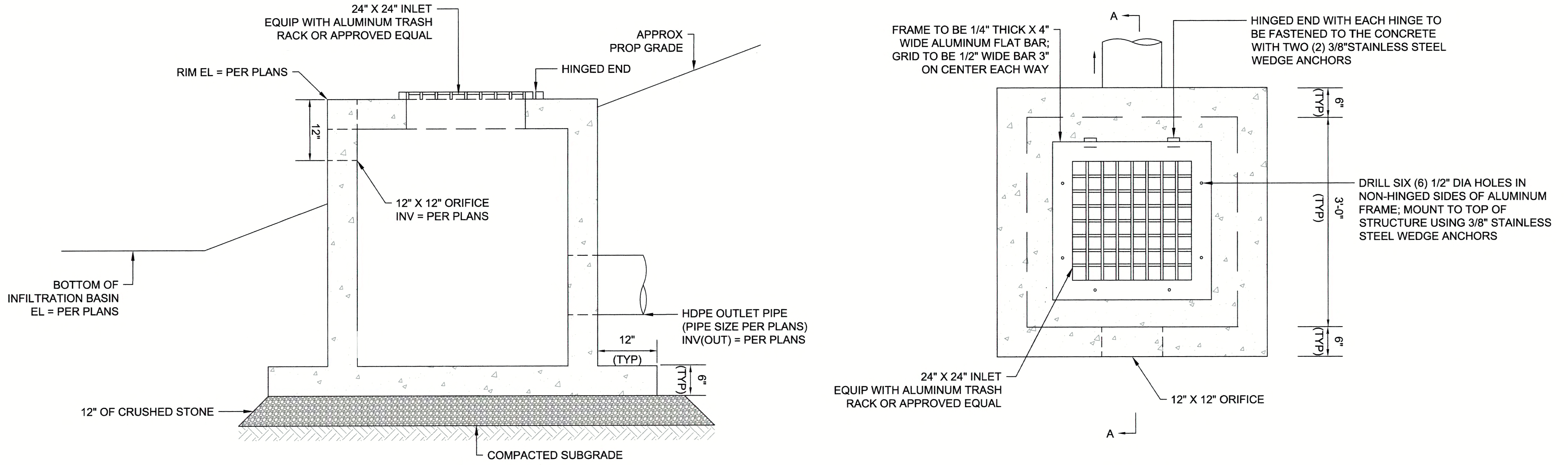
SECTION

VEGETATED DRAINAGE SWALE
NOT TO SCALE



SECTION

VEGETATED SEDIMENT FOREBAY
NOT TO SCALE



SECTION A-A

PLAN VIEW

NOTE:

1. STRUCTURE SHALL BE PRECAST REINFORCED CONCRETE MANUFACTURED IN ACCORDANCE WITH ASTM C-478 DESIGNED FOR HS-20 LOADING.

OUTLET CONTROL STRUCTURE (OCS-1)
NOT TO SCALE

TETRA TECH
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SEAN PATRICK REARDON
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MARK	DATE	DESCRIPTION	BY
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Hastings Street Plaza LLC

Hastings Street and Washington Street
Mendon, Massachusetts

Construction Details
(sheet 6 of 10)

PROJ: 143-305225-20004
DESN: MWM
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CHKD: SPR

C-506

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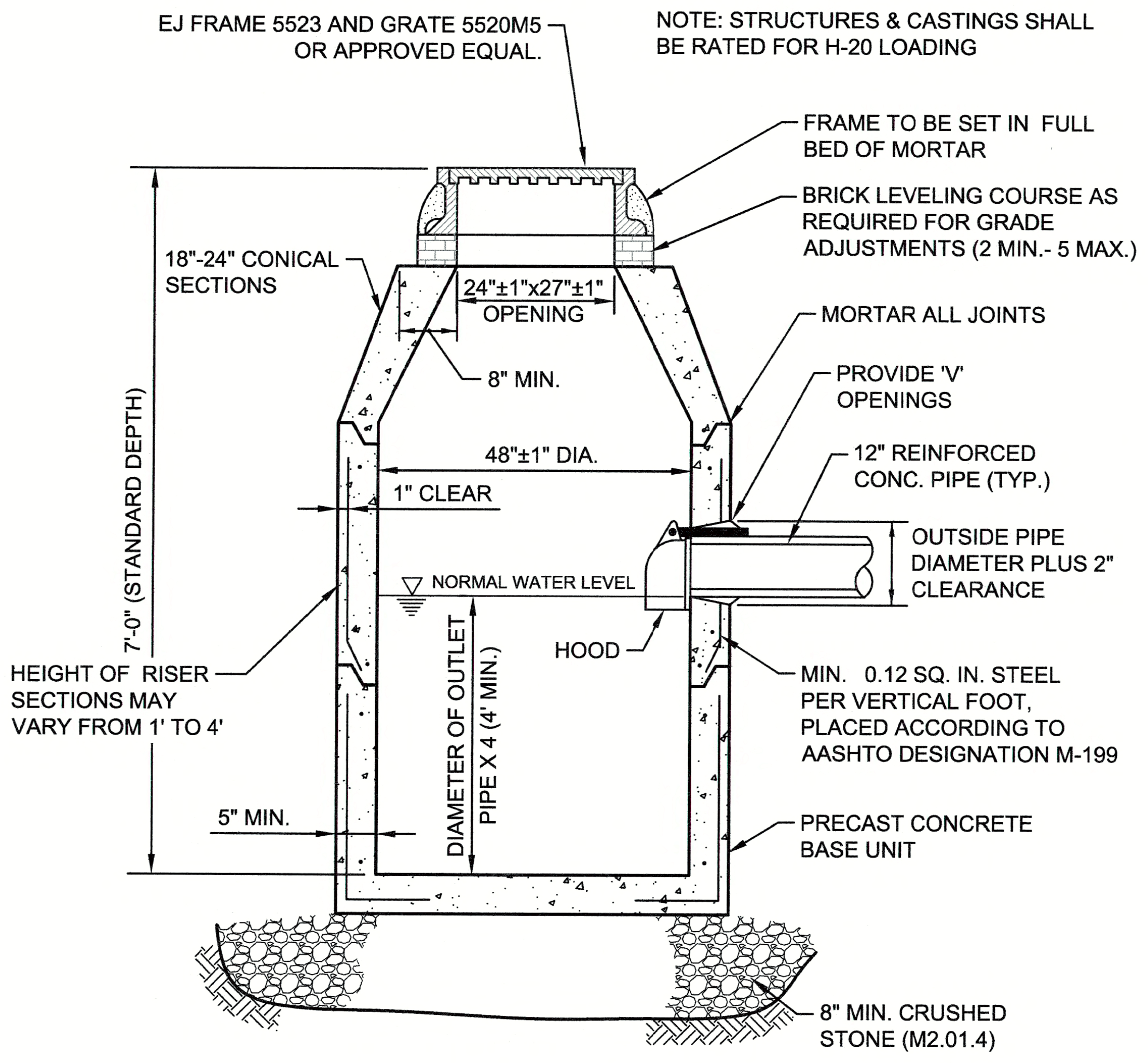
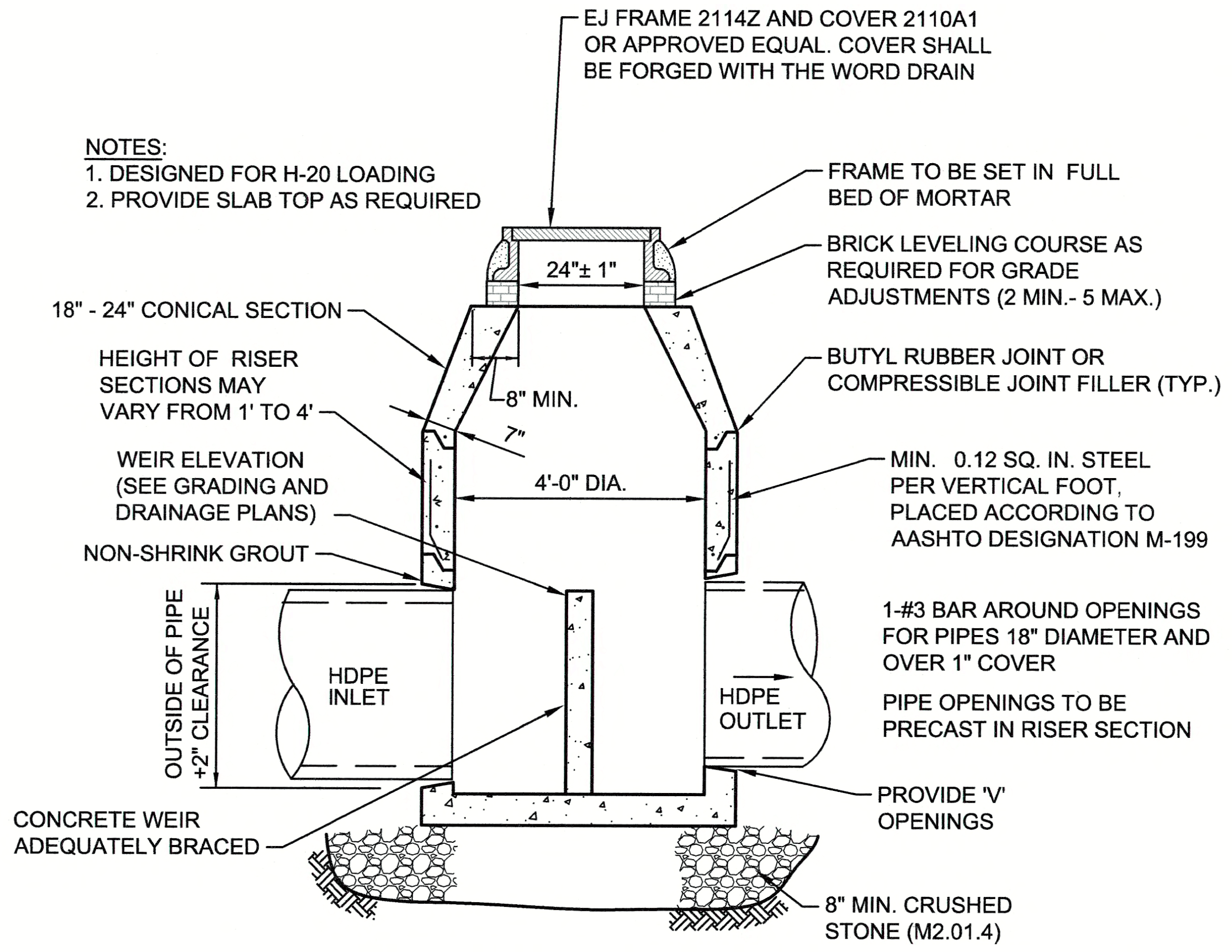


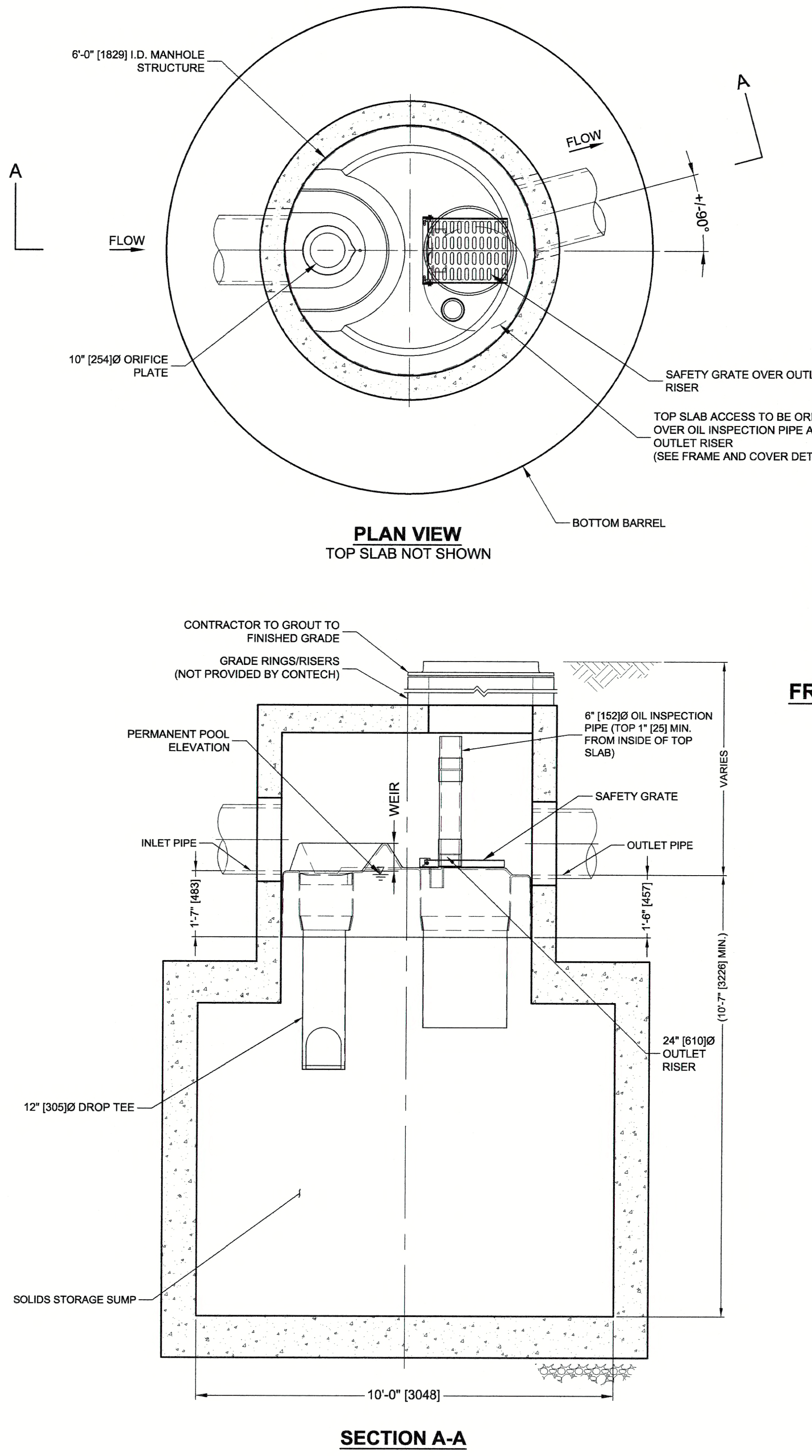
PRECAST CONCRETE CATCH BASIN

NOT TO SCALE



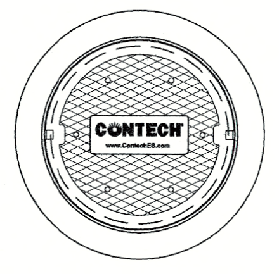
WEIR MANHOLE (OCS-2)

NOT TO SCALE



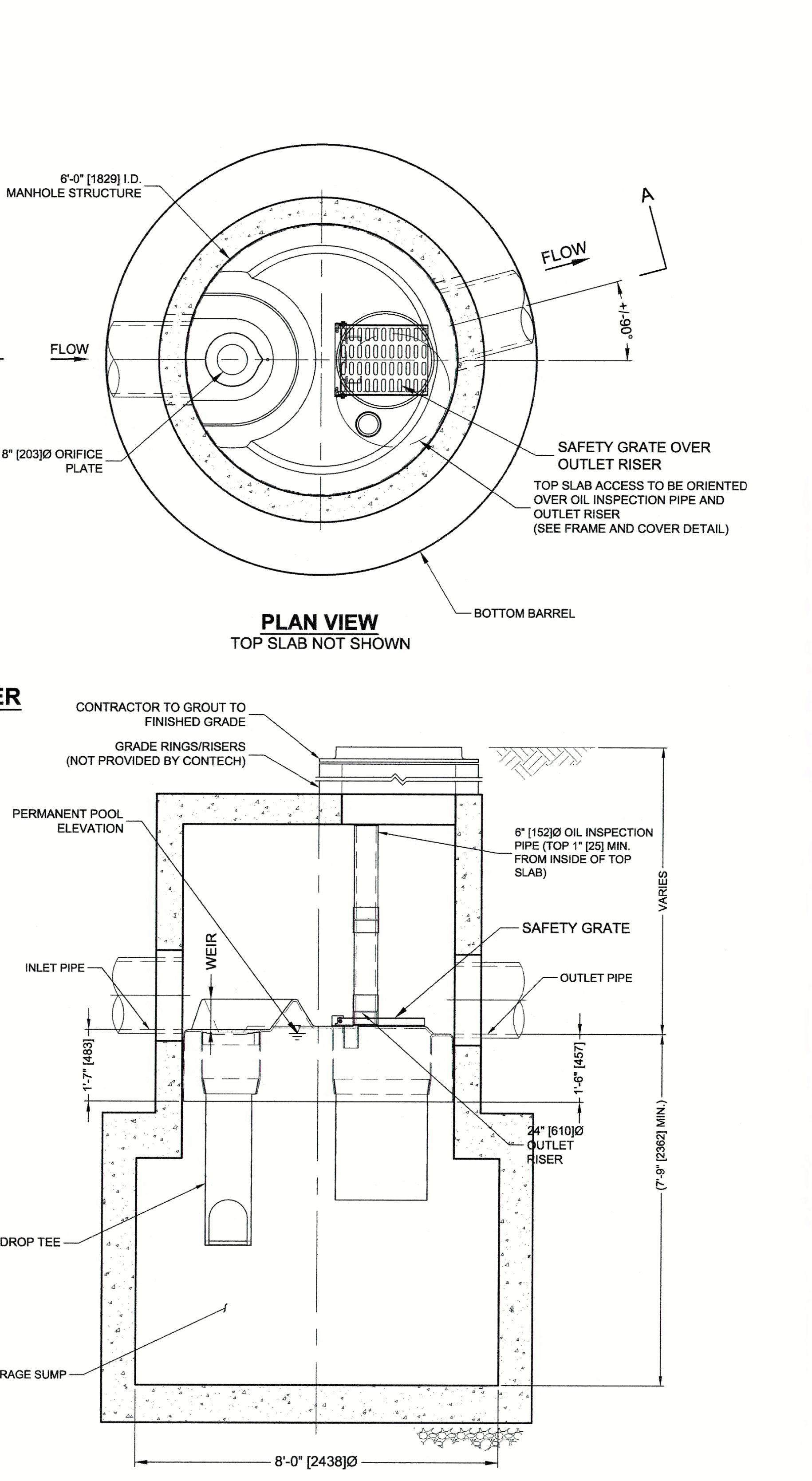
STORMCEPTOR STC-4800 (WQS-1)

NOT TO SCALE



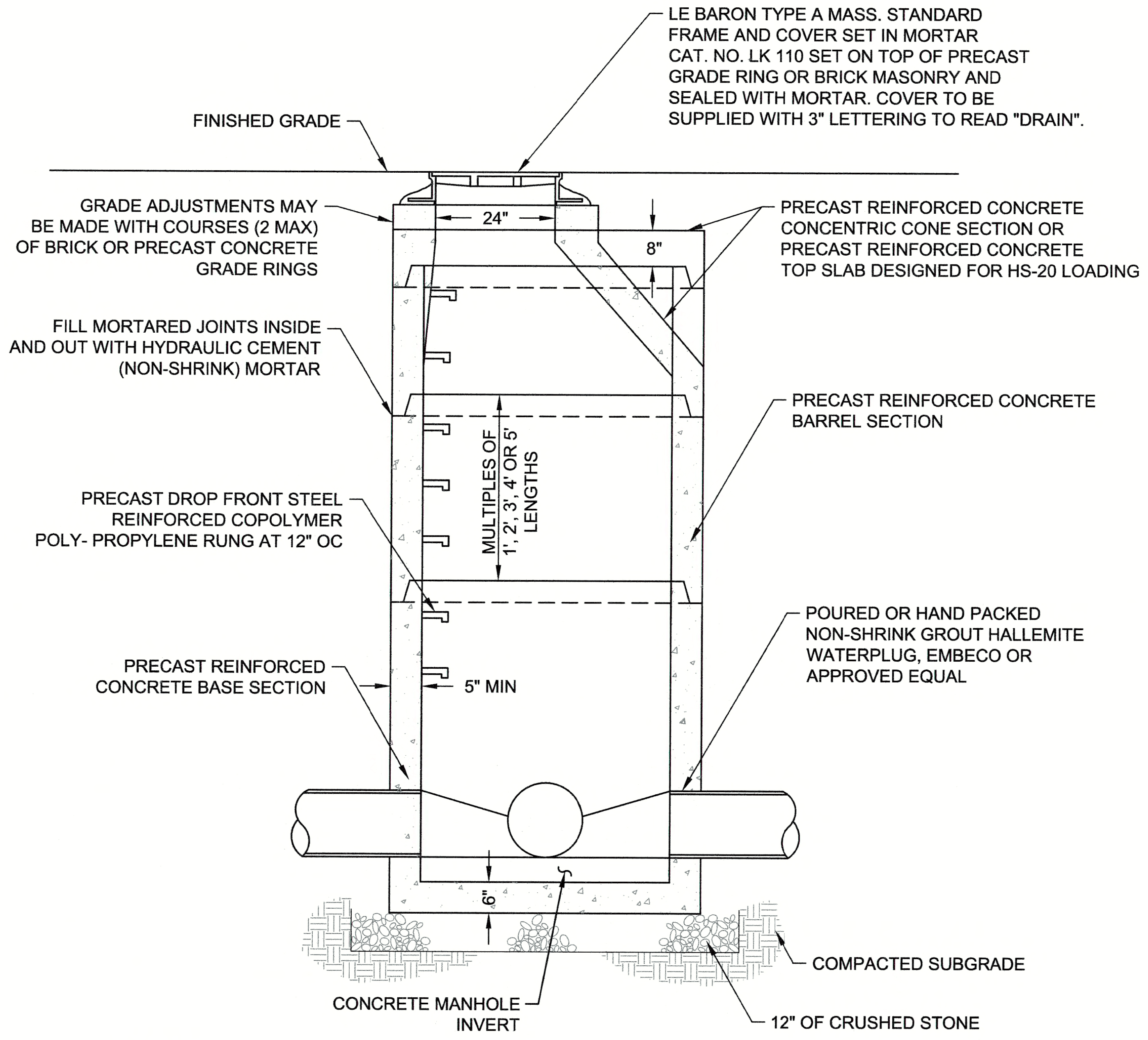
FRAME AND COVER

(MAY VARY)
NOT TO SCALE



STORMCEPTOR STC-2400 (WQS-2)

NOT TO SCALE

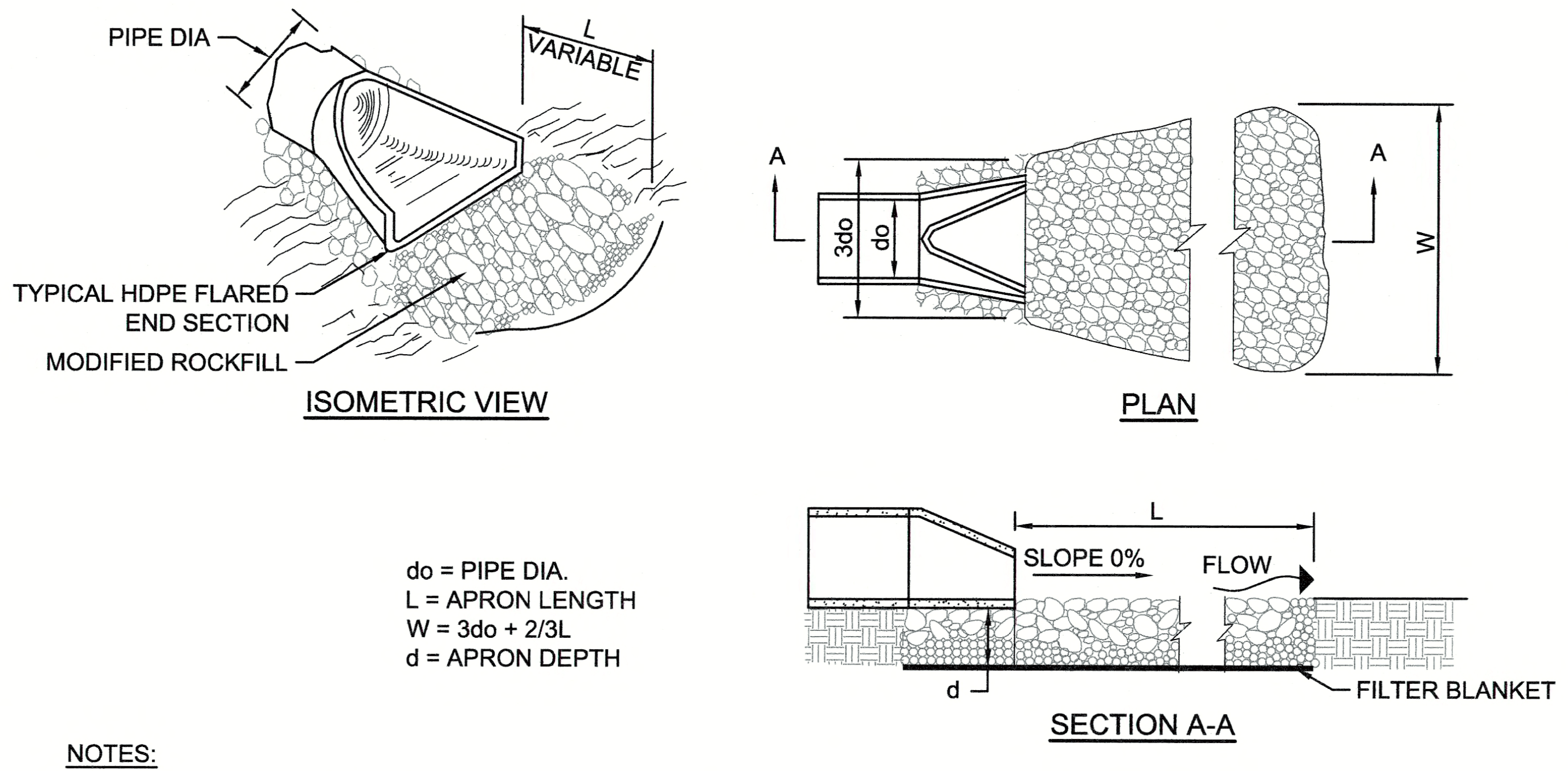


NOTES:

1. MANHOLES SHALL BE 48" INSIDE DIAMETER (ID) UNLESS OTHERWISE INDICATED ON PLANS.
2. EXCAVATION TO ALLOW FOR FREE TRAVEL OF COMPACTION EQUIPMENT.
3. ALL COMPACTION TO A MINIMUM 95 PERCENT DRY DENSITY DETERMINED BY ASTM D1557.
4. ALL PRECAST TO MEET OR EXCEED ASTM C-478 AND AASHTO M 199 SPECIFICATIONS.
5. REINFORCED STEEL TO MEET OR EXCEED ASTM A185 AND H-20 LOADING REQUIREMENTS.
6. ALL PRECAST CONCRETE TO BE 4,000 PSI MINIMUM AND MEET ASTM C-478 (6.1).
7. FILL ALL INTERNAL AND EXTERNAL HOLES WITH NON-SHRINK GROUT.

PRECAST CONCRETE DRAIN MANHOLE

NOT TO SCALE



do = PIPE DIA.
L = APRON LENGTH
W = 3do + 2/3L
d = APRON DEPTH

NOTES:

1. d = 3.5 TIMES THE MEDIAN STONE DIAMETER (16.5" MIN).
2. A FILTER BLANKET OR FILTER FABRIC SHOULD BE INSTALLED BETWEEN THE RIP-RAP AND SOIL FOUNDATION.

FLARED END SECTION (FES) OUTLET PROTECTION

NOT TO SCALE

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COMMONWEALTH OF MASSACHUSETTS
SEAN PATRICK REARDON
CIVIL
No. 45962
REGISTERED
PROFESSIONAL ENGINEER

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(sheet 7 of 10)

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C-507

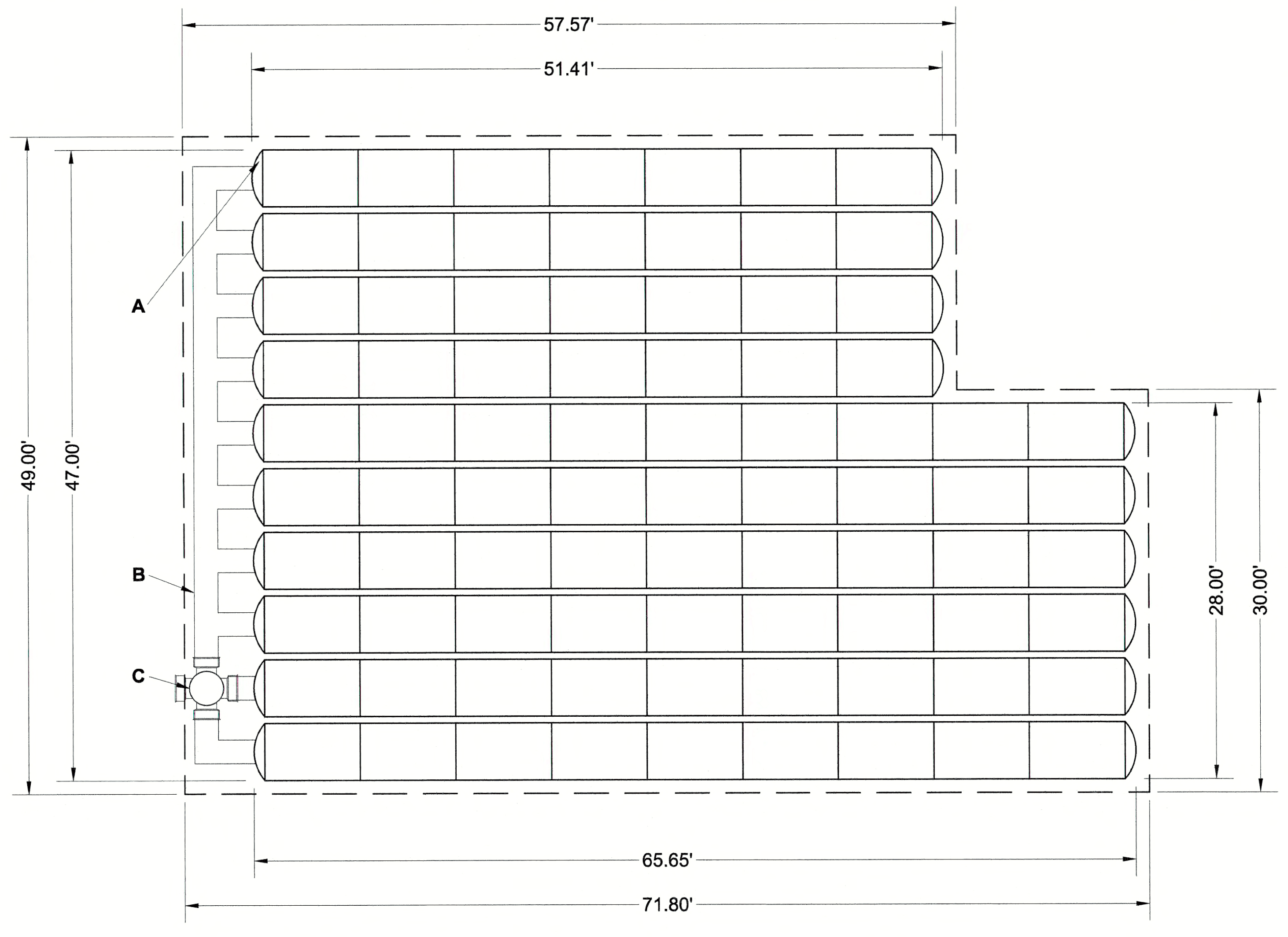
4/25/2022 10:40:30 AM - P:\30522\5\143-305225-20004 (35-37 HASTINGS)\CAD\SHEETFILES\SITE PLANS\SPECIAL PERMIT SET\C-500 CONSTRUCTION DETAILS.DWG - DOCANTO, MARCOS

Bar Measures 1 inch, otherwise drawing not to scale

PROPOSED LAYOUT		PROPOSED ELEVATIONS	
81	STORMTECH SC-740 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	443.00
18	STORMTECH SC-740 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	437.00
6	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	436.50
6	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	436.50
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	436.50
6681	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE: TOP OF SC-740 CHAMBER: 18" x 18" BOTTOM MANIFOLD INVERT: 18" BOTTOM CONNECTION INVERT:	435.50 435.00 432.63 432.63
3177	SYSTEM AREA (SF)	BOTTOM OF SC-740 CHAMBER:	432.50
232.1	SYSTEM PERIMETER (ft)	BOTTOM OF STONE:	432.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*
PREFABRICATED END CAP	A	18" BOTTOM PREFABRICATED END CAP, PART#: SC740EPE18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.60"
MANIFOLD	B	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.60"
NYLOPLAST (OUTLET)	C	30" DIAMETER (DESIGN BY ENGINEER)	

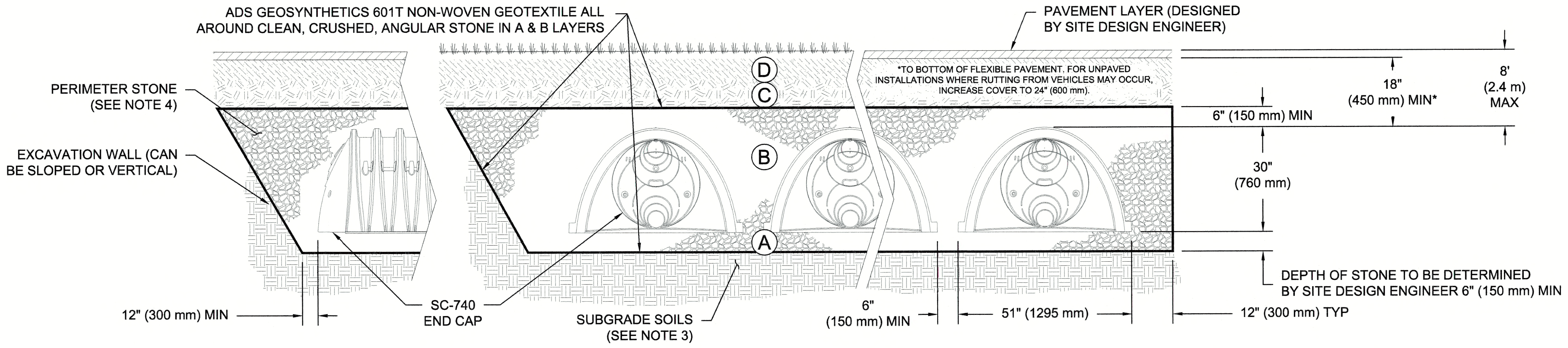


PLAN

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

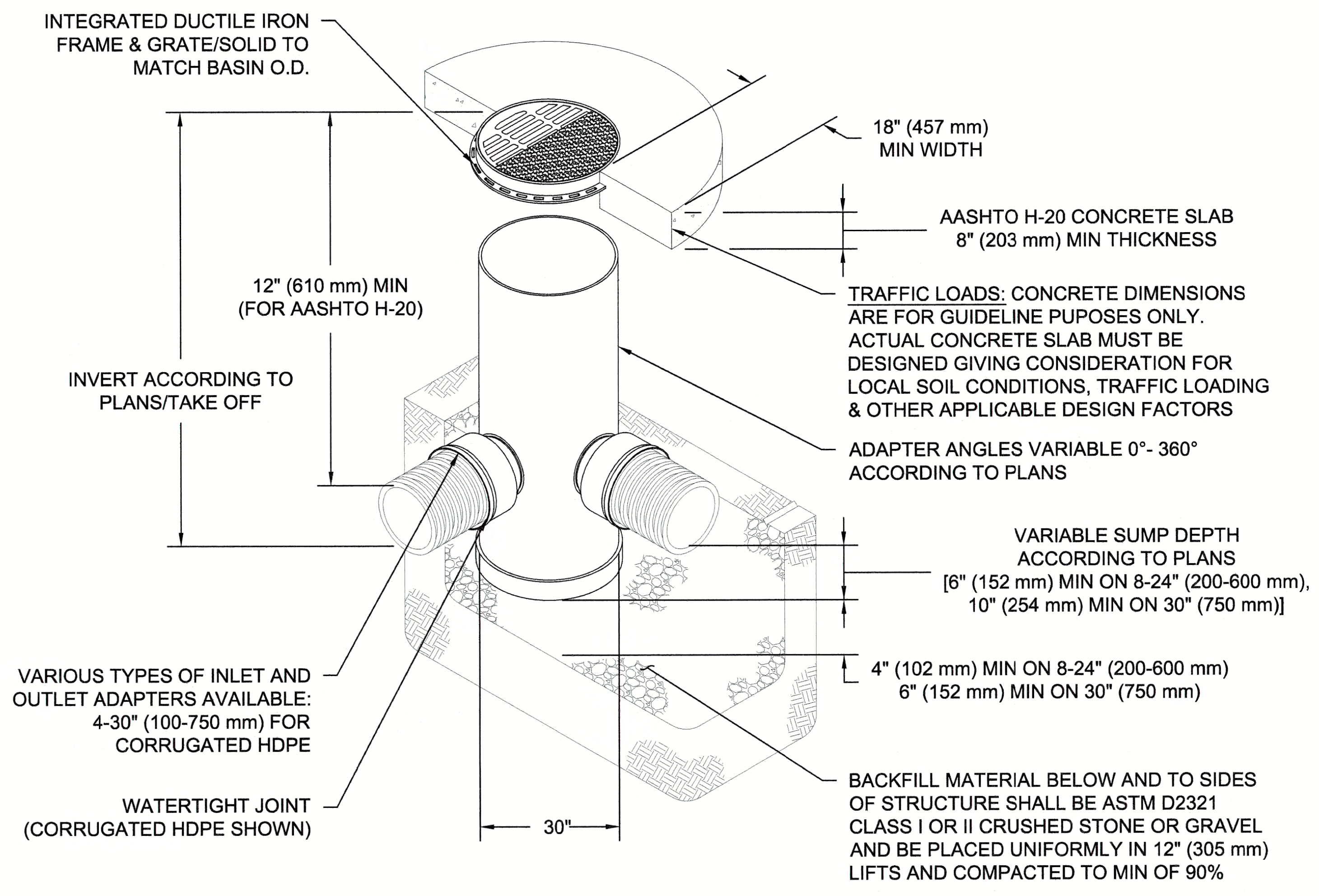
PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



SECTION

SUBSURFACE INFILTRATION SYSTEM

NOT TO SCALE



NYLOPLAST DRAIN BASIN

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www.tetratech.com
100 Nickerson Road
Marlborough, Massachusetts 01752
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SEAN PATRICK REARDON
CIVIL
No. 41082

MARK	DATE	DESCRIPTION	BY
-	4/25/22	Special Permit and Site Plan Review	NRK

Hastings Street Plaza LLC

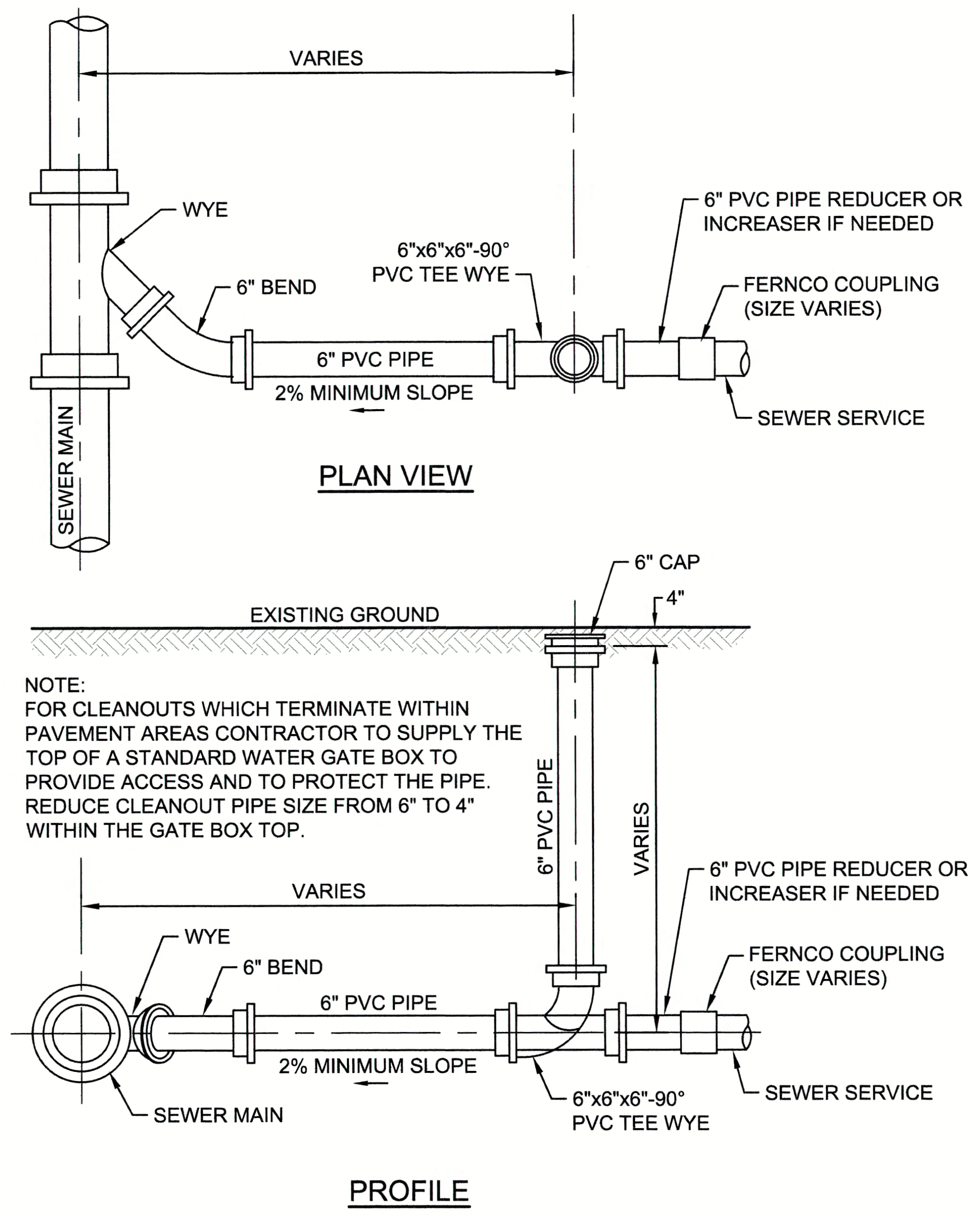
Hastings Street and Washington Street
Mendon, Massachusetts

Construction Details
(sheet 8 of 10)

PROJ: 143-305225-20004
DESN: MWM
DRWN: NRK
CHKD: SPR

C-508

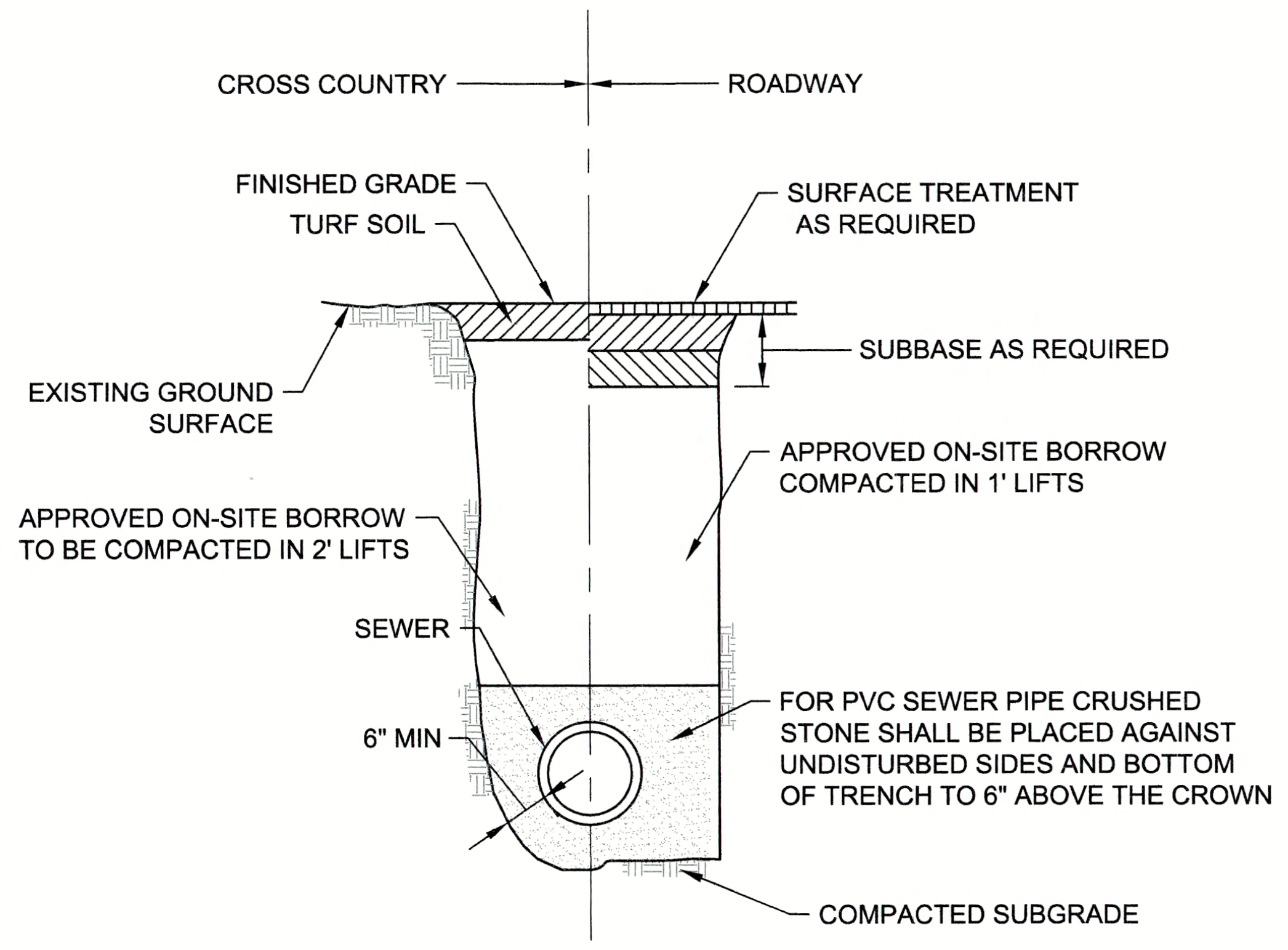
Bar Measures 1 inch, otherwise drawing not to scale



NOTE:
FOR CLEANOUTS WHICH TERMINATE WITHIN PAVEMENT AREAS CONTRACTOR TO SUPPLY THE TOP OF A STANDARD WATER GATE BOX TO PROVIDE ACCESS AND TO PROTECT THE PIPE. REDUCE CLEANOUT PIPE SIZE FROM 6" TO 4" WITHIN THE GATE BOX TOP.

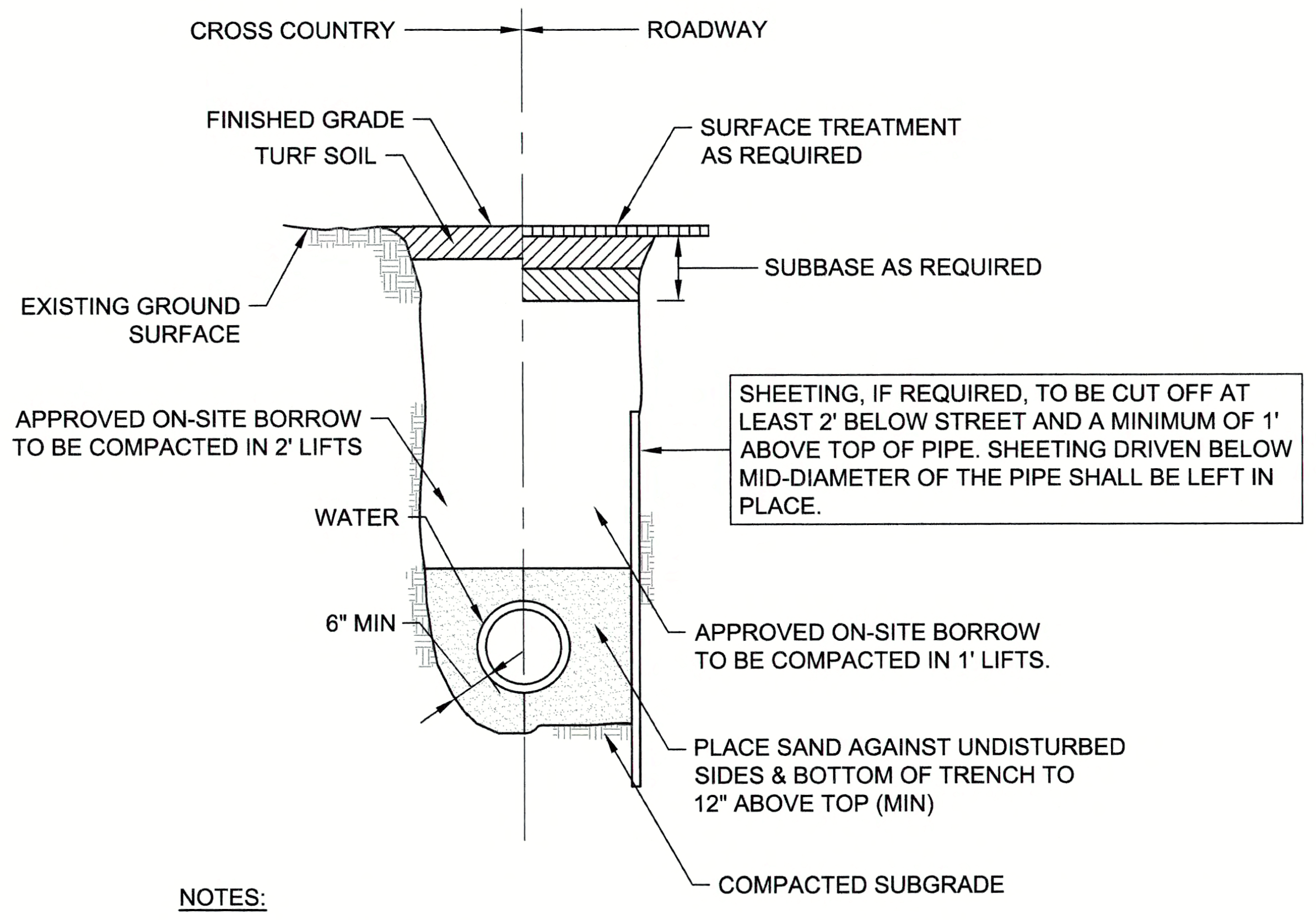
SEWER SERVICE WYE CONNECTION

NOT TO SCALE



SEWER TRENCH SECTION

NOT TO SCALE

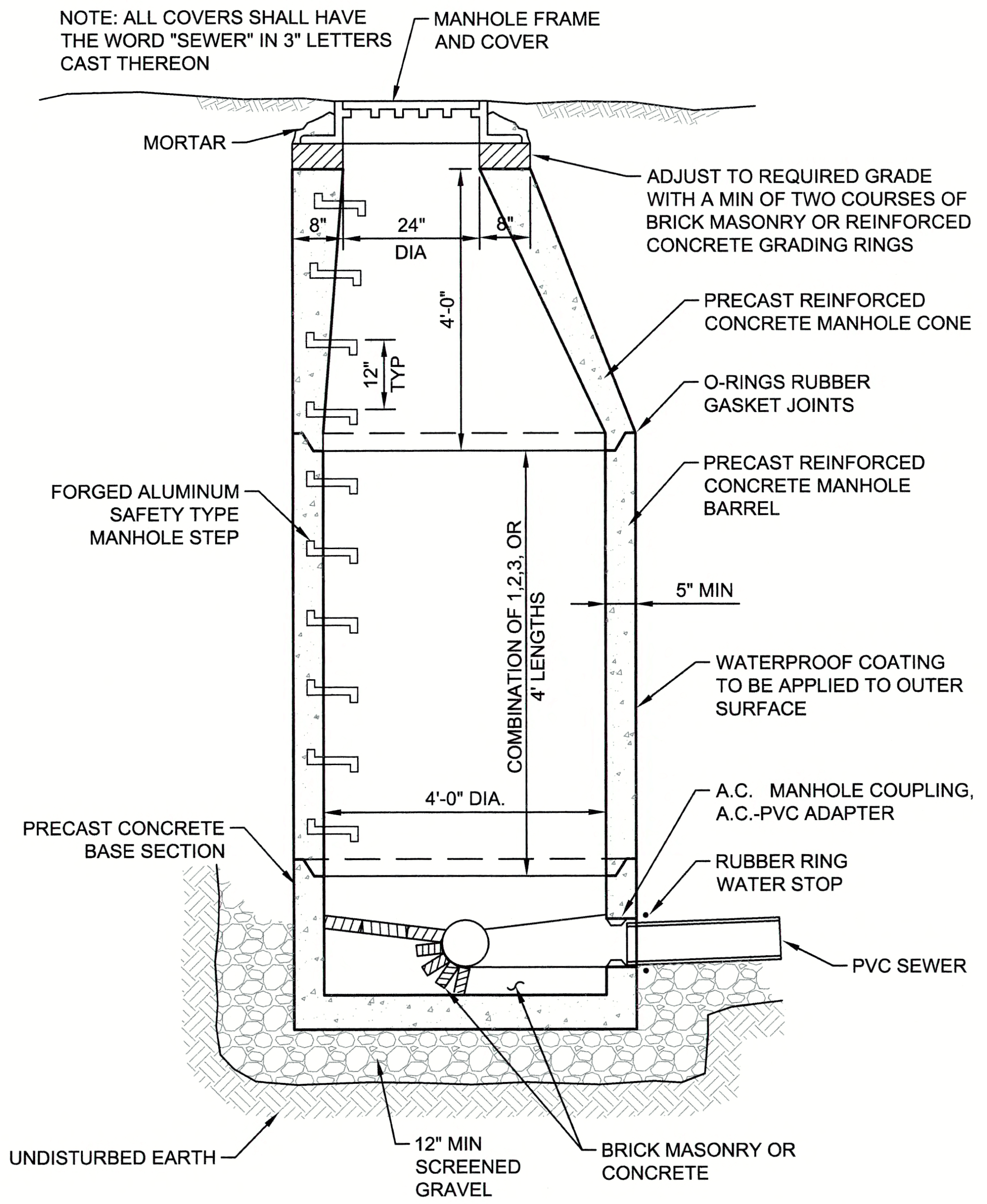


NOTES:

1. 5'-0" MIN COVER (TYP)
2. CONNECTION AND INSTALLATION OF WATER MAIN TO BE COORDINATED WITH TOWN OF NORWOOD WATER DEPARTMENT.

WATER MAIN TRENCH SECTION

NOT TO SCALE



PRECAST CONCRETE SEWER MANHOLE

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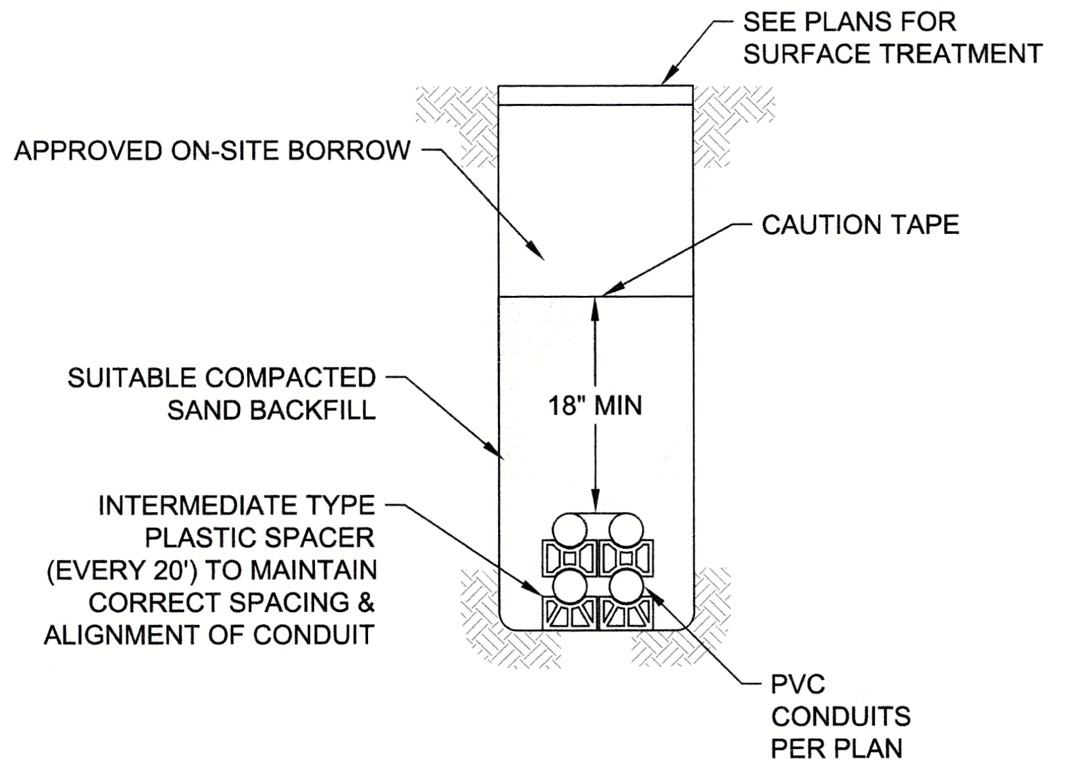
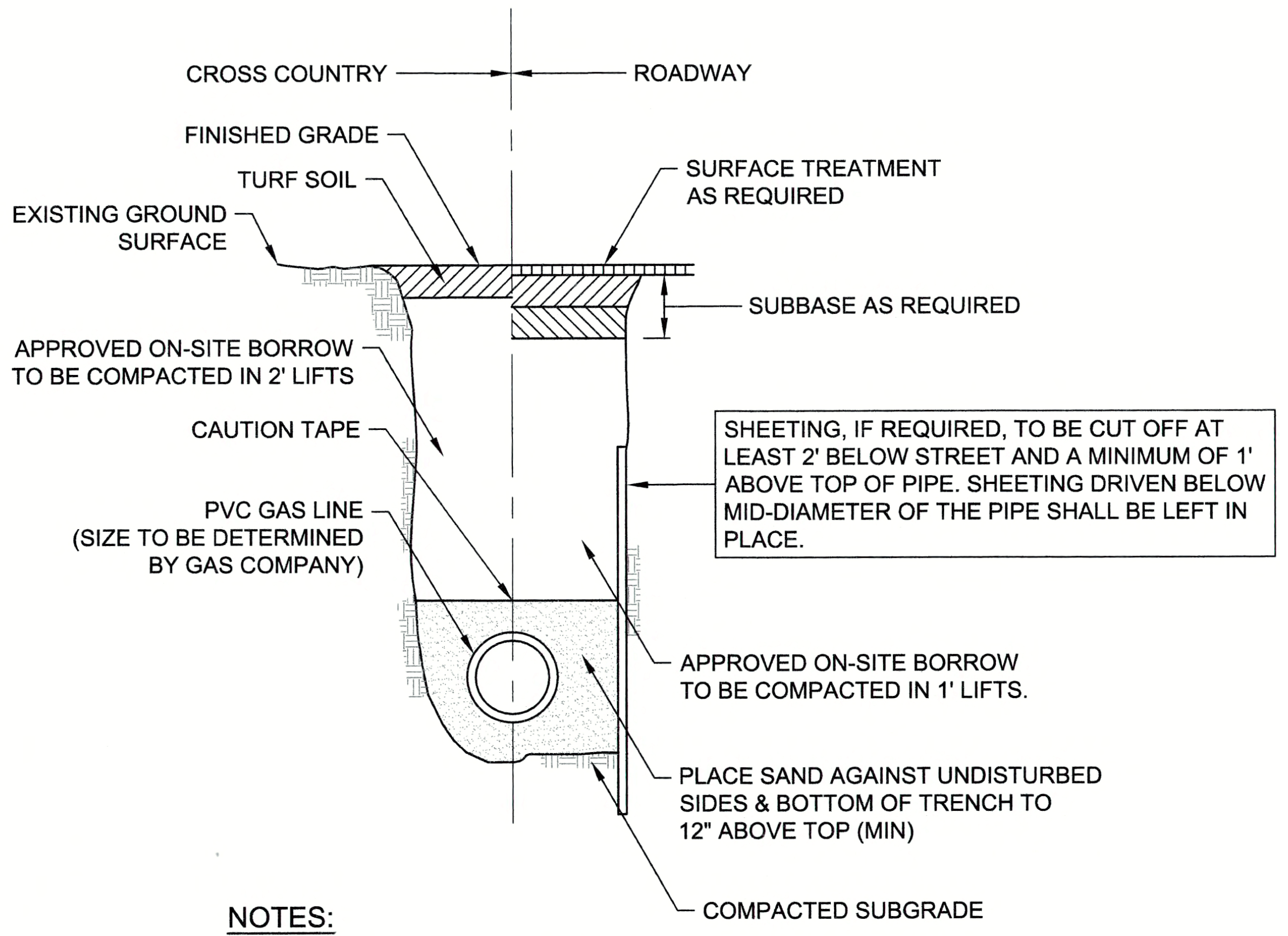


NOTES:

1. DIMENSIONS SHOWN ARE ARE TYPICAL DUCT BANK CONFIGURATIONS.
2. CONDUIT SHALL BE SCHED. 40 PVC, PROVIDED WITH PULLING WIRE ONLY - CABLE BY OTHERS. - SEE PLAN FOR CONDUIT SIZES AND LOCATIONS.
3. CONDUITS SHALL BE PLUGGED WITH PLASTIC CAPS. - PULLING WIRE SHALL BE THREADED THRU CAP AND SECURED ON OUTSIDE OF CAP.
4. INSTALL UTILITY CAUTION TAPE ABOVE ALL DUCT BANKS.

ELECTRICAL/TEL DATA TRENCH DETAIL

NOT TO SCALE



NOTES:

1. PROVIDE 30" MINIMUM COVER OVER GAS LINE.

GAS LINE TRENCH SECTION

NOT TO SCALE

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MARK	DATE	DESCRIPTION	BY
-	4/25/22	Special Permit and Site Plan Review	NRK

Hastings Street Plaza LLC

Hastings Street and Washington Street
Mendon, Massachusetts

Construction Details

(sheet 9 of 10)

PROJ: 143-305225-20004
DESN: MWM
DRWN: NRK
CHKD: SPR

C-509

Bar Measures 1 inch, otherwise drawing not to scale

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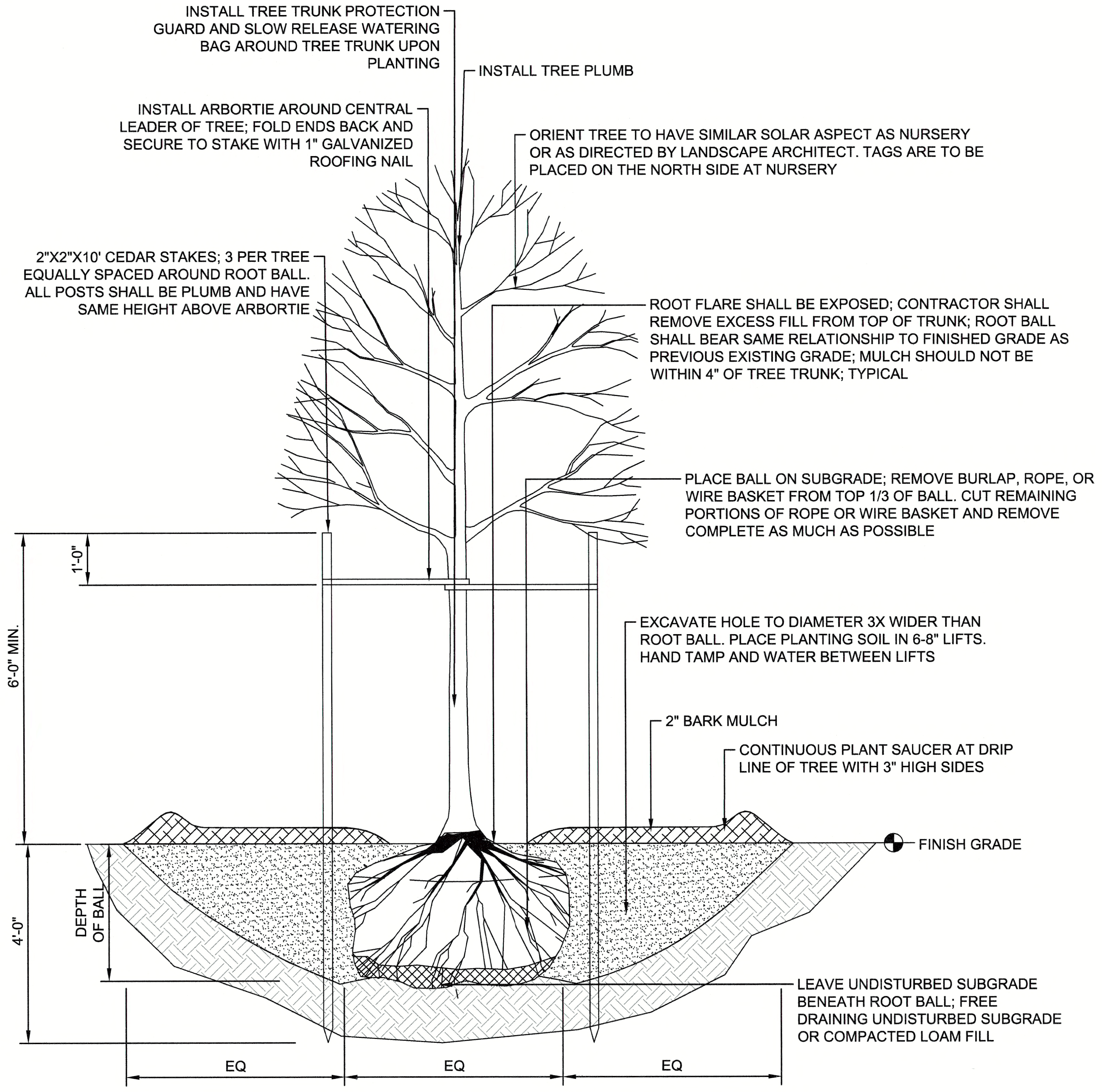
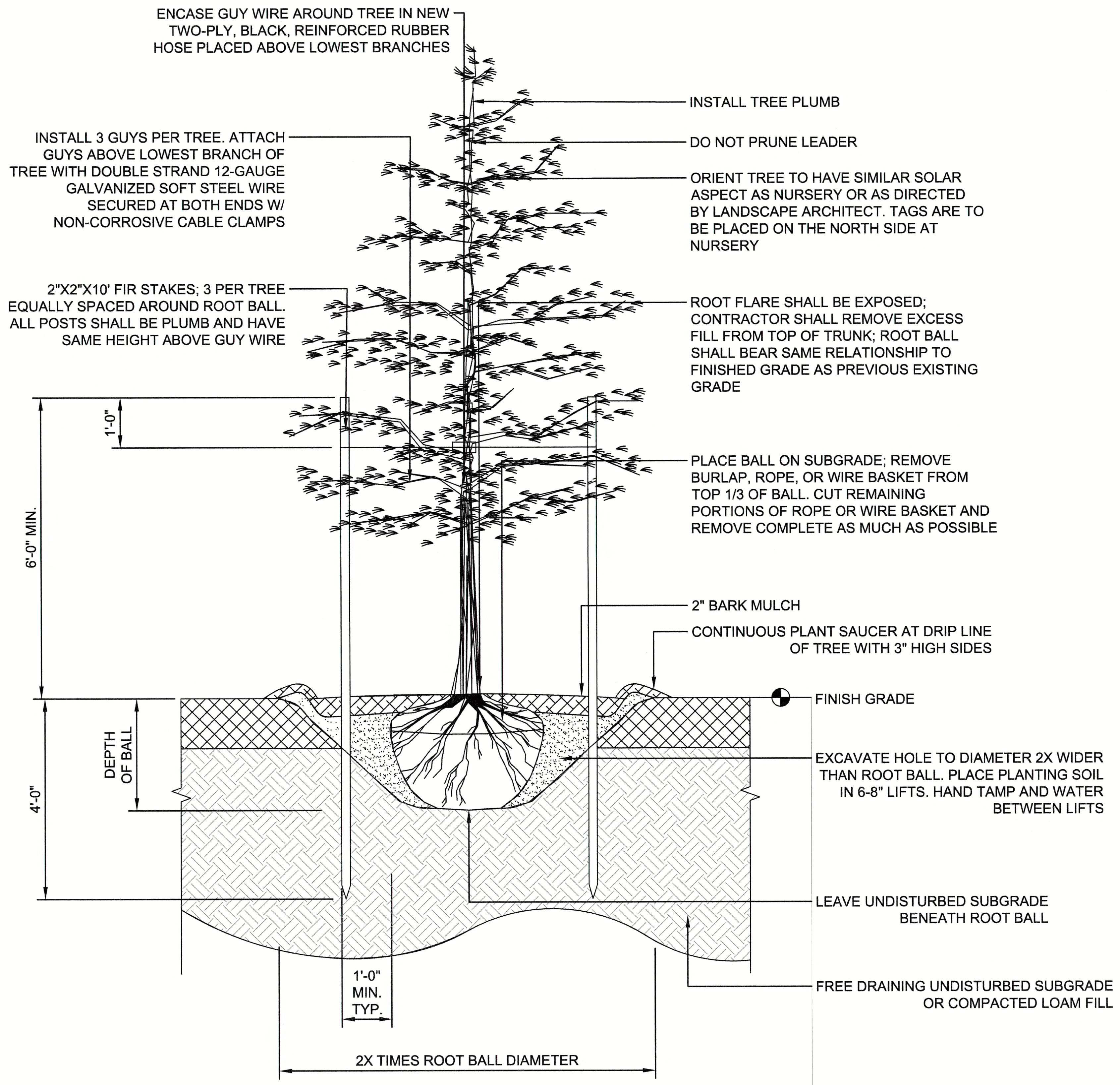


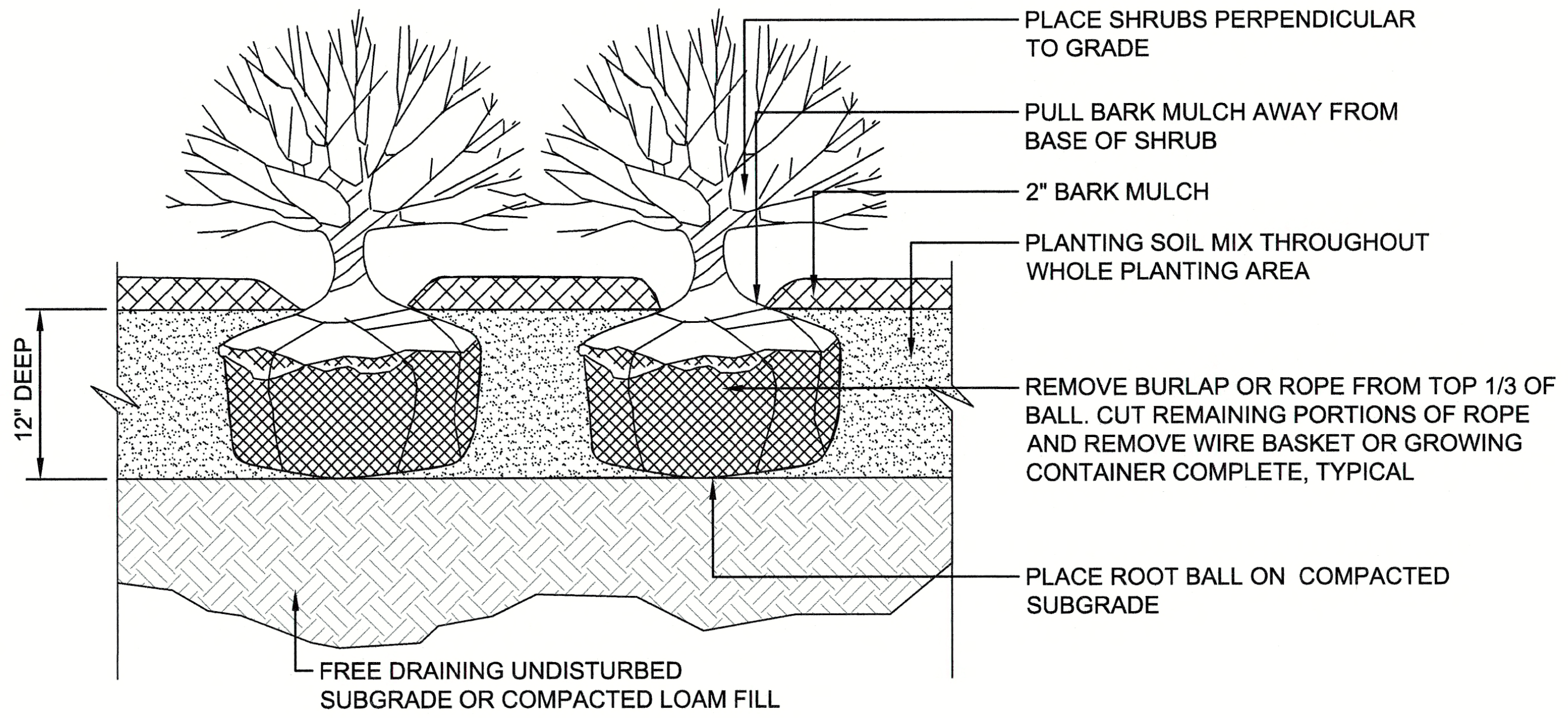
DECIDUOUS TREE PLANTING

NOT TO SCALE



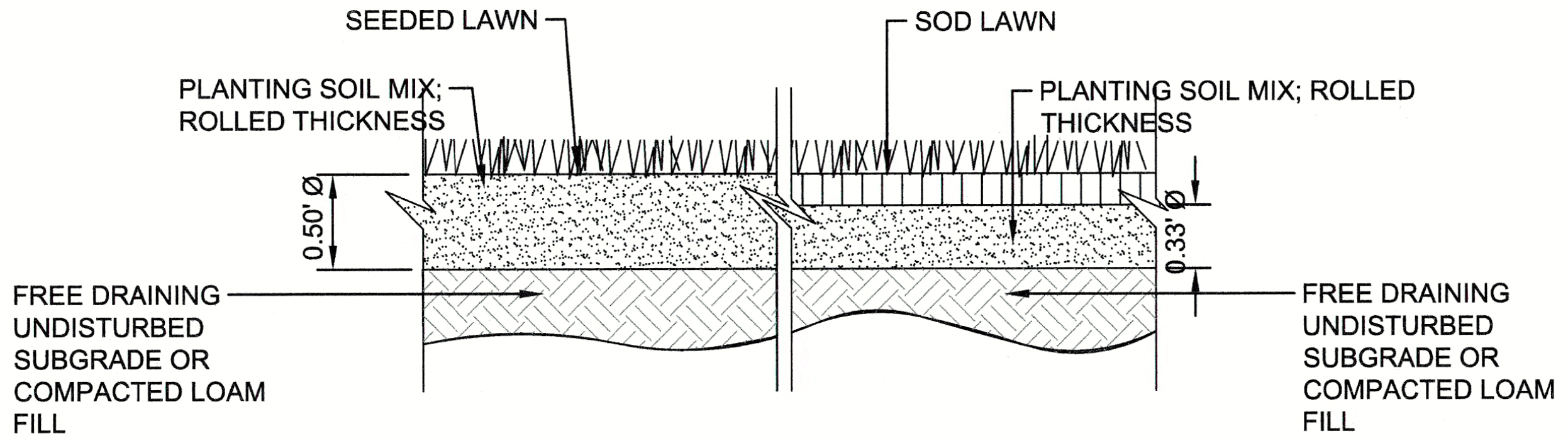
EVERGREEN TREE PLANTING

NOT TO SCALE



SHRUB PLANTING

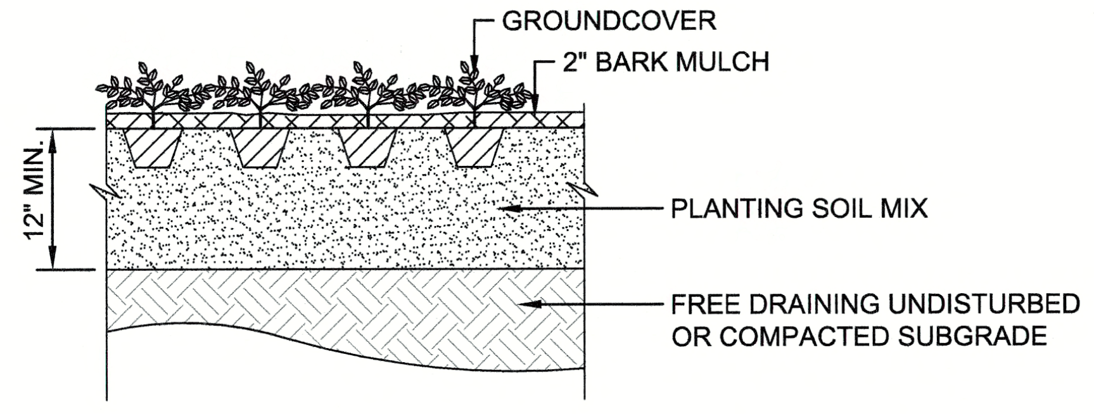
NOT TO SCALE



NOTE:
ALL DISTURBED AREAS SHALL BE LOAMED AND SEEDED UNLESS NOTED OTHERWISE

SEED/SOD LAWN PLANTING

NOT TO SCALE



PERENNIAL PLANTING

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NO. 41062

MARK	DATE	DESCRIPTION	BY
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Hastings Street Plaza LLC

Hastings Street and Washington Street
Mendon, Massachusetts

Construction Details
(sheet 10 of 10)

PROJ:	143-305225-20004
DESN:	MWM
DRWN:	NRK
CHKD:	SPR

C-510

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Appendix C

Architectural Elevations and Renderings

MAXIMUM HEIGHT OF TALLEST BUILDING ELEMENTS = <35'-0" ABOVE FINISHED GRADE

04/22/22

BUILDING HEIGHT
DIAGRAM

ScottGriffin ARCHITECTS

MAXIMUM HEIGHT OF TALLEST BUILDING ELEMENTS = <35'-0" ABOVE FINISHED GRADE

04/22/22

BUILDING HEIGHT
DIAGRAM

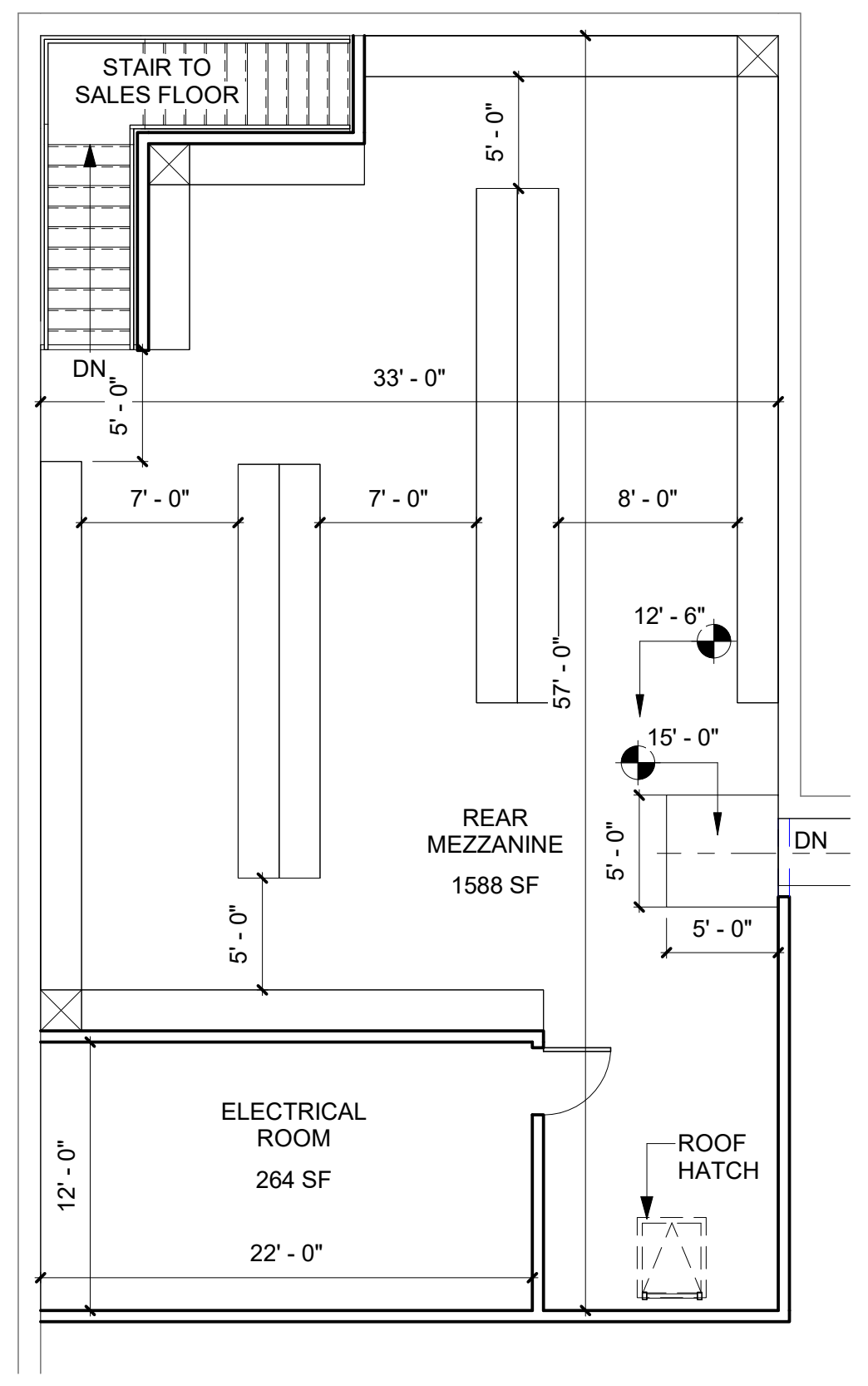
ScottGriffin
ARCHITECTS

MAXIMUM HEIGHT OF TALLEST BUILDING ELEMENTS = <35'-0" ABOVE FINISHED GRADE

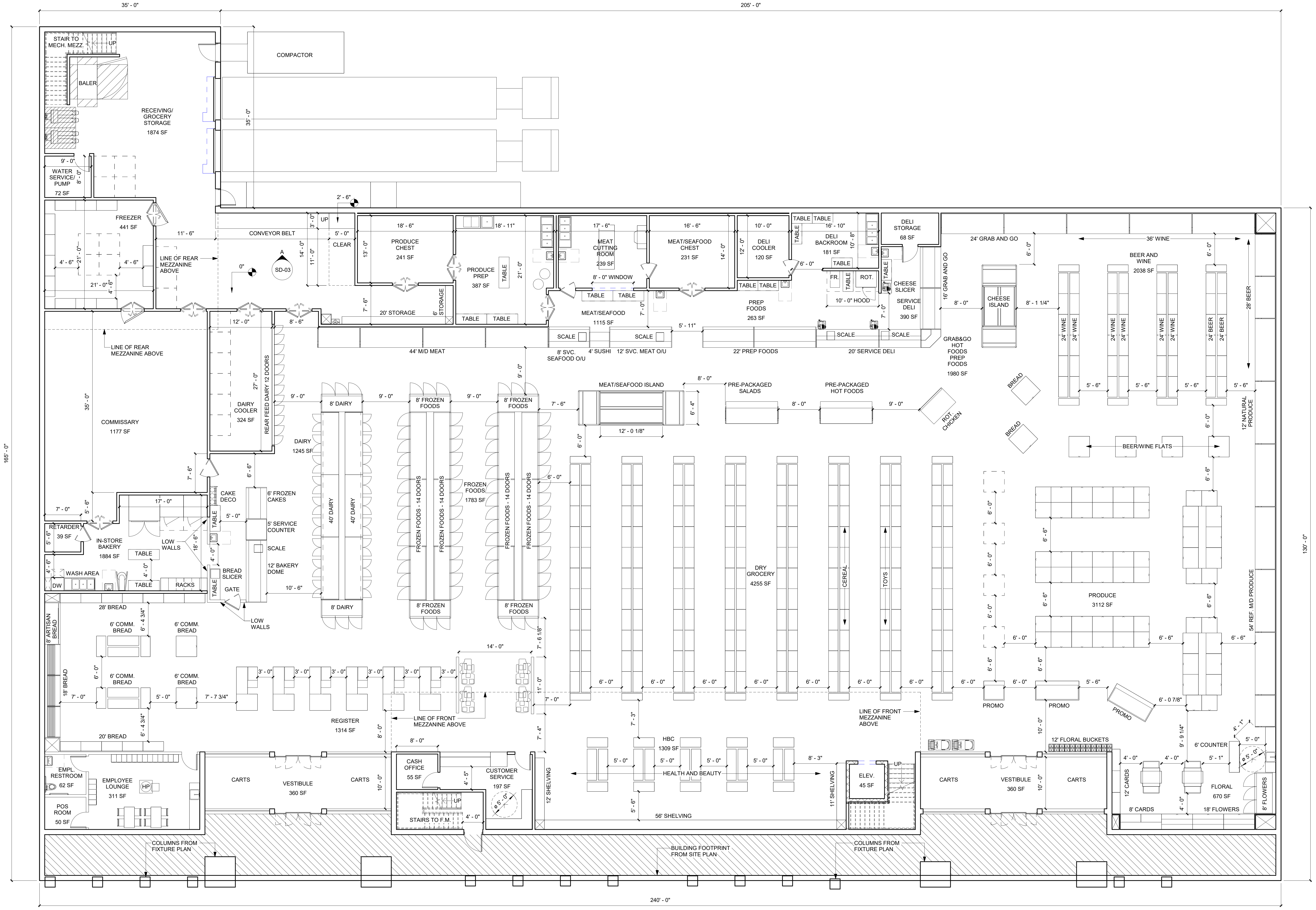
04/22/22

BUILDING HEIGHT
DIAGRAM

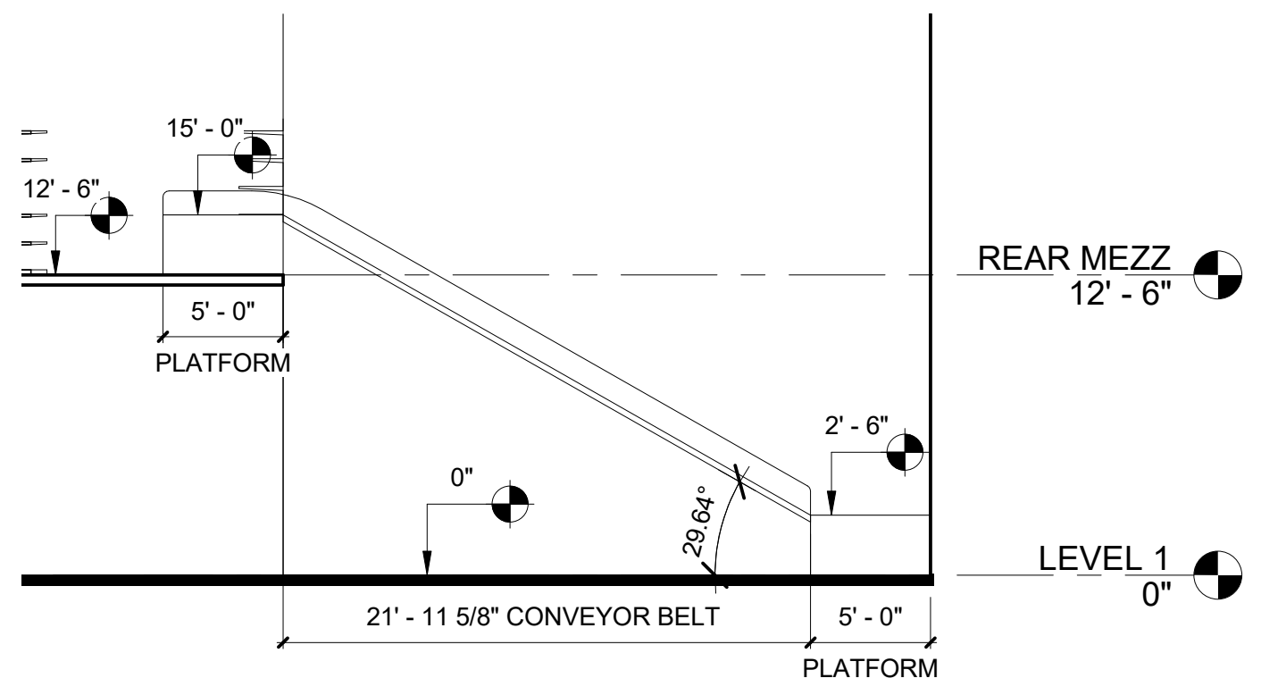
ScottGriffin
ARCHITECTS



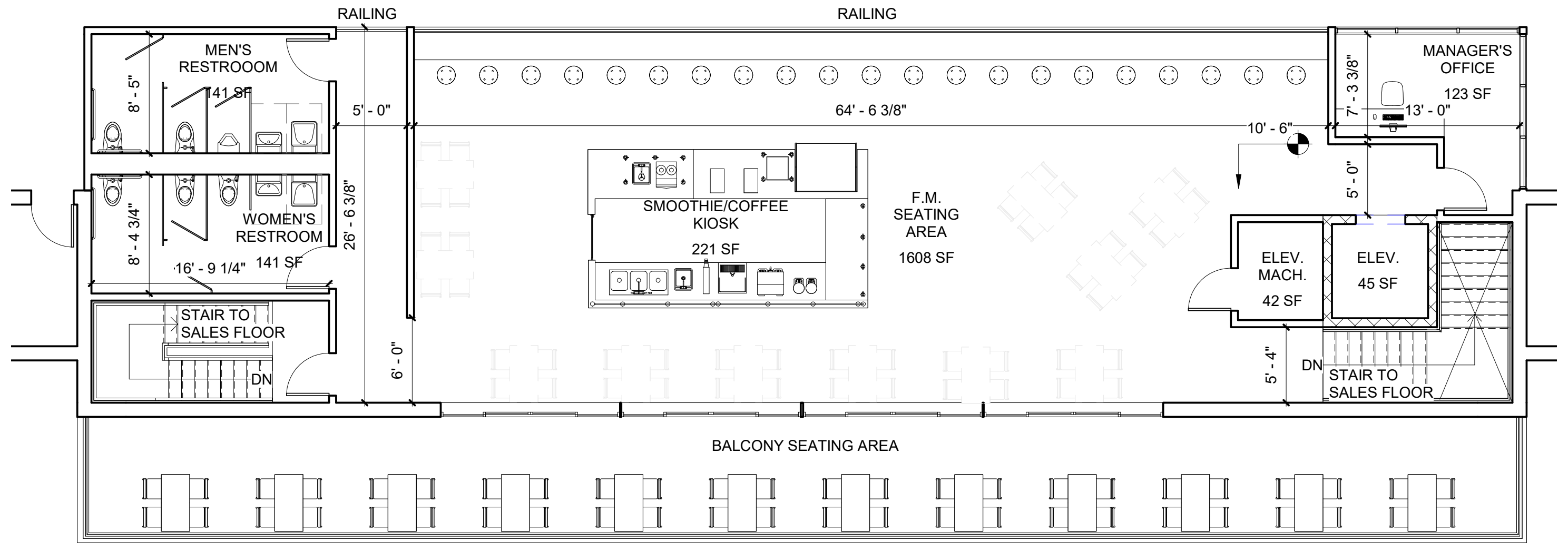
③ SCHEME 3 - REAR MEZZ
1/8" = 1'-0"



① SCHEME 3 - SALES FLOOR
1/8" = 1'-0"



Ⓐ CONVEYOR BELT DIAGRAM
1/8" = 1'-0"



② SCHEME 3 - FRONT MEZZANINE
1/8" = 1'-0"

LINEAR FOOTAGE

DRY GROCERY 768 LF
HBC 189 LF
PRODUCE 286 LF
BEER AND WINE 304 LF
FLORAL 70 LF
BAKERY 147 LF
DAIRY 120
FROZEN FOODS 176 (68 DOORS)
PREP FOODS/DELI/HOT FOODS 136
MEAT/SEAFOOD 104

TOTAL: 2,300 LF

ROOM SCHEDULE

NAME	AREA
DRY GROCERY	4255 SF
PRODUCE	3112 SF
BEER AND WINE	2038 SF
GRAB&GO HOT FOODS PREP FOODS	1980 SF
IN-STORE BAKERY	1884 SF
RECEIVING/ GROCERY STORAGE	1874 SF
FROZEN FOODS	1783 SF
F.M. SEATING AREA	1608 SF
REAR MEZZANINE	1588 SF
REGISTER	1314 SF
HBC	1309 SF
DAIRY	1245 SF
COMMISSARY	1177 SF
MEAT/SEAFOOD	1115 SF
FLORAL	670 SF
FREEZER	441 SF
SERVICE DELI	390 SF
PRODUCE PREP	387 SF
VESTIBULE	360 SF
VESTIBULE	360 SF
DAIRY COOLER	324 SF
EMPLOYEE LOUNGE	311 SF
ELECTRICAL ROOM	264 SF
PREP FOODS	263 SF
PRODUCE CHEST	241 SF
MEAT CUTTING ROOM	239 SF
MEAT/SEAFOOD CHEST	231 SF
SMOOTHIE/COFFEE KIOSK	221 SF
CUSTOMER SERVICE	197 SF
DELI BACKROOM	181 SF
MEN'S RESTROOOM	141 SF
WOMEN'S RESTROOM	141 SF
MANAGER'S OFFICE	123 SF
DELI COOLER	120 SF
WATER SERVICE/ PUMP	72 SF
DELI STORAGE	68 SF
EMPL. RESTROOM	62 SF
CASH OFFICE	55 SF
POS ROOM	50 SF
ELEV.	45 SF
ELEV.	45 SF
ELEV. MACH.	42 SF
RETARDER	39 SF

Field verification of existing conditions is the responsibility of the General Contractor. Where new work abuts existing construction, the General Contractor shall take care to verify that all existing and proposed conditions are coordinated and field verified. Where new work is intended to align with existing conditions, the General Contractor shall ensure that existing conditions are field verified to ensure proper alignment. Objects depicted on the drawings as *"existing"* shall be field verified by the General Contractor to ensure accuracy. The General Contractor shall bring discrepancies to the attention of the Owner and Architect for resolution before continuing with the work. Shop drawings must be field verified by each sub-contractor or the General Contractor as required for complete coordination. The Architect will only review shop drawings that have been: 1. Reviewed by the General Contractor, 2. Drawn to reflect field verified conditions, and 3. Stamped with the General Contractor's approval verifying such review, field verification, and coordination.

Revision Schedule

#	Description	Date

STAMP

ScottGriffin
ARCHITECTS
880 Main Street, Fifth Floor
Waltham, Massachusetts 02451
Phone (781) 693-7400 Fax (781) 693-7350

HASTINGS STREET PLAZA

35-37 HASTINGS ST
MENDON, MA

SCHEMATIC FLOOR PLAN 3 - ALTERNATE 1

DATE	04/21/2022
DRAWN BY	VG
CHECKED BY	NN/TS
PROJECT NUMBER	22040.00
SCALE	As indicated

SD-03

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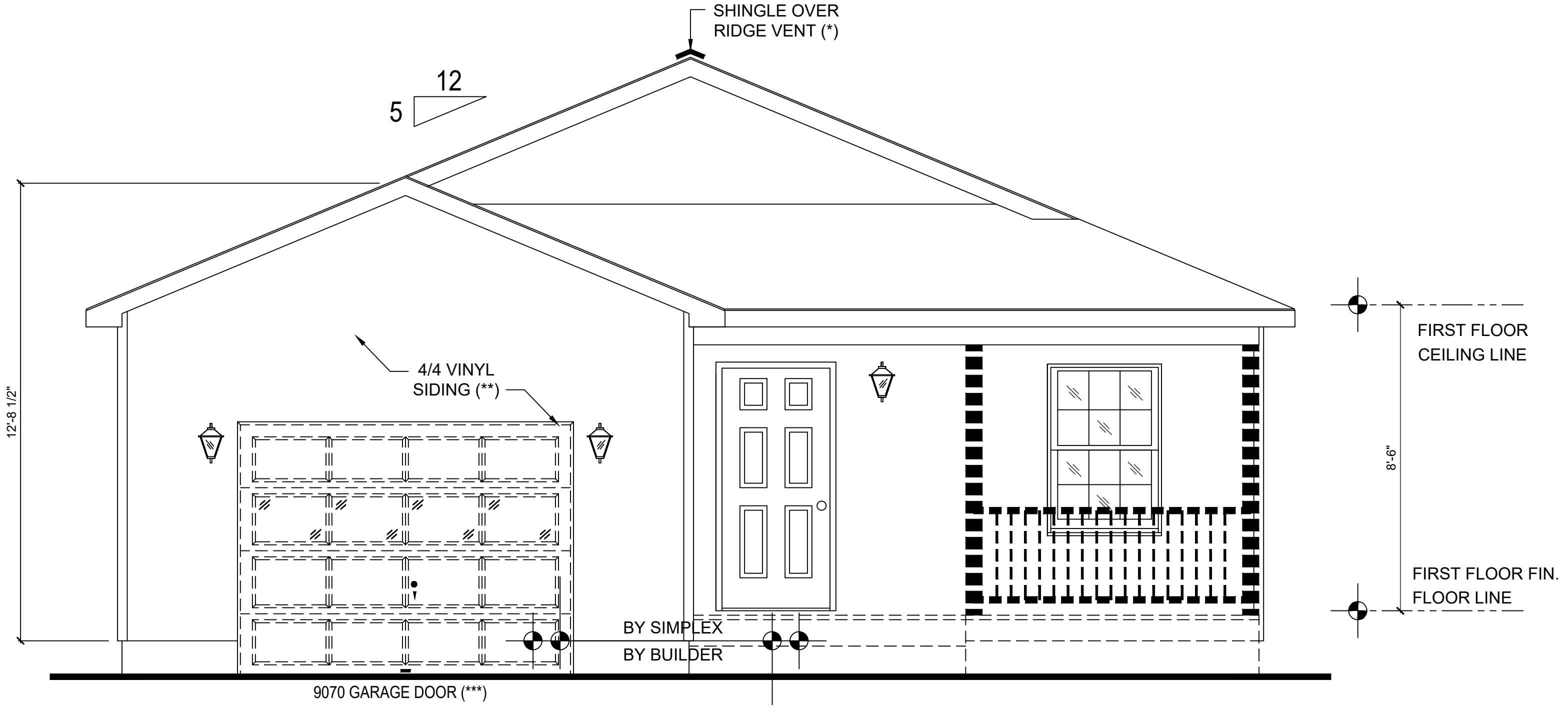

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No.	DATE	DESCRIPTION	APPROVED
6.	A	A	A
5.	A	A	A
4.	A	A	A
3.	A	A	A
2.	A	A	A
	A	----	A

REVISIONS

CUSTOMER:
ARDMORE
WASHINGTON STREET
MENDON, MA

BUILDER:
MODULAR BUILDING SYSTEMS INC
P.O. BOX 432
ADAMS, MA 01220

DRAWING TITLE:
BUILDING ELEVATIONS

REGISTERED ARCHITECT / PE STAMP

Eng. No:	22-0208
Eng. Date:	03/04/22
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DRAWING BY:	SDD
CHECKED BY:	A
DRAWING No.	2.0
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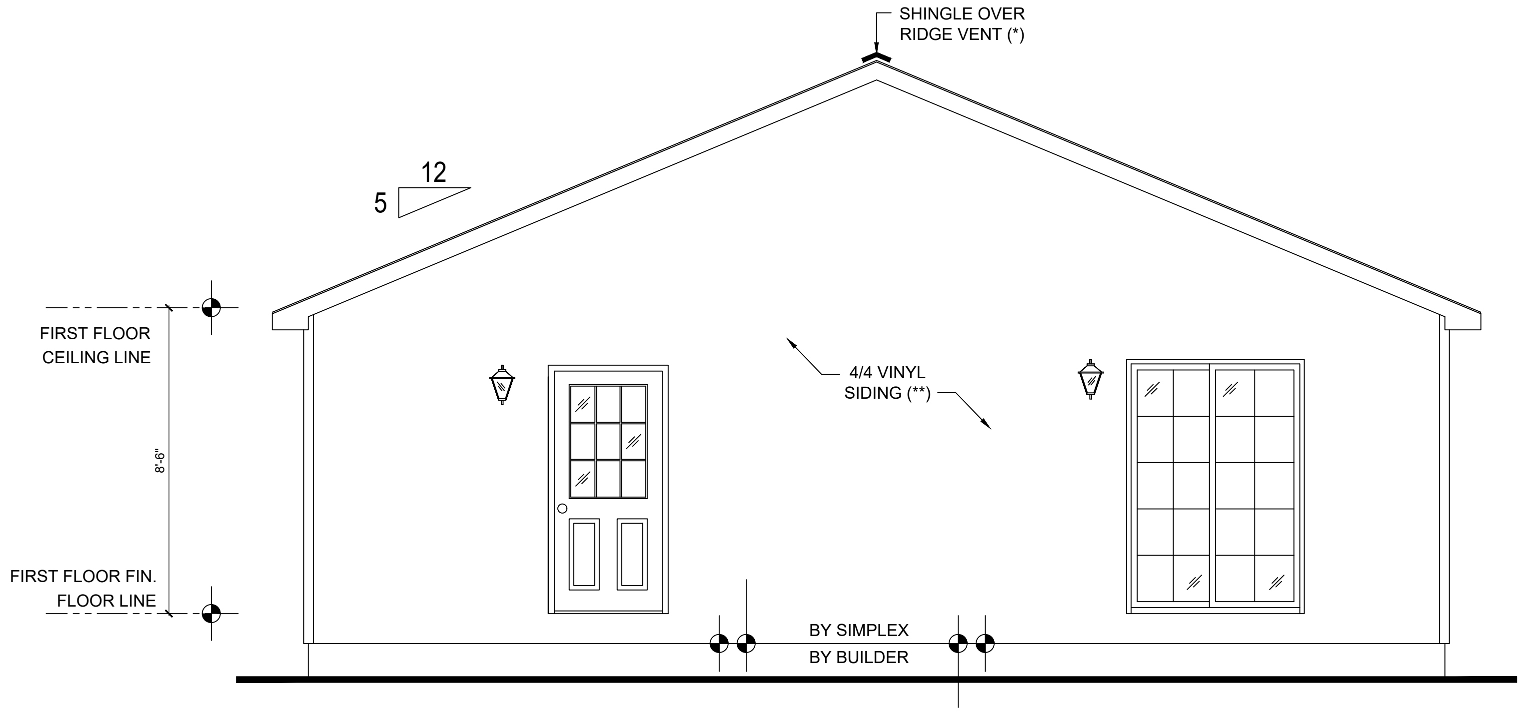

REAR ELEVATION

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DUE TO MOISTURE CONTENT OF WOOD. SOME SHRINKAGE MAY OCCUR IN THE FACE WIDTH OF THE LUMBER DUE TO NATURAL LUMBER SEASONING PROCESS AND MAY EFFECT THE EXTERIOR FINISH APPLICATION. EXTERIOR FINISH INSTALLED SHOULD CONSULT THE EXTERIOR FINISH MATERIAL MANUFACTURER FOR RECOMMENDED INSTALLATION INSTRUCTIONS TO ACCOUNT FOR POSSIBLE WOOD SHRINKAGE.

REVISIONS

No.	DATE	DESCRIPTION	APPROVED
6.	A	A	A
5.	A	A	A
4.	A	A	A
3.	A	A	A
2.	A	A	A
1.	A	----	A

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Eng. No:	22-0208
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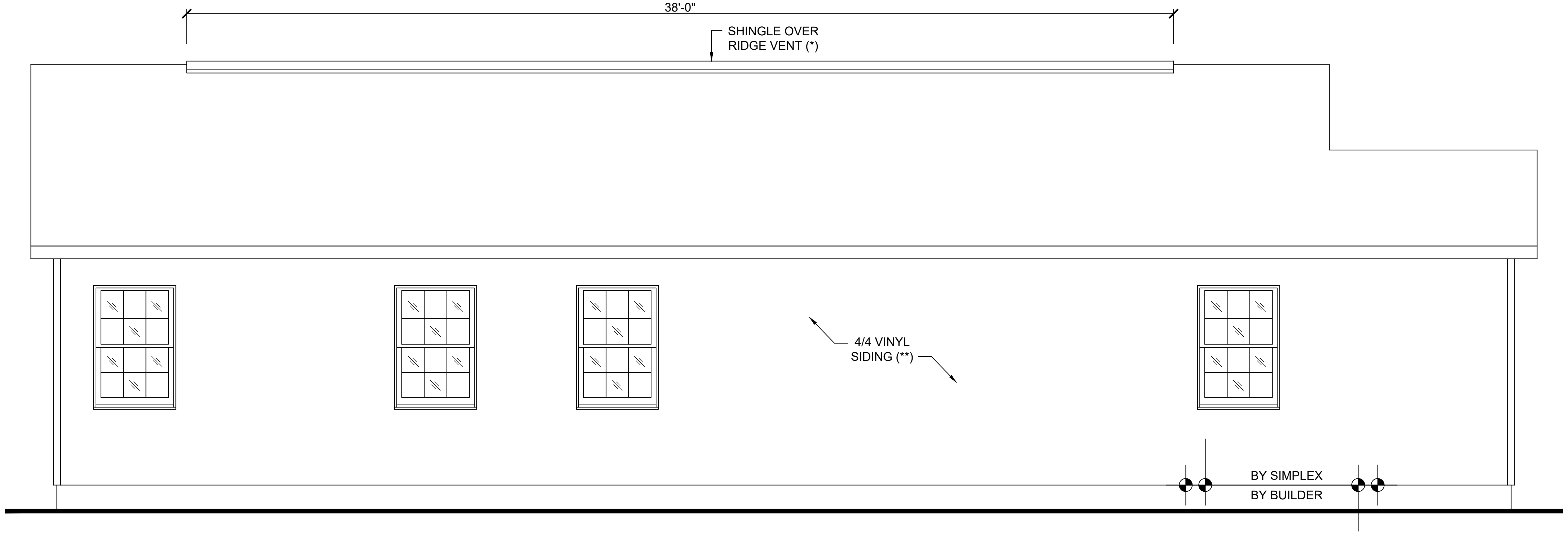

LEFT ELEVATION

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No.	DATE	DESCRIPTION	APPROVED
6.	A	A	A
5.	A	A	A
4.	A	A	A
3.	A	A	A
2.	A	A	A
1.	A	----	A

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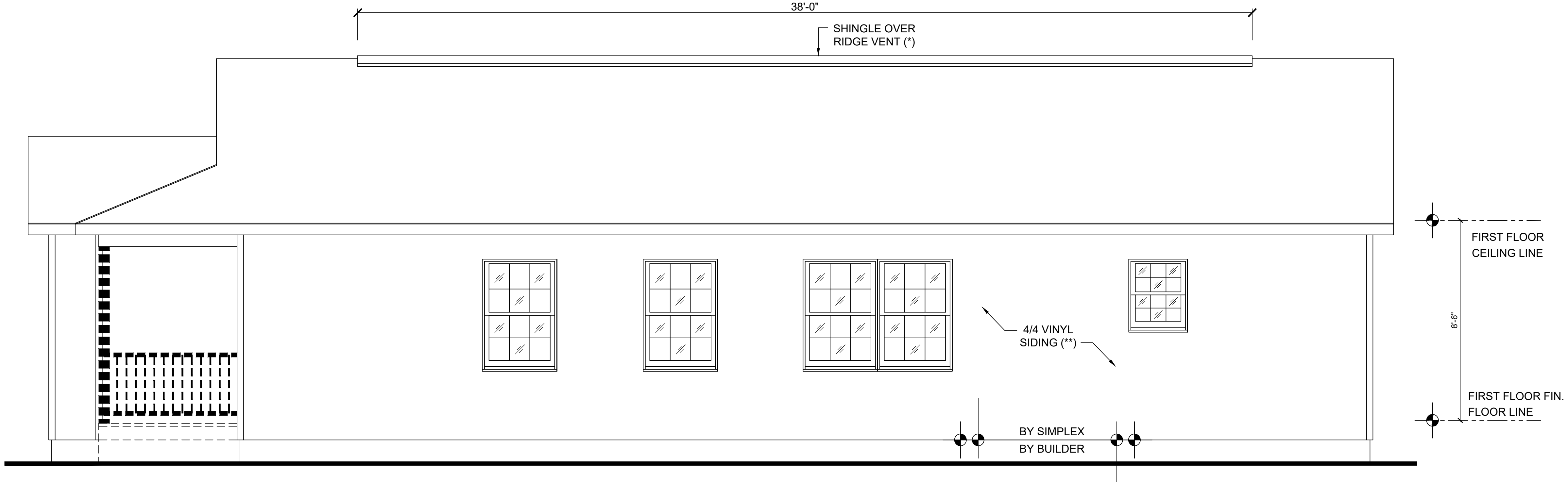

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6.	A	A	A
5.	A	A	A
4.	A	A	A
3.	A	A	A
2.	A	A	A
1.	A	----	A

REVISIONS

CUSTOMER:
ARDMORE
WASHINGTON STREET
MENDON, MA

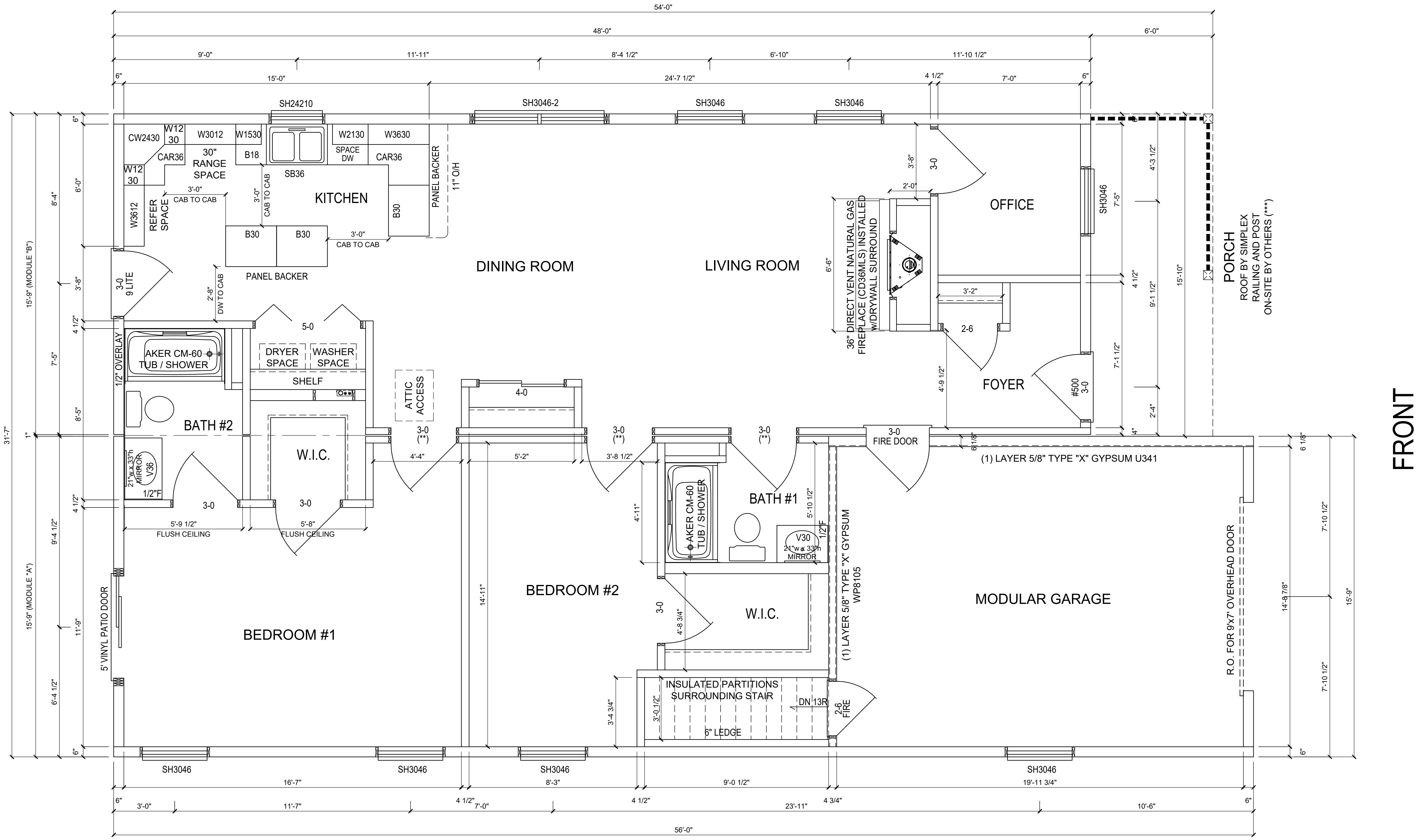
BUILDER:
MODULAR BUILDING SYSTEMS, INC
P.O. BOX 432
ADAMS, MA 01220

DRAWING TITLE:
BUILDING ELEVATIONS

REGISTERED ARCHITECT / PE STAMP

Eng. No:	22-0208
Eng. Date:	03/04/22
SERIAL No:	0000
DRAWING BY:	SDD
CHECKED BY:	A
DRAWING No.	2.3
SCALE:	3/16" = 1'-0"

PERMIT SET ONLY



GENERAL NOTES:

8'-6" CEILING HEIGHT

WINDOWS HEADER HEIGHT @ 6'-10 1/4" UNLESS NOTED OTHERWISE

7-D SERIES SINGLE HUNG WINDOWS w/COLONIAL GRILLES

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REVISIONS

No.	DATE	DESCRIPTION	APPROVED
6.	A	A	A
5.	A	A	A
4.	A	A	A
3.	A	A	A
2.	A	A	A
	A	----	A

CUSTOMER:
ARDMORE
WASHINGTON STREET
MENDON, MA

BUILDER:
MODULAR BUILDING SYSTEMS, INC
P.O. BOX 432
ADAMS, MA 01220

DRAWING TITLE:

1st. FLOOR PLAN

REGISTERED ARCHITECT / PE STAMP

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Eng. Date:	03/04/22
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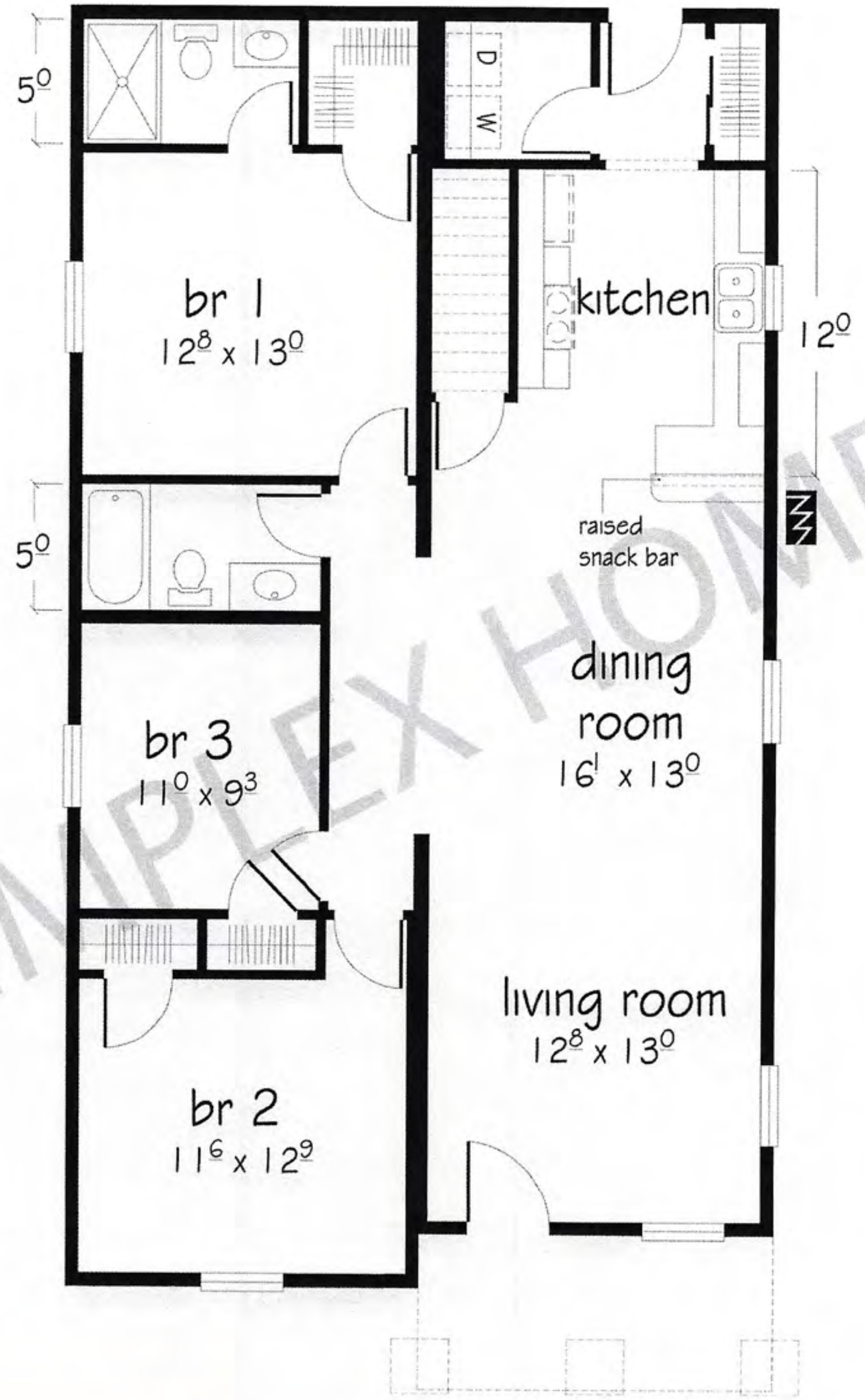
DRAWING BY:	SDD
CHECKED BY:	A
DRAWING No.	3.0
SCALE:	3/16" = 1'-0"

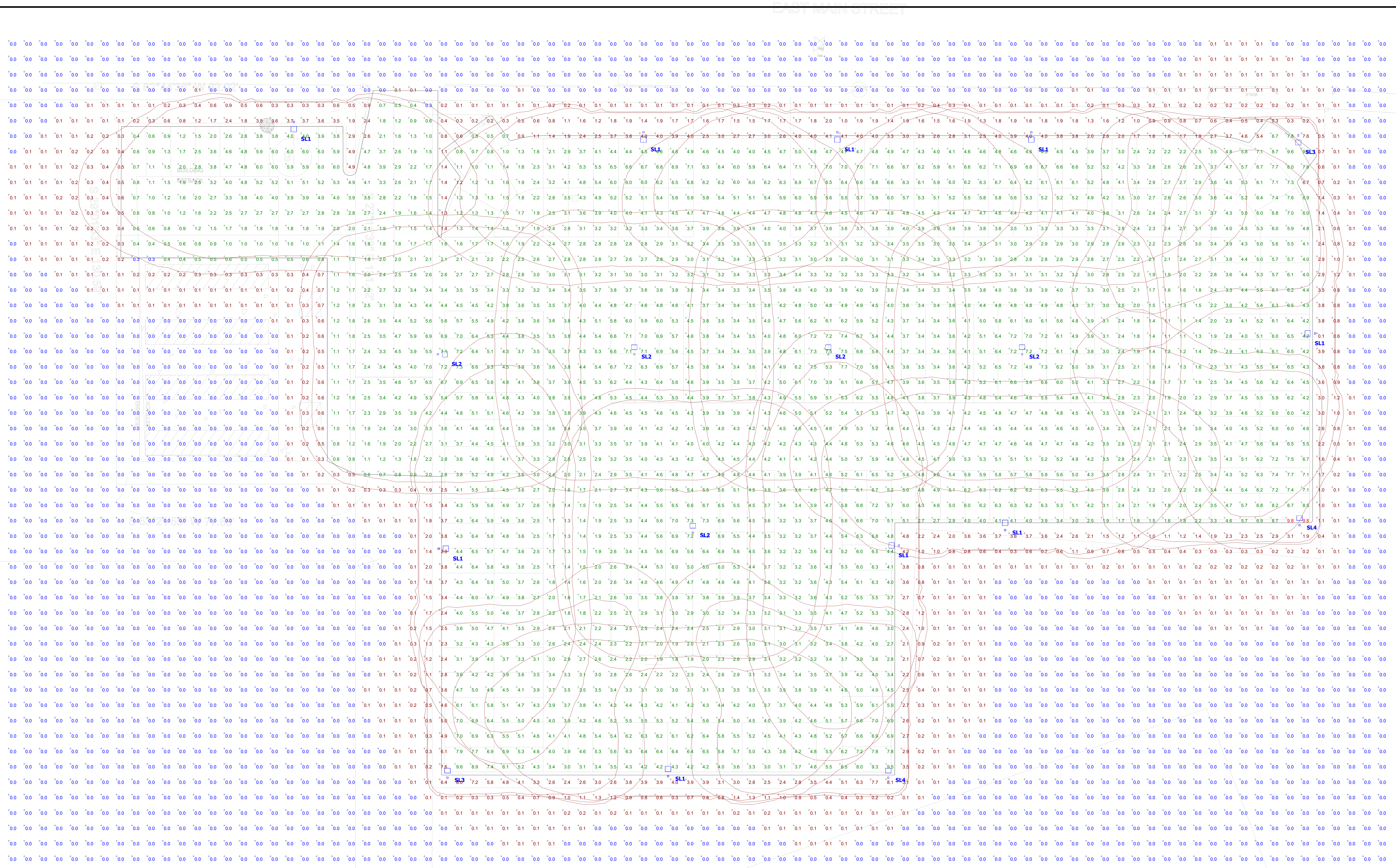
The Ardmore



Ardmore floor plan 27⁶ x 50⁰ / 48⁰ 1344 sq. ft.

Appendix D

Site Lighting Photometric Plan



Plan View

Scale - 1" = 12ft

SCHEDULE

Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Light Loss Factor	Wattage
☐ ▫	SL1	9	Lithonia Lighting	DSX1 LED P6 30K BLC VOLTAGE MOUNTING XX XX FINISH	D-Series Size 1	0.9	163
☐ ▫	SL2	5	Lithonia Lighting	DSX1 LED P6 30K T5S VOLTAGE MOUNTING XX XX FINISH	D-Series Size 1	0.9	163
☐ ▫	SL3	2	Lithonia Lighting	DSX1 LED P6 30K LCCO VOLTAGE MOUNTING XX XX FINISH	D-Series Size 1	0.9	163
☐ ▫	SL4	2	Lithonia Lighting	DSX1 LED P6 30K RCCO VOLTAGE MOUNTING XX XX FINISH	D-Series Size 1	0.9	163

STATISTICS

DESCRIPTION	SYMBOL	AVG.	MAX	MIN.	MAX/MIN	AVG/MIN
Boundary	+	1.9 fc	9.8 fc	0.0 fc	N/A	N/A
Lot	+	4.0 fc	9.8 fc	0.3 fc	32.7:1	13.3:1

NOTES:

-REFLECTANCES ASSUMED:
GROUND: 20

- MOUNTING HEIGHTS: 20'-0" AFG

- TASK HEIGHT: AFG
- CALCULATION POINT SPACING: 5'X5' OC

DISCLAIMER:

-THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES ONLY AND ARE NOT INTENDED FOR CONSTRUCTION. VALUES REPRESENTED ARE AN APPROXIMATION GENERATED FROM MANUFACTURERS PHOTOMETRIC IN-HOUSE OR INDEPENDANT LAB TEST WITH DATA SUPPLIED BY LAMP MANUFACTURERS.

149 East Main Street
04-25-2022

Designer
Benjamin P. Rowe
Date
04/25/2022
Scale
Not to Scale
Drawing No.

Job No.

Appendix E

Traffic Impact and Access Study

Traffic Impact and Access Study

Hastings Street Plaza
Mendon, Massachusetts

Prepared for:

Hastings Street Plaza, LLC
PO Box 444
Mendon, MA 01756

Prepared by:

Tetra Tech, Inc.
100 Nickerson Road
Marlborough, MA 01752

TETRA TECH

April 2022

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(Technical Appendices Available Upon Request)

EXECUTIVE SUMMARY

Tetra Tech has reviewed the potential traffic impacts associated with the proposed redevelopment of 35-37 Hastings Street and 18-20 Washington Street in Mendon, Massachusetts. The project site consists of four parcels of land which currently support a driving range, former restaurant, and two single family homes. The proposed project calls for the demolition of the existing commercial buildings on site and one of the existing single family homes, to support the construction of a 66,600 square foot shopping center and 26 new single family homes. The existing home at 12 (also known as 18) Washington Street will remain and be incorporated into the proposed residential development. The anticipated parking demands associated with the proposed shopping center will be accommodated in a surface parking lot providing approximately 234 parking spaces and individual driveways with garages for each of the proposed single family homes.

Access to the project site is currently provided by two commercial site driveways located on the north side of Hastings Street and two residential driveways on the west side of Washington Street. The westerly commercial site driveway will be relocated approximately 100 feet to the west (directly across from Millville Street) to form the fourth leg to the intersection with Route 16 (Hastings Street/Uxbridge Road) and Millville Street. As part of the proposed project, the intersection will be reconstructed to provide a modern multilane roundabout. The easterly commercial site driveway will be relocated approximately 50 feet further east (along the eastern edge of the project site) to provide secondary, delivery vehicle only access for the shopping center. Access to the proposed residential portion of the development will be provided by two new driveways along the west side of Washington Street.

Independent of the proposed mixed-use development, the Route 16 corridor through the Town of Mendon is slated for reconstruction as part of MassDOT project No. 608491. The MassDOT project is currently at the 25% design stage and would include geometric and traffic control improvements along the corridor. For the purpose of this study, the currently proposed MassDOT improvements were considered in the evaluation of future traffic operations. The proposed site access improvements for the mixed-use development, including the multi-lane roundabout at Hastings Street/Uxbridge Road, Millville Street and the shopping center driveway, were developed to be compatible with the planned MassDOT improvements.

A summary of the study methodology and key findings is presented below.

Study Methodology

The study evaluates existing and future traffic operations (with and without the proposed project) at the project site driveways and key study intersections identified in consultation with the Massachusetts Department of Transportation (MassDOT). The study provides a detailed analysis of intersection capacity during the weekday morning, weekday evening, and Saturday midday peak hours, when the combination of existing traffic on the surrounding area roadways and new traffic associated with the proposed development would be greatest.

Due to significant changes in traffic volumes resulting from the ongoing COVID-19 pandemic, the 2021 Existing weekday morning and weekday evening peak hour traffic volumes at the study area intersections were established based on historic traffic counts collected in April 2018. The 2018 traffic counts were increased by the MassDOT annual growth rates to reflect the 2021 Existing weekday morning, weekday evening, and Saturday midday peak hour volumes. The 2021 Existing peak hour traffic volumes were then projected to the future design year of 2028, by which time the proposed project is expected to be built and occupied. The 2021 Existing traffic volumes were grown by 0.5 percent per year for the seven-year forecast period (2021 to 2028) and the traffic volumes adjusted to reflect the 2028 No Build (Without Project) conditions. The traffic increases associated with the currently proposed project were then added to the 2028 No Build peak hour traffic volumes to reflect the future 2028 Build (With Project) conditions.

The construction of the planned MassDOT Route 16 improvement project will also impact future traffic operations along Route 16 directly adjacent to the project site. For the purposes of this study, it is assumed that the MassDOT Route 16 project will be completed by the future design year of 2028.

Intersection capacity analyses were then conducted for each of the study intersections for the 2021 Existing, 2028 No Build (Without Project) and 2028 Build (With Project) weekday morning, weekday evening, and Saturday midday peak hour traffic volumes to identify existing and projected traffic deficiencies near the project site.

Crash Analysis

Crash data for the study area intersections were obtained from the MassDOT crash database for the three-year period, 2016 through 2018. The MassDOT Crash Rate Worksheets were then used to determine if the crash frequency at the study intersections was unusually high given the existing travel demands. The MassDOT Crash Rate Worksheet calculates the intersection crash rate expressed in crashes per million entering vehicles. The crash rates calculated for each intersection were then compared to the statewide and MassDOT District 3 averages.

The crash rates indicate that most of the intersections along Hastings Street are currently above the statewide and MassDOT District 3 average crash rates. However, all of the study intersections along Hastings Street are slated for reconstruction as part of the Route 16 improvement project (MassDOT project no. 608491). It is anticipated that the geometric and traffic control modifications to be implemented as part of the MassDOT project will generally improve traffic safety along the corridor.

Future Site-Generated Traffic – Proposed Shopping Center and Residential

Vehicle trip generation estimates for the currently proposed 66,600 square foot shopping center and 26 new single family homes were developed based on data presented in the Institute of Transportation Engineers' (ITE) publication *Trip Generation Manual, 10th Edition* for the closest available land uses (Land Use 210 – Single Family Detached Housing and Land Use 820 – Shopping Center). The ITE data indicates that proposed development is expected to generate approximately 208 vehicle trips (121 entering trips and 87 exiting trips) during the weekday morning peak hour, 430 vehicle trips (211 entering trips and 219 exiting trips) during the weekday evening peak, and 489 vehicle trips (255 entering trips and 234 exiting trips) during the Saturday midday peak hour.

Not all project trips associated with the shopping center component of the project will represent new trips on the surrounding area roadways. It is anticipated that a significant portion of the shopping center traffic will be pass-by trips drawn from existing traffic already traveling past the site.

Project Trip Distribution Patterns

The project vehicle trips were distributed to the surrounding roadway network via separate arrival and departure patterns for the shopping center and residential portion of the project. The shopping center trip distribution patterns were developed based on a population based gravity model for the anticipated market draw area for the shopping center in consideration of competing shopping opportunities in the surrounding communities. The residential project trip distribution patterns were developed based on the latest US census journey to work data for home based trips in the Town of Mendon.

Intersection Capacity Analysis

To quantify potential traffic impacts associated with the proposed development, Tetra Tech conducted intersection capacity analyses at key intersections near the project site for the 2021 Existing, 2028 No Build (Without Project), and 2028 Build (With Project) weekday morning, weekday evening, and Saturday midday peak hour traffic conditions.

The capacity analyses indicate the unsignalized intersections of Route 16 with Hartford Avenue West, Millville Street, Emerson Street/Washington Street, and Maple Street all have at least one intersection approach that operates at or above capacity with long delays during one or more of the peak hours evaluated in this study. The planned MassDOT Route 16 improvement project will include geometric and/or traffic control improvements at each of the study area intersections which are expected to improve future traffic operations.

The planned MassDOT Route 16 improvement project includes new traffic signals at the intersections of Route 16 and Hartford Avenue West and Route 16 and Maple Street, which are expected to improve traffic operations to overall LOS C or better during all peak hours. With the addition of project traffic, these intersections will continue to operate at overall LOS C or better.

The planned MassDOT Route 16 improvement project also includes minor geometric modifications at the Hastings Street intersection with Millville Street. However, even with the currently planned MassDOT improvements, the Millville Street northbound approach is expected to operate above capacity (LOS F) during the future 2028 No Build (without Project) peak hour condition. As part of the currently proposed mixed-use development project, a multilane roundabout is proposed to provide primary access to the shopping center and improve operations on the Millville Street approach relative to the No Build (Without Project) conditions. The roundabout is expected to operate at overall LOS B or better during all peak hours with all lane groups operating at LOS C or better with the exception of the Millville Street northbound approach which is expected to operate at LOS E during the weekday morning peak hour.

The planned MassDOT Route 16 improvement project also includes minor geometric and traffic control improvements at the intersection of Hastings Street and Emerson Street/Washington Street. These include dedicated left-turn lanes on the Hastings Street eastbound and westbound approaches and left-turn and through movement restrictions on the Emerson Road northbound approach. However, even with the currently planned MassDOT Route 16 improvements, the intersection is expected to continue to operate at LOS F on the southbound approach during all three peak hours in the future, with or without the proposed project traffic.

One potential improvement that could improve operations on the Washington Street approach to Hastings Street is to implement a turn restriction (restrict left turns onto Hastings Street and through movements onto Emerson Street), similar to what is proposed on the Emerson Street northbound approach as part of MassDOT project no. 608491. The addition of the site access roundabout would allow for vehicles turning right out of Washington Street to reverse direction at the roundabout to make the intended movements onto Hastings Street eastbound and should help reduce delays for the Washington Street southbound approach.

The capacity analysis indicates the intersection of Hastings Street with North Avenue/Main Street operates at overall LOS C or better under existing conditions, although some lane groups operate at LOS E or F during the peak hours. Signal modifications are proposed at the Hastings Street intersection with North Avenue and Main Street and the capacity analysis indicates the intersection is expected to operate at LOS D or better in the future, with or without the proposed project.

Traffic Mitigation

Tetra Tech has identified site access improvements to be implemented as part of the proposed project to address existing and future traffic operational deficiencies and offset the potential traffic increases associated with the proposed project. The specific site access improvements to be implemented as part of the proposed project, as well as potential Transportation Demand Management measures that could be implemented to further reduce traffic increases associated with the project are described below.

Proposed Roundabout - Route 16, Millville Street and Proposed Shopping Center Driveway

The Town of Mendon had expressed interest in exploring a roundabout as a potential solution to address existing traffic safety and capacity issues at the intersection with Route 16 and Millville Street. The capacity analysis presented in this report indicates that a multilane roundabout can accommodate the projected traffic demands at the intersection while also providing safe and convenient access to the proposed shopping center. As part of the proposed project, the proponent is committed to funding the final design and construction of a multilane roundabout to enhance access to the shopping center and improve operations on the Route 16 (Hastings Street/Uxbridge Road) and Millville Street intersection.

As part of this effort, the existing westerly commercial site driveway will be closed and replaced with a new two-lane, two-way access driveway approximately 100 feet to the west (directly across from Millville Street) to form a four-way intersection of Route 16 (Hastings Street/Uxbridge Road), Millville Street and the primary access drive to the shopping center driveway. The new four-way intersection will be reconstructed to provide a modern multilane roundabout. As currently proposed, the Hastings Street eastbound and westbound approaches will each consist of two lanes, tapering back to a single lane in each direction before and after the roundabout. Tapers are provided in both directions on the approaches and departures. The Millville Street northbound and site driveway southbound approach will each consist of a single lane. A shared use path will be provided on both sides of Hastings Street. Pedestrian crossings are proposed on all four approaches.

The proposed project will require a state highway access permit to construct the proposed site access improvements along Route 16. Any improvements at the intersection will need to be further evaluated through MassDOT's Intersection Control Evaluation (ICE) review process. The proponent will continue to coordinate with MassDOT through the state permitting and design review process to ensure that the final proposed improvement is compatible with other planned improvements along Route 16 as part of MassDOT Project No. 608491.

Proposed Residential Driveways - Washington Street Residential Driveways

Access to the proposed residential portion of the development will be provided by two new driveways to be located along the west side of Washington Street. The proposed residential driveways will each provide a single entry and exit lane, with STOP sign control provided for the vehicles exiting the site. As part of this effort, the existing driveways will be closed and a new driveway serving the existing home at 12 Washington Street that will remain as part of the residential development will be provided from the south site drive. The proposed residential driveways will be interconnected via a loop roadway.

Travel Demand Management Measures

In addition to the proposed site access improvements, the proponent will develop a Transportation Demand Management (TDM) program to reduce automobile travel and traffic impacts associated with the proposed project.

Conclusions

TT has developed conceptual site access improvements needed to accommodate the proposed project. As currently envisioned, primary access to the shopping plaza would be provided by a proposed multilane roundabout at the intersection of Route 16 (Uxbridge Road/Hastings Street) and Millville Street and the shopping center driveway. As part of the proposed project, the proponent will fund the design and construction of a roundabout at the intersection of Hastings Street/Uxbridge Road (Route 16) and Millville Street/Site Driveway, including a donation of land along their property to support the proposed roundabout. The proponent will also work with the future tenants of the site to develop a TDM program to minimize reliance on single-occupant vehicles and further reduce single occupancy vehicle trips to and from the site.

Based on the analysis presented in this report, upon implementation of the recommended site access improvements, the potential traffic increases associated with the proposed project can be safely accommodated at the site driveways with no significant impact to future traffic operations on surrounding area roadways.

The proposed project will require a state highway access permit to construct the proposed site access improvements along Route 16. The final design of these improvements will need to be reviewed and approved through MassDOT's Intersection Control Evaluation (ICE) and design review process. The proposed project will also exceed the Massachusetts Environmental Policy Act (MEPA) traffic volume review thresholds for categorical inclusion for the preparation of a Draft Environmental Impact Report (DEIR).

The proponent will continue to coordinate with MassDOT through the state permitting and design review process to ensure that the final proposed site access improvements are compatible with other planned improvements along Route 16 as part of MassDOT Project No. 608491.

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The project site consists of four parcels including 35 Hastings Street (Parcel # 11-142-35-0), 37 Hastings Street (Parcel # 11-142-37-0), 18 Washington Street (Parcel # 8-242-18-0), and 20 Washington Street (Parcel # 8-242-20-0) in Mendon, Massachusetts. The project site supports a driving range, and associated bar and restaurant along Hastings Street, in addition to the two existing single-family homes on Washington Street. Access to the project site is currently provided by two commercial site driveways located on the north side of Hastings Street and two residential driveways on the west side of Washington Street.

The proposed project calls for the demolition of the existing commercial buildings on site, and one of the existing single-family homes, to support the construction of a 66,600 square foot (sf) shopping center which will include a 31,000 sf market, 15,000 sf outdoor retail, 17,000 sf retail, and 3,600 sf bank with drive-through along Hastings Street and 26 new single family homes along Washington Street. An accessory carousel is also proposed within the shopping center parking lot. The existing home at 12 Washington Street will remain and be incorporated into the proposed residential development. The anticipated parking demands associated with the proposed shopping center will be accommodated in a surface parking lot providing approximately 234 parking spaces and individual driveways with garages for each of the proposed single family homes.

As currently proposed, the existing westerly commercial site driveway will be relocated approximately 100 feet to the west (directly across from Millville Street) to form a four-way intersection with Route 16 (Hastings Street/Uxbridge Road) and Millville Street. As part of the proposed project, the four-way intersection will be reconstructed to provide a modern multilane roundabout. The easterly commercial site driveway will be relocated approximately 50 feet further east (along the eastern edge of the project site) to provide secondary, delivery vehicle only access for the shopping center. Access to the proposed residential portion of the development will be provided by two new driveways along the west side of Washington Street. A copy of the currently proposed site plan is provided in Appendix A.

1.2 STUDY METHODOLOGY

The traffic study methodology was developed in consultation with representatives from Massachusetts Department of Transportation (MassDOT) District 3 at a traffic scoping meeting for the project that was held virtually on September 22, 2021. The purpose of the meeting was to discuss the assumptions from the Traffic Scoping Letter (dated September 10, 2021), which identified key aspects of the traffic study including the study area roadways and intersections to be reviewed, consideration of other possible area developments and background traffic growth, and analysis required to evaluate the potential project-related traffic impacts. The Traffic Scoping Letter is included in Appendix B.

This Traffic Impact and Access Study (TIAS) provides a detailed analysis of existing and future traffic operations (both with and without the proposed development) during the weekday morning, weekday evening, and Saturday midday peak hours at the study area intersections (including the site driveways along Washington Street and Hastings Street) identified through consultation with MassDOT officials.

This study was conducted in three phases. The first phase involved an inventory of existing traffic conditions in the vicinity of the site. As part of the existing conditions assessment, peak period traffic counts from 2018 were adjusted to reflect 2021 conditions for the key roadways and intersections in the vicinity of the site. A field visit was conducted to inventory roadway and intersection geometries and traffic control and to observe the general operational characteristics for each of the study area intersections. Massachusetts Department of Transportation (MassDOT) crash data was also reviewed.

The second phase of the study builds upon the data collected in the first phase and establishes the framework for evaluating potential traffic impacts associated with the project. The 2021 Existing peak hour traffic volumes were then projected to the design year 2028. The future 2028 No Build (Without Project) traffic volumes were assumed to include traffic increases resulting from general background traffic growth as well as specific projects that are planned in the area. Traffic increases associated with the redevelopment of the site were then added to the No Build traffic volumes to reflect the future 2028 Build (With Project) weekday morning and weekday evening peak hour volumes.

In the third phase of this study, the existing and projected future traffic operations at each of the study intersections were analyzed to identify potential traffic operational deficiencies and, if warranted, potential improvements to mitigate the project’s impacts.

2.0 EXISTING CONDITIONS

The effective evaluation of potential transportation impacts associated with the project requires a thorough understanding of the existing traffic conditions on the roadways and intersections in the vicinity of the project site. The existing conditions assessment consists of an inventory of the roadway and intersection geometries and traffic control devices; projection of peak period traffic volumes; field observations; safety analysis; review of pedestrian, bicycle, and transit services; and analysis of existing traffic operations.

2.1 STUDY AREA ROADWAYS

The site is located at 35-37 Hastings Street and 18-20 Washington Street and is bounded by Route 16 (Hastings Street) to the south and Washington Street to the east. The project-generated traffic will travel to and from the site via the following key study area roadways.

Route 16 (Uxbridge Road and Hastings Street). Route 16 is classified as an urban principal arterial and is under MassDOT jurisdiction. It generally runs east to west with one travel lane in each direction. Sidewalks are provided along the north side of Route 16 throughout most of the study area. Concrete sidewalks are provided along the south side of Route 16 from Hartford Avenue West to Millville Street. The posted speed limit is 45 miles per hour (mph) between Hartford Avenue West and Washington Street. From Washington Street to North Avenue the posted speed limit is 35 mph. Land uses along this roadway consist of residential and various commercial uses including restaurants, gas stations, convenience stores, and car dealerships.

Millville Street. Millville Street is classified as an urban minor arterial and is under local jurisdiction (Town of Mendon). Within the study area, Millville Street has a single travel lane in each direction. The posted speed limit along Millville Street in the study area is 30 mph. Land use along this roadway is primarily residential with some commercial uses near the intersection with Route 16.

Maple Street. Maple Street is classified as an urban minor arterial and is under local jurisdiction. Within the study area, Maple Street provides one travel lane in each direction. The posted speed limit along Maple

Street in the study area is 30 mph. Sidewalks are provided along the north side of Maple Street. Land use along this roadway is primarily residential with some commercial and religious uses.

North Avenue. North Avenue is classified as an urban minor arterial and is under local jurisdiction (Town of Mendon). Within the study area, North Avenue provides a single travel lane in each direction. North Avenue generally runs in a north-south direction and has a straight alignment. Sidewalks are provided along the west side of North Avenue. The posted speed limit along North Avenue is 30 mph. Land uses along North Avenue in the vicinity of Route 16 include residential, a bank, and a school.

Main Street. Main Street is classified as an urban minor arterial under local jurisdiction. Within the study area, Main Street typically consists of a single travel lane in each direction. Main Street runs in a north-south direction and has a generally straight alignment. Sidewalks are provided along the west side of Main Street. The posted speed limit along Main Street is 25 mph south of Route 16. Land uses along Main Street within the study area include a mix of religious uses and single-family homes The Mendon Town Hall is also located along Main Street, near its intersection with Maple Street.

2.2 STUDY AREA INTERSECTIONS

The study area intersections chosen for detailed analysis were determined in consultation with MassDOT. The study area intersections are shown in Figure 1 and are listed below:

1. Uxbridge Road (Route 16) at Hartford Avenue West (Unsignalized)
2. Uxbridge Road/Hastings Street (Route 16) at Millville Street/West Site Drive (Unsignalized)
3. Hastings Street (Route 16) at East Site Drive (Unsignalized)
4. Hastings Street (Route 16) at Washington Street and Emerson Street (Unsignalized)
5. Hastings Street (Route 16) at Maple Street (Unsignalized)
6. Hastings Street (Route 16) at Main Street and North Avenue (Signalized)
7. Washington Street at South Site Drive (Unsignalized)
8. Washington Street at North Site Drive (Unsignalized)

The existing lane geometry and traffic control at each of the study intersections is documented in the capacity analysis provided in the appendix of this report and detailed for the key intersections below.

Uxbridge Road (Route 16) at Hartford Avenue West. Uxbridge Road (Route 16) intersects Hartford Avenue West to form a three-way, unsignalized intersection. The Route 16 eastbound approach consists of a single general-purpose lane. The Route 16 westbound approach consists of a single shared through/right lane. The Hartford Ave West southbound approach consists of a single shared left/right turn lane and is under STOP control. There are currently no sidewalks or crosswalks at the intersection. Land uses adjacent to the intersection include single-family homes on the north side of Route 16 and an Imperial Cars inventory lot on the south side.

Uxbridge Road/Hastings Street (Route 16) at Millville Street/West Site Drive. Millville Street intersects Uxbridge Road/Hastings Street (Route 16) from the south and the western site drive intersects from the north to form a four-way, unsignalized intersection. The Route 16 eastbound approach to the intersection consists of a single general purpose lane. The Route 16 westbound approach consists of a single general purpose lane which is wide enough for left-turning vehicles to queue while allowing westbound through vehicles to pass. The Millville Street northbound approach is split by a triangle island. Northbound left turns pass to the left side of the island and are under STOP control. Northbound right turns stay to the right of the island and are under YIELD control. Left turns from Route 16 westbound stay on the east side of the island and have the right-of-way passing the southerly tip of the triangle island. Right turns from Route 16 eastbound are under YIELD control at the intersection at the southerly point of the island. The site drive southbound approach is opposite the Millville Street northbound right turn and provides a single general purpose lane. Sidewalks are located on both sides of Route 16 to the west of the intersection. Sidewalks are also present on the north side of Route 16 (Hastings Street) and the west side of Millville Street at the intersection. Adjacent land uses are commercial (Imperial Gas, Driving Range, and Hood Plaza).

Hastings Street (Route 16) at East Site Drive. The eastern site drive approaches from the north to form a three-way, unsignalized intersection with Route 16 (Hastings Street). The Route 16 eastbound and westbound approaches each consist of a single general purpose lane. The site drive southbound operates as a single approach lane and is assumed to be under STOP control. No crosswalks are provided at the intersection and sidewalks are provided along the north side of Route 16.

Hastings Street (Route 16) at Washington Street and Emerson Street. Washington Street approaches from the north and Emerson Street approaches from the south to form a four-way, unsignalized intersection with Route 16 (Hastings Street). The Route 16 eastbound and westbound approaches each consist of a single general purpose lane. The Washington Street southbound approach consists of a single general purpose lane and is under STOP control. On the Emerson Street northbound approach, there is a small traffic island, which essentially channelizes the northbound right turn. Northbound left and through vehicles stay to the left of the island, while right turning vehicles stay to the right. All northbound movements are under STOP control. No crosswalks are provided at the intersection and sidewalks are provided only along the north side of Route 16.

Hastings Street (Route 16) at Maple Street. Maple Street intersects Hastings Street (Route 16) at an oblique angle, forming a three-way, unsignalized intersection. The Maple Street northwest approach consists of a single lane and is under STOP control. The Hastings Street eastbound and westbound approach each consist of a single, general purpose lane. Sidewalks are provided on the north side of Route 16 at this intersection and no crosswalks are provided. Land uses in the vicinity of the intersection are primarily residential and commercial.

Hastings Street (Route 16) at Main Street/North Avenue. Main Street intersects from the south and North Avenue intersects from the north to form a four-legged, signalized intersection with Hastings Street (Route 16). The Route 16 eastbound and westbound approaches each consist of a single general purpose lane. The North Avenue southbound approach consists of a single general purpose lane. The Main Street northbound approach consists of a wide lane (observed to be used as a left-turn and a through lane in the field) and a channelized right-turn lane. Sidewalks are provided along the north side of Route 16 and the west sides of North Avenue and Main Street. A faded crosswalk is provided across the Route 16 eastbound approach, along with pedestrian signal heads and push buttons. The traffic signal operates with the following phases:

- Route 16 eastbound and westbound
- Exclusive pedestrian phase (upon actuation only)
- North Avenue southbound and Main Street northbound

Land uses in the vicinity of the intersection include a convenience store and a bank.

2.3 EXISTING TRAFFIC VOLUMES

Due to the ongoing COVID-19 pandemic, no new traffic count data was collected. Instead, previous traffic count data from 2017 and 2018 was used to project volumes for 2021 based on Massachusetts Department of Transportation's *Guidance on Traffic Count Data, Revised: April 2020.* MassDOT's Guidance states that "traffic counts are currently at historic lows and may underrepresent a realistic existing condition." MassDOT is currently allowing the use of historical count data in place of new traffic count data with the appropriate adjustments.

Peak period intersection turning movement counts (TMCs) were previously collected in collected in April 2018 in the vicinity of the project site as part of the *Functional Design Report – Resurfacing and Related Work on Route 16, Project No. 608491*, dated July 2021, prepared by HNTB Corporation. An automatic traffic recorder (ATR) count was collected in September 2017 in the vicinity of the project site. A new ATR was collected in October 2021 to confirm that the existing 2017 and 2018 volumes were higher than current traffic counts.

2.3.1 Daily Traffic Volumes

An ATR count was conducted along Route 16 in the site vicinity on Thursday, September 28 and Saturday, September 30, 2017. The ATR data has been adjusted per the MassDOT guidance. According to the 2017 MassDOT weekday seasonal and axle correction factors, the seasonal adjustment factors for 2017 for urban principal arterials in September is 0.93. To provide a conservative analysis, the traffic count data was not adjusted downward. The 2017 volumes were then adjusted based on MassDOT yearly growth rates referenced in the MassDOT guidance to establish the 2021 daily traffic volumes. This assumes no growth from 2019 to 2021 as the MassDOT guidance assumes 2019 volumes to be existing due to COVID-19 travel reductions.

The ATR data with growth indicates that Route 16 carries a total two-way traffic volume of approximately 24,175 vehicles per day (vpd) on a typical weekday and 19,215 vpd on a Saturday. The 2021 data was collected on Thursday, October 28, 2021 and indicates that Route 16 carried approximately 22,284 vehicles per day, which is approximately eight percent lower than the projected existing traffic volumes. A more detailed summary of the ATR data is presented in Table 1.

Table 1 Weekday Daily Traffic Volume Summary – Route 16 (Hastings Street)

Location	Weekday ADT (vpd)[1]	AM Peak Hour (vph)[2]	PM Peak Hour (vph)	Saturday ADT (vpd)	Midday Peak Hour (vph)
Route 16 East of Proposed Site	**24,175**	**2,045**	**2,081**	**19,215**	**1,533**
Eastbound	12,461	1,434	794	9,828	780
Westbound	11,714	611	1,287	9,387	753

Based on automatic traffic recorder counts collected on September 28-30, 2017, adjusted to estimate 2021 traffic volumes.
[1] vpd = vehicles per day
[2] vph = vehicles per hour

The ATR traffic volume data are provided in Appendix C.

2.3.2 Peak Hour Traffic Volumes

The combined critical peak demand periods of site traffic and adjacent street traffic will occur during the weekday morning, weekday evening, and Saturday midday peak hours. The TMCs were conducted at the study area intersections on Saturday, April 7, 2018, and Tuesday, April 10, 2018, as part of Functional Design Report for the Route 16 improvements. The TMC data was collected during the typical weekday from 7:00 AM to 6:00 PM and on Saturday from 11:00 AM to 2:00 PM. Since driveway volumes for the existing site were not collected as part of the TMCs for the FDR, previous turning movement counts for the driveways from September of 2017 were utilized to estimate existing site traffic volumes. These driveway volumes were added to the TMC data for the Hastings Street/Millville Street intersection. The turning movement count data are provided in Appendix C.

2.3.2.1 Peak Hour Volume Adjustments

Similar to the adjustments made to the ATR data, seasonal adjustments were reviewed for the TMC data. According to the 2018 MassDOT weekday seasonal and axle correction factors, the seasonal adjustment factors for 2018 for urban principal arterials and urban minor arterials, collectors, and local roads in April are 0.96 and 0.95, respectively. To provide a conservative analysis, the traffic count data were not adjusted downward.

MassDOT yearly growth rates from the latest guidance indicate a growth rate of 0.4 percent from 2018 to 2019. The 2018 traffic volumes were then grown by 0.4 percent to establish the 2021 adjusted weekday morning, weekday evening, and Saturday midday peak hour traffic volumes. This assumes no growth from 2019 to 2021 as the MassDOT guidance assumes 2019 volumes to be existing due to COVID-19 travel reductions. The seasonal adjustment and growth calculations are included in Appendix C.

The 2021 Existing volumes will be used as a basis for analysis of existing and projected future weekday peak hour traffic operations and are presented in Figure 2, 3, and 4 for the weekday morning, weekday evening, and Saturday midday peak hours, respectively.

2.4 PUBLIC TRANSPORTATION

The Mendon Council on Aging offers transportation to Mendon residents aged 60 and over and to people with disabilities Monday through Thursday for local medical appointments, shopping/errands and to/from Senior Center activities. There are no other public transportation services located within the Town of Mendon. The MetroWest Regional Transit Authority (MWRTA) operates bus service in nearby Milford with the closest stop located approximately 2.5 miles east of the site at Milford Regional Hospital and Dana-Farber/Brigham and Women’s Cancer Center on Prospect Street. The closest commuter rail station is located approximately 7 miles east of the site at Forge Park in Franklin and is operated by the Massachusetts Bay Transportation Authority (MBTA). Public Transportation information is provided in Appendix D.

2.5 PEDESTRIAN AND BICYCLE ACCOMMODATIONS

Within the study area, sidewalks exist on both sides of Route 16 between Hartford Avenue West and Millville Street. Sidewalks are provided on only the north side of Route 16 from Millville Street to North Avenue. Sidewalks are also provided along the west side of Millville Street, North Avenue and Main Street, as well as the north side of Maple Street. The only marked and signaled pedestrian crossing within the study area is located along the west side of the intersection of Route 16 and North Avenue/Main Street. Bicycle shared lanes (sharrows) are marked along Main Street south of Route 16.

2.6 CRASH ANALYSIS

Crash data for the study area intersections were obtained from the MassDOT crash database for 2016 through 2018. The MassDOT Crash Rate Worksheets were then used to determine if the crash frequency at the study intersections was unusually high given the existing travel demands. The MassDOT Crash Rate Worksheet calculates the intersection crash rate expressed in crashes per million entering vehicles. The crash rates calculated for each intersection were then compared to the statewide and MassDOT District 3 averages. The crash data, if any, and crash rate calculations for each study intersection are provided in Appendix E. A summary of the reported crashes at the study area intersections is provided in a Table 2. A brief description of the crash history for the three-year study period reviewed for each of the study area intersections is provided below.

Uxbridge Road/Hastings Street (Route 16)/Millville St/West Site Driveway. During the three-year study period, 35 crashes were reported at the unsignalized Uxbridge Road/Hastings Street (Route 16)/Millville Street/West Site Driveway intersection resulting in a crash rate of 1.44 crashes per million entering vehicles. The majority of the crashes were angle collisions (18 crashes). Nearly 49 percent of the crashes occurred during the weekday morning and weekday evening peak periods. Injuries were reported at nine of the crashes and no crashes involved either pedestrians or bicyclists. No fatalities were reported at this location during the three-year study period.

Hastings Street (Route 16)/ Washington Street/Emerson Street. During the three-year study period, 18 crashes were reported at the unsignalized intersection of Hastings Street (Route 16)/Washington Street/ Emerson Street resulting in a crash rate of 0.73 crashes per million entering vehicles. This is higher than the State and District 3 average crash rates for unsignalized intersections. The majority of the crashes were rear-end collisions (12 crashes). Thirty-three percent of the crashes occurred during the weekday morning and weekday evening peak periods. Injuries were reported at two of the crashes, however no crashes involved pedestrians or bicyclists.

Hastings Street (Route 16)/Maple Street. During the three-year study period, 11 crashes were reported at the unsignalized intersection of Hastings Street (Route 16) and Maple Street resulting in a crash rate of 0.48 crashes per million entering vehicles. This is lower than the statewide and District 3 average crash rates for unsignalized intersections. The majority of collisions reported were rear-end collisions.

Hastings St (Route 16)/North Avenue/Main Street. During the three-year study period, 54 crashes were reported at the signalized intersection of Route 16 and North Avenue/Main Street resulting in a crash rate of 2.29 crashes per million entering vehicles. This is higher than the statewide and district 3 average crash rates for signalized intersections. The majority of crashes were rear-end (46 percent) and angle crashes (33 percent). Thirty-seven percent of the crashes occurred during the morning and evening peak periods. Injuries were reported at 12 of the crashes.

Uxbridge Road (Route 16)/Hartford Avenue West. During the three-year study period, 13 crashes were reported at the unsignalized intersection of Uxbridge Road at Hartford Avenue West, resulting in a crash rate of 0.65 crashes per million entering vehicles. The majority of the crashes were angle collisions (seven crashes). Nearly 62 percent of the crashes occurred during the weekday morning and weekday evening peak periods. Injuries were reported at one of the crashes and no crashes involved either pedestrians or bicyclists. No fatalities were reported at this location during the three-year study period.

Table 2 Crash Data Summary (2016-2018)

	Uxbridge Road/Hastings Street (Route 16) at:					
	Hartford Ave West	**Millville St/ Site Driveway**	**Washington St/ Emerson St**	**Maple St**	**North Ave/ Main St**	**East Site Driveway**
Year						
2016	4	12	7	4	15	1
2017	4	11	5	3	16	1
2018	5	12	6	4	23	0
Total	**13**	**35**	**18**	**11**	**54**	**2**
Type						
Angle	7	13	1	1	18	0
Rear-end	3	18	12	7	25	2
Head-on	0	1	1	0	0	0
Sideswipe	1	3	4	3	8	0
Single Vehicle	2	0	0	0	3	0
Other/Unknown	0	0	0	0	0	0
Total	**13**	**35**	**18**	**11**	**54**	**2**
Severity						
Property	12	26	16	9	42	1
Injury	1	9	2	2	12	1
Fatality	0	0	0	0	0	0
Unknown	0	0	18	0	0	0
Total	**13**	**35**	**18**	**11**	**54**	**2**
Non-Motorists						
Pedestrians	0	0	0	0	0	0
Bicyclists	0	0	0	0	0	0
Vehicles Only	13	13	18	11	54	2
Other/Unknown	0	0	0	0	0	0
Total	**13**	**35**	**18**	**11**	**54**	**2**
Weather						
Clear	8	24	11	6	37	2
Cloudy	0	8	6	4	4	0
Rain	2	2	0	0	8	0
Snow	1	1	1	1	0	0
Other/Unknown	0	0	0	0	0	0
Total	**13**	**35**	**18**	**11**	**54**	**2**
Time						
7am to 9am	4	7	5	4	9	1
9am to 4pm	2	12	12	5	26	0
4pm to 6pm	4	10	1	2	11	0
6pm to 12am	1	3	0	0	5	1
12am to 7am	2	3	0	0	3	0
Total	**13**	**35**	**18**	**11**	**54**	**2**
Crash Rates[2]	**0.65**	**1.44**	**0.73**	**0.48**	**2.29**	**0.08**

1) Based on crash data obtained from MassDOT's online crash portal.
2) Crash rates per million entering vehicles (MEV) calculated using MassDOT Worksheets. MassDOT average unsignalized crash rates are 0.57 statewide and 0.61 districtwide. MassDOT average signalized crash rate is 0.78 statewide and 0.89 district wide.

3.0 FUTURE CONDITIONS

3.1 FUTURE NO BUILD CONDITIONS

The future No Build (Without Project) condition establishes the basis for evaluating the transportation impacts associated with the proposed project. The No Build condition includes the effects of general area growth, other planned development projects and planned transportation improvements expected to be completed by the Design Year of 2028.

To establish the future 2028 No Build traffic volumes, the 2021 Existing condition traffic volumes were projected to the 2028 design year, by which time the project is expected to be built and occupied. Traffic growth is primarily a function of changes in motor vehicle use and expected land development in the region. To predict a rate at which traffic on the roadways in the vicinity of the site can be expected to grow during the seven-year forecast period (2021 to 2028), both historic traffic growth and planned area developments were examined. A discussion of the development of the future No Build (Without Project) condition is provided below.

3.1.1 General Background Traffic Growth

A general background growth rate was applied to the 2021 Existing condition traffic volumes based on a review of MassDOT permanent count station data. The two nearest permanent count stations (Location 3180: I-495 at the Medway Town Line and Location 3199: Route 146 south of Route 16) both indicate declining traffic volumes since 2018. However, to provide a conservative assessment, an annual growth rate of 0.5 percent per year was assumed for this study. This is consistent with the growth rate applied in the Route 16 FDR. The MassDOT traffic count data is provided in Appendix F.

3.1.2 Background Development

Other planned area developments could also result in increased traffic on the surrounding area roadways. During the traffic study scoping process, MassDOT did not identify any additional background development projects within the study area.

3.1.3 Planned Roadway Improvements

Based on consultation with MassDOT, the Route 16 corridor is slated for reconstruction as part of project no. 608491. The project involves the reconstruction of Route 16 through Mendon. As part of the project, the intersections of Uxbridge Road/Hartford Avenue West and Hastings Street/Maple Street will be signalized, and a new traffic signal is proposed at the North Avenue/Main Street intersection with Route 16. The intersection of Hastings Street/Millville Street will be reconfigured to form a more standard T-type intersection with a channelized northbound right-turn lane. A two-way left-turn lane is proposed along Route 16 adjacent to the Millville Street intersection, providing access to the many driveways along this segment of road. At the intersection of Route 16 with Emerson Street and Washington Street, a turn restriction is proposed along Emerson Street northbound that would restrict left turns onto Route 16 westbound and through movements to Washington Street. Drivers would instead use the new signalized intersection at Maple Street to make those movements. Pedestrian and bicycle accommodations would be provided along the Route 16 corridor. Excerpts from the 25 percent design plans are included in Appendix G.

No other major planned roadway improvements within the study area need to be considered for the 2028 No Build conditions.

3.1.4 Future 2028 No Build Traffic Volumes

The 2021 Existing condition peak hour traffic volumes were grown by 0.5 percent per year over the seven-year study horizon and the redistribution of trips from the turn restriction proposed as part of the MassDOT Route 16 project listed above were added to establish the 2028 No Build (Without Project) traffic volumes. The 2028 No Build weekday morning, weekday evening, and Saturday midday peak hour traffic volume networks are illustrated in Figures 5, 6, and 7.

3.2 FUTURE BUILD CONDITIONS

To assess the project's transportation impacts, the overall travel demands were determined based on proposed site access as well as the anticipated trip generation, travel mode split, trip distribution and trip assignment. The project's travel demand was then added to the future 2028 No Build traffic volumes (without the proposed project) to develop the future 2028 Build condition traffic volumes (with the proposed project). A discussion of the development of the future Build condition is provided below.

3.2.1 Project-Generated Trips

To assess the project's transportation impacts, the project's overall travel demand was determined in a four-step process including trip generation, travel mode share, trip distribution and trip assignment. The following sections describe the process of translating the proposed development program into the resulting trips in each mode of travel.

Trip Generation. Trip generation estimates for the project were developed based on data presented in the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10th Edition with Supplement* (2020). The project will consist of a 66,600 sf shopping center along Hastings Street and 26 single family homes along Washington Street. Trip estimates for the mixed-use development were based on the ITE trip rates for Land Use 820 (Shopping Center) and Land Use 210 (Single-Family Detached Housing). The trip generation summary is provided in Table 3.

Table 3 Trip Generation Summary

Time Period	Site Trips		
	Shopping Center[1] (66.6 ksf)	Residential[2] (26 single family homes)	Total
Weekday Daily			
Enter	2,280	151	**2,431**
Exit	2,280	150	**2,430**
Total	*4,560*	*301*	***4,861***
Weekday Morning Peak Hour			
Enter	115	6	**121**
Exit	70	17	**87**
Total	*185*	*23*	***208***
Weekday Evening Peak Hour			
Enter	193	18	**211**
Exit	209	10	**219**
Total	*402*	*28*	***430***
Saturday Daily			
Enter	3,464	138	**3,602**
Exit	3,463	139	**3,602**
Total	*6,927*	*277*	***7,204***
Saturday Peak Hour			
Enter	233	22	**255**
Exit	216	18	**234**
Total	*449*	*40*	***489***

[1] Based on ITE *Trip Generation Manual,10th Edition* trip rates for Land Use 820 (Shopping Center) applied to 66,600 sf.
[2] Based on ITE *Trip Generation Manual,10th Edition* trip rates for Land Use 210 (Single Family Detached Housing) applied to 26 dwelling units.

As shown in Table 3, based on the ITE data, the project is expected to generate a total of approximately 4,861 trips on a daily basis, including 208 trips during the weekday morning peak hour and 430 trips during the weekday evening peak hour for the site. On a Saturday, the project is expected to generate approximately 7,204 trips, including 489 trips during the peak hour.

Not all project trips associated with the shopping center component of the project will represent new trips on the surrounding area roadways. It is anticipated that a significant portion of the shopping center traffic will be pass-by trips drawn from existing traffic already traveling past the site. For the purpose of the Traffic Impact and Access Study (TIAS), a pass-by rate of 25 percent was assumed to account for vehicle trips drawn from existing traffic traveling past the site. Additionally, there will likely be some shared trips between the residential and shopping center. To provide a conservative analysis, no credit was taken for any shared trips. A breakdown of new and pass-by trips is presented in Table 4.

Table 4 Trip Generation Summary

	Shopping Center			Residential	Total
Time Period	Total Trips[1]	Pass-by Trips[2]	New Trips[3]	New Trips[1]	New Trips
Weekday Daily					
Enter	2,280	570	1,710	151	**1,861**
Exit	2,280	570	1,710	150	**1,860**
Total	4,560	1,140	3,420	301	**3,721**
Weekday Morning Peak Hour					
Enter	115	23	92	6	**98**
Exit	70	23	47	17	**64**
Total	185	46	139	23	**164**
Weekday Evening Peak Hour					
Enter	193	50	143	18	**161**
Exit	209	50	159	10	**169**
Total	402	100	302	28	**330**
Saturday Daily					
Enter	3,464	866	2,598	138	**2,736**
Exit	3,463	866	2,597	139	**2,736**
Total	6,927	1,732	5,195	277	**5,472**
Saturday Peak Hour					
Enter	233	56	177	22	**199**
Exit	216	56	160	18	**178**
Total	449	112	337	40	**377**

[1] From Table 3
[2] Assumes a pass-by rate of 25% for all conditions.
[3] New trips = Total trips – Pass-by trips

As shown in Table 4, the proposed development is expected to generate approximately 164 new trips during the weekday morning peak hour, 330 new trips during the weekday evening peak hour, and 377 new trips during the Saturday midday peak hour. To provide a conservative analysis, no credit was taken for existing traffic generated by the site throughout the study area; the few existing trips were removed from the driveway turning movements only. The trip generation calculations are provided in Appendix H.

Travel Mode Share. Travel mode data for the Town of Mendon based on latest US Census data was reviewed to determine the project's mode share. Based on the travel mode split data, approximately 18 percent of trips in Mendon occur by modes other than single occupancy vehicles (carpool, walk, bike, and transit). The remaining 82 percent of trips are expected to occur by single occupant automobile. A summary of the Mendon travel mode splits is shown in Table 5.

Table 5 Travel Mode Split

Mode	Percentage
Auto – Single Occupancy Vehicle	82%
Auto – Carpool	3%
Transit	5%
Walk	0%
Bike	0%
Other (Work from Home)	10%
Total	***100%***

As shown in Table 5, the US Census data indicates that as much as 15 percent of the people who live in Mendon use alternative modes of travel to commute to work, including working from home. However, to provide a conservative assessment of potential traffic increases associated with the proposed project, no credit was taken for potential transit reductions.

3.2.2 Trip Distribution

Separate trip distribution patterns were developed for the shopping center and residential components of the project. The trip distribution patterns for the shopping center were developed based on consideration of the effective population within the anticipated market draw area for the shopping plaza and competing existing facilities. The trip distribution for the residences was developed based on US Census journey to work data for the residents of the town of Mendon, Massachusetts.

For purposes of this study, it is assumed that customers will come from within a draw area of approximately five miles for a grocery store due to the number of competing facilities nearby. To estimate the distribution patterns for the retail component, a 5-mile radius was drawn around the site and the cities and towns within the service area were each assigned a route (or routes, if more than one seemed appropriate) to travel to/from the site. The routes were determined based on travel patterns during peak commuting periods. The populations of each of the cities or towns within the service area was determined using available US Census population data and used as a method of "weighting" the trip distribution of each of the likely routes to the site. The calculated trip distribution patterns are shown in Table 6.

Table 6 Trip Distribution Summary

	Commercial		Residential	
Roadway/Direction	**Entering Distribution**	**Exiting Distribution**	**Entering Distribution**	**Exiting Distribution**
Uxbridge St to/from the West	12%	12%	7%	7%
Hartford Ave West to/from the West	6%	6%	2%	2%
Millville St to/from the South	7%	7%	2%	2%
Washington St to/from the North	7%	7%	2%	2%
Emerson St to/from the South	0%	8%	0%	1%
Maple St to/from the South	39%	31%	28%	27%
North St to/from the North	8%	8%	29%	29%
Hastings St to/from the East	21%	21%	30%	30%
Total	***100%***	***100%***	***100%***	***100%***

In general, the analysis indicates that the majority of project trips will arrive/depart the site from the east. The trip distribution is shown on Figures 8 and 9. The distribution analysis is included in Appendix I.

The project trips associated with the proposed mixed-use development were then assigned to the surrounding roadway network based on the project distribution patterns presented in Figures 8 and 9. The resulting shopping center traffic volumes are presented in Figures 10, 11 and 12 for the weekday morning, weekday evening, and Saturday midday peak hours. The resulting residential traffic volumes are presented in Figures 13, 14, and 15 for the weekday morning, weekday evening, and Saturday midday peak hours.

3.2.3 Build (With Project) Peak Hour Traffic Volumes

The new trips associated with the proposed project were then added to the 2028 No Build (Without Project) traffic volumes. The resulting 2028 Build (With Project) weekday morning, weekday evening, and Saturday midday peak hour traffic volumes are presented in Figures 16, 17, and 18. Table 7 provides a summary of the total new project trips and how they relate to the 2028 No-Build condition volumes for the study intersections.

Table 7 Peak Hour Traffic Volume Comparison

Intersection	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
	2028 No-Build	New Project Trips	% Change[1]	2028 No-Build	New Project Trips	% Change	2028 No-Build	New Project Trips	% Change
Uxbridge Rd/Hartford Ave W	1,664	29	1.7%	1,706	58	3.4%	1,397	66	4.7%
Hastings St/Millville St	2,083	142	6.8%	2,028	305	15.0%	1,817	342	18.8%
Hastings St/Washington St/ Emerson St	2,118	127	6.0%	2,071	254	12.3%	1,812	293	16.2%
Hastings St/Maple St	1,954	111	5.7%	1,925	217	11.3%	1,714	251	14.6%
Hastings St/North Ave/ Main St.	1,922	54	2.8%	2,017	104	5.2%	1,665	121	7.3%

[1] Percent change is relative to the No-Build condition

When the mixed use project is constructed, peak hour traffic levels at the Hastings Street/Millville Street intersection will increase by approximately 142 to 342 trips or by approximately seven to 19 percent over No-Build levels. Smaller percent increases are expected as the project trips dissipate further from the site. At the intersection of Hastings Street/North Avenue/Main Street, traffic volume increases of 54 to 121 vehicles are expected in the peak hours, resulting in increases of three to seven percent over projected 2028 No Build traffic volumes. The project Traffic Projection Model detailing the traffic volume adjustments from the unadjusted count data through the 2028 Build condition is provided in Appendix J.

4.0 TRAFFIC OPERATIONS ANALYSIS

In previous sections of this report, the quantity (volume) of traffic on the study area roadways was described. The following section describes the quality of traffic flow at the study area intersections for the given traffic demands. As a basis for this assessment, intersection capacity analyses were conducted at each study area intersection for the 2021 Existing, 2028 No Build (Without Project) and 2028 Build (With Project) weekday morning and weekday evening peak hour traffic conditions using Synchro 11 Intersection Capacity and Traffic Simulation Software. A discussion of the evaluation criteria and a summary of the results of the intersection capacity analyses are presented below. The detailed capacity analysis worksheets are provided in Appendix K.

4.1 METHODOLOGY

Level-of-service (LOS) is a term used to describe the quality of traffic flow on roadways or at intersections. It is an aggregate measure of travel delay, driver convenience and safety based on a comparison of a roadway facility's capacity relative to the traffic demands. Operating levels of service are reported on a scale of A to F, with A representing the best operating conditions (with little or no vehicle delay) and F representing the worst operating conditions (with long delays). The capacity analyses for the unsignalized study intersections were based on the *Highway Capacity Manual (HCM) 6th Edition*. The capacity analyses for the signalized study intersections are based on the *2000 Highway Capacity Manual (HCM),* which establishes separate level-of-service criteria for unsignalized and signalized intersections. The 2000 HCM was used since the HCM 6th Edition does not provide a methodology for signalized intersections with exclusive pedestrian phases, which are provided at some of the study intersections. The level-of-service criteria for signalized and unsignalized intersections are presented in Table 8.

Table 8 Intersection Level of Service Criteria

Level of Service[1]	Average Delay per Vehicle (Seconds)	
	Signalized Intersections	Unsignalized Intersections
A	≤10.0	≤10.0
B	10.1 to 20.0	10.1 to 15.0
C	20.1 to 35.0	15.1 to 25.0
D	35.1 to 55.0	25.1 to 35.0
E	55.1 to 80.0	35.1 to 50.0
F	>80.0	>50.0

Source: Transportation Research Board Highway Capacity Manual (HCM) 2000 (signalized)/6th Edition (unsignalized)
[1] If the v/c is greater than 1.0, than the level-of-service designation is LOS F, regardless of delays (HCM 6th Edition only)

The results of the intersection capacity analyses for the weekday morning, weekday evening, and Saturday midday peak hours are summarized in Tables 9, 10, and 11 for the signalized intersections for the weekday morning, weekday evening, and Saturday midday peak hours, respectively. The results of the capacity analysis for the unsignalized study intersections are included in Tables 12, 13, and 14 for the weekday morning, weekday evening, and Saturday midday peak hours, respectively. Detailed summary tables and intersection capacity analysis worksheets are provided in Appendix K of this report. A brief discussion of the results of the intersection capacity analyses is presented in the following sections of this report.

4.2 UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS RESULTS

As shown in Tables 9, 10, and 11, the capacity analyses for the weekday morning, weekday evening, and Saturday midday peak hours indicate that the unsignalized study intersections of Hastings Street at Hartford Avenue West, Millville Street, Washington Street/Emerson Street, and Maple Street all have at least one movement that operates at LOS F during at least one peak hour under existing conditions. As noted, the Hartford Avenue West and Maple Street intersections are planned to be signalized by MassDOT in the future.

The intersection of Hastings Street at Millville Street is expected to be reconstructed by MassDOT in the future but will remain unsignalized. Under 2028 No-Build conditions, the intersection is expected to continue to operate at LOS F on the Millville Street northbound approach during the weekday peak hours. The existing site driveway southbound approach operates at LOS F during the weekday evening and Saturday midday peak hours.

The addition of the proposed site driveway directly across from Millville Street necessitates a change in geometry for the intersection. To accommodate the proposed site traffic and improve operations for the Millville Street northbound approach, a roundabout is proposed as mitigation for the intersection. With the addition of the roundabout, the intersection is expected to operate at overall LOS B or better, with all approaches operating at LOS C or better during all three peak hours with one exception. During the weekday morning peak hour, the Millville Street northbound approach is expected to operate at LOS E (approximately 36 seconds of delay) under Build conditions. This is an improvement over the expected LOS F operations expected under the 2028 No-Build condition. Vehicle queues of five vehicles or less are expected along Route 16 during all peak hours.

Under existing conditions, the Washington Street southbound and Emerson Street northbound approaches operate at LOS F during all three peak hours. With the proposed addition of left turn lanes along Route 16 and the Emerson Street northbound restriction of left turns and through movements, the Emerson Street northbound approach is expected to improve to LOS E or better under No Build conditions. The Washington Street southbound approach is still expected to remain at LOS F during all three peak hours. The additional project trips are expected to result in additional delays to the Washington Street southbound approach during all three peak hours and are expected to continue operating at LOS F under the Build condition.

To improve operations at the intersection, MassDOT could consider implementing a turn restriction on the Washington Street southbound approach, allowing only right turns. This turn restriction would be similar to the turn restriction proposed on the Emerson Street northbound approach to the intersection. The proposed roundabout at the Route 16/Millville Street/site driveway intersection would allow for those vehicles desiring to travel through to Emerson Street or turn left onto Route 16 from Washington Street to reverse direction to make those movements.

Under the Build condition, the residential driveways are expected to operate at LOS A with less than nine seconds of delay during all three peak hours. Left turns into the site are also expected to operate at LOS A during all peak hours. The truck only east site drive is expected to generate only seven truck trips per day, which will be spread out over the course of the day. This will amount to a negligible number of trips during the peak hours and is expected to operate at LOS A during all three peak hours.

4.3 SIGNALIZED INTERSECTION CAPACITY ANALYSIS RESULTS

Hastings Street/North Avenue/Main Street. Under 2021 Existing conditions, the signalized intersection of Hastings Street/North Avenue/Main Street operates at overall LOS D or better during all three peak hours. All lane groups operate at LOS D or better, with three exceptions. The North Avenue southbound approach operates at LOS E during the weekday morning peak hour. The Main Street northbound left-turn lane operates at LOS F during the weekday evening peak hour and at LOS E during the Saturday midday peak hour. Under 2028 No-Build conditions, the intersection is expected to be reconstructed as part of the MassDOT Route 16 improvement project (no. 608491). The addition of left-turn lanes to all approaches is expected to improve operations in the future. Under 2028 No-Build conditions, the intersection is expected to operate at overall LOS C or better conditions during all three peak hours, with all lane groups expected to operate at LOS D or better during peak hours. With the addition of project traffic, the intersection is expected to operate at overall LOS D or better under 2028 Build conditions, with all individual lane groups expected to operate at LOS D or better during the three peak hours, with two exceptions. During the weekday evening peak hour, the Route 16 eastbound left-turn lane and the Main Street northbound left-turn lane are both expected to operate at LOS E. Since this intersection is planned to be fully reconstructed by MassDOT as part of project 604952, no additional mitigation is currently proposed. However, signal timing modifications could be explored (i.e., removing the exclusive northbound left-turn phase), to improve the operations at the intersection, if desired.

Uxbridge Road/Hartford Avenue West. The intersection of Uxbridge Road with Hartford Avenue West is proposed to be signalized by MassDOT in the future. The capacity analyses indicate that the intersection of Uxbridge Road/Hartford Avenue West is expected to operate at overall LOS C or better during all three peak hours under 2028 No-Build conditions. All individual lane groups are expected to operate at LOS D or better for all peak hours. With the addition of project trips under 2028 Build conditions, no changes in level of service are expected. As a result, no mitigation is necessary at this intersection.

Hastings Street/Maple Street. The intersection of Hastings Street with Maple Street is proposed to be signalized by MassDOT in the future. The capacity analyses indicate that the intersection of Hastings Street at Maple Street will operate at overall LOS C with all individual lane groups operating at LOS D or better during the weekday morning, weekday evening, and Saturday midday peak hours under 2028 No-Build conditions. With the addition of project trips in the 2028 Build condition, the overall levels of service are not expected to change. The westbound through lane is expected to degrade from LOS C to LOS D with the addition of project trips during the weekday evening peak hour. All other lane groups are expected to remain at the same level of service as under No-Build conditions. No additional mitigation is proposed at this location.

Table 9 Unsignalized Intersection Capacity Analysis Summary – Weekday AM Peak Hour

		2021 Existing				2028 No-Build				2028 Build			
Intersection	**Movement**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**95th Q[4]**	**v/c**	**Delay**	**LOS**	**95th Q**	**v/c**	**Delay**	**LOS**	**95th Q**
Uxbridge Road & Hartford Ave West	EB LT	0.01	8.2	A	0.0	-	-	-	-	-	-	-	-
	SB LR	1.97	>120	F	21.7	-	-	-	-	-	-	-	-
Hastings Street & Millville Street/West Site Drive	EB LT	0.00	0.0	A	0.0	0.00	0.0	A	0.0	-	-	-	-
	WB LTR	0.12	12.3	B	0.4	-	-	-	-	-	-	-	-
	WB L	-	-	-	-	0.12	13.2	B	0.4				
	NB L	0.47	83.3	F	1.9	0.63	>120	F	2.6	-	-	-	-
	NB R	1.30	>120	F	15.1	1.45	>120	F	16.5	-	-	-	-
	SB LR	0.00	12.2	B	0.0	0.00	12.1	B	0.0				
Hastings Street & Millville Street (Roundabout)	EB LT	-	-	-	-	-	-	-	-	0.53	8.8	A	3.2
	EB TR	-	-	-	-	-	-	-	-	0.60	10.1	B	4.1
	WB LT	-	-	-	-	-	-	-	-	0.26	5.2	A	1.0
	WB TR	-	-	-	-	-	-	-	-	0.29	5.5	A	1.2
	NB LTR	-	-	-	-	-	-	-	-	0.76	35.8	E	6.3
	SB LTR	-	-	-	-	-	-	-	-	0.10	5.5	A	0.3
	Overall	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**11.6**	**B**	
Hastings Street & East Site Drive	EB LT	0.00	8.6	A	0.0	0.00	8.6	A	0.0	0.00	0.0	A	0.0
	SB LR	0.00	0.0	A	0.0	0.00	0.0	A	0.0	0.00	0.0	A	0.0
Hastings Street & Emerson St/Washington St	EB LTR	0.11	9.3	A	0.4	-	-	-	-	-	-	-	-
	EB L	-	-	-	-	0.12	9.2	A	0.4	0.13	9.6	A	0.4
	WB LTR	0.00	7.2	A	0.0	-	-	-	-	-	-	-	-
	WB L	-	-	-	-	0.00	13.2	B	0.0	0.00	13.4	B	0.0
	NB LT	0.48	>120	F	1.2	-	-	-	-	-	-	-	-
	NB R	0.02	8.5	A	0.1	0.14	35.6	E	0.5	0.15	37.2	E	0.5
	SB LTR	1.03	>120	F	5.0	0.39	62.5	F	1.6	1.49	>120	F	6.4
Hastings Street & Maple Street	NWB LR	1.03	>120	F	6.5	-	-	-	-	-	-	-	-
Washington Street & North Site Drive	NB LT	-	-	-	-	-	-	-	-	0.00	7.3	A	0.0
	EB LR	-	-	-	-	-	-	-	-	0.01	8.5	A	0.0
Washington Street & South Site Drive	NB LT	-	-	-	-	-	-	-	-	0.00	7.3	A	0.0
	EB LR	-	-	-	-	-	-	-	-	0.01	8.6	A	0.0

[1] v/c = Volume to capacity ratio (no v/c reported for roundabout)
[2] Delay = Average delay per vehicle (seconds)
[3] LOS = Level of Service
[4] 95th percentile queue (vehicles)

Table 10 Unsignalized Intersection Capacity Analysis Summary – Weekday PM Peak Hour

		2021 Existing				2028 No-Build				2028 Build			
Intersection	**Movement**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**95th Q[4]**	**v/c**	**Delay**	**LOS**	**95th Q**	**v/c**	**Delay**	**LOS**	**95th Q**
Uxbridge Road & Hartford Ave West	EB LT	0.01	10.7	B	0.0	-	-	-	-	-	-	-	-
	SB LR	1.26	>120	F	12.5	-	-	-	-	-	-	-	-
Hastings Street & Millville Street	EB LT	0.00	0.0	A	0.0	0.00	0.0	A	0.0	-	-	-	-
	WB LTR	0.18	9.7	A	0.6	-	-	-	-	-	-	-	-
	WB L	-	-	-	-	0.19	9.9	A	0.7	-	-	-	-
	NB L	0.55	89.6	F	2.4	0.36	50.0	F	1.4				
	NB R	0.21	14.9	B	0.8	0.20	14.7	B	0.7	-	-	-	-
	SB LR	0.04	>120	F	0.1	0.01	26.7	D	0.0	-	-	-	-
Hastings Street & Millville Street (Roundabout)	EB LT	-	-	-	-	-	-	-	-	0.33	6.9	A	1.5
	EB TR	-	-	-	-	-	-	-	-	0.37	7.5	A	1.7
	WB LT	-	-	-	-	-	-	-	-	0.56	9.2	A	3.6
	WB TR	-	-	-	-	-	-	-	-	0.63	10.7	B	4.7
	NB LTR	-	-	-	-	-	-	-	-	0.21	7.6	A	0.8
	SB LTR	-	-	-	-	-	-	-	-	0.55	21.2	C	3.2
	Overall	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**10.1**	**B**	
Hastings Street & East Site Drive	EB LT	0.00	11.9	B	0.0	0.00	12.2	B	0.0	0.00	0.0	A	0.0
	SB LR	0.00	0.0	A	0.0	0.00	0.0	A	0.0	0.00	0.0	A	0.0
Hastings Street & Emerson St/Washington St	EB LTR	0.12	12.4	B	0.4	-	-	-	-	-	-	-	-
	EB L	-	-	-	-	0.14	13.3	B	0.5	0.19	14.8	B	0.7
	WB LTR	0.02	9.1	A	0.1	-	-	-	-	-	-	-	-
	WB L	-	-	-	-	0.03	9.2	A	0.1	0.03	9.7	A	0.1
	NB LT	0.33	>120	F	0.9	-	-	-	-	-	-	-	-
	NB R	0.02	13.2	B	0.1	0.02	13.4	B	0.1	0.02	14.7	B	0.1
	SB LTR	0.66	68.7	F	3.7	0.69	85.5	F	3.7	1.63	>120	F	9.3
Hastings Street & Maple Street	NWB LR	1.95	>120	F	18.3	-	-	-	-	-	-	-	-
Washington Street & North Site Drive	NB LT	-	-	-	-	-	-	-	-	0.01	7.4	A	0.0
	EB LR	-	-	-	-	-	-	-	-	0.01	8.8	A	0.0
Washington Street & South Site Drive	NB LT	-	-	-	-	-	-	-	-	0.01	7.4	A	0.0
	EB LR	-	-	-	-	-	-	-	-	0.01	8.8	A	0.0

[1] v/c = Volume to capacity ratio (no v/c reported for roundabout)
[2] Delay = Average delay per vehicle (seconds)
[3] LOS = Level of Service
[4] 95th percentile queue (vehicles)

Table 11 Unsignalized Intersection Capacity Analysis Summary – Saturday Midday Peak Hour

		2021 Existing				2028 No-Build				2028 Build			
Intersection	**Movement**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**95th Q[4]**	**v/c**	**Delay**	**LOS**	**95th Q**	**v/c**	**Delay**	**LOS**	**95th Q**
Uxbridge Road & Hartford Ave West	EB LT	0.01	9.1	A	0.0	-	-	-	-	-	-	-	-
	SB LR	1.08	>120	F	11.4	-	-	-	-	-	-	-	-
Hastings Street & Millville Street	EB LT	0.00	9.3	A	0.0	0.00	10.0	B	0.0	-	-	-	-
	WB LTR	0.17	10.1	B	0.6	-	-	-	-	-	-	-	-
	WB L	-	-	-	-	0.18	10.3	B	0.7				
	NB L	0.55	67.0	F	2.7	0.39	37.6	E	1.7	-	-	-	-
	NB R	0.31	18.0	C	1.3	0.32	18.1	C	1.4	-	-	-	-
	SB LR	0.04	69.5	F	0.1	0.01	21.8	C	0.0	-	-	-	-
Hastings Street & Millville Street (Roundabout)	EB LT	-	-	-	-	-	-	-	-	0.38	7.6	A	1.8
	EB TR	-	-	-	-	-	-	-	-	0.43	8.3	A	2.2
	WB LT	-	-	-	-	-	-	-	-	0.43	7.4	A	2.2
	WB TR	-	-	-	-	-	-	-	-	0.49	8.2	A	2.8
	NB LTR	-	-	-	-	-	-	-	-	0.33	10.2	B	1.5
	SB LTR	-	-	-	-	-	-	-	-	0.40	12.4	B	1.9
	Overall	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**8.5**	**A**	
Hastings Street & East Site Drive	EB LT	0.00	0.0	A	0.0	0.00	0.0	A	0.0	0.00	0.0	A	0.0
	SB LR	0.01	44.6	E	0.0	0.01	21.7	C	0.0	0.00	0.0	A	0.0
Hastings Street & Emerson St/Washington St	EB LTR	0.07	10.1	B	0.2	-	-	-	-	-	-	-	-
	EB L	-	-	-	-	0.07	10.4	B	0.2	0.11	11.4	B	0.4
	WB LTR	0.01	9.6	A	0.0	-	-	-	-	-	-	-	-
	WB L	-	-	-	-	0.01	9.6	A	0.0	0.01	10.1	B	0.0
	NB LT	0.26	112.9	F	0.9	-	-	-	-	-	-	-	-
	NB R	0.02	15.2	C	0.1	0.02	15.3	C	0.1	0.03	16.9	C	0.1
	SB LTR	0.56	58.7	F	2.8	0.48	57.0	F	2.2	1.43	>120	F	8.0
Hastings Street & Maple Street	NWB LR	1.45	>120	F	14.6	-	-	-	-	-	-	-	-
Washington Street & North Site Drive	NB LT	-	-	-	-	-	-	-	-	0.01	7.4	A	0.0
	EB LR	-	-	-	-	-	-	-	-	0.01	8.7	A	0.0
Washington Street & South Site Drive	NB LT	-	-	-	-	-	-	-	-	0.01	7.4	A	0.0
	EB LR	-	-	-	-	-	-	-	-	0.01	8.7	A	0.0

[1] v/c = Volume to capacity ratio (no v/c reported for roundabout)
[2] Delay = Average delay per vehicle (seconds)
[3] LOS = Level of Service
[4] 95th percentile queue (vehicles)

Table 12 **Signalized Intersection Capacity Analysis Summary – Weekday AM Peak Hour**

		2021 Existing					2028 No-Build					2028 Build				
Intersection	**Movement**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**50th Q[4]**	**95thQ[5]**	**v/c**	**Delay**	**LOS**	**50thQ**	**95thQ**	**v/c**	**Delay**	**LOS**	**50thQ**	**95thQ**
Uxbridge Rd (Route 16) & Hartford Ave W[6]	EB L	-	-	-	-	-	0.17	38.8	D	2	11	0.17	38.8	D	2	11
	EB T	-	-	-	-	-	0.97	31.9	C	~429	#732	0.98	34.5	C	~457	#743
	WB T	-	-	-	-	-	0.28	9.4	A	43	120	0.29	9.5	A	45	125
	WB R	-	-	-	-	-	0.10	2.7	A	0	11	0.10	2.7	A	0	11
	SB LR	-	-	-	-	-	0.80	41.0	D	113	#222	0.82	43.0	D	116	#230
	Intersection	**-**	**-**	**-**	**-**	**-**	**1.10**	**27.4**	**C**			**1.12**	**29.3**	**C**		
Hastings St (Route 16) & Maple St[6]	EB T	-	-	-	-	-	0.72	8.3	A	191	396	0.76	9.8	A	219	#440
	EB R	-	-	-	-	-	0.63	6.7	A	125	268	0.66	7.8	A	144	289
	WB T	-	-	-	-	-	0.42	4.7	A	76	154	0.46	5.3	A	91	171
	NB L	-	-	-	-	-	0.53	27.8	C	42	85	0.65	31.3	C	58	111
	Intersection	**-**	**-**	**-**			**0.69**	**8.0**	**A**			**0.74**	**9.6**	**A**		
Hastings St (Route 16) & North St/Main St	EB LTR	0.88	26.8	C	337	#594	-	-	-	-	-	-	-	-	-	-
	EB L	-	-	-	-	-	0.41	14.8	B	59	129	0.47	16.4	B	66	142
	EB TR	-	-	-	-	-	0.83	25.7	C	307	#564	0.87	29.6	C	328	#611
	WB LTR	0.43	12.2	B	103	152	-	-	-	-	-	-	-	-	-	-
	WB L	-	-	-	-	-	0.31	14.7	B	13	45	0.36	16.7	B	13	49
	WB TR	-	-	-	-	-	0.40	14.4	B	104	196	0.44	15.7	B	117	213
	NB L	0.66	40.3	D	58	#127	0.48	19.0	B	44	91	0.46	18.7	B	46	91
	NB TR	0.82	40.5	D	183	#302	0.61	21.5	C	162	283	0.59	21.1	C	169	283
	SB LTR	0.95	62.4	E	167	#298	-	-	-	-	-	-	-	-	-	-
	SB L	-	-	-	-	-	0.18	23.8	C	18	49	0.19	24.9	C	19	49
	SB TR	-	-	-	-	-	0.69	32.0	C	141	248	0.73	35.2	D	153	258
	Intersection	**0.93**	**33.6**	**C**			**0.80**	**22.5**	**C**			**0.83**	**24.5**	**C**		

[1] v/c = Volume to capacity ratio

[2] Delay = Average delay per vehicle (seconds)

[3] LOS = Level of Service

[4] 50th percentile queue (feet)

[5] 95th percentile queue (feet)

Table 13 **Signalized Intersection Capacity Analysis Summary – Weekday PM Peak Hour**

		2021 Existing					2028 No-Build					2028 Build				
Intersection	**Movement**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**50th Q[4]**	**95thQ[5]**	**v/c**	**Delay**	**LOS**	**50thQ**	**95thQ**	**v/c**	**Delay**	**LOS**	**50thQ**	**95thQ**
Uxbridge Rd (Route 16) & Hartford Ave W[6]	EB L	-	-	-	-	-	0.23	33.0	C	2	14	0.23	33.2	C	2	14
	EB T	-	-	-	-	-	0.38	6.4	A	71	129	0.40	6.7	A	79	137
	WB T	-	-	-	-	-	0.77	17.1	B	142	#453	0.80	18.7	B	154	#474
	WB R	-	-	-	-	-	0.31	4.0	A	0	20	0.32	4.0	A	0	20
	SB LR	-	-	-	-	-	0.60	25.1	C	56	138	0.61	25.3	C	59	145
	Intersection	**-**	**-**	**-**	**-**	**-**	**0.82**	**11.7**	**B**			**0.85**	**12.4**	**B**		
Hastings St (Route 16) & Maple St[6]	EB T	-	-	-	-	-	0.34	5.7	A	73	118	0.40	6.2	A	82	132
	EB R	-	-	-	-	-	0.31	5.5	A	54	93	0.37	6.0	A	64	108
	WB T	-	-	-	-	-	0.98	32.1	C	~461	#763	1.03	48.2	D	~578	#806
	NB L	-	-	-	-	-	0.71	35.2	D	88	#162	0.90	54.5	D	121	#254
	Intersection	**-**	**-**	**-**	**-**	**-**	**0.92**	**23.4**	**C**			**1.00**	**34.0**	**C**		
Hastings St (Route 16) & North St/Main St	EB LTR	0.40	11.6	B	101	161	-	-	-	-	-	-	-	-	-	-
	EB L	-	-	-	-	-	0.64	32.0	C	31	#105	0.88	75.4	E	43	#140
	EB TR	-	-	-	-	-	0.42	17.1	B	137	208	0.45	16.9	B	143	215
	WB LTR	0.74	18.6	B	258	400	-	-	-	-	-	-	-	-	-	-
	WB L	-	-	-	-	-	0.23	15.4	B	32	65	0.23	15.0	B	29	60
	WB TR	-	-	-	-	-	0.89	35.0	D	396	#628	0.91	35.9	D	396	#603
	NB L	1.20	>120	F	~122	#245	0.82	40.5	D	83	#192	0.94	69.3	E	84	#228
	NB TR	0.61	29.5	C	131	212	0.44	19.3	B	144	221	0.46	20.9	C	146	237
	SB LTR	0.91	50.8	D	212	#370	-	-	-	-	-	-	-	-	-	-
	SB L	-	-	-	-	-	0.16	24.7	C	22	51	0.16	26.1	C	22	54
	SB TR	-	-	-	-	-	0.85	43.5	D	241	#395	0.91	54.5	D	259	#467
	SB LT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Intersection	**0.93**	**39.6**	**D**			**0.90**	**30.9**	**C**			**0.96**	**37.5**	**D**		

[1] v/c = Volume to capacity ratio

[2] Delay = Average delay per vehicle (seconds)

[3] LOS = Level of Service

[4] 50th percentile queue (feet)

[5] 95th percentile queue (feet)

Table 14 **Signalized Intersection Capacity Analysis Summary – Saturday Midday Peak Hour**

		2021 Existing					2028 No-Build					2028 Build				
Intersection	**Movement**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**50th Q[4]**	**95thQ[5]**	**v/c**	**Delay**	**LOS**	**50thQ**	**95thQ**	**v/c**	**Delay**	**LOS**	**50thQ**	**95thQ**
Uxbridge Rd (Route 16) & Hartford Ave W[6]	EB L	-	-	-	-	-	0.17	28.2	C	1	12	0.18	29.5	C	1	12
	EB T	-	-	-	-	-	0.53	9.5	A	96	156	0.55	9.8	A	104	167
	WB T	-	-	-	-	-	0.74	18.6	B	98	252	0.75	19.0	B	104	268
	WB R	-	-	-	-	-	0.16	3.9	A	0	15	0.17	3.7	A	0	15
	SB LR	-	-	-	-	-	0.55	17.7	B	50	#186	0.57	18.9	B	57	#200
	Intersection	**-**	**-**	**-**	**-**	**-**	**0.80**	**12.8**	**B**			**0.81**	**13.2**	**B**		
Hastings St (Route 16) & Maple St[6]	EB T	-	-	-	-	-	0.48	7.7	A	87	148	0.55	9.1	A	109	175
	EB R	-	-	-	-	-	0.46	7.5	A	67	121	0.53	9.0	A	88	147
	WB T	-	-	-	-	-	0.75	12.5	B	166	289	0.84	17.2	B	208	342
	NB L	-	-	-	-	-	0.63	22.2	C	67	#195	0.77	28.2	C	104	#287
	Intersection	**-**	**-**	**-**			**0.72**	**11.5**	**B**			**0.81**	**15.1**	**B**		
Hastings St (Route 16) & North St/Main St	EB LTR	0.48	12.7	B	132	206	-	-	-	-	-	-	-	-	-	-
	EB L	-	-	-	-	-	0.39	17.3	B	22	66	0.53	20.3	C	30	88
	EB TR	-	-	-	-	-	0.64	20.0	B	131	260	0.67	21.2	C	158	292
	WB LTR	0.57	14.3	B	165	248	-	-	-	-	-	-	-	-	-	-
	WB L	-	-	-	-	-	0.32	16.4	B	21	62	0.34	17.0	B	23	63
	WB TR	-	-	-	-	-	0.73	22.8	C	157	308	0.76	24.7	C	190	348
	NB L	0.90	72.3	E	73	#185	0.46	12.7	B	37	96	0.49	14.2	B	41	103
	NB TR	0.45	25.5	C	85	151	0.31	11.5	B	60	144	0.32	12.6	B	67	155
	SB LTR	0.80	38.1	D	189	239	-	-	-	-	-	-	-	-	-	-
	SB L	-	-	-	-	-	0.17	18.5	B	15	47	0.16	19.5	B	16	50
	SB TR	-	-	-	-	-	0.70	26.0	C	119	249	0.73	28.8	C	139	287
	Intersection	**0.71**	**25.8**	**C**			**0.69**	**19.7**	**B**			**0.73**	**21.6**	**C**		

[1] v/c = Volume to capacity ratio

[2] Delay = Average delay per vehicle (seconds)

[3] LOS = Level of Service

[4] 50th percentile queue (feet)

[5] 95th percentile queue (feet)

5.0 TRAFFIC MITIGATION

Tetra Tech has identified site access improvements to be implemented as part of the proposed project to address existing and future traffic operational deficiencies and off-set the potential traffic increases associated with the proposed project. The specific site access improvements to be implemented as part of the proposed project, as well as potential Transportation Demand Management measures that could be implemented to further reduce traffic increases associated with the project are described below.

5.1 SITE ACCESS IMPROVEMENTS

The Town of Mendon had expressed interest in exploring a roundabout as a potential solution to address existing traffic safety and capacity issues at the intersection with Route 16 and Millville Street. The capacity analysis presented in this report indicates that a multilane roundabout can accommodate the projected traffic demands at the intersection while also providing safe and convenient access to the proposed shopping center. As part of the proposed project, the proponent is committed to funding the final design and construction of a multilane roundabout to enhance access to the shopping center and improve operations on the Route 16 (Hastings Street/Uxbridge Road) and Millville Street intersection.

As part of this effort, the existing westerly commercial site driveway will be closed and replaced with a new two-lane, two-way access driveway approximately 100 feet to the west (directly across from Millville Street) to form a four-way intersection of Route 16 (Hastings Street/Uxbridge Road), Millville Street and the primary access drive to the shopping center driveway. The new four-way intersection will be reconstructed to provide a modern multilane roundabout. As currently proposed, the Hastings Street eastbound and westbound approaches will each consist of two lanes, tapering back to a single lane in each direction before and after the roundabout. Tapers are provided in both directions on the approaches and departures. The Millville Street northbound and site driveway southbound approach will each consist of a single lane. A shared use path will be provided on both sides of Hastings Street. Pedestrian crossings are proposed on all four approaches.

The east site driveway along the easterly property line will provide access for delivery and service vehicles for the shopping center. Two proposed driveways, the north and south site drives, will be provided along the west side of Washington Street for residential site access. These driveways will each have a single entry lane and exit lane.

The proposed project will require a state highway access permit to construct the proposed site access improvements along Route 16. Any improvements at the intersection will need to be further evaluated through MassDOT's Intersection Control Evaluation (ICE) review process. The proponent will continue to coordinate with MassDOT through the state permitting and design review process to ensure that the final proposed improvement is compatible with other planned improvements along Route 16 as part of MassDOT Project No. 608491.

5.2 TRANSPORTATION DEMAND MANAGEMENT (TDM) PROGRAM

The project proponent will develop a Transportation Demand Management (TDM) program to encourage the use of alternative modes of transportation and reduce single occupancy vehicle trips to and from the site. Elements of the Transportation Demand Management Plan will be incorporated into the proposed site plan and include the following:

- **Preferential Parking -** Provide preferential parking spaces for employees who rideshare or use low-emission vehicles.

- **Bicycle Accommodations –** Provide bicycle racks within the parking lot to encourage employees to bike to work or customers to bike to the shopping plaza.

The project proponent will also work with the future tenants of the site to explore additional TDM measures to further reduce single occupancy vehicle trips to and from the site.

6.0 SIGHT DISTANCE ANALYSIS

Tetra Tech reviewed the available sight distance at the proposed site driveways on Washington Street and the truck access driveway on Route 16 to ensure that safe and efficient access would be provided to the project site. The available sight distance at the site driveways was determined based on procedures outlined in *A Policy On Geometric Design of Highways and Streets*, published by the American Association of State Highway and Transportation Officials (AASHTO). Tetra Tech then compared the available sight distance at the proposed driveways to the required Stopping Sight Distance (SSD) and desirable Intersection Sight Distance (ISD) for the anticipated travel speeds for vehicle traveling past the site.

There are no speed limit signs posted along Washington Street, but the area is posted as thickly settled, so a prima facie speed limit of 30 mph was assumed in both directions for the purpose of this sight distance analysis. The speed data from the Route 16 project (Project No. 608491) indicates that travel speeds along Route 16 are approximately 44 miles per hour (mph) in the eastbound direction and approximately 43 mph in the westbound direction. This is consistent with the posted speed limit of 45 mph in this area. To provide a conservative assessment, the posted speed limit of 45 mph was used as a basis of the sight distance analysis along Route 16. A summary of the available and required SSD and ISD at the proposed driveway locations along Washington Street and Route 16 is presented in Table 15.

Table 15 Sight Distance Summary

Intersection	Assumed Speed (mph)	Approx. Grade	AASHTO Desirable (feet)[1]	AASHTO Minimum (feet)	Estimated Distance (feet)	Meets AASHTO Desirable	Meets AASHTO Minimum
Washington Street/Proposed Northerly Site Driveway							
Stopping Distance							
From the North	30	0%	200	NA	>500	Yes	-
From the South	30	0%	200	NA	>500	Yes	-
Intersection Sight Distance							
To the North	30		335	200	>500	Yes	Yes
To the South	30		335	200	>500	Yes	Yes
Washington Street/Proposed Southerly Site Driveway							
Stopping Distance							
From the North	30	0%	200	NA	>500	Yes	-
From the South	30	0%	200	NA	>500	Yes	-
Intersection Sight Distance							
To the North	30		335	200	>500	Yes	Yes
To the South	30		335	200	>500	Yes	Yes
Route 16/Truck Access Driveway							
Stopping Distance							
From the West[2]	30	0%	200	NA	200	Yes	-
From the East	45	0%	360	NA	475[3]	Yes	-
Intersection Sight							
To the East	45		500	360	525[4]	Yes	Yes

[1] Obtained from A Policy On Geometric Design of Highways and Streets, 2018 Edition, published by the American Association of State Highway and Transportation Officials (Exhibit 3-1) for the assumed travel speeds for required stopping sight distance and desirable intersection sight distance based on roadway grades.

[2] Since traffic from the west will be exiting the roundabout, a lower speed (30 mph) is assumed in this direction. Distance from roundabout exit to back of truck turning into driveway is approximately 200 feet, which is listed as the available stopping sight distance in this direction.

[3] Distance from Washington Street to back of a truck turning in to the driveway is approximately 475 feet, which is listed as the available stopping sight distance from this direction.

[4] Distance to next intersection (Washington Street) is approximately 525 feet, which is listed as the available intersection sight distance looking to the left from the truck driveway.

As shown in Table 15, the available sight distance at each of the proposed site driveways is equal to or in excess of AASHTO-required stopping sight distance and AASHTO-recommended desirable intersection sight distance for the assumed travel speeds on Washington Street assuming selective clearing of roadside vegetation and restricting on-site objects (i.e., fencing, signage, etc.) to two feet or less. This will provide motorists waiting to exit the site driveways with sufficient view of the intersecting roadway to decide when they can safely enter onto Washington Street and Route 16.

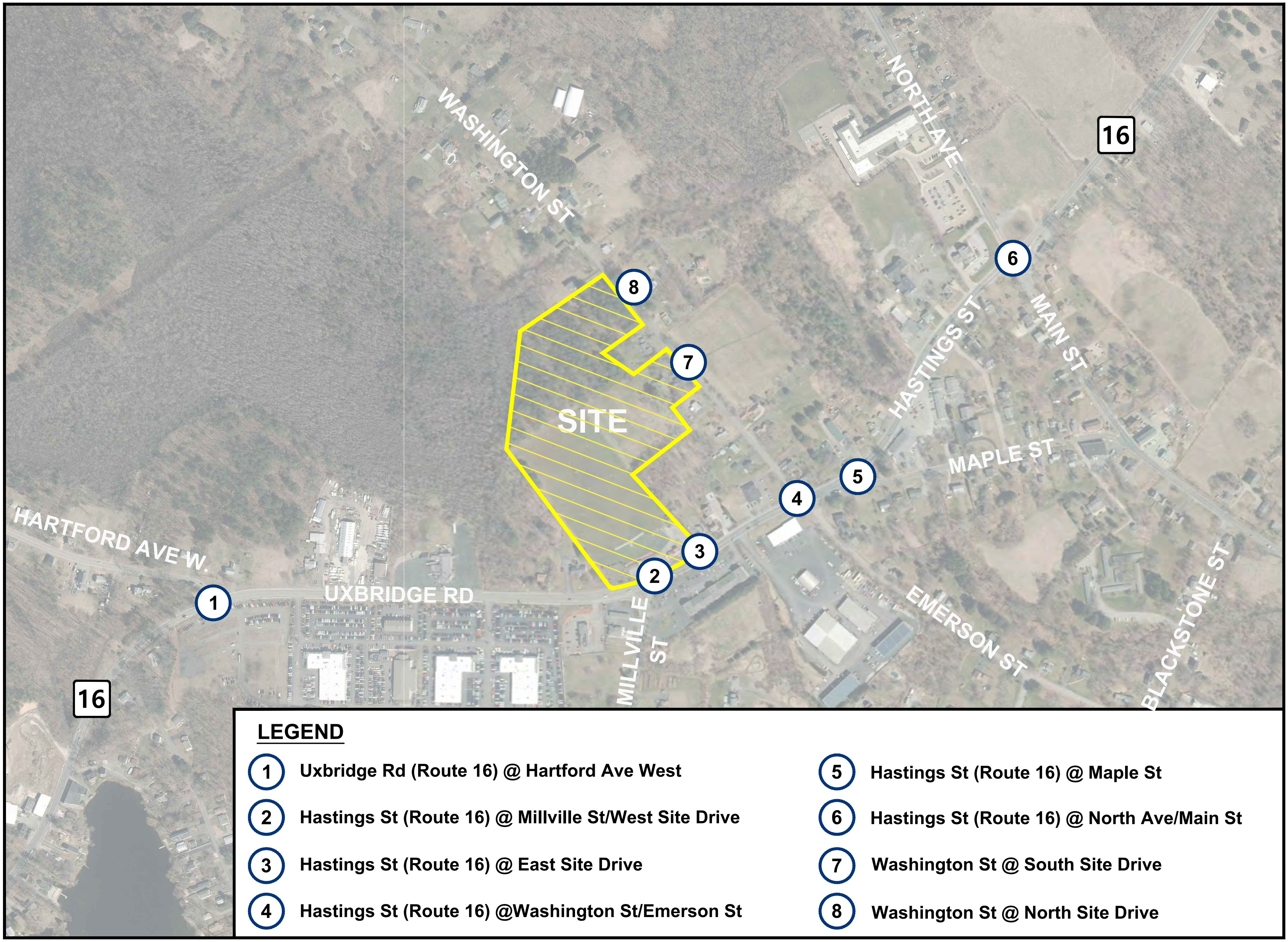
Adequate sight lines for all approaches to the proposed site access roundabout will be ensured as the roundabout design advances. It is assumed that a left turn restriction will be in place at the secondary site driveway and trucks will only exit the driveway onto Route 16 by turning right and will traverse through the roundabout to reverse direction. The available stopping sight distance in the eastbound direction at the proposed truck access driveway along Route 16 is assumed to be 200 feet, which is the distance between the roundabout and the back of a truck waiting to turn into the driveway. Similarly, in the westbound direction, the distance between the next intersection (Washington Street/Emerson Street) is approximately 475 feet from the intersection to the back of a truck waiting to turn into the proposed truck access driveway, and this distance is assumed to be the available stopping sight distance. The sight distance calculations are included in Appendix L.

7.0 CONCLUSION

Based on the analysis presented in this report, upon implementation of the recommended site access improvements, the potential traffic increases associated with the proposed project can be safely accommodated at the site driveways with no significant impact to future traffic operations on surrounding area roadways. As part of the proposed project, the proponent will fund the design and construction of a roundabout at the intersection of Uxbridge Street/Hastings Street (Route 16) and Millville Street/Site Driveway, including a donation of land along their property to support the proposed roundabout. The proponent will also work with the future tenants of the site to develop a TDM program to minimize reliance on single-occupant vehicles and further reduce single occupancy vehicle trips to and from the site at the project site.

The proposed project will require a state highway access permit to construct the proposed site access improvements along Route 16. The final design of these improvements will need to be reviewed and approved through MassDOT's Intersection Control Evaluation (ICE) and design review process. The proposed project will also exceed the Massachusetts Environmental Policy Act (MEPA) traffic volume review thresholds for categorical inclusion for the preparation of a Draft Environmental Impact Report (DEIR).

The proponent will continue to coordinate with MassDOT through the state permitting and design review process to ensure that the final proposed site access improvements are compatible with other planned improvements along Route 16 as part of MassDOT Project No. 608491.

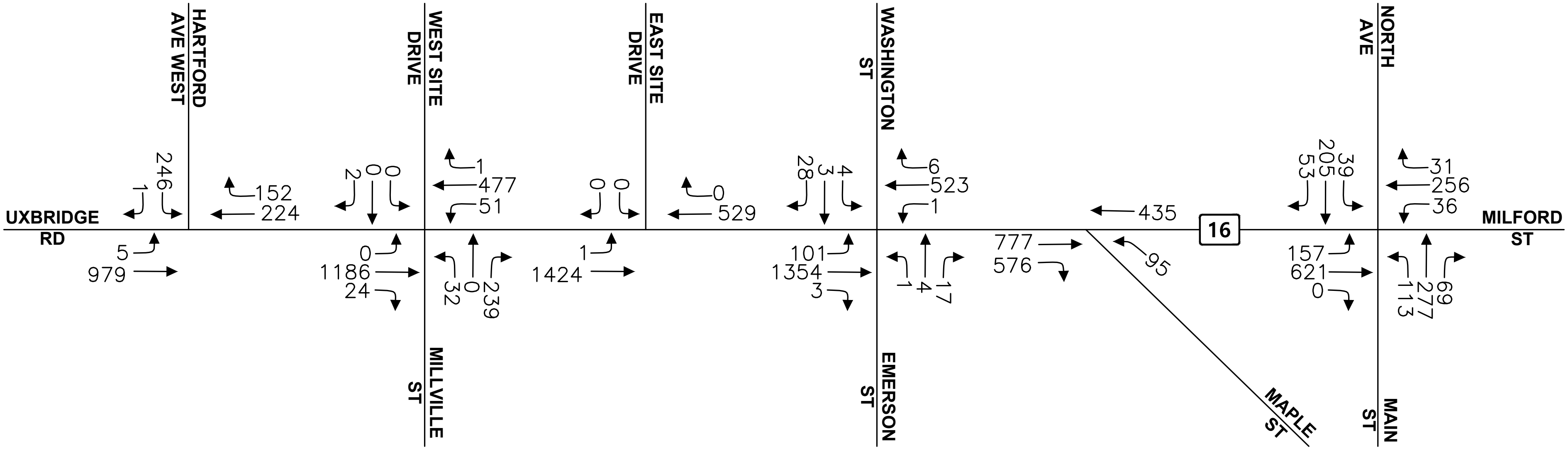


TETRA TECH

Proposed Mixed-Use Development
Mendon, Massachusetts

STUDY AREA INTERSECTIONS

FIGURE
1

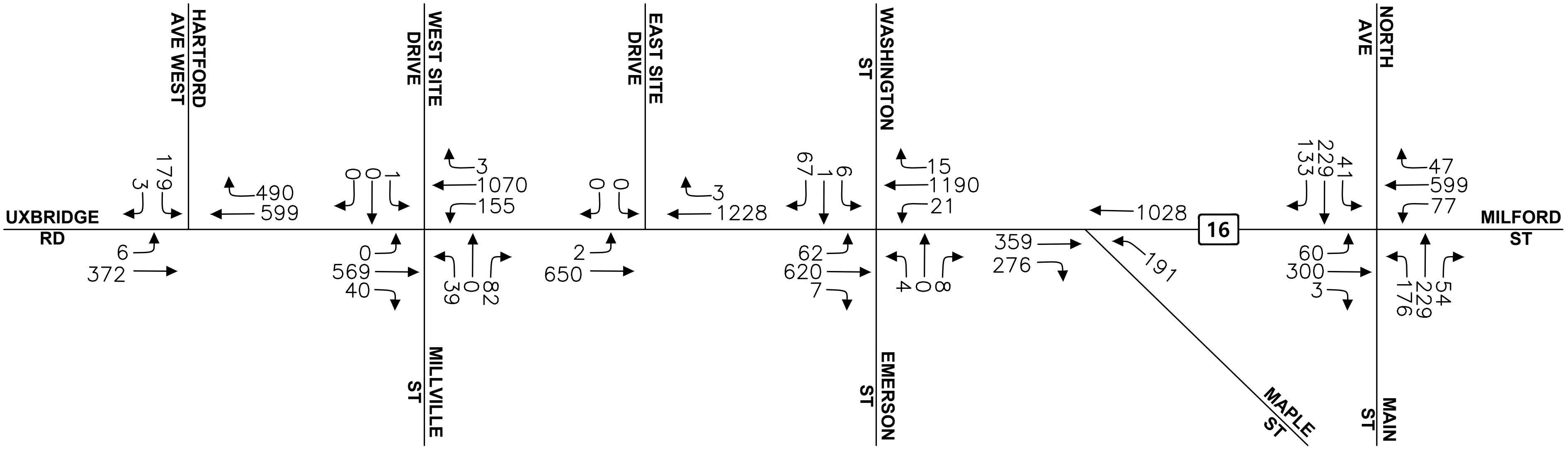


Proposed Mixed-Use Development
Mendon, Massachusetts

2021 EXISTING TRAFFIC VOLUMES
WEEKDAY MORNING PEAK HOUR

FIGURE
2

TETRA TECH



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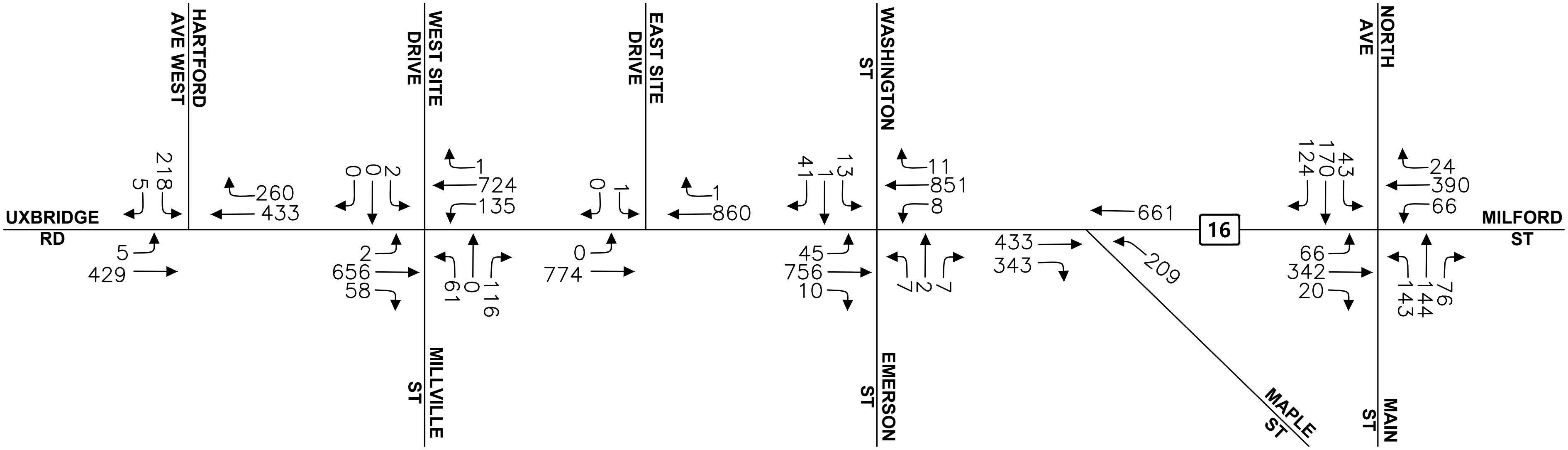
Proposed Mixed-Use Development
Mendon, Massachusetts

2021 EXISTING TRAFFIC VOLUMES
WEEKDAY EVENING PEAK HOUR

FIGURE
3

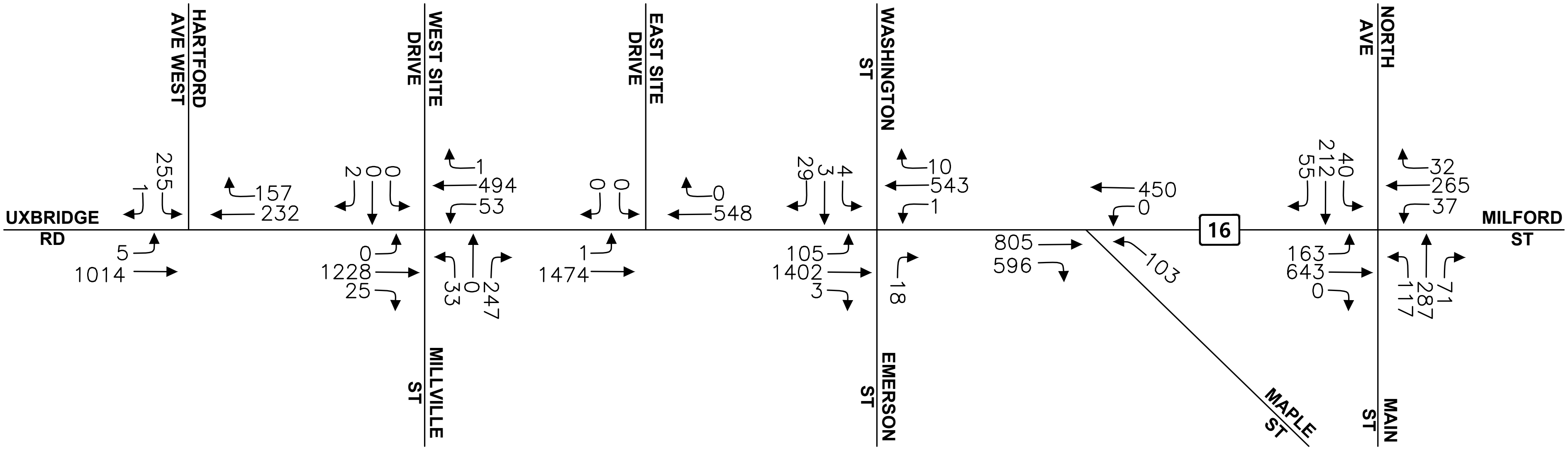


TETRA TECH

Proposed Mixed-Use Development
Mendon, Massachusetts

2021 EXISTING TRAFFIC VOLUMES
SATURDAY MIDDAY PEAK HOUR

FIGURE
4

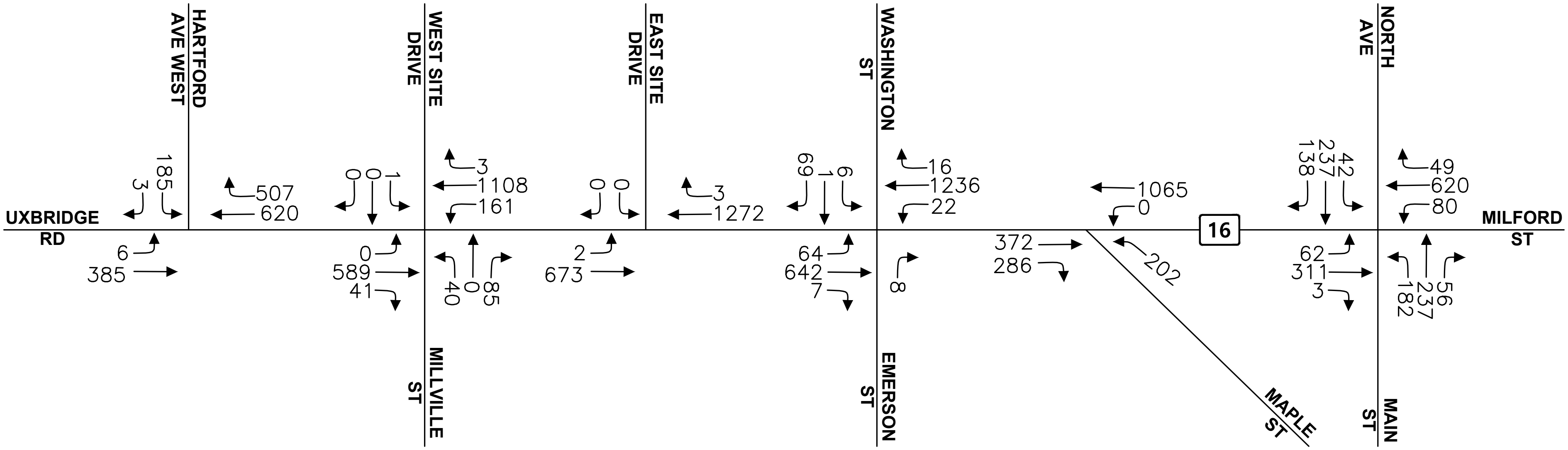


TETRA TECH

Proposed Mixed-Use Development
Mendon, Massachusetts

2028 NO BUILD TRAFFIC VOLUMES
WEEKDAY MORNING PEAK HOUR

FIGURE
5

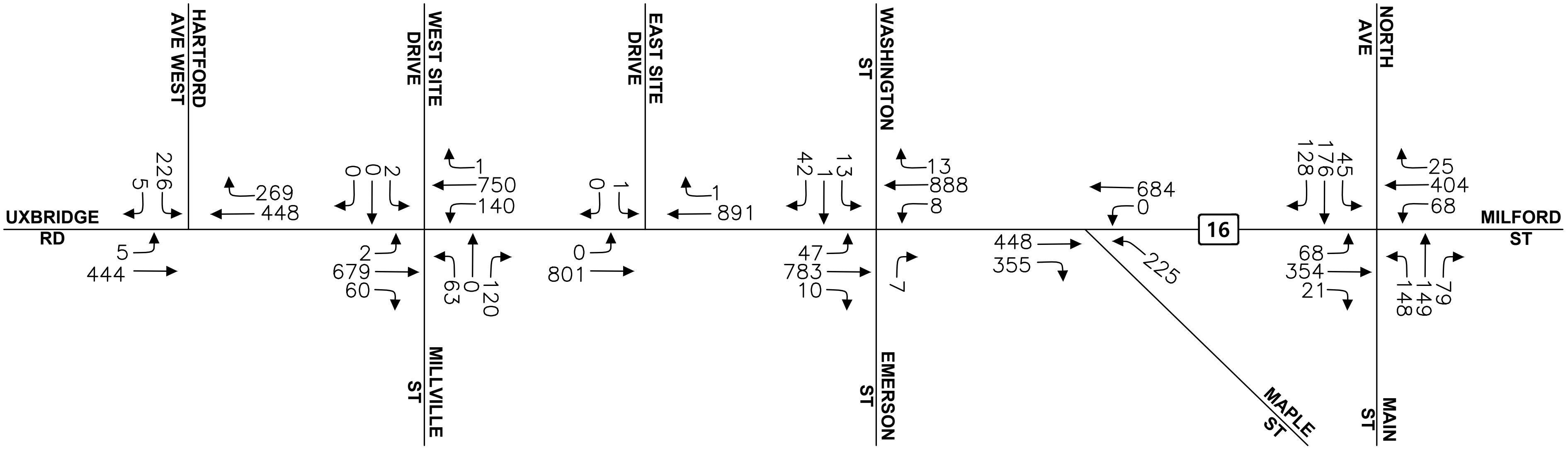


TETRA TECH

Proposed Mixed-Use Development
Mendon, Massachusetts

2028 NO BUILD TRAFFIC VOLUMES
WEEKDAY EVENING PEAK HOUR

FIGURE
6

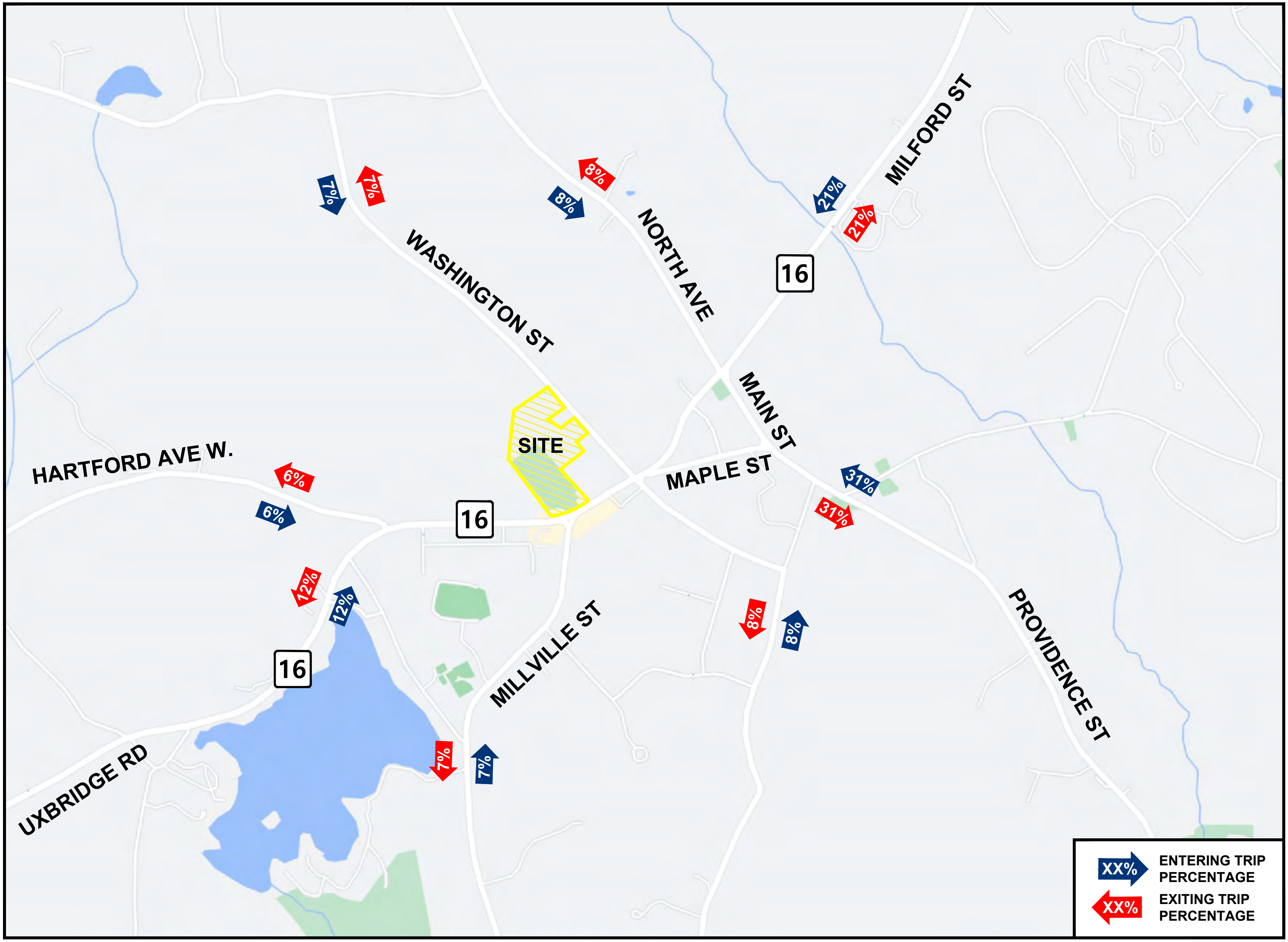


TETRA TECH

Proposed Mixed-Use Development
Mendon, Massachusetts

2028 NO BUILD TRAFFIC VOLUMES
SATURDAY MIDDAY PEAK HOUR

FIGURE
7



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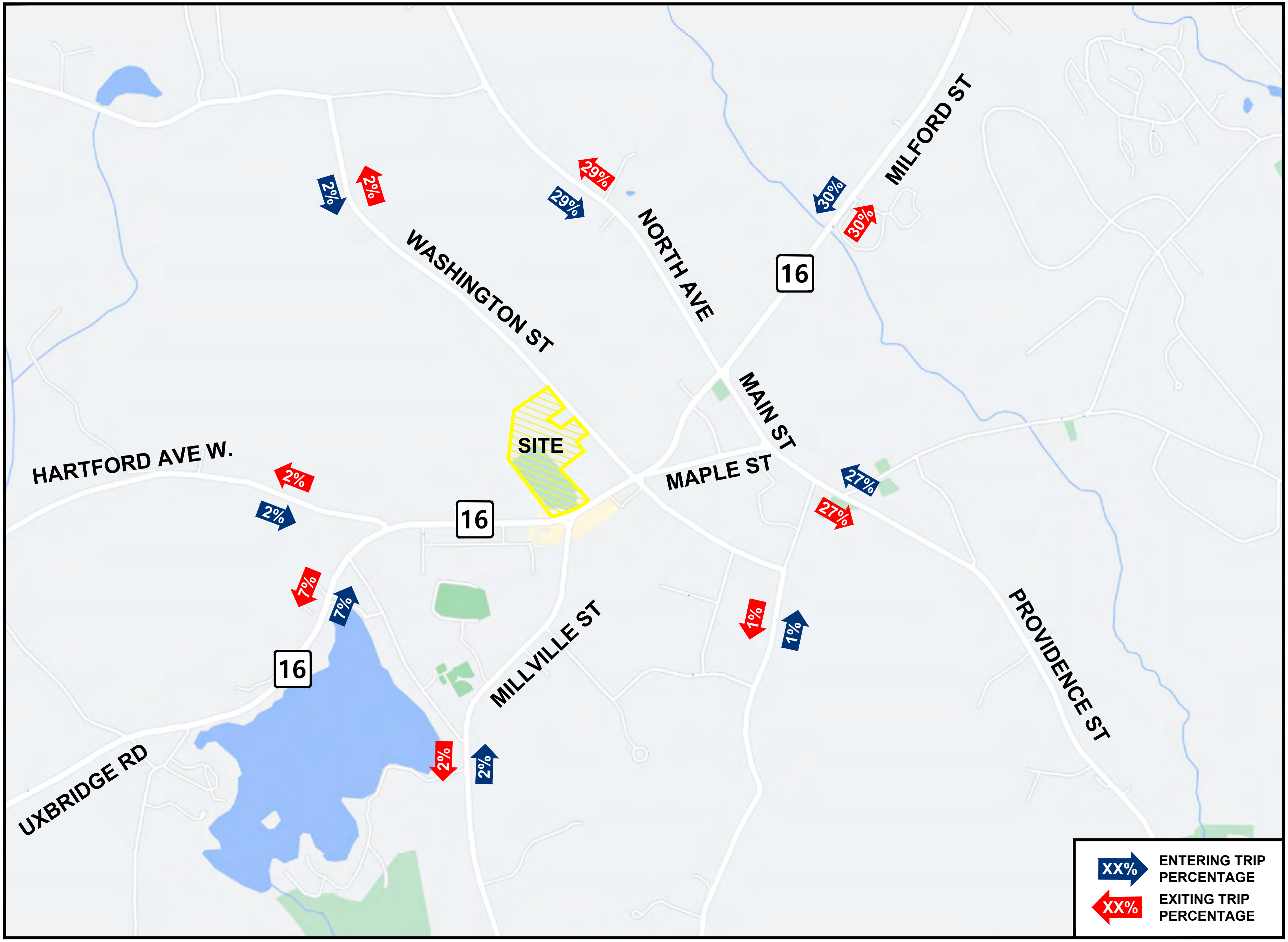
Proposed Mixed-Use Development
Mendon, Massachusetts

RETAIL
TRIP DISTRIBUTION

FIGURE
8



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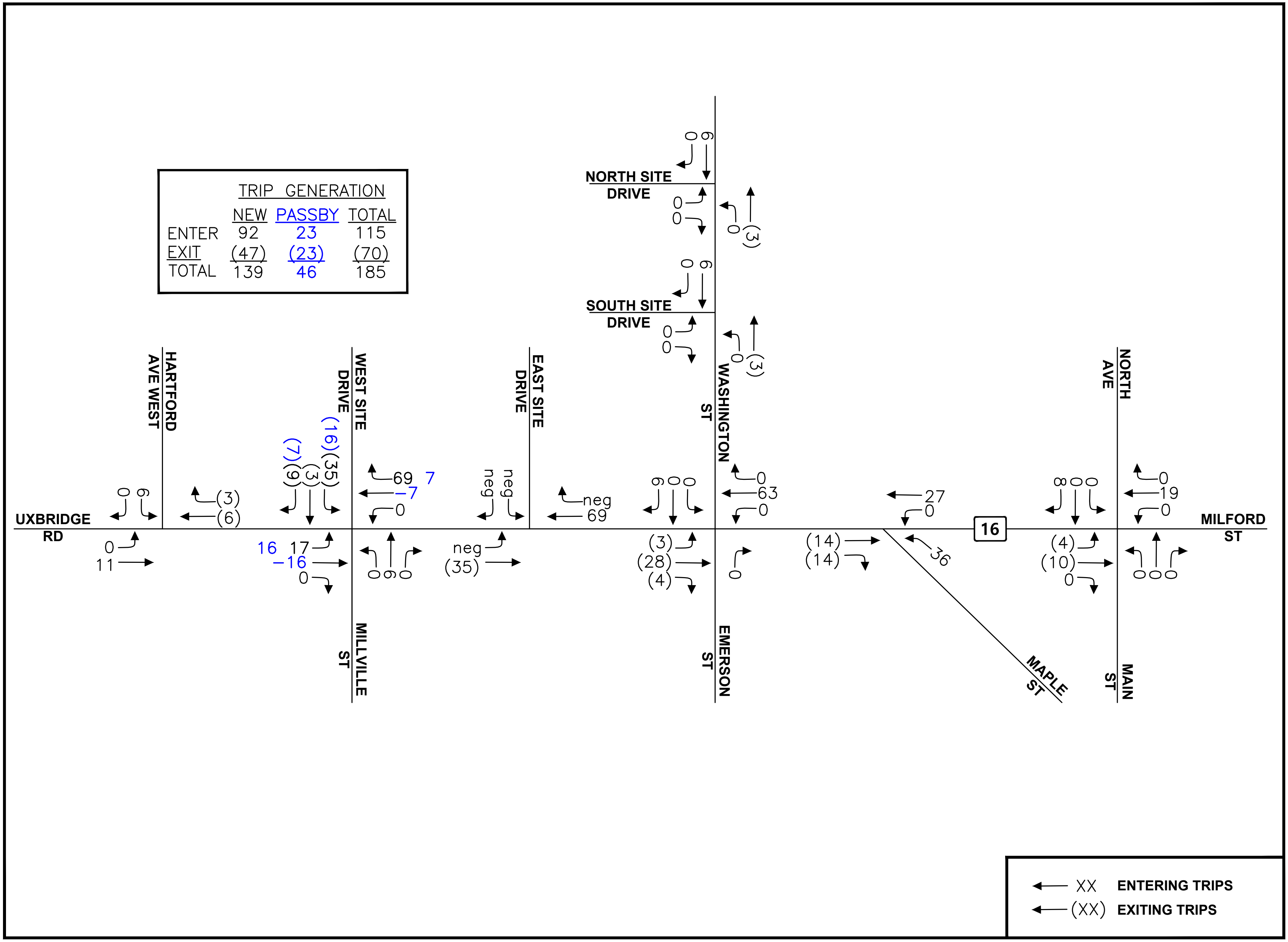
Proposed Mixed-Use Development
Mendon, Massachusetts

RESIDENTIAL TRIP DISTRIBUTION

FIGURE
9



TRIP GENERATION

	NEW	PASSBY	TOTAL
ENTER	92	23	115
EXIT	(47)	(23)	(70)
TOTAL	139	46	185

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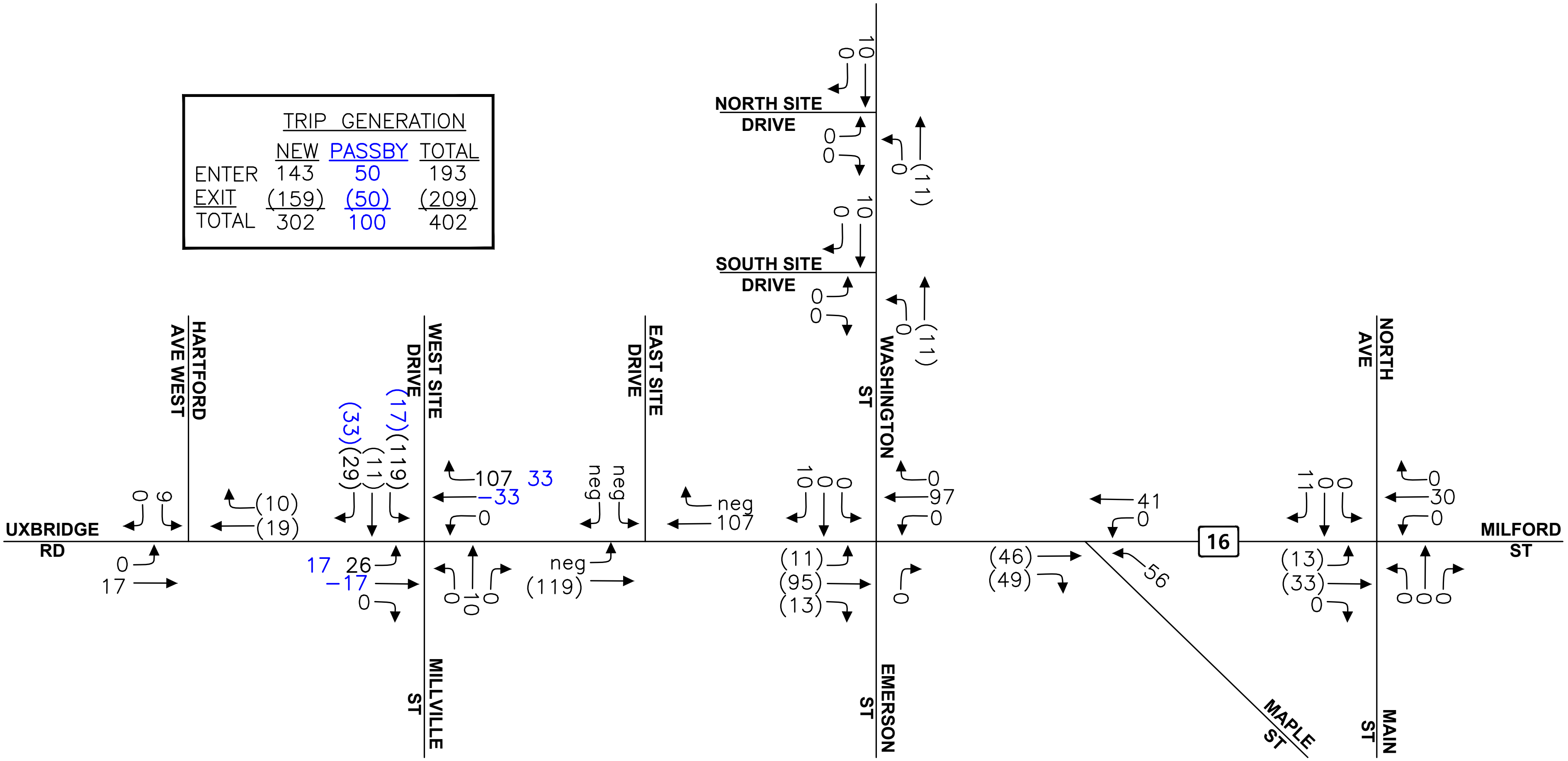
Proposed Mixed-Use Development
Mendon, Massachusetts

RETAIL PROJECT TRIPS
WEEKDAY MORNING PEAK HOUR

FIGURE
10

	TRIP GENERATION		
	NEW	PASSBY	TOTAL
ENTER	143	50	193
EXIT	(159)	(50)	(209)
TOTAL	302	100	402



← XX ENTERING TRIPS
← (XX) EXITING TRIPS

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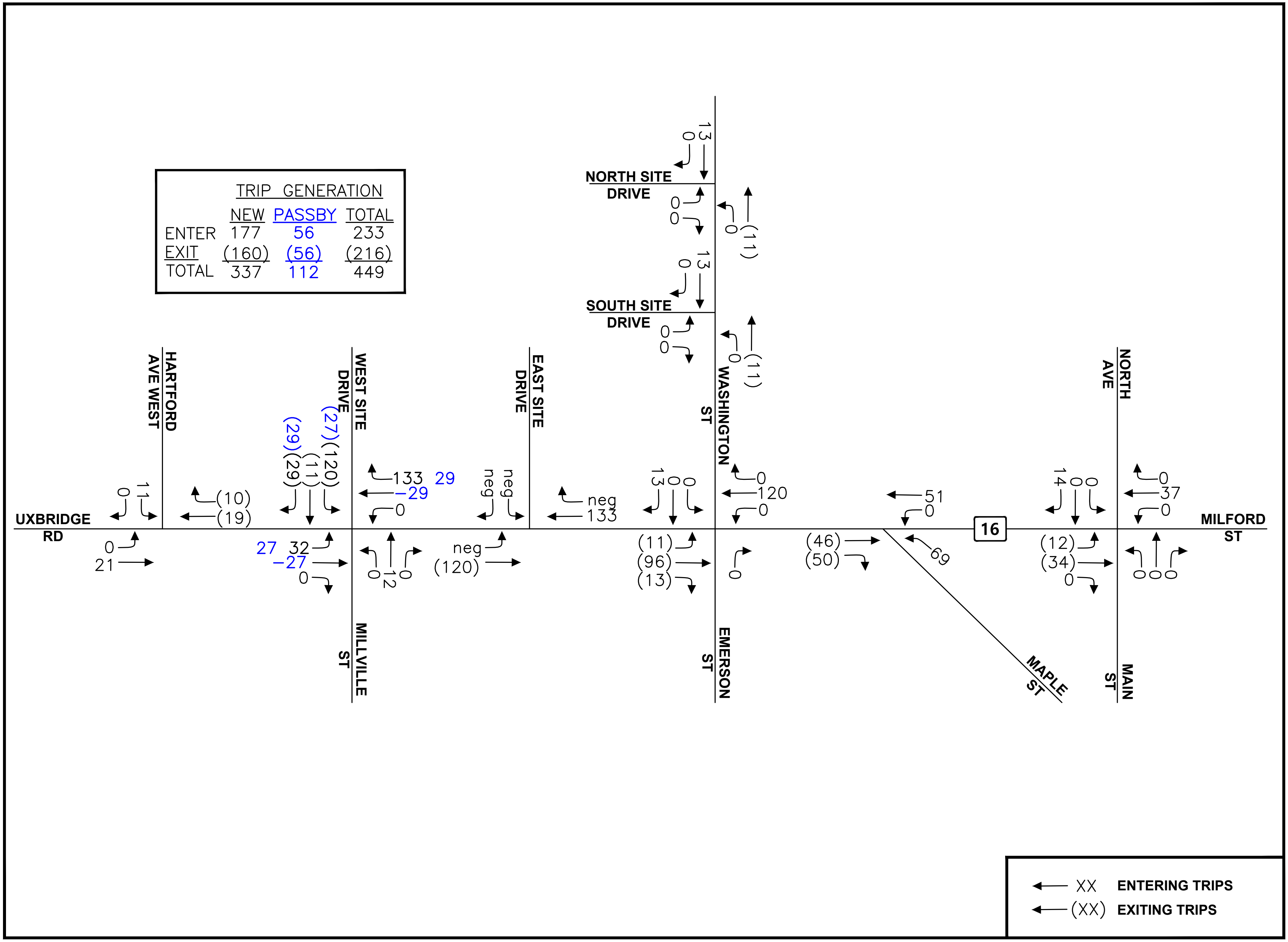
Proposed Mixed-Use Development
Mendon, Massachusetts

RETAIL PROJECT TRIPS
WEEKDAY EVENING PEAK HOUR

FIGURE
11



	TRIP GENERATION		
	NEW	PASSBY	TOTAL
ENTER	177	56	233
EXIT	(160)	(56)	(216)
TOTAL	337	112	449

← XX ENTERING TRIPS
← (XX) EXITING TRIPS

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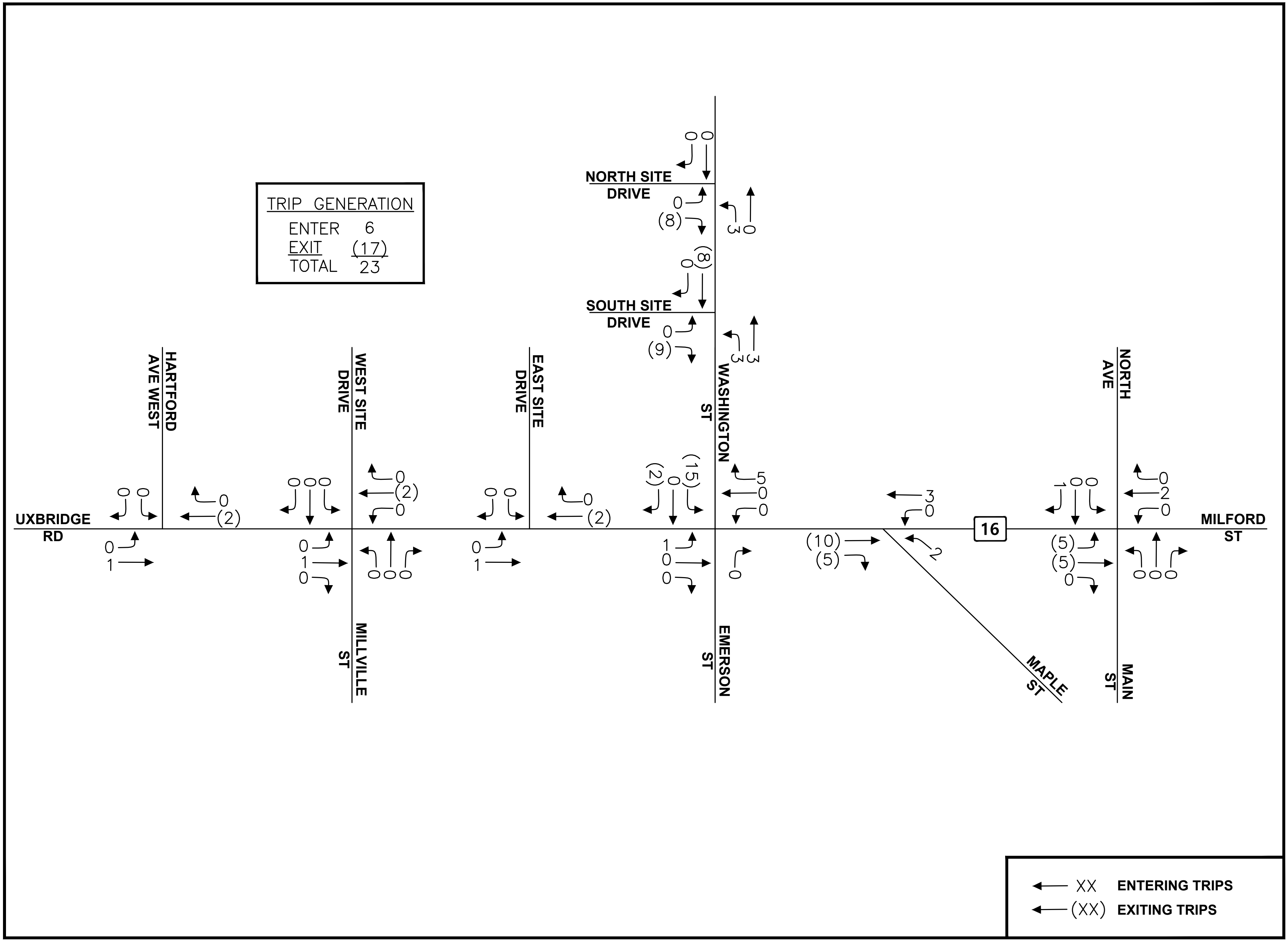
Proposed Mixed-Use Development
Mendon, Massachusetts

RETAIL PROJECT TRIPS
SATURDAY MIDDAY PEAK HOUR

FIGURE
12



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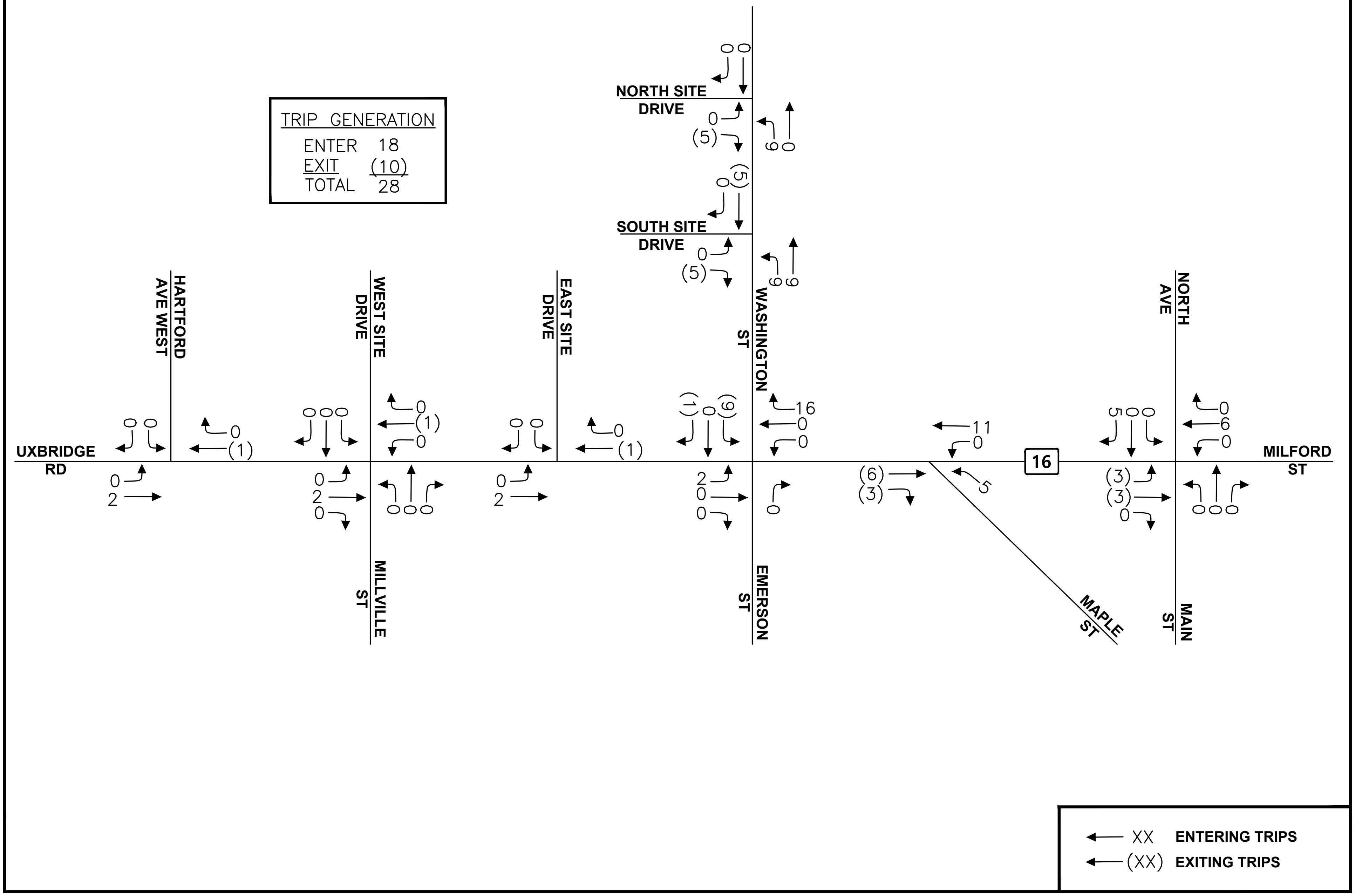
Proposed Mixed-Use Development
Mendon, Massachusetts

RESIDENTIAL PROJECT TRIPS
WEEKDAY MORNING PEAK HOUR

FIGURE
13



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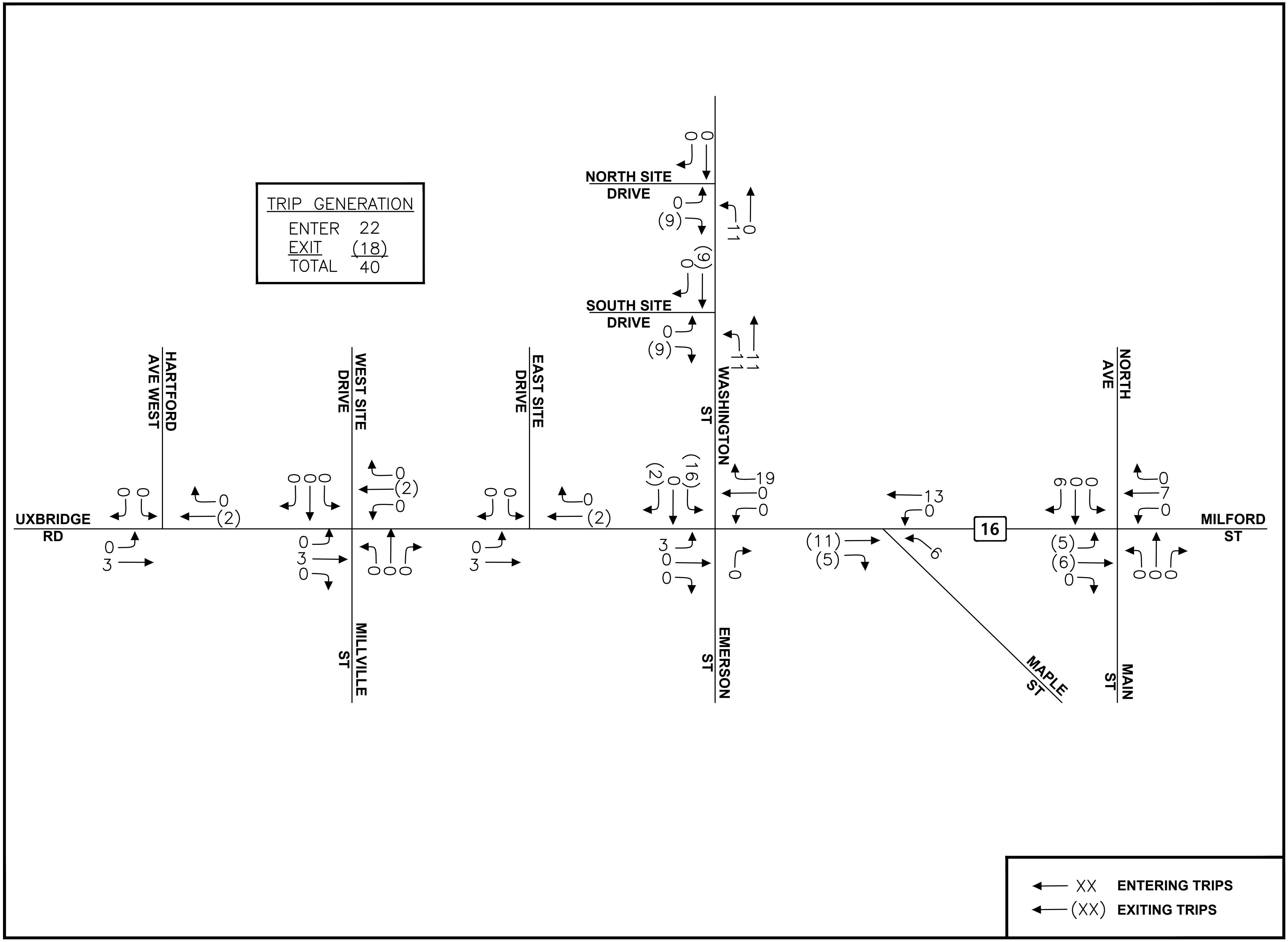
Proposed Mixed-Use Development
Mendon, Massachusetts

RESIDENTIAL PROJECT TRIPS
WEEKDAY EVENING PEAK HOUR

FIGURE
14

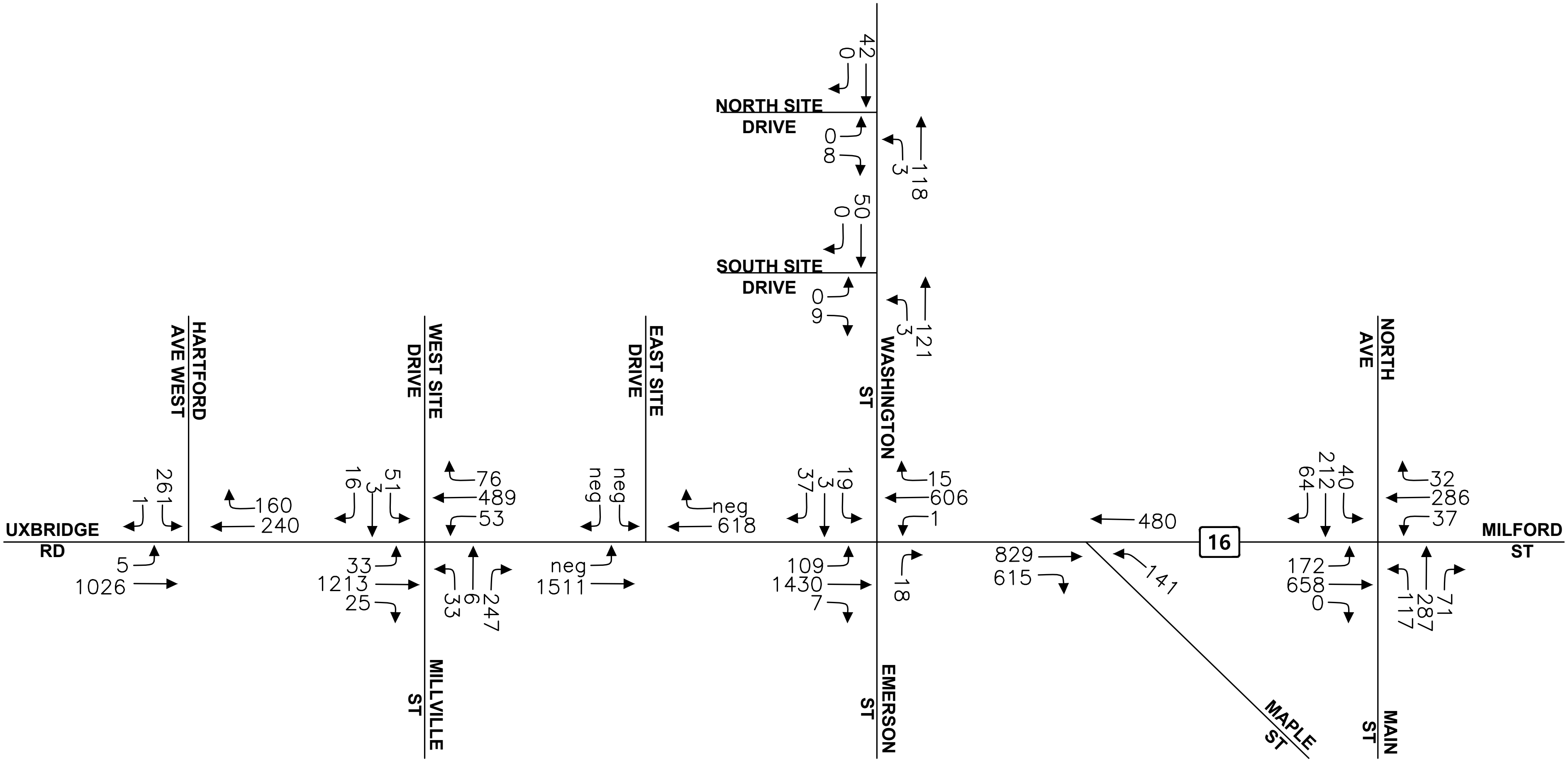


Proposed Mixed-Use Development
Mendon, Massachusetts

TETRA TECH

RESIDENTIAL PROJECT TRIPS
SATURDAY MIDDAY PEAK HOUR

FIGURE
15



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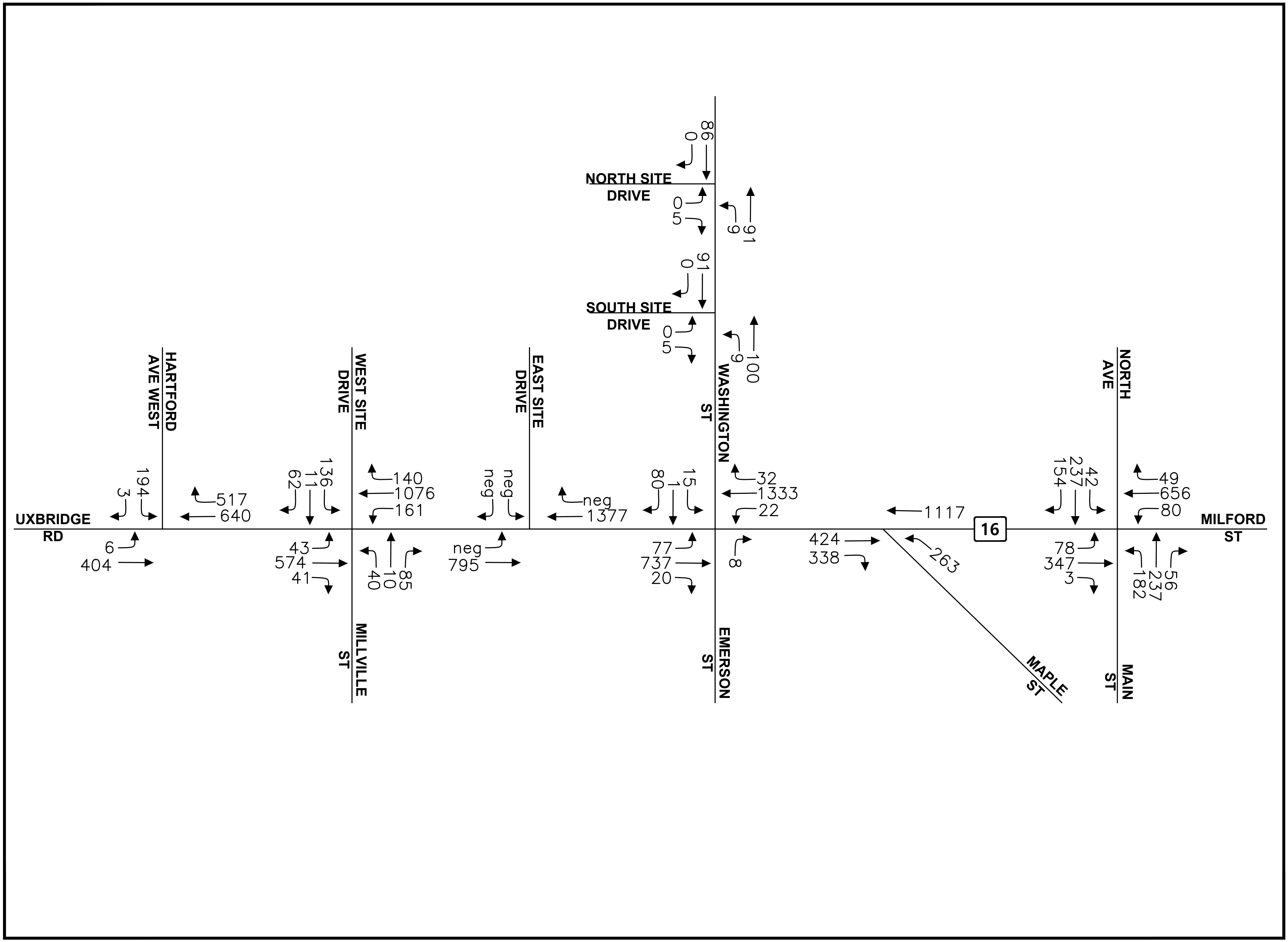
Proposed Mixed-Use Development
Mendon, Massachusetts

2028 BUILD TRAFFIC VOLUMES
WEEKDAY MORNING PEAK HOUR

FIGURE
16

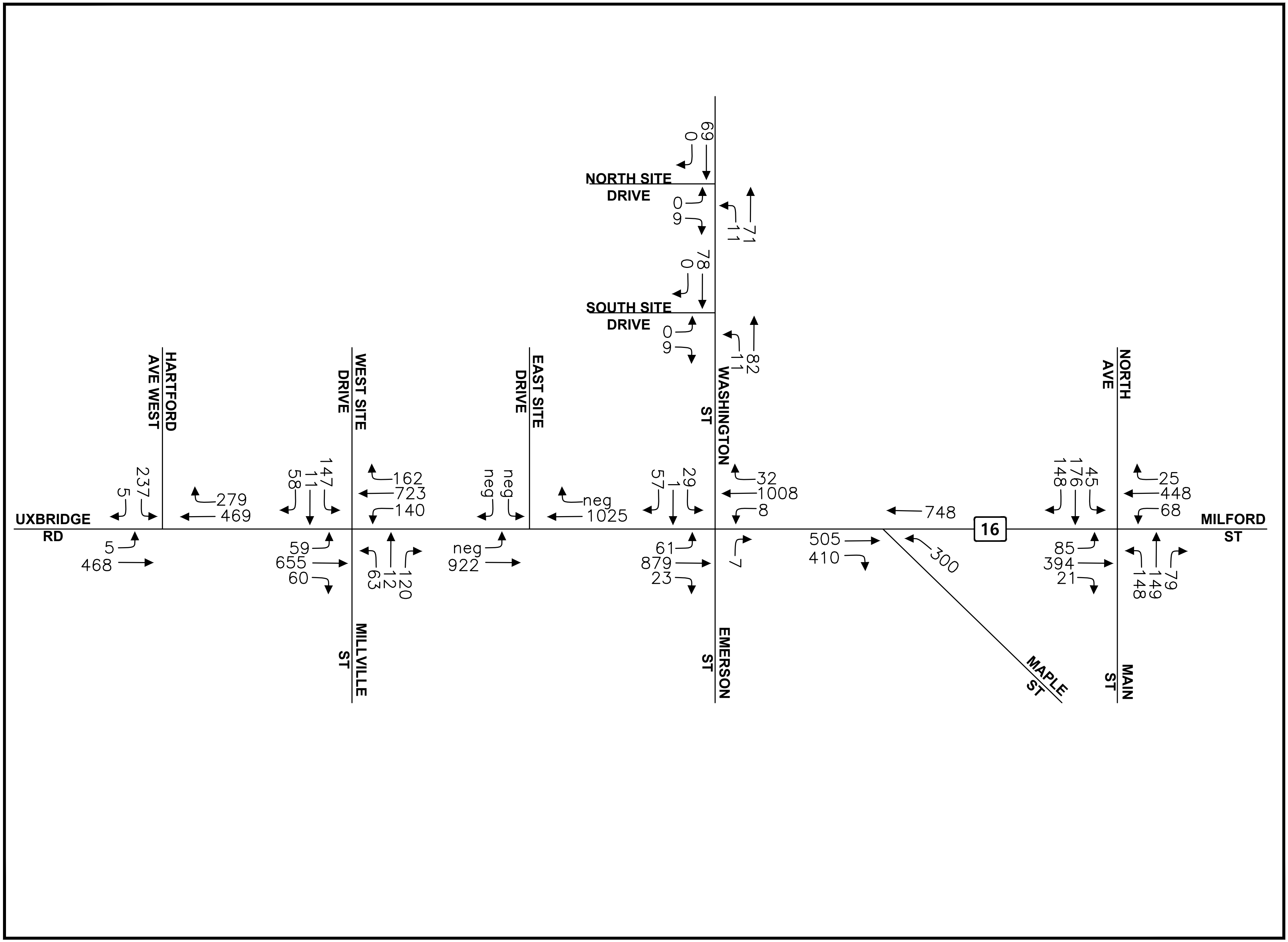


TETRA TECH

Proposed Mixed-Use Development
Mendon, Massachusetts

2028 BUILD TRAFFIC VOLUMES
WEEKDAY EVENING PEAK HOUR

FIGURE
17



Proposed Mixed-Use Development
Mendon, Massachusetts

2028 BUILD TRAFFIC VOLUMES
SATURDAY MIDDAY PEAK HOUR

FIGURE
18

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Proposed Mixed-Use Development
Mendon, Massachusetts

CONCEPTUAL SITE ACCESS IMPROVEMENT

FIGURE
19

Appendix F

Stormwater Management Report

Stormwater Management Report

Hastings Street Plaza
Mendon, Massachusetts

Prepared for:

Hastings Street Plaza, LLC
PO Box 444
Mendon, MA 01756

Prepared by:

Tetra Tech, Inc.
100 Nickerson Road
Marlborough, MA 01752

TETRA TECH

April 2022

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LIST OF TABLES

LIST OF APPENDICIES

INTRODUCTION

This Stormwater Management Report, prepared in accordance with Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards (the Standards) and the Town of Mendon Stormwater Management Performance Criteria, summarizes the Stormwater Management Plan and associated analyses for the proposed mixed-use development (the Project) on 18.3-acres of land with frontage and access along Hastings Street (Route 16) and Washington Street in Mendon, Massachusetts (the Project Site). A United States Geological Survey (USGS) Locus Map is provided as Figure 1 in Appendix A.

The purpose of the Stormwater Management Plan is to provide a comprehensive framework for the long-term protection of natural resources on and around the Project Site from degradation as a result of stormwater discharges. This is achieved through the implementation of a variety of stormwater management strategies to address water quality and quantity standards.

The following sections describe the specific stormwater management strategies and expected performance of the Stormwater Management Plan to be implemented at the Project Site and summarizes compliance with applicable stormwater regulations.

1.1 EXISTING CONDITIONS

The Project Site includes 18.3 acres of land with frontage and access along Hastings Street (Route 16) and Washington Street in Mendon, Massachusetts. The parcel assemblage is currently occupied by Barry's Place (closed) at 35 Hastings Street, the Mendon Driving Range at 37 Hastings Street, and single-family residences at 12 Washington Street and 20 Washington Street. Commercial improvements on the Project Site include a small restaurant structure, three support structures, a driving range facility, and miniature golf course served by an approximately 60-space parking lot. Residential improvements on the Project Site include two single-family homes and a large barn structure served by driveways. The remainder of the Project Site is mostly vegetated with large areas of mowed and maintained grass at the driving range and adjacent residence as well as woodland to the north.

The Project Site is bounded to the north by an existing residence at 22 Washington Street, to the east by several commercial and residential properties and the Washington Street right-of-way, to the south by the Route 16 right-of-way, and to the west by an existing commercial property at 1 Uxbridge Road (Route 16) and a large wetland resource area.

Project Site topography generally slopes from east to west ranging from a high elevation of 447 near Hastings Street (Route 16) to a low elevation of 417 at a wetland resource area within the woods downgradient of the 220-yard-long driving range, referenced to the North American Vertical Datum of 1988 (NAVD 88). Stormwater runoff from the Project Site flows predominantly to the northwest where it discharges overland to a wetland resource area. The remainder of the Project Site either flows overland to the east towards Washington Street (2.0 acres) or to the south where it is collected by drainage infrastructure located within the Route 16 right-of-way (0.7 acres).

A small portion of the Project Site is located within the 100-year floodplain according to the most recent Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map; Map No. 25027C1031E; Effective Date July 4, 2011. No base flood elevation has been determined. The referenced FEMA Flood Insurance Rate Map is provided as Figure 2 in Appendix A.

1.2 PROPOSED CONDITIONS

The Project includes demolition of unwanted components associated with the existing commercial and residential uses for the construction of a mixed-used development comprised of two mutually compatible connected uses sharing critical infrastructure. The building program and site improvements will occupy roughly 15 acres of the 18.3-acre Project Site with the remainder left in its natural state as open space.

Runoff from impervious surfaces, including collected rooftop runoff, will be directed to on-site stormwater Best Management Practices (BMPs) for water quantity mitigation prior to discharge. Paved waterways or vegetated swales collect runoff from paved surfaces and rooftops within the residential portion of the Project Site. Runoff from the commercial portion of the Project Site will be collected by a series of deep sump catch basins and conveyed via the closed drainage system. Collected flows will be directed to sediment forebays and infiltration basins or rain gardens for recharge and water quality treatment prior to discharge. Rooftop runoff from the Warehouse, Market, Outdoor Retail, and Retail spaces will be collected and directed to a subsurface infiltration system for recharge. Runoff from the Project Site to the Route 16 right-of-way drainage infrastructure will be decreased by roughly 0.2 acres and managed as part of the proposed off-site intersection improvements being coordinated with the Massachusetts Department of Transportation.

STORMWATER MANAGEMENT

2.1 METHOD OF CALCULATION

The hydrologic model was created and calculated with HydroCAD®, Version 10.0 software, developed by HydroCAD® Software Solutions LLC, to analyze the hydrology of the Project Site. Hydraulic calculations were performed utilizing the Rational Method to determine contributing flows, and the Manning's Equation to determine pipe flows.

2.2 SOURCES OF DATA

The following sources of data were used for the hydrologic and hydraulic calculations.

- Soil Conservation Service (SCS) Technical Release No. 20 (TR-20)
- Soil Conservation Service (SCS) Technical Release No. 55 (TR-55)
- United States Department of Commerce, Technical Paper No. 40 (TP-40), Rainfall Frequency Atlas of the United States
- Northeast Regional Climate Center (NRCC), Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada
- NRCS Soil Survey of Worcester County, Massachusetts, Southern Part
- Tetra Tech Subsurface Exploration Data
- Intensity Duration Frequency (IDF) Curves for the Mendon, Massachusetts Area

2.3 RAINFALL DEPTHS

In accordance with MassDEP Stormwater Management Policy the 2-, 10-, and 100-year, 24-hour storm events were analyzed. Table 1 indicates the rainfall depths, interpolated from TP-40 Rainfall Frequency

Atlas of the United States (per MassDEP) and NRCC Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada (per Town of Mendon Stormwater Management Bylaw), used for each storm event.

Table 1 Rainfall Depths

Storm Event	TP-40	NRCC
2-Year, 24-Hour	3.20”	2.80”
10-Year, 24-Hour	4.60”	4.20”
100-Year, 24-Hour	6.80”	7.20”

2.4 SOIL CONDITIONS

NRCS Soil Survey of Worcester County, Massachusetts, Southern Part, indicates that soils onsite consist of Scituate fine sandy loam and Freetown muck. Scituate fine sandy loam is a very deep, moderately well drained soil that has a Hydrologic Soil Group (HSG) C rating. Freetown muck is a very deep, very poorly drained, organic soil that has a HSG D rating. A NRCS Soils Map is provided as Figure 3 in Appendix A.

Based on subsurface explorations consisting of test pits, soils onsite consist of a sandy loam topsoil (0.7 to 0.9 feet thick), a sandy loam subsoil (0.5 to 1.7 feet thick), and a loamy sand substratum observed between roughly 2 and 10 feet below ground surface. Subsurface Exploration Data is provided in Appendix B.

2.5 EXISTING CONDITIONS

2.5.1 Existing Watershed

Under existing conditions, the Project Site is divided into three (3) design points and three (3) drainage subcatchment areas. The study area is 12.6 acres of developed land consisting of single-family residences served by driveways as well as a small restaurant structure, three support structures, a driving range facility, and miniature golf course served by an approximately 60-space parking lot. The remaining 7.2 acres of the study area is undeveloped woodland. The design points and subcatchment areas are described below and shown on Figure 4 in Appendix A.

Design Point

- Design Point 1 (DP-1) – The wetland located along the Project Site’s western boundary.
- Design Point 2 (DP-2) – The existing subsurface drainage system located along Washington Street.
- Design Point 3 (DP-3) – The existing subsurface drainage system located along Route 16.

Subcatchment Area

- Subcatchment E-1 – Stormwater runoff travels overland in a westerly direction and discharges to a wetland located along the Project Site’s western boundary (Point of Analysis DP-1).
- Subcatchment E-2 – Stormwater runoff travels overland in a northerly direction and discharges offsite where it is collected by an existing subsurface drainage system located along Washington Street (Point of Analysis DP-2).

- Subcatchment E-3 – Stormwater runoff travels overland in an easterly direction and discharges offsite where it is collected by an existing subsurface drainage system located along Route 16 (Point of Analysis DP-3).

2.5.2 Existing Runoff Calculations

To determine the peak rate of discharge for existing conditions, runoff hydrographs were generated for the storm events using the SCS TR-20 method. In accordance with MassDEP Stormwater Management Policy the 2-, 10-, and 100-year, 24-hour storm events were analyzed. Table 2 summarizes existing discharge rates using TP-40 rainfall depths (per MassDEP) and NRCC rainfall depths (per Town of Mendon Stormwater Management Bylaw) for each storm event.

Table 2 Existing Peak Runoff Rates

	Peak Runoff (cubic feet per second)					
	TP-40 Rainfall Depths			NRCC Rainfall Depths		
Point of Analysis	2-Year Storm	10-Year Storm	100-Year Storm	2-Year Storm	10-Year Storm	100-Year Storm
DP-1	2.79	10.70	28.29	1.42	8.05	31.89
DP-2	0.77	2.37	5.60	0.44	1.87	6.24
DP-3	1.75	2.79	4.43	1.45	2.49	4.72

2.6 PROPOSED CONDITIONS

2.6.1 Proposed Watershed

Under proposed conditions, the Project Site is divided into three (4) design points and nine (9) drainage subcatchment areas. The study area is 15.7 acres developed land consisting of single-family residences served by driveways and a loop road as well as a shopping center served by a 234-space parking lot. The remaining 3.1 acres of the study area is undeveloped woodland. The design points and subcatchment areas are described below and shown on Figure 5 in Appendix A.

Design Point

- Design Point 1 (DP-1) – The wetland located along the Project Site's western boundary.
- Design Point 2 (DP-2) – The existing subsurface drainage system located along Washington Street.
- Design Point 3 (DP-3) – The existing subsurface drainage system located along Route 16.

Subcatchment Area

- Subcatchment P-1A – Stormwater runoff travels overland to a vegetated swale and ultimately a wetland located along the Project Site's western boundary (Point of Analysis DP-1).
- Subcatchment P-1B – Stormwater runoff travels overland to two vegetated swales that convey flows to sediment forebays and an infiltration basin. Outflows from the infiltration basin discharge

into a wetland located along the Project Site's western boundary within Subcatchment P-1A (Point of Analysis DP-1).

- Subcatchment P-1C – Stormwater runoff is collected by a series of inlet structures that connect to a subsurface drainage system and is routed through water quality structures before reaching an infiltration basin within Subcatchment P-1B. Outflows from the infiltration basin discharge into a wetland located along the Project Site's western boundary within Subcatchment P-1A (Point of Analysis DP-1).
- Subcatchment P-1D – Stormwater runoff is collected by a rooftop system that connect to an underground header pipe and is routed into a subsurface infiltration system within Subcatchment P-1C. Outflows from the subsurface infiltration system discharge into a wetland located along the Project Site's western boundary within Subcatchment P-1A (Point of Analysis DP-1).
- Subcatchment P-2A – Stormwater runoff travels overland to a rain garden. Outflows from the rain garden discharge into existing subsurface drainage system located along Washington Street (Point of Analysis DP-2).
- Subcatchment P-2B – Stormwater runoff travels overland to a low-lying landscape area. Outflows from the landscape area discharge into existing subsurface drainage system located along Washington Street (Point of Analysis DP-2).
- Subcatchment P-2C – Stormwater runoff travels overland to a rain garden. Outflows from the rain garden discharge into existing subsurface drainage system located along Washington Street (Point of Analysis DP-2).
- Subcatchment P-2D – Stormwater runoff travels overland in a northerly direction and discharges offsite where it is collected by an existing subsurface drainage system located along Washington Street (Point of Analysis DP-2).
- Subcatchment P-3 – Stormwater runoff travels overland in an easterly direction and discharges offsite where it is collected by an existing subsurface drainage system located along Route 16 (Point of Analysis DP-3).

2.6.2 Proposed Runoff Calculations

To determine the peak rate of discharge for existing conditions, runoff hydrographs were generated for the storm events using the SCS TR-20 method. In accordance with MassDEP Stormwater Management Policy the 2-, 10-, and 100-year, 24-hour storm events were analyzed. Table 3 summarizes proposed discharge rates using TP-40 rainfall depths (per MassDEP) and NRCC rainfall depths (per Town of Mendon Stormwater Management Bylaw) for each storm event.

Table 3 Proposed Peak Runoff Rates

	Peak Runoff (cubic feet per second)					
	TP-40 Rainfall Depths			NRCC Rainfall Depths		
Point of Analysis	2-Year Storm	10-Year Storm	100-Year Storm	2-Year Storm	10-Year Storm	100-Year Storm
DP-1	2.27	10.15	27.76	0.55	8.05	31.26
DP-2	0.69	2.27	4.88	0.43	1.76	5.26
DP-3	1.24	1.95	3.07	1.04	1.75	3.27

2.6.3 Drainage Collection System Design

The proposed drainage collection system consists of deep sump catch basins, yard drains, water quality structures, flared end sections, manholes, and high-density polyethylene (HDPE) pipes to collect and convey runoff from the commercial uses to an infiltration basin and subsurface infiltration system. The proposed drainage collection system has been designed for a the 10-year storm event utilizing the Rational Method to determine contributing flows, and the Manning's Equation to determine pipe flows.

The following criteria were used to design the pipe network:

- Pipe sizes are based on flows for the 10-year storm event;
- Manning's coefficient (n) of 0.012 for HDPE pipe;
- Manholes are provided at all changes in direction or changes in pipe size;
- All storm drain pipes are made of HDPE with a minimum cover of two feet; and
- Pipe flow velocities are maintained at a maximum of ten feet per second

MASSDEP STORMWATER MANAGEMENT STANDARDS

The ten (10) MassDEP Stormwater Management Standards provided in the Stormwater Management Policy and Massachusetts Wetlands Protection Act relate to the protection of wetlands and water bodies, control of water quantity, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control and stormwater maintenance. The MassDEP Checklist for Stormwater Report is provided in Appendix C, and the following sections summarize the Project's compliance with the Stormwater Management Standards.

3.1 STANDARD 1 – NO NEW UNTREATED DISCHARGES

The Project complies with Standard 1. No new point source discharges of untreated stormwater to or causing erosion in resource areas are proposed as part of the Project. Stormwater quality control for the Project includes street sweeping, vegetated swales, infiltration basins, and rain gardens. Stormwater discharge velocities for the Project are mitigated by using stone-lined energy dissipation pads or aprons at point source discharges. Outlet protection sizing calculation are provided in Appendix D.

3.2 STANDARD 2 – PEAK RATE ATTENUATION

The Project complies with Standard 2. The Project's stormwater management systems are designed so that post-development peak discharge rates do not exceed pre-development discharge rates for the 2-year and 10-year, 24-hour storm event, and so that there will not be increased flooding impacts off-site for the 100-year, 24-hour storm event.

To determine the peak rate of discharge for existing and proposed conditions, runoff hydrographs were generated for the storm events using the SCS TR-20 method. In accordance with MassDEP Stormwater Management Policy the 2-, 10-, and 100-year, 24-hour storm events were analyzed using TP-40 Rainfall Frequency Atlas of the United States (per MassDEP) and NRCC Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada (per Town of Mendon Stormwater Management Bylaw) rainfall depths. HydroCAD input/output data for existing and proposed conditions are provided in

Appendix E. Tables 4a and 4b summarize the pre- and post-development peak runoff discharge rates determined in the hydrologic/hydraulic analyses performed for the Project Site.

Table 4a Comparison of Peak Runoff Rates (TP-40 Rainfall Depths)

Point of Analysis	Peak Runoff (cubic feet per second)								
	2-Year Storm			10-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP-1	2.79	2.27	(0.52)	10.70	10.15	(0.55)	28.29	27.76	(0.53)
DP-2	0.77	0.69	(0.08)	2.37	2.27	(0.10)	5.60	4.88	(0.72)
DP-3	1.75	1.24	(0.51)	2.79	1.95	(0.84)	4.43	3.07	(1.36)

Table 4b Comparison of Peak Runoff Rates (NRCC Rainfall Depths)

Point of Analysis	Peak Runoff (cubic feet per second)								
	2-Year Storm			10-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP-1	1.42	0.54	(0.88)	8.05	8.05	(0.00)	31.89	31.45	(0.44)
DP-2	0.44	0.43	(0.01)	1.87	1.76	(0.11)	6.24	5.26	(0.98)
DP-3	1.45	1.04	(0.41)	2.49	1.75	(0.74)	4.72	3.27	(1.45)

3.3 STANDARD 3 – RECHARGE

The Project complies with Standard 3. The Project is designed to infiltrate the required recharge volume. Required recharge is achieved through the implementation of infiltration basins, rain gardens, and a subsurface infiltration system that are sized to capture the adjusted required recharge volume.

Required Recharge Volume (Rv) = Target Depth Factor for HSG B x Impervious Area

Required Rv = (0.35 inches / 12 inches) x (8.13 acres) x (43,560 sf/acre) = 10,330 cubic feet

Impervious Cover (IC) Draining to Recharge Facilities = 6.85 acres

Ratio of Total IC to IC Draining to Recharge Facilities = 8.13 acres / 6.85 acres = 1.19

Adjusted Required Rv = 12,292 cubic feet

The infiltration basin and subsurface infiltration system are designed to drain completely within 72 hours. Drawdown calculations are provided in Appendix F.

3.4 STANDARD 4 – WATER QUALITY

The Project complies with Standard 4. The Project is designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). TSS removal is achieved through the implementation of pretreatment BMPs and structural BMPs sized to capture the required one-inch water quality volume and to treat the impervious area on site. TSS removal calculations are provided in Appendix G. Additionally, suitable practices for source control and pollution prevention by the facility and its staff are identified in a Long-Term Pollution Prevention Plan provided in Appendix H.

3.5 STANDARD 5 – LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS

The Project complies with Standard 5. The Project is designed to remove 44% of the average annual post-construction load of TSS before discharging to infiltration practices and to meet the one-inch rule for calculating the required water quality volume. The design also includes proprietary water quality structures due to the potential for runoff with high concentration of hydrocarbon within the parking lot.

3.6 STANDARD 6 – CRITICAL AREAS

The Project complies with Standard 6. The Project is designed to remove 44% of the average annual post-construction load of TSS before discharging to infiltration practices, to meet the one-inch rule for calculating the required water quality volume, and to incorporate BMPs that are suitable for stormwater discharges within Interim Wellhead Protection Area of a proposed public water supply.

3.7 STANDARD 7 – REDEVELOPMENT PROJECTS

Standard 7 is not applicable to the Project. The Project does not qualify as a redevelopment project or other project subject to the Standards only to the maximum extent practicable.

3.8 STANDARD 8 – CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL

The project complies with Standard 8. The Project will result in the disturbance of greater than one acre of land and requires coverage under the U.S. EPA National Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Construction Activities. In support of coverage, a project-specific Storm Water Pollution Prevention Plan (SWPPP) will be prepared and a Notice of Intent will be submitted to the EPA prior to commencement of construction activities.

The SWPPP will be prepared describing the specific practices, installation methods and inspection requirements for temporary and permanent erosion prevention and sediment control practices. The SWPPP will follow the template developed by the U.S. EPA and, at a minimum, will include the following measures:

- Minimize the extent and time of disturbed area and exposed soils;
- Provide perimeter sedimentation control;
- Minimize sediment track out with stabilized construction exits;
- Dedicated concrete washout areas;
- Control discharges from soil stockpiles;
- Minimize dust and soil compaction;
- Temporary stormwater management practices including basins, traps and swales;
- Dewatering requirements;
- Temporary and permanent stabilization requirements including seeding, mulching and matting;
- Good housekeeping pollution prevention measures;
- Maintenance requirements; and

- Inspection, recordkeeping, and reporting requirements.

3.9 STANDARD 9 – OPERATIONS AND MAINTENANCE PLAN

The Project complies with Standard 9. An Operations and Maintenance Plan to be implemented by the owner and its responsible operations and maintenance staff to ensure that stormwater management systems function as designed is provided in Appendix H.

3.10 STANDARD 10 – PROHIBITION OF ILLICIT DISCHARGES

The Project complies with Standard 10. There are no known or designed illicit discharges on the Project Site. An Illicit Discharge Compliance Statement is provided in Appendix I.

CONCLUSION

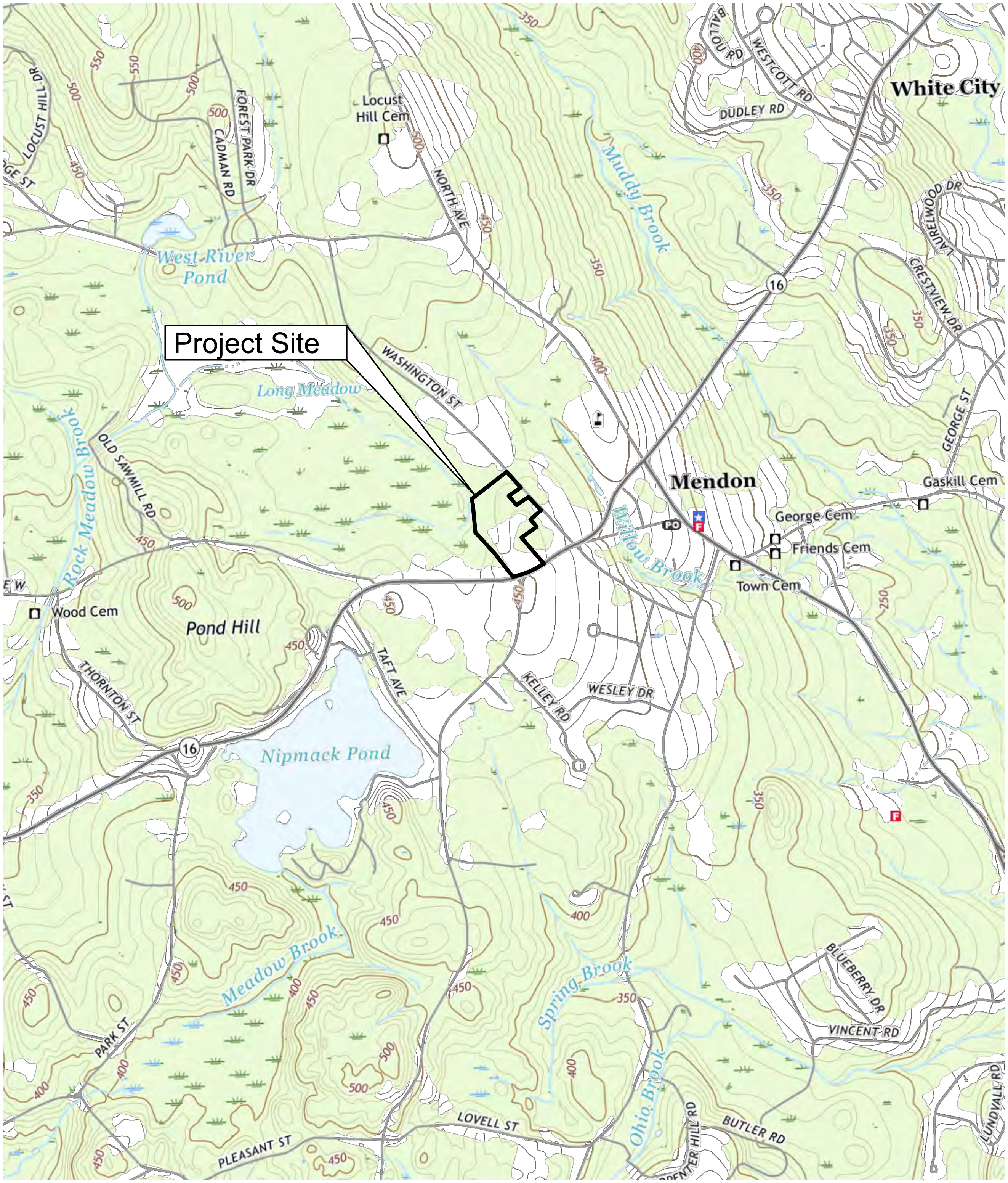
The Stormwater Management Plan addresses both the quantity and quality of stormwater runoff from the Project Site and conforms to the ten (10) MassDEP Stormwater Management Standards as well as the Town of Mendon Stormwater Management Performance Criteria.

Appendix A

Figures

INFORMATION BASED ON:

1. USGS MAP OF BLACKSTONE, MASSACHUSETTS, DATED 2018



TETRA TECH

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Phone: 1 (508) 786-2200 | Fax: 1 (508) 786-2201

Mehan Group

Hastings St and Washington St
Mendon, Massachusetts

0 1000' 2000'
SCALE: 1" = 2000'

Site Locus Map

N

Project No.:	143-305225-20004
Date:	April 21, 2022
Designed By:	MDC

Figure
1

Bar Measures 1 inch

4/21/2022 3:55:57 PM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\CONCEPTUAL\FIGURE 1 - SITE LOCUS.DWG - DOCANTO, MARCOS

National Flood Hazard Layer FIRMette

FEMA

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

SPECIAL FLOOD HAZARD AREAS	🟦	Without Base Flood Elevation (BFE) *Zone A, V, A99* With BFE or Depth *Zone AE, AO, AH, VE, AR*
	▨	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	🟧	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	▨	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	▨	Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
	▨	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
	▭	Effective LOMRs
	🟧	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	- — - -	Channel, Culvert, or Storm Sewer
	ııııııı	Levee, Dike, or Floodwall
OTHER FEATURES	(B) 20.2 / 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8 — — —	Coastal Transect
	~~ 513 ~~~	Base Flood Elevation Line (BFE)
	—	Limit of Study
	—	Jurisdiction Boundary
	--- — ---	Coastal Transect Baseline
	- —	Profile Baseline
	—	Hydrographic Feature
MAP PANELS	☐	Digital Data Available
	⬚	No Digital Data Available
	☒	Unmapped
	📍	The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

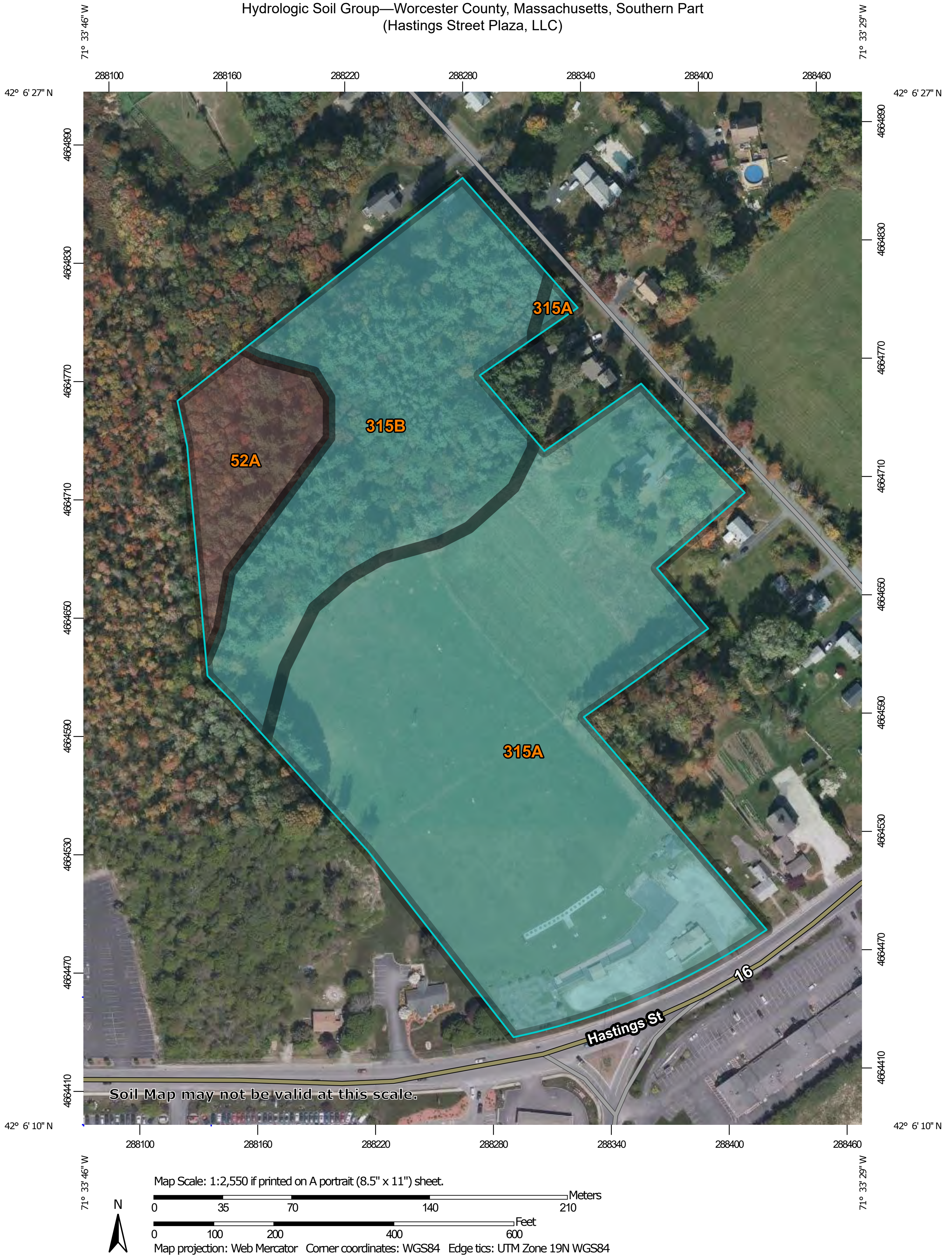
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/21/2022 at 7:45 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Figure 2

Hydrologic Soil Group—Worcester County, Massachusetts, Southern Part
(Hastings Street Plaza, LLC)



Map Scale: 1:2,550 if printed on A portrait (8.5" x 11") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

Figure 3

MAP LEGEND

Area of Interest (AOI)

- ⬜ Area of Interest (AOI)

Soils

Soil Rating Polygons

- 🟪 A
- 🟩 A/D
- 🟦 B
- 🟫 B/D
- 🟦 C
- 🟨 C/D
- 🟥 D
- ⬜ Not rated or not available

Soil Rating Lines

- 〰 A
- 〰 A/D
- 〰 B
- 〰 B/D
- 〰 C
- 〰 C/D
- 〰 D
- 〰 Not rated or not available

Soil Rating Points

- ■ A
- ■ A/D
- ■ B
- ■ B/D
- ■ C
- ■ C/D
- ■ D
- □ Not rated or not available

Water Features

- 〰 Streams and Canals

Transportation

- ┼┼┼ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

Background

- ▨ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 14, Sep 3, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 24, 2020—Oct 15, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

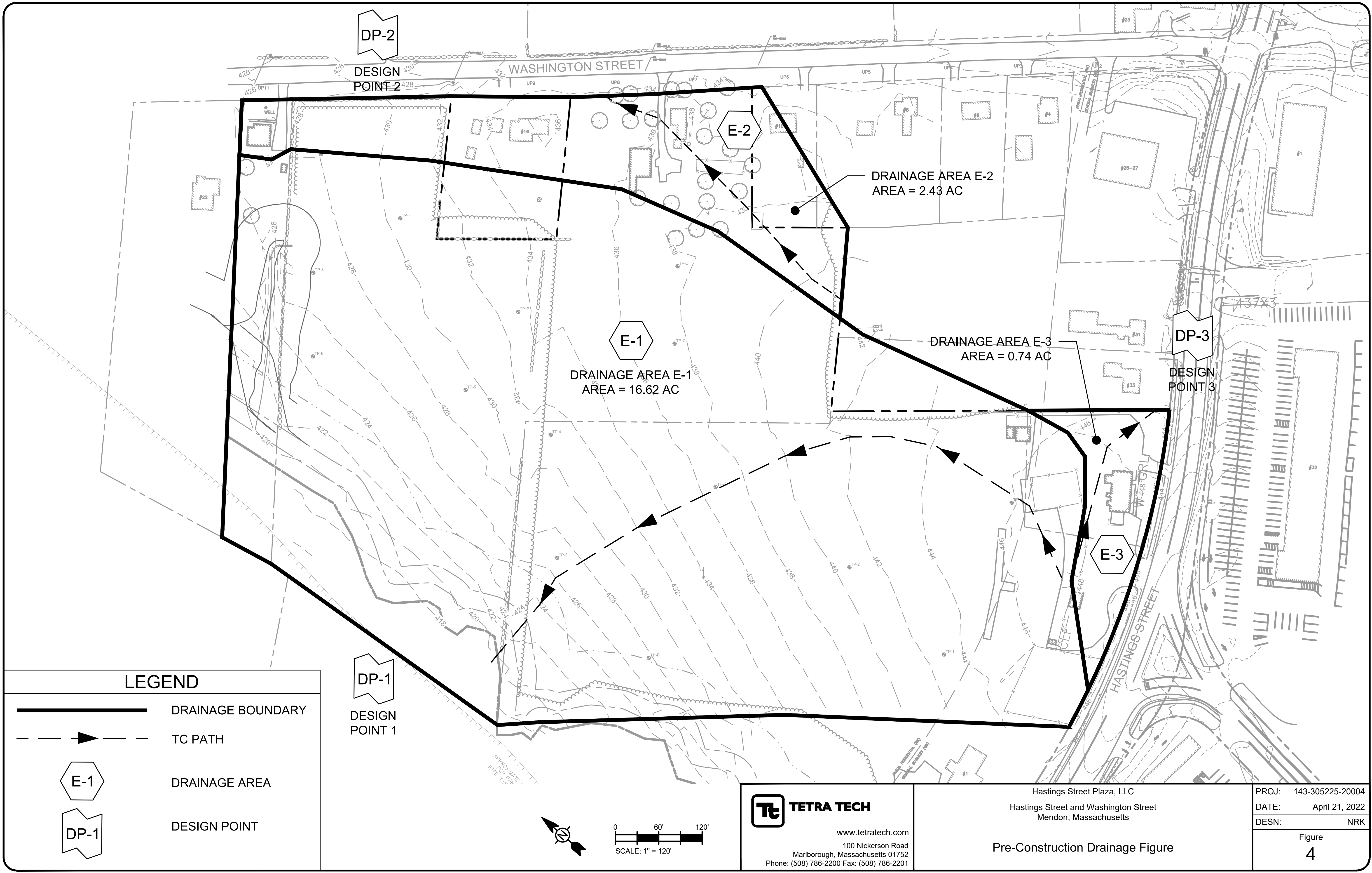
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	B/D	1.5	8.2%
315A	Scituate fine sandy loam, 0 to 3 percent slopes	C	11.4	62.5%
315B	Scituate fine sandy loam, 3 to 8 percent slopes	C	5.4	29.4%
Totals for Area of Interest			**18.3**	**100.0%**

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



LEGEND

DRAINAGE BOUNDARY

TC PATH

E-1 DRAINAGE AREA

DP-1 DESIGN POINT

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Hastings Street Plaza, LLC

Hastings Street and Washington Street
Mendon, Massachusetts

Pre-Construction Drainage Figure

PROJ: 143-305225-20004
DATE: April 21, 2022
DESN: NRK

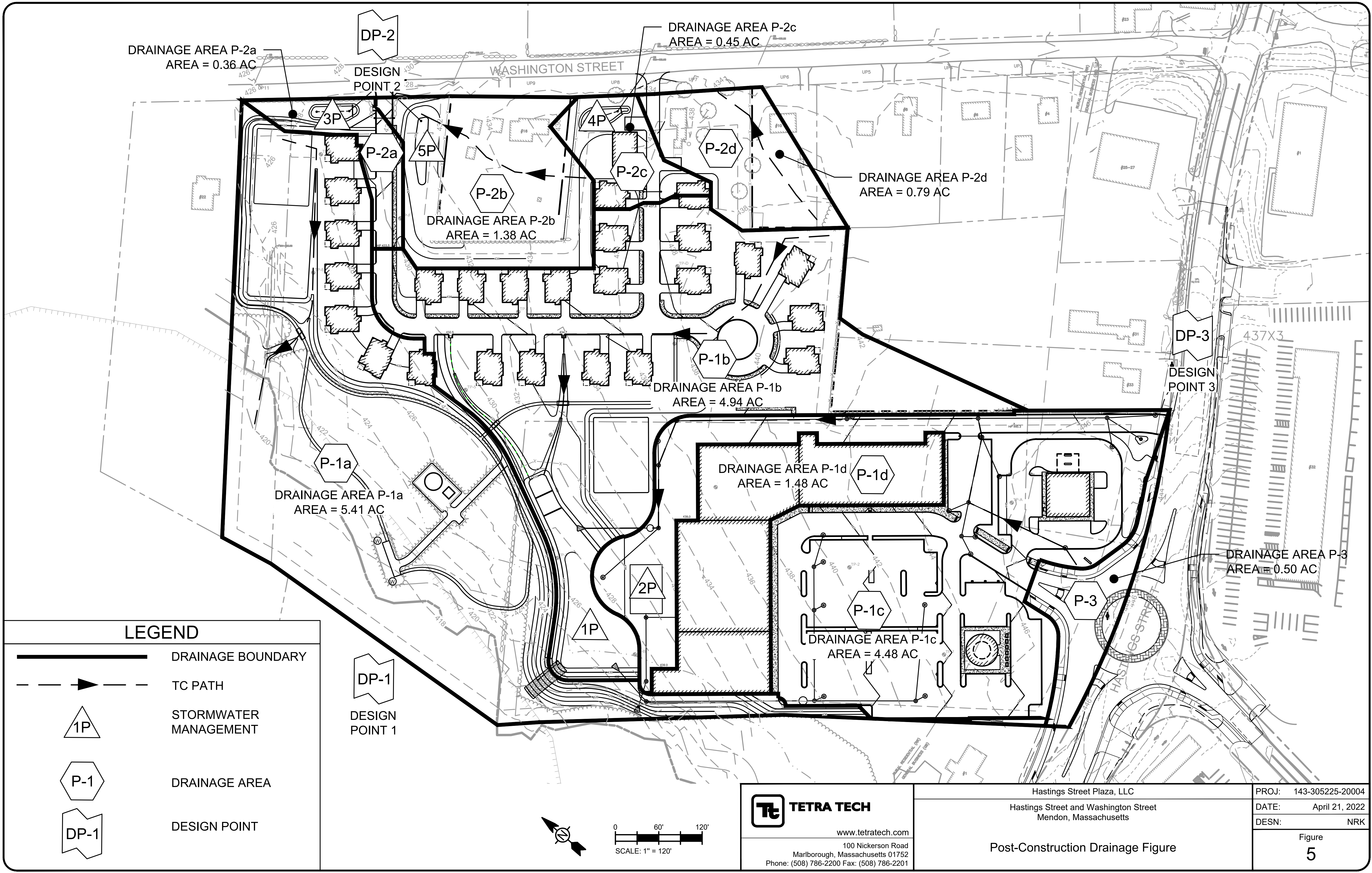
Figure
4

Copyright: Tetra Tech

Bar Measures 1 inch

4/21/2022 2:08:17 PM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SUPPORTFILES\STORMWATER\PRE-DEVLEOPMENT.DWG - KORZEC, NICK

4/21/2022 2:04:17 PM - P:\305225\143-305225-20004 (35-37 HASTINGS)\CAD\SUPPORTFILES\STORMWATER\POST-DEVELOPMENT.DWG - KORZEC, NICK



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Hastings Street Plaza, LLC

Hastings Street and Washington Street
Mendon, Massachusetts

Post-Construction Drainage Figure

PROJ: 143-305225-20004
DATE: April 21, 2022
DESN: NRK

Figure
5

Copyright: Tetra Tech

Bar Measures 1 inch

Appendix B

Subsurface Exploration Data

TEST PIT NUMBER TP-A

PAGE 1 OF 1

CLIENT Meehan Group

PROJECT NAME Hastings Street Plaza, LLC

PROJECT NUMBER 143-305225-20004

PROJECT LOCATION Hastings St and Washington St, Mendon , MA

DATE 9/13/2021

GROUND ELEVATION ± 446

EXCAVATION CONTRACTOR

GROUNDWATER SYMBOLS:

EXCAVATION METHOD Excavator

▽ **ESTIMATED SEASONAL HIGH GROUNDWATER**

▼ **GROUNDWATER**

LOGGED BY Chris Stanton

CHECKED BY Matt Moyen, PE

WEATHER Mostly Sunny; Temperature in the 70s

DEPTH (ft)	SAMPLE NUMBER	REMARKS	Soil Texture (USDA)		SUBSURFACE DESCRIPTION
0.0			Sandy Loam	0.7	Dark Brown, SANDY LOAM, HSG B, some organics. (Top soil)
			Sandy Loam	2.0	Yellowish Brown, SANDY LOAM HSG B. Moist soil consistency, Friable. (Subsoil)
		▽ ▼ Evidence of ESHG Observed at 26" Weeping observed at 30"	Loamy Sand	5.0	Pale Brown, LOAMY SAND, HSG A. Redoximorphic red staining pockets at 26" below ground surface. Moist soil consistency, Friable. (Substratum)
5.0					
10.0					
15.0					

TEST PIT NUMBER TP-B

PAGE 1 OF 1

CLIENT Meehan Group

PROJECT NAME Hastings Street Plaza, LLC

PROJECT NUMBER 143-305225-20004

PROJECT LOCATION Hastings St and Washington St, Mendon , MA

DATE 9/13/2021

GROUND ELEVATION ± 428

EXCAVATION CONTRACTOR

GROUNDWATER SYMBOLS:

EXCAVATION METHOD Excavator

▽ **ESTIMATED SEASONAL HIGH GROUNDWATER**

LOGGED BY Chris Stanton **CHECKED BY** Matt Moyen, PE

▼ **GROUNDWATER**

WEATHER Mostly Sunny; Temperature in the 70s

DEPTH (ft)	SAMPLE NUMBER	REMARKS	Soil Texture (USDA)	SUBSURFACE DESCRIPTION
0.0			Sandy Loam	Dark Brown, SANDY LOAM, HSG B. (Topsoil) 0.9
		▽ Weeping observed at 22"	Sandy Loam	Yellowish Brown, SANDY LOAM HSG B. Moist soil consistency, Friable, 5% gravel. (Subsoil) 1.9
5.0		Standing groundwater ▼ observed at 58"	Loamy Sand	Pale Brown, LOAMY SAND, HSG A. Moist soil consistency, Friable, 10% gravel. (Substratum) 5.0
10.0				
15.0				

TEST PIT NUMBER TP-C

PAGE 1 OF 1

CLIENT Meehan Group

PROJECT NAME Hastings Street Plaza, LLC

PROJECT NUMBER 143-305225-20004

PROJECT LOCATION Hastings St and Washington St, Mendon , MA

DATE 9/13/2021

GROUND ELEVATION ± 437

EXCAVATION CONTRACTOR

GROUNDWATER SYMBOLS:

EXCAVATION METHOD Excavator

▽ **ESTIMATED SEASONAL HIGH GROUNDWATER**

▼ **GROUNDWATER**

LOGGED BY Chris Stanton **CHECKED BY** Matt Moyen, PE

WEATHER Mostly Sunny; Temperature in the 70s

DEPTH (ft)	SAMPLE NUMBER	REMARKS	Soil Texture (USDA)	SUBSURFACE DESCRIPTION
0.0			Sandy Loam	Dark Brown, SANDY LOAM, HSG B. (Topsoil) 0.8
			Sandy Loam	Pale yellowish Brown, SANDY LOAM HSG B. Moist soil consistency, Friable, 10% gravel. (Subsoil) 1.9
5.0		▽ Weeping observed at 26" Standing groundwater ▼ observed at 46"	Loamy Sand	Pale Brown, LOAMY SAND, HSG A. Moist soil consistency, Friable, 15% gravel (Substratum) 5.0
10.0				
15.0				

TEST PIT NUMBER TP-D

PAGE 1 OF 1

CLIENT Meehan Group

PROJECT NUMBER 143-305225-20004

PROJECT NAME Hastings Street Plaza, LLC

PROJECT LOCATION Hastings St and Washington St, Mendon , MA

DATE 9/13/2021

GROUND ELEVATION ± 438

EXCAVATION CONTRACTOR

EXCAVATION METHOD Excavator

LOGGED BY Chris Stanton **CHECKED BY** Matt Moyen, PE

WEATHER Mostly Sunny; Temperature in the 70s

GROUNDWATER SYMBOLS:

▽ **ESTIMATED SEASONAL HIGH GROUNDWATER**

▼ **GROUNDWATER**

DEPTH (ft)	SAMPLE NUMBER	REMARKS	Soil Texture (USDA)		SUBSURFACE DESCRIPTION
0.0			Sandy Loam	0.8	Dark Brown, SANDY LOAM, HSG B. (Topsoil)
		▽ Evidence of ESHG Observed at 26"	Loamy Sand	2.3	Yellowish Brown, LOAMY SAND HSG A. Moist soil consistency, Friable, 10% gravel. (Subsoil)
		▼ Weeping observed at 30"	Loamy Sand	4.9	Light yellowish brown, GRAVELLY LOAMY SAND, HSG A. Redoximorphic light red staining pockets at 26" below ground surface. Moist soil consistency, loose, 25% gravel. (Substratum)
5.0					Test pit terminated approximately 59" below ground surface.
10.0					
15.0					

TETRA TECH

TEST PIT NUMBER TP-E

PAGE 1 OF 1

CLIENT Meehan Group

PROJECT NAME Hastings Street Plaza, LLC

PROJECT NUMBER 143-305225-20004

PROJECT LOCATION Hastings St and Washington St, Mendon , MA

DATE 9/13/2021

GROUND ELEVATION ± 433

EXCAVATION CONTRACTOR

GROUNDWATER SYMBOLS:

EXCAVATION METHOD Excavator

▽ **ESTIMATED SEASONAL HIGH GROUNDWATER**

LOGGED BY Chris Stanton **CHECKED BY** Matt Moyen, PE

▼ **GROUNDWATER**

WEATHER Mostly Sunny; Temperature in the 70s

DEPTH (ft)	SAMPLE NUMBER	REMARKS	Soil Texture (USDA)	SUBSURFACE DESCRIPTION
0.0			Sandy Loam	Dark Brown, SANDY LOAM, HSG B, some organics. (Topsoil) 0.8
			Sandy Loam	Yellowish Brown, FINE SANDY LOAM HSG B. Moist soil consistency, Friable. (Subsoil) 2.5
5.0		▽ ▼ Weeping observed at 32"	Loamy Sand	Light yellowish brown, FINE LOAMY SAND, HSG A. Moist soil consistancy, Friable, 5% gravel. (Substratum) 6.0
10.0 15.0				Test pit terminated approximately 72" below ground surface.

TEST PIT NUMBER TP-F

PAGE 1 OF 1

TETRA TECH

CLIENT Meehan Group

PROJECT NAME Hastings Street Plaza, LLC

PROJECT NUMBER 143-305225-20004

PROJECT LOCATION Hastings St and Washington St, Mendon , MA

DATE 9/13/2021

GROUND ELEVATION ± 430

EXCAVATION CONTRACTOR

GROUNDWATER SYMBOLS:

EXCAVATION METHOD Excavator

▽ **ESTIMATED SEASONAL HIGH GROUNDWATER**

LOGGED BY Chris Stanton **CHECKED BY** Matt Moyen, PE

▼ **GROUNDWATER**

WEATHER Mostly Sunny; Temperature in the 70s

DEPTH (ft)	SAMPLE NUMBER	REMARKS	Soil Texture (USDA)	SUBSURFACE DESCRIPTION
0.0			Sandy Loam	Dark brown, SANDY LOAM, HSG B. (Topsoil) 0.8
			Sandy Loam	Reddish brown, SANDY LOAM HSG B. Moist soil consistency, Friable, 15% gravel. (Subsoil) 2.3
5.0		▽ ▼ Weeping observed at 32"	Loamy Sand	Light yellowish brown, LOAMY SAND, HSG A. Moist soil consistency, Friable, 20% gravel, 5% cobbles. (Substratum) 9.75
10.0 15.0				Test pit terminated approximately 117" below ground surface.

TEST PIT NUMBER TP-3

PAGE 1 OF 1

CLIENT Meehan Group

PROJECT NAME Hastings Street Plaza, LLC

PROJECT NUMBER 143-305225-20004

PROJECT LOCATION Hastings St and Washington St, Mendon , MA

DATE 9/13/2021

GROUND ELEVATION ± 427

EXCAVATION CONTRACTOR

GROUNDWATER SYMBOLS:

EXCAVATION METHOD Excavator

▽ **ESTIMATED SEASONAL HIGH GROUNDWATER**

▼ **GROUNDWATER**

LOGGED BY Chris Stanton

CHECKED BY Matt Moyen, PE

WEATHER Mostly Sunny; Temperature in the 70s

DEPTH (ft)	SAMPLE NUMBER	REMARKS	Soil Texture (USDA)	SUBSURFACE DESCRIPTION
0.0			Sandy Loam	Dark brown, SANDY LOAM, HSG B. (Topsoil) 0.7
		▽ Evidence of ESHG Observed at 21"	Sandy Loam	Redoximorphic light red pockets observed at 21" below ground surface. Moist soil consistency, Friable, 10% gravel. (Subsoil) 2.4
5.0 10.0		▼ Weeping observed at 32"	Loamy Sand	Pale brown, LOAMY SAND, HSG A. Moist soil consistency, Friable, 15% gravel. (Substratum) 12.0
15.0				Test pit terminated approximately 120" below ground surface.

TEST PIT NUMBER TP-4

PAGE 1 OF 1

CLIENT Meehan Group

PROJECT NAME Hastings Street Plaza, LLC

PROJECT NUMBER 143-305225-20004

PROJECT LOCATION Hastings St and Washington St, Mendon , MA

DATE 9/13/2021

GROUND ELEVATION ± 431

EXCAVATION CONTRACTOR

GROUNDWATER SYMBOLS:

EXCAVATION METHOD Excavator

∇ **ESTIMATED SEASONAL HIGH GROUNDWATER**

▼ **GROUNDWATER**

LOGGED BY Chris Stanton

CHECKED BY Matt Moyen, PE

WEATHER Mostly Sunny; Temperature in the 70s

DEPTH (ft)	SAMPLE NUMBER	REMARKS	Soil Texture (USDA)	SUBSURFACE DESCRIPTION
0.0			Sandy Loam	Dark brown, SANDY LOAM, some organics, HSG B. (Topsoil) 0.8
			Sandy Loam	Reddish brown, SANDY LOAM HSG B. Moist soil consistency, Friable, 5% gravel. (Subsoil) 2.1
5.0 10.0		∇ ▼ Evidence of ESHG Observed at 26" Weeping observed at 32"	Loamy Sand	Pale brown, LOAMY SAND, HSG A. Redoximorphic light red pockets observed 26" below ground surface. Moist soil consistency, Friable, 15% gravel. (Substratum) 12.0
15.0				Test pit terminated approximately 120" below ground surface

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Hastings Street Plaza LLC
Owner Name

37 Hastings Street
Street Address

11
Map/Lot #

Mendon
City

MA
State

01756
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: UC Davis Soil Web

315A
Soil Map Unit

Scituate Fine Sandy Loam 0-3% Slopes
Soil Name

High Groundwater
Soil Limitations

Glacial Till
Soil Parent material

Drumlin
Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No If yes: 2008/Stone

Year Published/Source

Thick Till
Map Unit

Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered gravel clasts and few large boulders at the surface; in the shallow subsurface, compact, nonsorted matrix of silt, very fine sand

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS): 9/27/2021 Range: ☒ Above Normal ☐ Normal ☐ Below Normal

Month/Day/ Year

8. Other references reviewed: Oliver -Within a Zone II

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 1 (Hole #) 9/13/21 (Date) 9:05 A.M. (Time) 79 degrees (Weather) ______ (Latitude) ______ (Longitude:)

1. Land Use Driving Range (e.g., woodland, agricultural field, vacant lot, etc.) Grassland (Vegetation) No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 1% (Slope (%))

Description of Location: ______

2. Soil Parent Material: Glacial Till Drumlin (Landform) BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body 1,500 feet Drainage Way 1,500 feet Wetlands 360 feet

Property Line 90 feet Drinking Water Well 300 feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 26" Depth Weeping from Pit 110" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10"	Ap	Sandy Loam	10YR 3/2	-	-	-	0	0	Massive	Friable	
10"-16"	Bw	Sandy Loam	10YR 5/6	-	-	-	10	0	Massive	Friable	
16"-114"	C	Loamy Sand	10YR 6/4	24"	10R 6/8	5	15	5	Massive	Friable	

Additional Notes:
No Refusal, E.S.H.W.T. @ 24".

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 2 Hole # 9/13/21 Date 9:40 A.M. Time 80 degrees Weather ______ Latitude ______ Longitude:

1. Land Use: Driving Range (e.g., woodland, agricultural field, vacant lot, etc.) Grassland Vegetation No Surface Stones (e.g., cobbles, stones, boulders, etc.) 1 Slope (%)

Description of Location: Middle of Driving Range

2. Soil Parent Material: Glacial Till Drumlin Landform BS Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body 1,800 feet Drainage Way 1,800 feet Wetlands 380 feet

Property Line 200 feet Drinking Water Well 480 feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 27" Depth Weeping from Pit 120" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-9"	Ap	Sandy Loam	10YR 3/2	-	-	-	0	0	Massive	Friable	
9"-26"	Bw	Sandy Loam	10YR 5/6	-	-	-	0	0	Massive	Friable	
26"-121"	C	Gr Loamy Sand	10YR 6/4	-	-	-	20	5	Massive	Friable	

Additional Notes:
No Refusal, E.S.H.W.T @ 27"

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used: Obs. Hole #1 Obs. Hole #2

	Obs. Hole #1	Obs. Hole #2
☒ Depth observed standing water in observation hole	110 inches	120 inches
☒ Depth weeping from side of observation hole	26 inches	27 inches
☒ Depth to soil redoximorphic features (mottles)	24 inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number ____________ Reading Date ____________

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: _____ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 9 inches Lower boundary: 121 inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

9/27/21
Date

14267
Typed or Printed Name of Soil Evaluator / License #

12/1/21
Expiration Date of License

Leonard Izzo
Name of Approving Authority Witness

Mendon Board of Health
Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Hastings Street Plaza LLC
Owner Name

37 Hastings Street
Street Address

11
Map/Lot #

Mendon
City

MA
State

01756
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: UC Davis Soil Web

315B
Soil Map Unit

Scituate Fine Sandy Loam 3-8% Slopes
Soil Name

High Groundwater
Soil Limitations

Glacial Till
Soil Parent material

Drumlin
Landform

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes: 2008/Stone

Year Published/Source

Thin Till
Map Unit

Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered gravel clasts and few large boulders; in areas where till is generally less than 10 to 15 ft thick and including areas of bedrock outcrop where till is absent.

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS): 9/27/2021 Range: ☒ Above Normal ☐ Normal ☐ Below Normal

Month/Day/ Year

8. Other references reviewed: Oliver -Within Surface Water Supply Watershed

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 5 (Hole #) 9/14/21 (Date) 8:30 A.M. (Time) 61 degrees (Weather) ______ (Latitude) ______ (Longitude:)

1. Land Use Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Woods (Vegetation) No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 4% (Slope (%))

Description of Location: ______________________

2. Soil Parent Material: Glacial Till Drumlin (Landform) BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Wetlands 100 feet

Property Line 80 feet Drinking Water Well 670 feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 31" Depth Weeping from Pit ______ Depth Standing Water in Hole

Soil Log

Depth (in)	**Soil Horizon /Layer**	**Soil Texture (USDA**	**Soil Matrix: Color-Moist (Munsell)**	**Redoximorphic Features**			**Coarse Fragments % by Volume**		**Soil Structure**	**Soil Consistence (Moist)**	**Other**
				Depth	**Color**	**Percent**	**Gravel**	**Cobbles & Stones**			
0-9"	Ap	Sandy Loam	10YR 3/2	-	-	-	0	0	Massive	Friable	
9"-27"	Bw	Sandy Loam	10YR 5/6	-	-	-	5	0	Massive	Friable	
27"-122"	C	Loamy Sand	2.5Y 7/3	-	-	-	20	5	Massive	Friable	

Additional Notes:
No Refusal, E.S.H.W.T. @ 31".

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 6 (Hole #) 9/14/21 (Date) 12:50 A.M. (Time) 80 degrees (Weather) ______ (Latitude) ______ (Longitude:)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Woods (Vegetation) No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 4 (Slope (%))

   Description of Location: Wooded area

2. Soil Parent Material: Glacial Till Drumlin (Landform) BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Wetlands 140 feet

   Property Line 60 feet Drinking Water Well 850 feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 41" Depth Weeping from Pit ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-7"	Ap	Sandy Loam	10YR 3/2	-	-	-	0	0	Massive	Friable	
7"-36"	Bw	Sandy Loam	10YR 5/8	-	-	-	5	0	Massive	Friable	
36"-120"	C	Gr Loamy Sand	2.5Y 6/2	-	-	-	20	10	Massive	Friable	

Additional Notes:
No Refusal, E.S.H.W.T @ 41"

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

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D. Determination of High Groundwater Elevation

1. Method Used: Obs. Hole #5 Obs. Hole #6

	Obs. Hole #5	Obs. Hole #6
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☒ Depth weeping from side of observation hole	31 inches	41 inches
☐ Depth to soil redoximorphic features (mottles)	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number ______________________ Reading Date ______________________

$S_h = S_c – [S_r \text{ x } (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: _____ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 7 inches Lower boundary: 122 inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator	9/27/21 Date
14267 Typed or Printed Name of Soil Evaluator / License #	12/1/21 Expiration Date of License
Leonard Izzo Name of Approving Authority Witness	Mendon Board of Health Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Hastings Street Plaza LLC
Owner Name

37 Hastings Street
Street Address

11
Map/Lot #

Mendon
City

MA
State

01756
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: UC Davis Soil Web

315A
Soil Map Unit

Scituate Fine Sandy Loam 0-3% Slopes
Soil Name

High Groundwater
Soil Limitations

Glacial Till
Soil Parent material

Drumlin
Landform

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes:

2008/Stone
Year Published/Source

Thin Till
Map Unit

Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered gravel clasts and few large boulders; in areas where till is generally less than 10 to 15 ft thick and including areas of bedrock outcrop where till is absent.

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS): 9/27/2021 Range: ☒ Above Normal ☐ Normal ☐ Below Normal

Month/Day/ Year

8. Other references reviewed: Oliver -Within Surface Water Supply Watershed

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 7 (Hole #) 9/13/21 (Date) 1:32 P.M. (Time) 61 degrees (Weather) ______ (Latitude) ______ (Longitude:)

1. Land Use Grassland (e.g., woodland, agricultural field, vacant lot, etc.) Grass (Vegetation) No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 2% (Slope (%))

Description of Location: ______

2. Soil Parent Material: Glacial Till Drumlin (Landform) BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body ______ feet Drainage Way 600 feet Wetlands 600 feet

Property Line 150 feet Drinking Water Well 200 feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 28" Depth Weeping from Pit 122" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10"	Ap	Sandy Loam	10YR 3/1	-	-	-	0	0	Massive	Friable	
10"-26"	Bw	Sandy Loam	10YR 5/6	24"	10R 6/6	5	5	0	Massive	Friable	
26"-122"	C	Loamy Sand	2.5Y 6/2	-	-	-	20	5	Massive	Friable	

Additional Notes:
No Refusal, E.S.H.W.T. @ 24".

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:	Obs. Hole # 7	Obs. Hole # _____
☒ Depth observed standing water in observation hole	122 inches	_____ inches
☒ Depth weeping from side of observation hole	28 inches	_____ inches
☒ Depth to soil redoximorphic features (mottles)	24 inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number _____ Reading Date _____

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: _____ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 10 inches Lower boundary: 122 inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

Date: 9/27/21

Typed or Printed Name of Soil Evaluator / License #: 14267

Expiration Date of License: 12/1/21

Name of Approving Authority Witness: Leonard Izzo

Approving Authority: Mendon Board of Health

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Hastings Street Plaza LLC
Owner Name

37 Hastings Street
Street Address

11
Map/Lot #

Mendon
City

MA
State

01756
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: UC Davis Soil Web

315B
Soil Map Unit

Scituate Fine Sandy Loam 3-8% Slopes
Soil Name

High Groundwater
Soil Limitations

Glacial Till
Soil Parent material

Drumlin
Landform

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes: 2008/Stone
Year Published/Source

Thin Till
Map Unit

Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered gravel clasts and few large boulders; in areas where till is generally less than 10 to 15 ft thick and including areas of bedrock outcrop where till is absent.

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:
Wetland Type

7. Current Water Resource Conditions (USGS): 9/27/2021
Month/Day/ Year
Range: ☒ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed: Oliver -Within Surface Water Supply Watershed

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 8 (Hole #) 9/14/21 (Date) 9:06 A.M. (Time) 61 degrees (Weather) ______ (Latitude) ______ (Longitude:)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Woods (Vegetation) No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 4% (Slope (%))
   Description of Location: ______
2. Soil Parent Material: Glacial Till Drumlin (Landform) BS (Position on Landscape (SU, SH, BS, FS, TS))
3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Wetlands 300 feet
   Property Line 40 feet Drinking Water Well 550 feet Other ______ feet
4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock
5. Groundwater Observed: ☒ Yes ☐ No If yes: 50" Depth Weeping from Pit ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10"	Ap	Sandy Loam	10YR 3/2	-	-	-	0	0	Massive	Friable	
10"-29"	Bw	Sandy Loam	10YR 5/4	-	-	-	5	0	Massive	Friable	
29"-116"	C	Loamy Sand	2.5Y 7/3	46"	10R 6/6	5	20	5	Massive	Friable	

Additional Notes:
No Refusal, E.S.H.W.T. @ 46".

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 9 (Hole #) 9/14/21 (Date) 11:16 A.M. (Time) 75 degrees (Weather) ______ (Latitude) ______ (Longitude:)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Woods (Vegetation) No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 4 (Slope (%))

Description of Location: Wooded area

2. Soil Parent Material: Glacial Till Drumlin (Landform) BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Wetlands 450 feet

Property Line 40 feet Drinking Water Well 500 feet Other ______ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 48" Depth Weeping from Pit ______ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-10"	Ap	Sandy Loam	10YR 3/2	-	-	-	0	0	Massive	Friable	
10"-28"	Bw	Sandy Loam	10YR 5/6	-	-	-	10	5	Massive	Friable	
28"-120"	C	F Loamy Sand	2.5Y 6/4	36"	10R 6/8	4	10	5	Massive	Friable	

Additional Notes:
No Refusal, E.S.H.W.T @ 36"

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # 8	Obs. Hole # 9
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☒ Depth weeping from side of observation hole	50 inches	48 inches
☒ Depth to soil redoximorphic features (mottles)	46 inches	36 inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number ____________ Reading Date ____________

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: _____ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 10 inches Lower boundary: 120 inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Mendon

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

	9/27/21
Signature of Soil Evaluator	Date
14267	12/1/21
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Leonard Izzo	Mendon Board of Health
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Appendix C

MassDEP Checklist for Stormwater Report

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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

✓ tab

return ✗

A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

---

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

SEAN PATRICK
REARDON
CIVIL
NO. 41062

4/25/22

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☒ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

  ☐ Credit 1

  ☐ Credit 2

  ☐ Credit 3

☒ Use of “country drainage” versus curb and gutter conveyance and pipe

☒ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☒ Grass Channel

☐ Green Roof

☐ Other (describe): ______________________________

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

---

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

  ☒ is within the Zone II or Interim Wellhead Protection Area

  ☐ is near or to other critical areas

  ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

  ☒ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☒ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☒ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

  ☒ Name of the stormwater management system owners;

  ☒ Party responsible for operation and maintenance;

  ☒ Schedule for implementation of routine and non-routine maintenance tasks;

  ☒ Plan showing the location of all stormwater BMPs maintenance access areas;

  ☐ Description and delineation of public safety features;

  ☒ Estimated operation and maintenance budget; and

  ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

  ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;

  ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Appendix D

Outlet Protection Sizing Calculations

Hastings Street Plaza
Hastings Street and Washington Street
Mendon, Massachusetts

Outlet Protection Sizing

Outfall Structure	**Peak Discharge (cfs)**	**Pipe Diameter (in)**	**D (ft)**	**TW (ft)**	**Velocity (ft/sec)**	**D_{50} (ft)**	**Apron Length (ft)**	**Apron Depth (in)**	**Apron W1 (ft)**	**Apron W2 (ft)**
FES 1	7.76	24	2.0	0.4	2.5	0.3	8.0	17.5	6.0	11.3
FES 2	9.83	24	2.0	0.4	3.1	0.4	8.0	17.5	6.0	11.3
FES 3	6.31	18	1.5	0.4	3.6	0.3	6.0	17.5	4.5	8.5
FES 4	6.59	18	1.5	0.4	3.7	0.4	6.0	17.5	4.5	8.5

Notes: 10-Year Storm Peak Discharge value taken from HydroCAD Output, Proposed Conditions

Equations to determine length of apron are as follows:

$D_{50} = 0.2*D*(Q/(\sqrt{(g)}*D^{2.5}))^{4/3}*(D/TW)$ (Equation 10.4, HEC 14, July 2006)

D_{50} = median stone diameter (ft)
Q = design discharge (cfs)
D = pipe diameter (ft)
TW = tailwater depth (ft)
g = acceleration due to gravity (32.2 ft/s^2)

Apron length and depth equations vary based on D_{50} size.

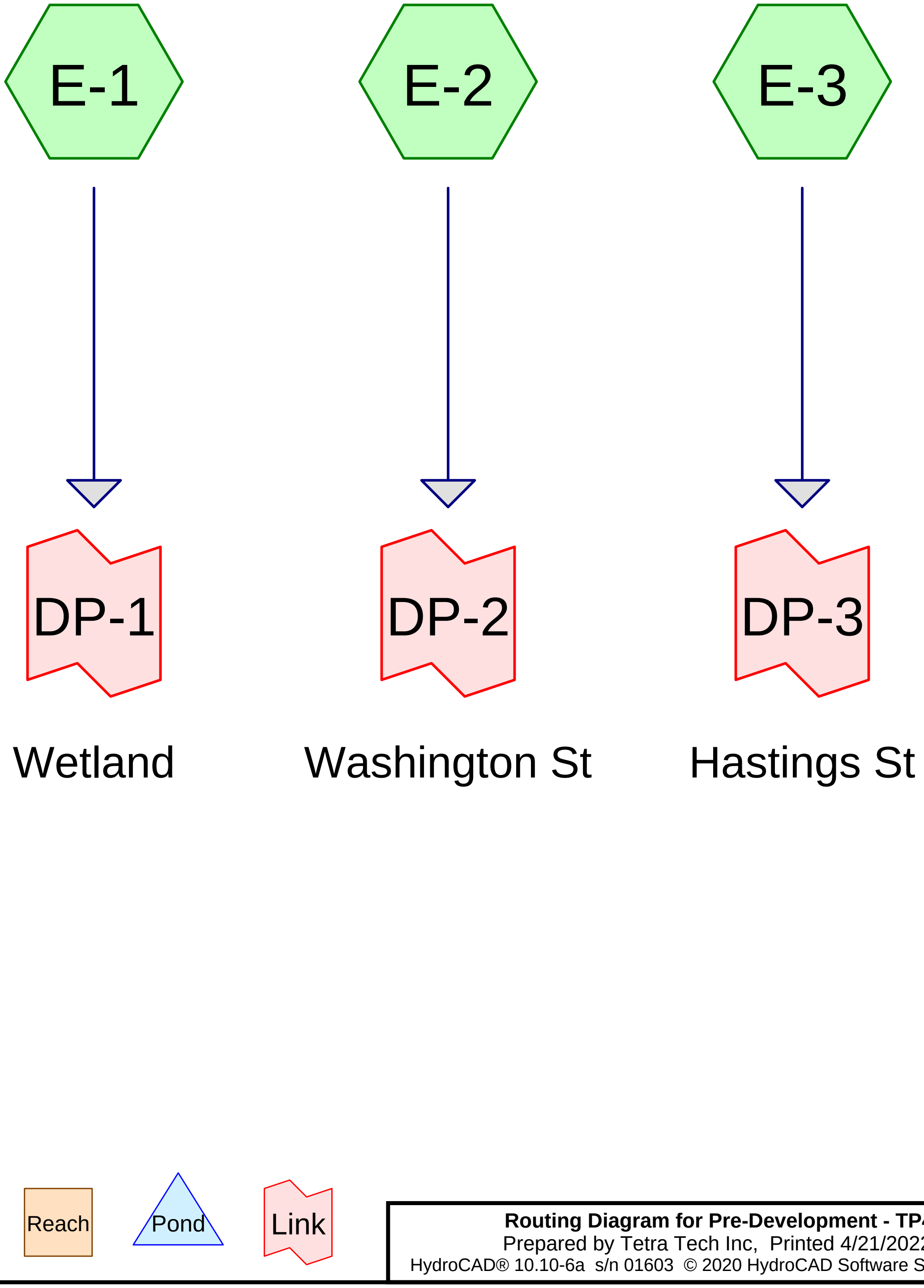
Class 1: D_{50} = 5 in (Table 10.1, HEC 14, July 2006)
Apron Length L = 4*D
Apron Depth = 3.5*D_{50}

Equations to determine widths of apron are as follows:

Apron Width (W1) at pipe outlet, W = 3D
Apron Width (W2) at end of apron, W = 3D +(2/3)L

Appendix E

HydroCAD® Input/Output Data



Routing Diagram for Pre-Development - TP40
Prepared by Tetra Tech Inc, Printed 4/21/2022
HydroCAD® 10.10-6a s/n 01603 © 2020 HydroCAD Software Solutions LLC

Summary for Subcatchment E-1:

Runoff = 2.79 cfs @ 12.49 hrs, Volume= 0.518 af, Depth= 0.37"
Routed to Link DP-1 : Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	296,491	55	Woods, Good, HSG B
	411,056	61	>75% Grass cover, Good, HSG B
*	16,261	98	Impervious, HSG B
	723,808	59	Weighted Average
	707,547		97.75% Pervious Area
	16,261		2.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
13.0	933	0.0290	1.19		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.3	983	Total			

Summary for Subcatchment E-2:

```
Runoff      =        0.77 cfs @   12.30 hrs,  Volume=          0.105 af,  Depth=  0.52"
    Routed to Link DP-2 : Washington St
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	15,382	55	Woods, Good, HSG B
	81,158	61	>75% Grass cover, Good, HSG B
*	9,317	98	Impervious, HSG B
	105,857	63	Weighted Average
	96,540		91.20% Pervious Area
	9,317		8.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
7.8	388	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.1	438	Total			

Summary for Subcatchment E-3:

Runoff = 1.75 cfs @ 12.09 hrs, Volume= 0.128 af, Depth= 2.08"
Routed to Link DP-3 : Hastings St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	7,890	61	>75% Grass cover, Good, HSG B
*	24,192	98	Impervious, HSG B
	32,082	89	Weighted Average
	7,890		24.59% Pervious Area
	24,192		75.41% Impervious Area

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

Summary for Link DP-1: Wetland

```
Inflow Area =      16.616 ac,   2.25% Impervious,  Inflow Depth =   0.37"    for  2 yr event
Inflow      =        2.79 cfs @   12.49 hrs,  Volume=          0.518 af
Primary     =        2.79 cfs @   12.49 hrs,  Volume=          0.518 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: Washington St

```
Inflow Area =          2.430 ac,    8.80% Impervious,  Inflow Depth =   0.52"    for  2 yr event
Inflow        =          0.77 cfs @   12.30 hrs,  Volume=              0.105 af
Primary      =          0.77 cfs @   12.30 hrs,  Volume=              0.105 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-3: Hastings St

```
Inflow Area =          0.737 ac,  75.41% Impervious,  Inflow Depth =   2.08"    for  2 yr event
Inflow       =         1.75 cfs @   12.09 hrs,  Volume=             0.128 af
Primary      =         1.75 cfs @   12.09 hrs,  Volume=             0.128 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment E-1:

Runoff = 10.70 cfs @ 12.37 hrs, Volume= 1.405 af, Depth= 1.01"
Routed to Link DP-1 : Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	296,491	55	Woods, Good, HSG B
	411,056	61	>75% Grass cover, Good, HSG B
*	16,261	98	Impervious, HSG B
	723,808	59	Weighted Average
	707,547		97.75% Pervious Area
	16,261		2.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
13.0	933	0.0290	1.19		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.3	983	Total			

Summary for Subcatchment E-2:

Runoff = 2.37 cfs @ 12.25 hrs, Volume= 0.256 af, Depth= 1.26"
Routed to Link DP-2 : Washington St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	15,382	55	Woods, Good, HSG B
	81,158	61	>75% Grass cover, Good, HSG B
*	9,317	98	Impervious, HSG B
	105,857	63	Weighted Average
	96,540		91.20% Pervious Area
	9,317		8.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
7.8	388	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.1	438	Total			

Summary for Subcatchment E-3:

Runoff = 2.79 cfs @ 12.09 hrs, Volume= 0.208 af, Depth= 3.39"
Routed to Link DP-3 : Hastings St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	7,890	61	>75% Grass cover, Good, HSG B
*	24,192	98	Impervious, HSG B
	32,082	89	Weighted Average
	7,890		24.59% Pervious Area
	24,192		75.41% Impervious Area

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

Summary for Link DP-1: Wetland

```
Inflow Area =      16.616 ac,    2.25% Impervious,  Inflow Depth =   1.01"    for  10 yr event
Inflow      =      10.70 cfs @   12.37 hrs,  Volume=           1.405 af
Primary     =      10.70 cfs @   12.37 hrs,  Volume=           1.405 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
```

Summary for Link DP-2: Washington St

```
Inflow Area =          2.430 ac,    8.80% Impervious,  Inflow Depth =   1.26"    for  10 yr event
Inflow        =          2.37 cfs @   12.25 hrs,  Volume=             0.256 af
Primary      =          2.37 cfs @   12.25 hrs,  Volume=             0.256 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-3: Hastings St

```
Inflow Area =        0.737 ac,  75.41% Impervious,  Inflow Depth =   3.39"    for  10 yr event
Inflow      =        2.79 cfs @   12.09 hrs,  Volume=          0.208 af
Primary     =        2.79 cfs @   12.09 hrs,  Volume=          0.208 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment E-1:

Runoff = 28.29 cfs @ 12.33 hrs, Volume= 3.279 af, Depth= 2.37"
Routed to Link DP-1 : Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

	Area (sf)	CN	Description
	296,491	55	Woods, Good, HSG B
	411,056	61	>75% Grass cover, Good, HSG B
*	16,261	98	Impervious, HSG B
	723,808	59	Weighted Average
	707,547		97.75% Pervious Area
	16,261		2.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
13.0	933	0.0290	1.19		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.3	983	Total			

Summary for Subcatchment E-2:

Runoff = 5.60 cfs @ 12.23 hrs, Volume= 0.557 af, Depth= 2.75"
Routed to Link DP-2 : Washington St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

	Area (sf)	CN	Description
	15,382	55	Woods, Good, HSG B
	81,158	61	>75% Grass cover, Good, HSG B
*	9,317	98	Impervious, HSG B
	105,857	63	Weighted Average
	96,540		91.20% Pervious Area
	9,317		8.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
7.8	388	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.1	438	Total			

Summary for Subcatchment E-3:

Runoff = 4.43 cfs @ 12.09 hrs, Volume= 0.338 af, Depth= 5.51"
Routed to Link DP-3 : Hastings St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

	Area (sf)	CN	Description
	7,890	61	>75% Grass cover, Good, HSG B
*	24,192	98	Impervious, HSG B
	32,082	89	Weighted Average
	7,890		24.59% Pervious Area
	24,192		75.41% Impervious Area

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

Summary for Link DP-1: Wetland

```
Inflow Area =       16.616 ac,   2.25% Impervious,  Inflow Depth =   2.37"    for  100 yr event
Inflow      =        28.29 cfs @   12.33 hrs,  Volume=          3.279 af
Primary     =        28.29 cfs @   12.33 hrs,  Volume=          3.279 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: Washington St

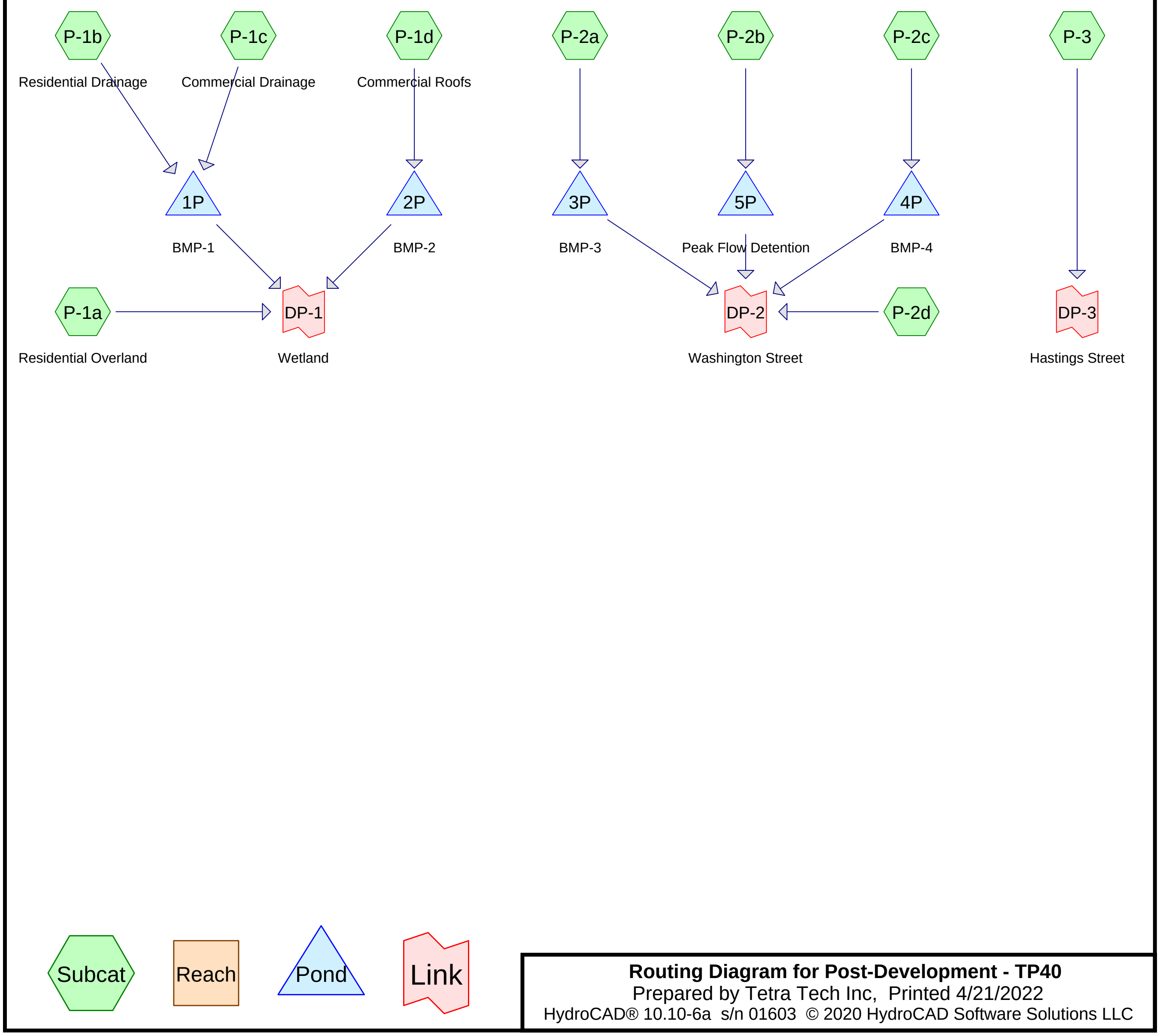
```
Inflow Area =       2.430 ac,    8.80% Impervious,  Inflow Depth =   2.75"    for  100 yr event
Inflow      =        5.60 cfs @   12.23 hrs,  Volume=          0.557 af
Primary     =        5.60 cfs @   12.23 hrs,  Volume=          0.557 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-3: Hastings St

```
Inflow Area =      0.737 ac,  75.41% Impervious,  Inflow Depth =   5.51"    for  100 yr event
Inflow      =       4.43 cfs @  12.09 hrs,  Volume=        0.338 af
Primary     =       4.43 cfs @  12.09 hrs,  Volume=        0.338 af,  Atten= 0%,  Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
```



Routing Diagram for Post-Development - TP40
Prepared by Tetra Tech Inc, Printed 4/21/2022
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Summary for Subcatchment P-1a: Residential Overland

Runoff = 1.02 cfs @ 12.49 hrs, Volume= 0.184 af, Depth= 0.41"
Routed to Link DP-1 : Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	82,690	61	>75% Grass cover, Good, HSG B
	133,272	55	Woods, Good, HSG B
	11,382	98	Roofs, HSG B
*	1,888	98	Impervious, HSG B
	6,328	85	Gravel roads, HSG B
	235,560	60	Weighted Average
	222,290		94.37% Pervious Area
	13,270		5.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	50	0.0050	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
7.6	318	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	90	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.2	458	Total			

Summary for Subcatchment P-1b: Residential Drainage

Runoff = 3.16 cfs @ 12.35 hrs, Volume= 0.382 af, Depth= 0.93"
Routed to Pond 1P : BMP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	16,437	60	Woods, Fair, HSG B
	134,615	61	>75% Grass cover, Good, HSG B
	26,829	98	Roofs, HSG B
*	33,917	98	Impervious, HSG B
	3,095	85	Gravel roads, HSG B
	214,893	72	Weighted Average
	154,147		71.73% Pervious Area
	60,746		28.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	50	0.0050	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
3.7	109	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	276	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	167	0.0275	1.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.5	602	Total			

Summary for Subcatchment P-1c: Commercial Drainage

Runoff = 10.68 cfs @ 12.14 hrs, Volume= 0.913 af, Depth= 2.45"
Routed to Pond 1P : BMP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	25,386	61	>75% Grass cover, Good, HSG B
*	163,918	98	Impervious, HSG B
	5,925	98	Roofs, HSG B
	195,229	93	Weighted Average
	25,386		13.00% Pervious Area
	169,843		87.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	28	0.0100	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
3.4	940	0.0050	4.55	8.05	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
10.3	968	Total			

Summary for Subcatchment P-1d: Commercial Roofs

Runoff = 4.49 cfs @ 12.09 hrs, Volume= 0.366 af, Depth= 2.97"
Routed to Pond 2P : BMP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
64,475	98	Roofs, HSG B
64,475		100.00% Impervious Area

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

Summary for Subcatchment P-2a:

Runoff = 0.41 cfs @ 12.10 hrs, Volume= 0.031 af, Depth= 1.04"
Routed to Pond 3P : BMP-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	10,080	61	>75% Grass cover, Good, HSG B
*	5,705	98	Impervious, HSG B
	15,785	74	Weighted Average
	10,080		63.86% Pervious Area
	5,705		36.14% Impervious Area

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

Summary for Subcatchment P-2b:

Runoff = 0.39 cfs @ 12.28 hrs, Volume= 0.055 af, Depth= 0.48"
Routed to Pond 5P : Peak Flow Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	52,120	61	>75% Grass cover, Good, HSG B
	4,563	55	Woods, Good, HSG B
*	3,153	98	Roofs, HSG B
	59,836	62	Weighted Average
	56,683		94.73% Pervious Area
	3,153		5.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
5.3	245	0.0120	0.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.6	295	Total			

Summary for Subcatchment P-2c:

```
Runoff       =          0.54 cfs @   12.10 hrs,  Volume=            0.041 af,  Depth=  1.09"
    Routed to Pond 4P : BMP-4
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	11,980	61	>75% Grass cover, Good, HSG B
	4,037	98	Roofs, HSG B
*	3,429	98	Impervious, HSG B
	19,446	75	Weighted Average
	11,980		61.61% Pervious Area
	7,466		38.39% Impervious Area

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

Summary for Subcatchment P-2d:

Runoff = 0.35 cfs @ 12.19 hrs, Volume= 0.039 af, Depth= 0.60"
Routed to Link DP-2 : Washington Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	29,886	61	>75% Grass cover, Good, HSG B
*	2,007	98	Roofs, HSG B
	592	55	Woods, Good, HSG B
*	1,341	98	Impervious, HSG B
	33,826	65	Weighted Average
	30,478		90.10% Pervious Area
	3,348		9.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
2.8	179	0.0225	1.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	229	Total			

Summary for Subcatchment P-3:

```
Runoff     =      1.24 cfs @  12.09 hrs,  Volume=        0.091 af,  Depth=  2.17"
    Routed to Link DP-3 : Hastings Street
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	4,769	61	>75% Grass cover, Good, HSG B
*	17,172	98	Impervious, HSG B
	21,941	90	Weighted Average
	4,769		21.74% Pervious Area
	17,172		78.26% Impervious Area

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

Summary for Pond 1P: BMP-1

Inflow Area = 9.415 ac, 56.22% Impervious, Inflow Depth = 1.65" for 2 yr event
Inflow = 12.50 cfs @ 12.16 hrs, Volume= 1.296 af
Outflow = 1.86 cfs @ 13.11 hrs, Volume= 1.296 af, Atten= 85%, Lag= 57.2 min
Discarded = 1.22 cfs @ 13.11 hrs, Volume= 1.200 af
Primary = 0.64 cfs @ 13.11 hrs, Volume= 0.096 af
Routed to Link DP-1 : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 429.24' @ 13.11 hrs Surf.Area= 13,105 sf Storage= 24,049 cf

Plug-Flow detention time= 203.4 min calculated for 1.295 af (100% of inflow)
Center-of-Mass det. time= 203.4 min (1,025.8 - 822.4)

Volume	Invert	Avail.Storage	Storage Description
#1	427.00'	69,107 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
427.00	8,625	390.0	0	0	8,625
428.00	10,410	470.0	9,504	9,504	14,117
430.00	14,910	622.0	25,186	34,689	27,370
432.00	19,615	765.0	34,418	69,107	43,215

Device	Routing	Invert	Outlet Devices
#1	Primary	427.50'	**18.0" Round Culvert** L= 30.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 427.50' / 426.90' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	428.90'	**12.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	429.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	430.90'	**8.0' long x 13.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63
#5	Discarded	427.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=1.22 cfs @ 13.11 hrs HW=429.24' (Free Discharge)
└─**5=Exfiltration** (Exfiltration Controls 1.22 cfs)

Primary OutFlow Max=0.64 cfs @ 13.11 hrs HW=429.24' (Free Discharge)
├─**1=Culvert** (Passes 0.64 cfs of 8.46 cfs potential flow)
│ ├─**2=Orifice/Grate** (Orifice Controls 0.64 cfs @ 1.87 fps)
│ └─**3=Orifice/Grate** (Controls 0.00 cfs)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Stage-Area-Storage for Pond 1P: BMP-1

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
427.00	8,625	8,625	0
427.10	8,796	9,128	871
427.20	8,969	9,642	1,759
427.30	9,143	10,165	2,665
427.40	9,319	10,699	3,588
427.50	9,497	11,243	4,529
427.60	9,676	11,797	5,487
427.70	9,857	12,362	6,464
427.80	10,040	12,937	7,459
427.90	10,224	13,522	8,472
428.00	10,410	14,117	9,504
428.10	10,616	14,692	10,555
428.20	10,824	15,276	11,627
428.30	11,034	15,870	12,720
428.40	11,246	16,472	13,834
428.50	11,459	17,084	14,969
428.60	11,675	17,705	16,125
428.70	11,893	18,336	17,304
428.80	12,113	18,975	18,504
428.90	12,335	19,624	19,727
429.00	12,559	20,282	20,971
429.10	12,785	20,950	22,239
429.20	13,013	21,626	23,528
429.30	13,243	22,312	24,841
429.40	13,475	23,007	26,177
429.50	13,709	23,711	27,536
429.60	13,946	24,425	28,919
429.70	14,184	25,147	30,326
429.80	14,424	25,879	31,756
429.90	14,666	26,620	33,210
430.00	14,910	27,370	34,689
430.10	15,130	28,085	36,191
430.20	15,352	28,808	37,715
430.30	15,575	29,539	39,261
430.40	15,799	30,278	40,830
430.50	16,026	31,025	42,421
430.60	16,254	31,781	44,035
430.70	16,483	32,544	45,672
430.80	16,715	33,316	47,332
430.90	16,948	34,096	49,015
431.00	17,182	34,884	50,722
431.10	17,418	35,681	52,452
431.20	17,656	36,485	54,205
431.30	17,895	37,298	55,983
431.40	18,136	38,118	57,784
431.50	18,378	38,947	59,610
431.60	18,622	39,785	61,460
431.70	18,868	40,630	63,335
431.80	19,116	41,483	65,234
431.90	19,364	42,345	67,158
432.00	**19,615**	**43,215**	**69,107**

Summary for Pond 2P: BMP-2

Inflow Area = 1.480 ac,100.00% Impervious, Inflow Depth = 2.97" for 2 yr event
Inflow = 4.49 cfs @ 12.09 hrs, Volume= 0.366 af
Outflow = 1.50 cfs @ 12.41 hrs, Volume= 0.366 af, Atten= 67%, Lag= 19.7 min
Discarded = 0.21 cfs @ 12.40 hrs, Volume= 0.334 af
Primary = 1.29 cfs @ 12.41 hrs, Volume= 0.032 af
Routed to Link DP-1 : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 435.73' @ 12.42 hrs Surf.Area= 2,996 sf Storage= 6,500 cf

Plug-Flow detention time= 259.6 min calculated for 0.366 af (100% of inflow)
Center-of-Mass det. time= 259.6 min (1,016.0 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	432.00'	2,705 cf	**44.25'W x 67.70'L x 3.50'H Field A** 10,485 cf Overall - 3,721 cf Embedded = 6,763 cf x 40.0% Voids
#2A	432.50'	3,721 cf	**ADS_StormTech SC-740 +Cap** x 81 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 81 Chambers in 9 Rows
#3	432.00'	128 cf	**5.00'D x 6.50'H Vertical Cone/Cylinder**-Impervious
		6,554 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	432.00'	**18.0" Round Culvert** L= 100.0' Ke= 0.500 Inlet / Outlet Invert= 432.00' / 430.00' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	435.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	432.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.21 cfs @ 12.40 hrs HW=435.71' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=1.12 cfs @ 12.41 hrs HW=435.70' (Free Discharge)
└─**1=Culvert** (Passes 1.12 cfs of 14.60 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.12 cfs @ 1.45 fps)

Stage-Area-Storage for Pond 2P: BMP-2

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
432.00	2,996	0
432.10	3,018	122
432.20	3,040	244
432.30	3,063	365
432.40	3,085	487
432.50	3,108	609
432.60	3,130	859
432.70	3,152	1,109
432.80	3,175	1,357
432.90	3,197	1,604
433.00	3,219	1,848
433.10	3,242	2,091
433.20	3,264	2,331
433.30	3,287	2,569
433.40	3,309	2,804
433.50	3,331	3,037
433.60	3,354	3,266
433.70	3,376	3,492
433.80	3,399	3,715
433.90	3,421	3,933
434.00	3,443	4,148
434.10	3,466	4,358
434.20	3,488	4,563
434.30	3,511	4,761
434.40	3,533	4,953
434.50	3,555	5,138
434.60	3,578	5,314
434.70	3,600	5,479
434.80	3,622	5,627
434.90	3,645	5,761
435.00	3,667	5,886
435.10	3,690	6,008
435.20	3,712	6,130
435.30	3,734	6,252
435.40	3,757	6,373
435.50	**3,779**	6,495
435.60	3,779	6,497
435.70	3,779	6,499
435.80	3,779	6,501
435.90	3,779	6,503
436.00	3,779	6,505
436.10	3,779	6,507
436.20	3,779	6,509
436.30	3,779	6,511
436.40	3,779	6,513
436.50	3,779	6,515
436.60	3,779	6,517
436.70	3,779	6,519
436.80	3,779	6,521
436.90	3,779	6,523
437.00	3,779	6,525
437.10	3,779	6,527
437.20	3,779	6,529
437.30	3,779	6,531
437.40	3,779	6,533
437.50	3,779	6,534
437.60	3,779	6,536
437.70	3,779	6,538
437.80	3,779	6,540
437.90	3,779	6,542
438.00	3,779	6,544
438.10	3,779	6,546
438.20	3,779	6,548
438.30	3,779	6,550
438.40	3,779	6,552
438.50	3,779	**6,554**

Summary for Pond 3P: BMP-3

Inflow Area = 0.362 ac, 36.14% Impervious, Inflow Depth = 1.04" for 2 yr event
Inflow = 0.41 cfs @ 12.10 hrs, Volume= 0.031 af
Outflow = 0.05 cfs @ 12.97 hrs, Volume= 0.031 af, Atten= 87%, Lag= 52.4 min
Primary = 0.05 cfs @ 12.97 hrs, Volume= 0.031 af
Routed to Link DP-2 : Washington Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 428.43' @ 12.97 hrs Surf.Area= 1,145 sf Storage= 453 cf

Plug-Flow detention time= 76.8 min calculated for 0.031 af (100% of inflow)
Center-of-Mass det. time= 76.8 min (938.8 - 862.1)

Volume	Invert	Avail.Storage	Storage Description
#1	428.00'	1,180 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
428.00	955	0	0	955
429.00	1,421	1,180	1,180	1,437

Device	Routing	Invert	Outlet Devices
#1	Primary	425.00'	**6.0" Round Culvert** L= 90.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 425.00' / 424.10' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#2	Device 1	428.75'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	428.00'	**2.000 in/hr Exfiltration over Surface area**
#4	Primary	429.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.05 cfs @ 12.97 hrs HW=428.43' (Free Discharge)
└─**1=Culvert** (Passes 0.05 cfs of 1.05 cfs potential flow)
  └─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Exfiltration** (Exfiltration Controls 0.05 cfs)
└─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Stage-Area-Storage for Pond 3P: BMP-3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
428.00	955	0
428.01	959	10
428.02	963	19
428.03	968	29
428.04	972	39
428.05	976	48
428.06	980	58
428.07	985	68
428.08	989	78
428.09	993	88
428.10	997	98
428.11	1,002	108
428.12	1,006	118
428.13	1,010	128
428.14	1,015	138
428.15	1,019	148
428.16	1,023	158
428.17	1,028	168
428.18	1,032	179
428.19	1,036	189
428.20	1,041	200
428.21	1,045	210
428.22	1,050	220
428.23	1,054	231
428.24	1,058	242
428.25	1,063	252
428.26	1,067	263
428.27	1,072	273
428.28	1,076	284
428.29	1,081	295
428.30	1,085	306
428.31	1,090	317
428.32	1,094	328
428.33	1,099	339
428.34	1,103	350
428.35	1,108	361
428.36	1,112	372
428.37	1,117	383
428.38	1,121	394
428.39	1,126	405
428.40	1,130	417
428.41	1,135	428
428.42	1,139	439
428.43	1,144	451
428.44	1,149	462
428.45	1,153	474
428.46	1,158	485
428.47	1,163	497
428.48	1,167	508
428.49	1,172	520
428.50	1,176	532
428.51	1,181	544
428.52	1,186	556
428.53	1,190	567
428.54	1,195	579
428.55	1,200	591
428.56	1,205	603
428.57	1,209	615
428.58	1,214	628
428.59	1,219	640
428.60	1,224	652
428.61	1,228	664
428.62	1,233	676
428.63	1,238	689
428.64	1,243	701
428.65	1,247	714
428.66	1,252	726
428.67	1,257	739
428.68	1,262	751
428.69	1,267	764
428.70	1,272	777
428.71	1,276	789
428.72	1,281	802
428.73	1,286	815
428.74	1,291	828
428.75	1,296	841
428.76	1,301	854
428.77	1,306	867
428.78	1,311	880
428.79	1,315	893
428.80	1,320	906
428.81	1,325	919
428.82	1,330	933
428.83	1,335	946
428.84	1,340	959
428.85	1,345	973
428.86	1,350	986
428.87	1,355	1,000
428.88	1,360	1,013
428.89	1,365	1,027
428.90	1,370	1,041
428.91	1,375	1,054
428.92	1,380	1,068
428.93	1,385	1,082
428.94	1,390	1,096
428.95	1,396	1,110
428.96	1,401	1,124
428.97	1,406	1,138
428.98	1,411	1,152
428.99	1,416	1,166
429.00	**1,421**	**1,180**

Summary for Pond 4P: BMP-4

Inflow Area = 0.446 ac, 38.39% Impervious, Inflow Depth = 1.09" for 2 yr event
Inflow = 0.54 cfs @ 12.10 hrs, Volume= 0.041 af
Outflow = 0.11 cfs @ 12.59 hrs, Volume= 0.041 af, Atten= 80%, Lag= 29.4 min
Primary = 0.11 cfs @ 12.59 hrs, Volume= 0.041 af
Routed to Link DP-2 : Washington Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 434.52' @ 12.59 hrs Surf.Area= 1,264 sf Storage= 590 cf

Plug-Flow detention time= 90.8 min calculated for 0.041 af (100% of inflow)
Center-of-Mass det. time= 90.7 min (949.5 - 858.8)

Volume	Invert	Avail.Storage	Storage Description
#1	434.00'	1,259 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
434.00	1,020	0	0	1,020
435.00	1,515	1,259	1,259	1,531

Device	Routing	Invert	Outlet Devices
#1	Primary	431.00'	**6.0" Round Culvert** L= 100.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 431.00' / 430.00' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#2	Device 1	434.50'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	434.00'	**2.000 in/hr Exfiltration over Surface area**
#4	Primary	435.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.11 cfs @ 12.59 hrs HW=434.52' (Free Discharge)
1=Culvert (Passes 0.11 cfs of 1.10 cfs potential flow)
  2=Orifice/Grate (Weir Controls 0.05 cfs @ 0.44 fps)
  3=Exfiltration (Exfiltration Controls 0.06 cfs)
4=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Stage-Area-Storage for Pond 4P: BMP-4

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
434.00	1,020	0
434.01	1,024	10
434.02	1,029	20
434.03	1,033	31
434.04	1,038	41
434.05	1,042	52
434.06	1,047	62
434.07	1,051	72
434.08	1,056	83
434.09	1,061	94
434.10	1,065	104
434.11	1,070	115
434.12	1,074	126
434.13	1,079	136
434.14	1,083	147
434.15	1,088	158
434.16	1,093	169
434.17	1,097	180
434.18	1,102	191
434.19	1,107	202
434.20	1,111	213
434.21	1,116	224
434.22	1,121	235
434.23	1,125	247
434.24	1,130	258
434.25	1,135	269
434.26	1,139	281
434.27	1,144	292
434.28	1,149	303
434.29	1,154	315
434.30	1,158	327
434.31	1,163	338
434.32	1,168	350
434.33	1,173	361
434.34	1,177	373
434.35	1,182	385
434.36	1,187	397
434.37	1,192	409
434.38	1,197	421
434.39	1,201	433
434.40	1,206	445
434.41	1,211	457
434.42	1,216	469
434.43	1,221	481
434.44	1,226	493
434.45	1,231	506
434.46	1,236	518
434.47	1,240	530
434.48	1,245	543
434.49	1,250	555
434.50	1,255	568
434.51	1,260	580
434.52	1,265	593
434.53	1,270	606
434.54	1,275	618
434.55	1,280	631
434.56	1,285	644
434.57	1,290	657
434.58	1,295	670
434.59	1,300	683
434.60	1,305	696
434.61	1,310	709
434.62	1,315	722
434.63	1,320	735
434.64	1,326	748
434.65	1,331	762
434.66	1,336	775
434.67	1,341	788
434.68	1,346	802
434.69	1,351	815
434.70	1,356	829
434.71	1,361	842
434.72	1,367	856
434.73	1,372	870
434.74	1,377	884
434.75	1,382	897
434.76	1,387	911
434.77	1,393	925
434.78	1,398	939
434.79	1,403	953
434.80	1,408	967
434.81	1,413	981
434.82	1,419	995
434.83	1,424	1,010
434.84	1,429	1,024
434.85	1,435	1,038
434.86	1,440	1,053
434.87	1,445	1,067
434.88	1,450	1,081
434.89	1,456	1,096
434.90	1,461	1,111
434.91	1,466	1,125
434.92	1,472	1,140
434.93	1,477	1,155
434.94	1,483	1,169
434.95	1,488	1,184
434.96	1,493	1,199
434.97	1,499	1,214
434.98	1,504	1,229
434.99	1,510	1,244
435.00	**1,515**	**1,259**

Summary for Pond 5P: Peak Flow Detention

Inflow Area = 1.374 ac, 5.27% Impervious, Inflow Depth = 0.48" for 2 yr event
Inflow = 0.39 cfs @ 12.28 hrs, Volume= 0.055 af
Outflow = 0.33 cfs @ 12.46 hrs, Volume= 0.055 af, Atten= 15%, Lag= 11.1 min
Primary = 0.33 cfs @ 12.46 hrs, Volume= 0.055 af
Routed to Link DP-2 : Washington Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 430.14' @ 12.46 hrs Surf.Area= 1,535 sf Storage= 194 cf

Plug-Flow detention time= 15.3 min calculated for 0.055 af (100% of inflow)
Center-of-Mass det. time= 15.3 min (932.8 - 917.5)

Volume	Invert	Avail.Storage	Storage Description
#1	430.00'	8,575 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
430.00	1,335	0	0	1,335
431.00	3,150	2,179	2,179	3,157
432.00	10,335	6,397	8,575	10,348

Device	Routing	Invert	Outlet Devices
#1	Primary	428.00'	**4.0" Round Culvert** L= 75.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 428.00' / 427.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.09 sf
#2	Device 1	430.00'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.34 cfs @ 12.46 hrs HW=430.13' (Free Discharge)
↑└─**1=Culvert** (Passes 0.34 cfs of 0.35 cfs potential flow)
↑└─**2=Orifice/Grate** (Weir Controls 0.34 cfs @ 1.20 fps)

Stage-Area-Storage for Pond 5P: Peak Flow Detention

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
430.00	1,335	0
430.02	1,364	27
430.04	1,393	55
430.06	1,422	83
430.08	1,452	111
430.10	1,482	141
430.12	1,512	171
430.14	1,543	201
430.16	1,574	232
430.18	1,605	264
430.20	1,637	297
430.22	1,668	330
430.24	1,701	363
430.26	1,733	398
430.28	1,766	433
430.30	1,799	468
430.32	1,832	505
430.34	1,866	542
430.36	1,900	579
430.38	1,934	618
430.40	1,969	657
430.42	2,004	696
430.44	2,039	737
430.46	2,075	778
430.48	2,110	820
430.50	2,147	862
430.52	2,183	906
430.54	2,220	950
430.56	2,257	994
430.58	2,294	1,040
430.60	2,332	1,086
430.62	2,370	1,133
430.64	2,408	1,181
430.66	2,447	1,230
430.68	2,486	1,279
430.70	2,525	1,329
430.72	2,564	1,380
430.74	2,604	1,432
430.76	2,644	1,484
430.78	2,685	1,537
430.80	2,726	1,592
430.82	2,767	1,646
430.84	2,808	1,702
430.86	2,850	1,759
430.88	2,892	1,816
430.90	2,934	1,874
430.92	2,977	1,934
430.94	3,019	1,993
430.96	3,063	2,054
430.98	3,106	2,116
431.00	3,150	2,179
431.02	3,253	2,243
431.04	3,358	2,309
431.06	3,464	2,377
431.08	3,572	2,447
431.10	3,682	2,520
431.12	3,793	2,595
431.14	3,906	2,672
431.16	4,021	2,751
431.18	4,137	2,832
431.20	4,255	2,916
431.22	4,375	3,003
431.24	4,496	3,091
431.26	4,619	3,182
431.28	4,744	3,276
431.30	4,870	3,372
431.32	4,998	3,471
431.34	5,128	3,572
431.36	5,259	3,676
431.38	5,392	3,783
431.40	5,526	3,892
431.42	5,663	4,004
431.44	5,800	4,118
431.46	5,940	4,236
431.48	6,081	4,356
431.50	6,224	4,479
431.52	6,369	4,605
431.54	6,515	4,734
431.56	6,663	4,865
431.58	6,812	5,000
431.60	6,963	5,138
431.62	7,116	5,279
431.64	7,271	5,423
431.66	7,427	5,570
431.68	7,585	5,720
431.70	7,744	5,873
431.72	7,905	6,029
431.74	8,068	6,189
431.76	8,232	6,352
431.78	8,398	6,518
431.80	8,566	6,688
431.82	8,736	6,861
431.84	8,907	7,038
431.86	9,079	7,217
431.88	9,254	7,401
431.90	9,430	7,588
431.92	9,608	7,778
431.94	9,787	7,972
431.96	9,968	8,169
431.98	10,151	8,371
432.00	**10,335**	**8,575**

Summary for Link DP-1: Wetland

```
Inflow Area =        16.303 ac,  43.42% Impervious,  Inflow Depth =   0.23"    for  2 yr event
Inflow       =          2.27 cfs @   12.42 hrs,  Volume=            0.312 af
Primary      =          2.27 cfs @   12.42 hrs,  Volume=            0.312 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: Washington Street

```
Inflow Area =      2.959 ac, 15.26% Impervious, Inflow Depth =  0.67"   for 2 yr event
Inflow      =      0.69 cfs @  12.37 hrs, Volume=          0.166 af
Primary     =      0.69 cfs @  12.37 hrs, Volume=          0.166 af, Atten= 0%, Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-3: Hastings Street

Inflow Area = 0.504 ac, 78.26% Impervious, Inflow Depth = 2.17" for 2 yr event
Inflow = 1.24 cfs @ 12.09 hrs, Volume= 0.091 af
Primary = 1.24 cfs @ 12.09 hrs, Volume= 0.091 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment P-1a: Residential Overland

Runoff = 3.64 cfs @ 12.39 hrs, Volume= 0.484 af, Depth= 1.07"
Routed to Link DP-1 : Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	82,690	61	>75% Grass cover, Good, HSG B
	133,272	55	Woods, Good, HSG B
	11,382	98	Roofs, HSG B
*	1,888	98	Impervious, HSG B
	6,328	85	Gravel roads, HSG B
	235,560	60	Weighted Average
	222,290		94.37% Pervious Area
	13,270		5.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	50	0.0050	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
7.6	318	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	90	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.2	458	Total			

Summary for Subcatchment P-1b: Residential Drainage

Runoff = 6.86 cfs @ 12.33 hrs, Volume= 0.779 af, Depth= 1.89"
Routed to Pond 1P : BMP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	16,437	60	Woods, Fair, HSG B
	134,615	61	>75% Grass cover, Good, HSG B
	26,829	98	Roofs, HSG B
*	33,917	98	Impervious, HSG B
	3,095	85	Gravel roads, HSG B
	214,893	72	Weighted Average
	154,147		71.73% Pervious Area
	60,746		28.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	50	0.0050	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
3.7	109	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	276	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	167	0.0275	1.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.5	602	Total			

Summary for Subcatchment P-1c: Commercial Drainage

```
Runoff      =      16.23 cfs @   12.14 hrs,  Volume=          1.421 af,  Depth=  3.81"
    Routed to Pond 1P : BMP-1
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	25,386	61	>75% Grass cover, Good, HSG B
*	163,918	98	Impervious, HSG B
	5,925	98	Roofs, HSG B
	195,229	93	Weighted Average
	25,386		13.00% Pervious Area
	169,843		87.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	28	0.0100	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
3.4	940	0.0050	4.55	8.05	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
10.3	968	Total			

Summary for Subcatchment P-1d: Commercial Roofs

```
Runoff       =          6.50 cfs @   12.09 hrs,  Volume=            0.538 af,  Depth=  4.36"
    Routed to Pond 2P : BMP-2
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
64,475	98	Roofs, HSG B
64,475		100.00% Impervious Area

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

Summary for Subcatchment P-2a:

```
Runoff       =         0.85 cfs @   12.10 hrs,  Volume=            0.062 af,  Depth=  2.05"
    Routed to Pond 3P : BMP-3
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	10,080	61	>75% Grass cover, Good, HSG B
*	5,705	98	Impervious, HSG B
	15,785	74	Weighted Average
	10,080		63.86% Pervious Area
	5,705		36.14% Impervious Area

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

Summary for Subcatchment P-2b:

Runoff = 1.30 cfs @ 12.23 hrs, Volume= 0.137 af, Depth= 1.20"
Routed to Pond 5P : Peak Flow Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	52,120	61	>75% Grass cover, Good, HSG B
	4,563	55	Woods, Good, HSG B
*	3,153	98	Roofs, HSG B
	59,836	62	Weighted Average
	56,683		94.73% Pervious Area
	3,153		5.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
5.3	245	0.0120	0.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.6	295	Total			

Summary for Subcatchment P-2c:

Runoff = 1.09 cfs @ 12.10 hrs, Volume= 0.079 af, Depth= 2.13"
Routed to Pond 4P : BMP-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	11,980	61	>75% Grass cover, Good, HSG B
	4,037	98	Roofs, HSG B
*	3,429	98	Impervious, HSG B
	19,446	75	Weighted Average
	11,980		61.61% Pervious Area
	7,466		38.39% Impervious Area

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

Summary for Subcatchment P-2d:

Runoff = 0.99 cfs @ 12.17 hrs, Volume= 0.090 af, Depth= 1.39"
Routed to Link DP-2 : Washington Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	29,886	61	>75% Grass cover, Good, HSG B
*	2,007	98	Roofs, HSG B
	592	55	Woods, Good, HSG B
*	1,341	98	Impervious, HSG B
	33,826	65	Weighted Average
	30,478		90.10% Pervious Area
	3,348		9.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
2.8	179	0.0225	1.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	229	Total			

Summary for Subcatchment P-3:

Runoff = 1.95 cfs @ 12.09 hrs, Volume= 0.147 af, Depth= 3.49"
Routed to Link DP-3 : Hastings Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	4,769	61	>75% Grass cover, Good, HSG B
*	17,172	98	Impervious, HSG B
	21,941	90	Weighted Average
	4,769		21.74% Pervious Area
	17,172		78.26% Impervious Area

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

Summary for Pond 1P: BMP-1

Inflow Area = 9.415 ac, 56.22% Impervious, Inflow Depth = 2.80" for 10 yr event
Inflow = 20.71 cfs @ 12.16 hrs, Volume= 2.200 af
Outflow = 7.88 cfs @ 12.61 hrs, Volume= 2.200 af, Atten= 62%, Lag= 27.0 min
Discarded = 1.57 cfs @ 12.61 hrs, Volume= 1.515 af
Primary = 6.31 cfs @ 12.61 hrs, Volume= 0.685 af
Routed to Link DP-1 : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 430.10' @ 12.61 hrs Surf.Area= 15,134 sf Storage= 36,217 cf

Plug-Flow detention time= 167.4 min calculated for 2.199 af (100% of inflow)
Center-of-Mass det. time= 167.4 min (979.6 - 812.2)

Volume	Invert	Avail.Storage	Storage Description
#1	427.00'	69,107 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
427.00	8,625	390.0	0	0	8,625
428.00	10,410	470.0	9,504	9,504	14,117
430.00	14,910	622.0	25,186	34,689	27,370
432.00	19,615	765.0	34,418	69,107	43,215

Device	Routing	Invert	Outlet Devices
#1	Primary	427.50'	**18.0" Round Culvert** L= 30.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 427.50' / 426.90' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	428.90'	**12.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	429.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	430.90'	**8.0' long x 13.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63
#5	Discarded	427.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=1.57 cfs @ 12.61 hrs HW=430.10' (Free Discharge)
└─**5=Exfiltration** (Exfiltration Controls 1.57 cfs)

Primary OutFlow Max=6.28 cfs @ 12.61 hrs HW=430.10' (Free Discharge)
├─**1=Culvert** (Passes 6.28 cfs of 11.57 cfs potential flow)
│ ├─**2=Orifice/Grate** (Orifice Controls 3.93 cfs @ 3.93 fps)
│ └─**3=Orifice/Grate** (Weir Controls 2.35 cfs @ 1.46 fps)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Stage-Area-Storage for Pond 1P: BMP-1

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
427.00	8,625	8,625	0
427.10	8,796	9,128	871
427.20	8,969	9,642	1,759
427.30	9,143	10,165	2,665
427.40	9,319	10,699	3,588
427.50	9,497	11,243	4,529
427.60	9,676	11,797	5,487
427.70	9,857	12,362	6,464
427.80	10,040	12,937	7,459
427.90	10,224	13,522	8,472
428.00	10,410	14,117	9,504
428.10	10,616	14,692	10,555
428.20	10,824	15,276	11,627
428.30	11,034	15,870	12,720
428.40	11,246	16,472	13,834
428.50	11,459	17,084	14,969
428.60	11,675	17,705	16,125
428.70	11,893	18,336	17,304
428.80	12,113	18,975	18,504
428.90	12,335	19,624	19,727
429.00	12,559	20,282	20,971
429.10	12,785	20,950	22,239
429.20	13,013	21,626	23,528
429.30	13,243	22,312	24,841
429.40	13,475	23,007	26,177
429.50	13,709	23,711	27,536
429.60	13,946	24,425	28,919
429.70	14,184	25,147	30,326
429.80	14,424	25,879	31,756
429.90	14,666	26,620	33,210
430.00	14,910	27,370	34,689
430.10	15,130	28,085	36,191
430.20	15,352	28,808	37,715
430.30	15,575	29,539	39,261
430.40	15,799	30,278	40,830
430.50	16,026	31,025	42,421
430.60	16,254	31,781	44,035
430.70	16,483	32,544	45,672
430.80	16,715	33,316	47,332
430.90	16,948	34,096	49,015
431.00	17,182	34,884	50,722
431.10	17,418	35,681	52,452
431.20	17,656	36,485	54,205
431.30	17,895	37,298	55,983
431.40	18,136	38,118	57,784
431.50	18,378	38,947	59,610
431.60	18,622	39,785	61,460
431.70	18,868	40,630	63,335
431.80	19,116	41,483	65,234
431.90	19,364	42,345	67,158
432.00	**19,615**	**43,215**	**69,107**

Summary for Pond 2P: BMP-2

Inflow Area = 1.480 ac,100.00% Impervious, Inflow Depth = 4.36" for 10 yr event
Inflow = 6.50 cfs @ 12.09 hrs, Volume= 0.538 af
Outflow = 6.80 cfs @ 12.12 hrs, Volume= 0.538 af, Atten= 0%, Lag= 1.8 min
Discarded = 0.21 cfs @ 12.10 hrs, Volume= 0.381 af
Primary = 6.59 cfs @ 12.12 hrs, Volume= 0.157 af
Routed to Link DP-1 : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 436.22' @ 12.12 hrs Surf.Area= 2,996 sf Storage= 6,509 cf

Plug-Flow detention time= 208.6 min calculated for 0.538 af (100% of inflow)
Center-of-Mass det. time= 208.7 min (958.1 - 749.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	432.00'	2,705 cf	**44.25'W x 67.70'L x 3.50'H Field A** 10,485 cf Overall - 3,721 cf Embedded = 6,763 cf x 40.0% Voids
#2A	432.50'	3,721 cf	**ADS_StormTech SC-740 +Cap** x 81 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 81 Chambers in 9 Rows
#3	432.00'	128 cf	**5.00'D x 6.50'H Vertical Cone/Cylinder**-Impervious
		6,554 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	432.00'	**18.0" Round Culvert** L= 100.0' Ke= 0.500 Inlet / Outlet Invert= 432.00' / 430.00' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	435.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	432.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.21 cfs @ 12.10 hrs HW=436.12' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=5.75 cfs @ 12.12 hrs HW=436.09' (Free Discharge)
└─**1=Culvert** (Passes 5.75 cfs of 15.55 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 5.75 cfs @ 2.51 fps)

Stage-Area-Storage for Pond 2P: BMP-2

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
432.00	2,996	0
432.10	3,018	122
432.20	3,040	244
432.30	3,063	365
432.40	3,085	487
432.50	3,108	609
432.60	3,130	859
432.70	3,152	1,109
432.80	3,175	1,357
432.90	3,197	1,604
433.00	3,219	1,848
433.10	3,242	2,091
433.20	3,264	2,331
433.30	3,287	2,569
433.40	3,309	2,804
433.50	3,331	3,037
433.60	3,354	3,266
433.70	3,376	3,492
433.80	3,399	3,715
433.90	3,421	3,933
434.00	3,443	4,148
434.10	3,466	4,358
434.20	3,488	4,563
434.30	3,511	4,761
434.40	3,533	4,953
434.50	3,555	5,138
434.60	3,578	5,314
434.70	3,600	5,479
434.80	3,622	5,627
434.90	3,645	5,761
435.00	3,667	5,886
435.10	3,690	6,008
435.20	3,712	6,130
435.30	3,734	6,252
435.40	3,757	6,373
435.50	**3,779**	6,495
435.60	3,779	6,497
435.70	3,779	6,499
435.80	3,779	6,501
435.90	3,779	6,503
436.00	3,779	6,505
436.10	3,779	6,507
436.20	3,779	6,509
436.30	3,779	6,511
436.40	3,779	6,513
436.50	3,779	6,515
436.60	3,779	6,517
436.70	3,779	6,519
436.80	3,779	6,521
436.90	3,779	6,523
437.00	3,779	6,525
437.10	3,779	6,527
437.20	3,779	6,529
437.30	3,779	6,531
437.40	3,779	6,533
437.50	3,779	6,534
437.60	3,779	6,536
437.70	3,779	6,538
437.80	3,779	6,540
437.90	3,779	6,542
438.00	3,779	6,544
438.10	3,779	6,546
438.20	3,779	6,548
438.30	3,779	6,550
438.40	3,779	6,552
438.50	3,779	**6,554**

Summary for Pond 3P: BMP-3

Inflow Area = 0.362 ac, 36.14% Impervious, Inflow Depth = 2.05" for 10 yr event
Inflow = 0.85 cfs @ 12.10 hrs, Volume= 0.062 af
Outflow = 0.29 cfs @ 12.43 hrs, Volume= 0.062 af, Atten= 66%, Lag= 19.9 min
Primary = 0.29 cfs @ 12.43 hrs, Volume= 0.062 af
Routed to Link DP-2 : Washington Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 428.80' @ 12.43 hrs Surf.Area= 1,320 sf Storage= 906 cf

Plug-Flow detention time= 129.7 min calculated for 0.062 af (100% of inflow)
Center-of-Mass det. time= 129.6 min (971.2 - 841.6)

Volume	Invert	Avail.Storage	Storage Description
#1	428.00'	1,180 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
428.00	955	0	0	955
429.00	1,421	1,180	1,180	1,437

Device	Routing	Invert	Outlet Devices
#1	Primary	425.00'	**6.0" Round Culvert** L= 90.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 425.00' / 424.10' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#2	Device 1	428.75'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	428.00'	**2.000 in/hr Exfiltration over Surface area**
#4	Primary	429.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.29 cfs @ 12.43 hrs HW=428.80' (Free Discharge)
- **1=Culvert** (Passes 0.29 cfs of 1.10 cfs potential flow)
  - **2=Orifice/Grate** (Weir Controls 0.23 cfs @ 0.73 fps)
  - **3=Exfiltration** (Exfiltration Controls 0.06 cfs)
- **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Stage-Area-Storage for Pond 3P: BMP-3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
428.00	955	0
428.01	959	10
428.02	963	19
428.03	968	29
428.04	972	39
428.05	976	48
428.06	980	58
428.07	985	68
428.08	989	78
428.09	993	88
428.10	997	98
428.11	1,002	108
428.12	1,006	118
428.13	1,010	128
428.14	1,015	138
428.15	1,019	148
428.16	1,023	158
428.17	1,028	168
428.18	1,032	179
428.19	1,036	189
428.20	1,041	200
428.21	1,045	210
428.22	1,050	220
428.23	1,054	231
428.24	1,058	242
428.25	1,063	252
428.26	1,067	263
428.27	1,072	273
428.28	1,076	284
428.29	1,081	295
428.30	1,085	306
428.31	1,090	317
428.32	1,094	328
428.33	1,099	339
428.34	1,103	350
428.35	1,108	361
428.36	1,112	372
428.37	1,117	383
428.38	1,121	394
428.39	1,126	405
428.40	1,130	417
428.41	1,135	428
428.42	1,139	439
428.43	1,144	451
428.44	1,149	462
428.45	1,153	474
428.46	1,158	485
428.47	1,163	497
428.48	1,167	508
428.49	1,172	520
428.50	1,176	532
428.51	1,181	544
428.52	1,186	556
428.53	1,190	567
428.54	1,195	579
428.55	1,200	591
428.56	1,205	603
428.57	1,209	615
428.58	1,214	628
428.59	1,219	640
428.60	1,224	652
428.61	1,228	664
428.62	1,233	676
428.63	1,238	689
428.64	1,243	701
428.65	1,247	714
428.66	1,252	726
428.67	1,257	739
428.68	1,262	751
428.69	1,267	764
428.70	1,272	777
428.71	1,276	789
428.72	1,281	802
428.73	1,286	815
428.74	1,291	828
428.75	1,296	841
428.76	1,301	854
428.77	1,306	867
428.78	1,311	880
428.79	1,315	893
428.80	1,320	906
428.81	1,325	919
428.82	1,330	933
428.83	1,335	946
428.84	1,340	959
428.85	1,345	973
428.86	1,350	986
428.87	1,355	1,000
428.88	1,360	1,013
428.89	1,365	1,027
428.90	1,370	1,041
428.91	1,375	1,054
428.92	1,380	1,068
428.93	1,385	1,082
428.94	1,390	1,096
428.95	1,396	1,110
428.96	1,401	1,124
428.97	1,406	1,138
428.98	1,411	1,152
428.99	1,416	1,166
429.00	**1,421**	**1,180**

Summary for Pond 4P: BMP-4

Inflow Area = 0.446 ac, 38.39% Impervious, Inflow Depth = 2.13" for 10 yr event
Inflow = 1.09 cfs @ 12.10 hrs, Volume= 0.079 af
Outflow = 0.87 cfs @ 12.17 hrs, Volume= 0.079 af, Atten= 20%, Lag= 4.7 min
Primary = 0.87 cfs @ 12.17 hrs, Volume= 0.079 af
Routed to Link DP-2 : Washington Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 434.62' @ 12.17 hrs Surf.Area= 1,314 sf Storage= 718 cf

Plug-Flow detention time= 70.5 min calculated for 0.079 af (100% of inflow)
Center-of-Mass det. time= 70.4 min (909.4 - 839.0)

Volume	Invert	Avail.Storage	Storage Description
#1	434.00'	1,259 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
434.00	1,020	0	0	1,020
435.00	1,515	1,259	1,259	1,531

Device	Routing	Invert	Outlet Devices
#1	Primary	431.00'	**6.0" Round Culvert** L= 100.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 431.00' / 430.00' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#2	Device 1	434.50'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	434.00'	**2.000 in/hr Exfiltration over Surface area**
#4	Primary	435.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.80 cfs @ 12.17 hrs HW=434.61' (Free Discharge)
1=Culvert (Passes 0.80 cfs of 1.11 cfs potential flow)
2=Orifice/Grate (Weir Controls 0.74 cfs @ 1.08 fps)
3=Exfiltration (Exfiltration Controls 0.06 cfs)
4=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Stage-Area-Storage for Pond 4P: BMP-4

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
434.00	1,020	0
434.01	1,024	10
434.02	1,029	20
434.03	1,033	31
434.04	1,038	41
434.05	1,042	52
434.06	1,047	62
434.07	1,051	72
434.08	1,056	83
434.09	1,061	94
434.10	1,065	104
434.11	1,070	115
434.12	1,074	126
434.13	1,079	136
434.14	1,083	147
434.15	1,088	158
434.16	1,093	169
434.17	1,097	180
434.18	1,102	191
434.19	1,107	202
434.20	1,111	213
434.21	1,116	224
434.22	1,121	235
434.23	1,125	247
434.24	1,130	258
434.25	1,135	269
434.26	1,139	281
434.27	1,144	292
434.28	1,149	303
434.29	1,154	315
434.30	1,158	327
434.31	1,163	338
434.32	1,168	350
434.33	1,173	361
434.34	1,177	373
434.35	1,182	385
434.36	1,187	397
434.37	1,192	409
434.38	1,197	421
434.39	1,201	433
434.40	1,206	445
434.41	1,211	457
434.42	1,216	469
434.43	1,221	481
434.44	1,226	493
434.45	1,231	506
434.46	1,236	518
434.47	1,240	530
434.48	1,245	543
434.49	1,250	555
434.50	1,255	568
434.51	1,260	580
434.52	1,265	593
434.53	1,270	606
434.54	1,275	618
434.55	1,280	631
434.56	1,285	644
434.57	1,290	657
434.58	1,295	670
434.59	1,300	683
434.60	1,305	696
434.61	1,310	709
434.62	1,315	722
434.63	1,320	735
434.64	1,326	748
434.65	1,331	762
434.66	1,336	775
434.67	1,341	788
434.68	1,346	802
434.69	1,351	815
434.70	1,356	829
434.71	1,361	842
434.72	1,367	856
434.73	1,372	870
434.74	1,377	884
434.75	1,382	897
434.76	1,387	911
434.77	1,393	925
434.78	1,398	939
434.79	1,403	953
434.80	1,408	967
434.81	1,413	981
434.82	1,419	995
434.83	1,424	1,010
434.84	1,429	1,024
434.85	1,435	1,038
434.86	1,440	1,053
434.87	1,445	1,067
434.88	1,450	1,081
434.89	1,456	1,096
434.90	1,461	1,111
434.91	1,466	1,125
434.92	1,472	1,140
434.93	1,477	1,155
434.94	1,483	1,169
434.95	1,488	1,184
434.96	1,493	1,199
434.97	1,499	1,214
434.98	1,504	1,229
434.99	1,510	1,244
435.00	**1,515**	**1,259**

Summary for Pond 5P: Peak Flow Detention

Inflow Area = 1.374 ac, 5.27% Impervious, Inflow Depth = 1.20" for 10 yr event
Inflow = 1.30 cfs @ 12.23 hrs, Volume= 0.137 af
Outflow = 0.39 cfs @ 12.75 hrs, Volume= 0.137 af, Atten= 70%, Lag= 31.5 min
Primary = 0.39 cfs @ 12.75 hrs, Volume= 0.137 af
Routed to Link DP-2 : Washington Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 430.73' @ 12.75 hrs Surf.Area= 2,592 sf Storage= 1,416 cf

Plug-Flow detention time= 30.1 min calculated for 0.137 af (100% of inflow)
Center-of-Mass det. time= 30.1 min (913.4 - 883.3)

Volume	Invert	Avail.Storage	Storage Description
#1	430.00'	8,575 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
430.00	1,335	0	0	1,335
431.00	3,150	2,179	2,179	3,157
432.00	10,335	6,397	8,575	10,348

Device	Routing	Invert	Outlet Devices
#1	Primary	428.00'	**4.0" Round Culvert** L= 75.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 428.00' / 427.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.09 sf
#2	Device 1	430.00'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.39 cfs @ 12.75 hrs HW=430.73' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.39 cfs @ 4.46 fps)
  └─**2=Orifice/Grate** (Passes 0.39 cfs of 1.44 cfs potential flow)

Stage-Area-Storage for Pond 5P: Peak Flow Detention

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
430.00	1,335	0
430.02	1,364	27
430.04	1,393	55
430.06	1,422	83
430.08	1,452	111
430.10	1,482	141
430.12	1,512	171
430.14	1,543	201
430.16	1,574	232
430.18	1,605	264
430.20	1,637	297
430.22	1,668	330
430.24	1,701	363
430.26	1,733	398
430.28	1,766	433
430.30	1,799	468
430.32	1,832	505
430.34	1,866	542
430.36	1,900	579
430.38	1,934	618
430.40	1,969	657
430.42	2,004	696
430.44	2,039	737
430.46	2,075	778
430.48	2,110	820
430.50	2,147	862
430.52	2,183	906
430.54	2,220	950
430.56	2,257	994
430.58	2,294	1,040
430.60	2,332	1,086
430.62	2,370	1,133
430.64	2,408	1,181
430.66	2,447	1,230
430.68	2,486	1,279
430.70	2,525	1,329
430.72	2,564	1,380
430.74	2,604	1,432
430.76	2,644	1,484
430.78	2,685	1,537
430.80	2,726	1,592
430.82	2,767	1,646
430.84	2,808	1,702
430.86	2,850	1,759
430.88	2,892	1,816
430.90	2,934	1,874
430.92	2,977	1,934
430.94	3,019	1,993
430.96	3,063	2,054
430.98	3,106	2,116
431.00	3,150	2,179
431.02	3,253	2,243
431.04	3,358	2,309
431.06	3,464	2,377
431.08	3,572	2,447
431.10	3,682	2,520
431.12	3,793	2,595
431.14	3,906	2,672
431.16	4,021	2,751
431.18	4,137	2,832
431.20	4,255	2,916
431.22	4,375	3,003
431.24	4,496	3,091
431.26	4,619	3,182
431.28	4,744	3,276
431.30	4,870	3,372
431.32	4,998	3,471
431.34	5,128	3,572
431.36	5,259	3,676
431.38	5,392	3,783
431.40	5,526	3,892
431.42	5,663	4,004
431.44	5,800	4,118
431.46	5,940	4,236
431.48	6,081	4,356
431.50	6,224	4,479
431.52	6,369	4,605
431.54	6,515	4,734
431.56	6,663	4,865
431.58	6,812	5,000
431.60	6,963	5,138
431.62	7,116	5,279
431.64	7,271	5,423
431.66	7,427	5,570
431.68	7,585	5,720
431.70	7,744	5,873
431.72	7,905	6,029
431.74	8,068	6,189
431.76	8,232	6,352
431.78	8,398	6,518
431.80	8,566	6,688
431.82	8,736	6,861
431.84	8,907	7,038
431.86	9,079	7,217
431.88	9,254	7,401
431.90	9,430	7,588
431.92	9,608	7,778
431.94	9,787	7,972
431.96	9,968	8,169
431.98	10,151	8,371
432.00	**10,335**	**8,575**

Summary for Link DP-1: Wetland

```
Inflow Area =       16.303 ac,  43.42% Impervious,  Inflow Depth =   0.98"    for  10 yr event
Inflow      =       10.15 cfs @   12.55 hrs,  Volume=           1.327 af
Primary     =       10.15 cfs @   12.55 hrs,  Volume=           1.327 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: Washington Street

```
Inflow Area =          2.959 ac,  15.26% Impervious,  Inflow Depth =   1.49"    for  10 yr event
Inflow      =          2.27 cfs @   12.17 hrs,  Volume=          0.368 af
Primary     =          2.27 cfs @   12.17 hrs,  Volume=          0.368 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-3: Hastings Street

```
Inflow Area =       0.504 ac,  78.26% Impervious,  Inflow Depth =   3.49"    for  10 yr event
Inflow      =       1.95 cfs @   12.09 hrs,  Volume=          0.147 af
Primary     =       1.95 cfs @   12.09 hrs,  Volume=          0.147 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment P-1a: Residential Overland

```
Runoff      =        9.33 cfs @   12.36 hrs,  Volume=         1.110 af,  Depth=  2.46"
    Routed to Link DP-1 : Wetland
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

	Area (sf)	CN	Description
	82,690	61	>75% Grass cover, Good, HSG B
	133,272	55	Woods, Good, HSG B
	11,382	98	Roofs, HSG B
*	1,888	98	Impervious, HSG B
	6,328	85	Gravel roads, HSG B
	235,560	60	Weighted Average
	222,290		94.37% Pervious Area
	13,270		5.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	50	0.0050	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
7.6	318	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	90	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.2	458	Total			

Summary for Subcatchment P-1b: Residential Drainage

Runoff = 13.55 cfs @ 12.31 hrs, Volume= 1.504 af, Depth= 3.66"
Routed to Pond 1P : BMP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

	Area (sf)	CN	Description
	16,437	60	Woods, Fair, HSG B
	134,615	61	>75% Grass cover, Good, HSG B
	26,829	98	Roofs, HSG B
*	33,917	98	Impervious, HSG B
	3,095	85	Gravel roads, HSG B
	214,893	72	Weighted Average
	154,147		71.73% Pervious Area
	60,746		28.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	50	0.0050	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
3.7	109	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	276	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	167	0.0275	1.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.5	602	Total			

Summary for Subcatchment P-1c: Commercial Drainage

Runoff = 24.83 cfs @ 12.14 hrs, Volume= 2.231 af, Depth= 5.97"
Routed to Pond 1P : BMP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

	Area (sf)	CN	Description
	25,386	61	>75% Grass cover, Good, HSG B
*	163,918	98	Impervious, HSG B
	5,925	98	Roofs, HSG B
	195,229	93	Weighted Average
	25,386		13.00% Pervious Area
	169,843		87.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	28	0.0100	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
3.4	940	0.0050	4.55	8.05	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
10.3	968	Total			

Summary for Subcatchment P-1d: Commercial Roofs

Runoff = 9.64 cfs @ 12.09 hrs, Volume= 0.809 af, Depth= 6.56"
Routed to Pond 2P : BMP-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

Area (sf)	CN	Description
64,475	98	Roofs, HSG B
64,475		100.00% Impervious Area

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

Summary for Subcatchment P-2a:

```
Runoff       =          1.61 cfs @   12.09 hrs,  Volume=            0.117 af,  Depth=  3.87"
    Routed to Pond 3P : BMP-3
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

	Area (sf)	CN	Description
	10,080	61	>75% Grass cover, Good, HSG B
*	5,705	98	Impervious, HSG B
	15,785	74	Weighted Average
	10,080		63.86% Pervious Area
	5,705		36.14% Impervious Area

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

Summary for Subcatchment P-2b:

Runoff = 3.17 cfs @ 12.21 hrs, Volume= 0.304 af, Depth= 2.65"
Routed to Pond 5P : Peak Flow Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

	Area (sf)	CN	Description
	52,120	61	>75% Grass cover, Good, HSG B
	4,563	55	Woods, Good, HSG B
*	3,153	98	Roofs, HSG B
	59,836	62	Weighted Average
	56,683		94.73% Pervious Area
	3,153		5.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
5.3	245	0.0120	0.77		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.6	295	Total			

Summary for Subcatchment P-2c:

```
Runoff      =        2.04 cfs @   12.09 hrs,  Volume=          0.148 af,  Depth=  3.97"
    Routed to Pond 4P : BMP-4
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

	Area (sf)	CN	Description
	11,980	61	>75% Grass cover, Good, HSG B
	4,037	98	Roofs, HSG B
*	3,429	98	Impervious, HSG B
	19,446	75	Weighted Average
	11,980		61.61% Pervious Area
	7,466		38.39% Impervious Area

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

Summary for Subcatchment P-2d:

Runoff = 2.22 cfs @ 12.16 hrs, Volume= 0.191 af, Depth= 2.95"
Routed to Link DP-2 : Washington Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

	Area (sf)	CN	Description
	29,886	61	>75% Grass cover, Good, HSG B
*	2,007	98	Roofs, HSG B
	592	55	Woods, Good, HSG B
*	1,341	98	Impervious, HSG B
	33,826	65	Weighted Average
	30,478		90.10% Pervious Area
	3,348		9.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
2.8	179	0.0225	1.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	229	Total			

Summary for Subcatchment P-3:

Runoff = 3.07 cfs @ 12.09 hrs, Volume= 0.236 af, Depth= 5.63"
Routed to Link DP-3 : Hastings Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.80"

	Area (sf)	CN	Description
	4,769	61	>75% Grass cover, Good, HSG B
*	17,172	98	Impervious, HSG B
	21,941	90	Weighted Average
	4,769		21.74% Pervious Area
	17,172		78.26% Impervious Area

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

Summary for Pond 1P: BMP-1

Inflow Area = 9.415 ac, 56.22% Impervious, Inflow Depth = 4.76" for 100 yr event
Inflow = 34.27 cfs @ 12.16 hrs, Volume= 3.735 af
Outflow = 17.86 cfs @ 12.51 hrs, Volume= 3.735 af, Atten= 48%, Lag= 20.9 min
Discarded = 1.98 cfs @ 12.51 hrs, Volume= 1.868 af
Primary = 15.88 cfs @ 12.51 hrs, Volume= 1.868 af
Routed to Link DP-1 : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 431.08' @ 12.51 hrs Surf.Area= 17,365 sf Storage= 52,063 cf

Plug-Flow detention time= 131.5 min calculated for 3.733 af (100% of inflow)
Center-of-Mass det. time= 131.6 min (933.2 - 801.5)

Volume	Invert	Avail.Storage	Storage Description
#1	427.00'	69,107 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
427.00	8,625	390.0	0	0	8,625
428.00	10,410	470.0	9,504	9,504	14,117
430.00	14,910	622.0	25,186	34,689	27,370
432.00	19,615	765.0	34,418	69,107	43,215

Device	Routing	Invert	Outlet Devices
#1	Primary	427.50'	**18.0" Round Culvert** L= 30.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 427.50' / 426.90' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	428.90'	**12.0" W x 12.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	429.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	430.90'	**8.0' long x 13.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63
#5	Discarded	427.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=1.98 cfs @ 12.51 hrs HW=431.08' (Free Discharge)
└─**5=Exfiltration** (Exfiltration Controls 1.98 cfs)

Primary OutFlow Max=15.83 cfs @ 12.51 hrs HW=431.08' (Free Discharge)
├─**1=Culvert** (Inlet Controls 14.30 cfs @ 8.09 fps)
│ ├─**2=Orifice/Grate** (Passes < 6.21 cfs potential flow)
│ └─**3=Orifice/Grate** (Passes < 20.88 cfs potential flow)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 1.52 cfs @ 1.09 fps)

Stage-Area-Storage for Pond 1P: BMP-1

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
427.00	8,625	8,625	0
427.10	8,796	9,128	871
427.20	8,969	9,642	1,759
427.30	9,143	10,165	2,665
427.40	9,319	10,699	3,588
427.50	9,497	11,243	4,529
427.60	9,676	11,797	5,487
427.70	9,857	12,362	6,464
427.80	10,040	12,937	7,459
427.90	10,224	13,522	8,472
428.00	10,410	14,117	9,504
428.10	10,616	14,692	10,555
428.20	10,824	15,276	11,627
428.30	11,034	15,870	12,720
428.40	11,246	16,472	13,834
428.50	11,459	17,084	14,969
428.60	11,675	17,705	16,125
428.70	11,893	18,336	17,304
428.80	12,113	18,975	18,504
428.90	12,335	19,624	19,727
429.00	12,559	20,282	20,971
429.10	12,785	20,950	22,239
429.20	13,013	21,626	23,528
429.30	13,243	22,312	24,841
429.40	13,475	23,007	26,177
429.50	13,709	23,711	27,536
429.60	13,946	24,425	28,919
429.70	14,184	25,147	30,326
429.80	14,424	25,879	31,756
429.90	14,666	26,620	33,210
430.00	14,910	27,370	34,689
430.10	15,130	28,085	36,191
430.20	15,352	28,808	37,715
430.30	15,575	29,539	39,261
430.40	15,799	30,278	40,830
430.50	16,026	31,025	42,421
430.60	16,254	31,781	44,035
430.70	16,483	32,544	45,672
430.80	16,715	33,316	47,332
430.90	16,948	34,096	49,015
431.00	17,182	34,884	50,722
431.10	17,418	35,681	52,452
431.20	17,656	36,485	54,205
431.30	17,895	37,298	55,983
431.40	18,136	38,118	57,784
431.50	18,378	38,947	59,610
431.60	18,622	39,785	61,460
431.70	18,868	40,630	63,335
431.80	19,116	41,483	65,234
431.90	19,364	42,345	67,158
432.00	**19,615**	**43,215**	**69,107**

Summary for Pond 2P: BMP-2

```
Inflow Area =         1.480 ac,100.00% Impervious,  Inflow Depth =   6.56"    for  100 yr event
Inflow      =        9.64 cfs @   12.09 hrs,  Volume=            0.809 af
Outflow     =       10.84 cfs @   12.10 hrs,  Volume=            0.809 af,  Atten= 0%,  Lag= 0.6 min
Discarded  =         0.21 cfs @   11.85 hrs,  Volume=            0.436 af
Primary     =       10.63 cfs @   12.10 hrs,  Volume=            0.373 af
    Routed to Link DP-1 : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 436.40' @ 12.10 hrs   Surf.Area= 2,996 sf   Storage= 6,513 cf

Plug-Flow detention time= 167.6 min calculated for 0.809 af (100% of inflow)
Center-of-Mass det. time= 167.8 min ( 911.2 - 743.3 )

Volume        Invert     Avail.Storage   Storage Description
   #1A       432.00'          2,705 cf   44.25'W x 67.70'L x 3.50'H Field A
                                         10,485 cf Overall - 3,721 cf Embedded = 6,763 cf  x 40.0% Voids
   #2A       432.50'          3,721 cf   ADS_StormTech SC-740 +Cap x 81  Inside #1
                                         Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
                                         Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
                                         81 Chambers in 9 Rows
   #3        432.00'            128 cf   5.00'D x 6.50'H Vertical Cone/Cylinder-Impervious
                              6,554 cf   Total Available Storage

    Storage Group A created with Chamber Wizard

Device    Routing            Invert    Outlet Devices
   #1     Primary           432.00'    18.0"  Round Culvert  L= 100.0'   Ke= 0.500
                                       Inlet / Outlet Invert= 432.00' / 430.00'   S= 0.0200 '/'   Cc= 0.900
                                       n= 0.012,  Flow Area= 1.77 sf
   #2     Device 1          435.50'    4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
   #3     Discarded         432.00'    2.410 in/hr Exfiltration over Wetted area

Discarded OutFlow  Max=0.21 cfs @ 11.85 hrs  HW=435.77'   (Free Discharge)
└──3=Exfiltration  (Exfiltration Controls 0.21 cfs)

Primary OutFlow  Max=10.30 cfs @ 12.10 hrs  HW=436.38'   (Free Discharge)
└──1=Culvert  (Passes 10.30 cfs of 16.21 cfs potential flow)
    └──2=Sharp-Crested Rectangular Weir (Weir Controls 10.30 cfs @ 3.07 fps)
```

Stage-Area-Storage for Pond 2P: BMP-2

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
432.00	2,996	0
432.10	3,018	122
432.20	3,040	244
432.30	3,063	365
432.40	3,085	487
432.50	3,108	609
432.60	3,130	859
432.70	3,152	1,109
432.80	3,175	1,357
432.90	3,197	1,604
433.00	3,219	1,848
433.10	3,242	2,091
433.20	3,264	2,331
433.30	3,287	2,569
433.40	3,309	2,804
433.50	3,331	3,037
433.60	3,354	3,266
433.70	3,376	3,492
433.80	3,399	3,715
433.90	3,421	3,933
434.00	3,443	4,148
434.10	3,466	4,358
434.20	3,488	4,563
434.30	3,511	4,761
434.40	3,533	4,953
434.50	3,555	5,138
434.60	3,578	5,314
434.70	3,600	5,479
434.80	3,622	5,627
434.90	3,645	5,761
435.00	3,667	5,886
435.10	3,690	6,008
435.20	3,712	6,130
435.30	3,734	6,252
435.40	3,757	6,373
435.50	**3,779**	6,495
435.60	3,779	6,497
435.70	3,779	6,499
435.80	3,779	6,501
435.90	3,779	6,503
436.00	3,779	6,505
436.10	3,779	6,507
436.20	3,779	6,509
436.30	3,779	6,511
436.40	3,779	6,513
436.50	3,779	6,515
436.60	3,779	6,517
436.70	3,779	6,519
436.80	3,779	6,521
436.90	3,779	6,523
437.00	3,779	6,525
437.10	3,779	6,527
437.20	3,779	6,529
437.30	3,779	6,531
437.40	3,779	6,533
437.50	3,779	6,534
437.60	3,779	6,536
437.70	3,779	6,538
437.80	3,779	6,540
437.90	3,779	6,542
438.00	3,779	6,544
438.10	3,779	6,546
438.20	3,779	6,548
438.30	3,779	6,550
438.40	3,779	6,552
438.50	3,779	**6,554**

Summary for Pond 3P: BMP-3

Inflow Area = 0.362 ac, 36.14% Impervious, Inflow Depth = 3.87" for 100 yr event
Inflow = 1.61 cfs @ 12.09 hrs, Volume= 0.117 af
Outflow = 1.12 cfs @ 12.18 hrs, Volume= 0.117 af, Atten= 30%, Lag= 5.2 min
Primary = 1.12 cfs @ 12.18 hrs, Volume= 0.117 af
Routed to Link DP-2 : Washington Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 428.95' @ 12.18 hrs Surf.Area= 1,397 sf Storage= 1,114 cf

Plug-Flow detention time= 95.9 min calculated for 0.117 af (100% of inflow)
Center-of-Mass det. time= 95.9 min (919.1 - 823.2)

Volume	Invert	Avail.Storage	Storage Description
#1	428.00'	1,180 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
428.00	955	0	0	955
429.00	1,421	1,180	1,180	1,437

Device	Routing	Invert	Outlet Devices
#1	Primary	425.00'	**6.0" Round Culvert** L= 90.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 425.00' / 424.10' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#2	Device 1	428.75'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	428.00'	**2.000 in/hr Exfiltration over Surface area**
#4	Primary	429.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

```
Primary OutFlow  Max=1.12 cfs @ 12.18 hrs  HW=428.95'   (Free Discharge)
 ↑
 ├─1=Culvert  (Barrel Controls 1.12 cfs @ 5.70 fps)
 │  ↑
 │  ├─2=Orifice/Grate  (Passes < 1.83 cfs potential flow)
 │  └─3=Exfiltration  (Passes < 0.06 cfs potential flow)
 └─4=Sharp-Crested Rectangular Weir ( Controls 0.00 cfs)
```

Stage-Area-Storage for Pond 3P: BMP-3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
428.00	955	0
428.01	959	10
428.02	963	19
428.03	968	29
428.04	972	39
428.05	976	48
428.06	980	58
428.07	985	68
428.08	989	78
428.09	993	88
428.10	997	98
428.11	1,002	108
428.12	1,006	118
428.13	1,010	128
428.14	1,015	138
428.15	1,019	148
428.16	1,023	158
428.17	1,028	168
428.18	1,032	179
428.19	1,036	189
428.20	1,041	200
428.21	1,045	210
428.22	1,050	220
428.23	1,054	231
428.24	1,058	242
428.25	1,063	252
428.26	1,067	263
428.27	1,072	273
428.28	1,076	284
428.29	1,081	295
428.30	1,085	306
428.31	1,090	317
428.32	1,094	328
428.33	1,099	339
428.34	1,103	350
428.35	1,108	361
428.36	1,112	372
428.37	1,117	383
428.38	1,121	394
428.39	1,126	405
428.40	1,130	417
428.41	1,135	428
428.42	1,139	439
428.43	1,144	451
428.44	1,149	462
428.45	1,153	474
428.46	1,158	485
428.47	1,163	497
428.48	1,167	508
428.49	1,172	520
428.50	1,176	532
428.51	1,181	544
428.52	1,186	556
428.53	1,190	567
428.54	1,195	579
428.55	1,200	591
428.56	1,205	603
428.57	1,209	615
428.58	1,214	628
428.59	1,219	640
428.60	1,224	652
428.61	1,228	664
428.62	1,233	676
428.63	1,238	689
428.64	1,243	701
428.65	1,247	714
428.66	1,252	726
428.67	1,257	739
428.68	1,262	751
428.69	1,267	764
428.70	1,272	777
428.71	1,276	789
428.72	1,281	802
428.73	1,286	815
428.74	1,291	828
428.75	1,296	841
428.76	1,301	854
428.77	1,306	867
428.78	1,311	880
428.79	1,315	893
428.80	1,320	906
428.81	1,325	919
428.82	1,330	933
428.83	1,335	946
428.84	1,340	959
428.85	1,345	973
428.86	1,350	986
428.87	1,355	1,000
428.88	1,360	1,013
428.89	1,365	1,027
428.90	1,370	1,041
428.91	1,375	1,054
428.92	1,380	1,068
428.93	1,385	1,082
428.94	1,390	1,096
428.95	1,396	1,110
428.96	1,401	1,124
428.97	1,406	1,138
428.98	1,411	1,152
428.99	1,416	1,166
429.00	**1,421**	**1,180**

Summary for Pond 4P: BMP-4

```
Inflow Area =        0.446 ac, 38.39% Impervious, Inflow Depth =  3.97"   for 100 yr event
Inflow      =       2.04 cfs @  12.09 hrs, Volume=          0.148 af
Outflow     =       1.15 cfs @  12.22 hrs, Volume=          0.148 af, Atten= 43%, Lag= 7.8 min
Primary     =       1.15 cfs @  12.22 hrs, Volume=          0.148 af
    Routed to Link DP-2 : Washington Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 434.92' @ 12.22 hrs  Surf.Area= 1,472 sf  Storage= 1,141 cf

Plug-Flow detention time= 56.0 min calculated for 0.148 af (100% of inflow)
Center-of-Mass det. time= 56.0 min ( 876.9 - 820.9 )

Volume        Invert     Avail.Storage   Storage Description
   #1        434.00'         1,259 cf    Custom Stage Data (Conic)Listed below (Recalc)

 Elevation         Surf.Area          Inc.Store          Cum.Store          Wet.Area
     (feet)           (sq-ft)       (cubic-feet)       (cubic-feet)            (sq-ft)
    434.00             1,020                  0                  0             1,020
    435.00             1,515              1,259              1,259             1,531

Device    Routing          Invert    Outlet Devices
    #1    Primary         431.00'    6.0"  Round Culvert
                                     L= 100.0'  CPP, end-section conforming to fill,  Ke= 0.500
                                     Inlet / Outlet Invert= 431.00' / 430.00'  S= 0.0100 '/'  Cc= 0.900
                                     n= 0.012,  Flow Area= 0.20 sf
    #2    Device 1        434.50'    12.0" Horiz. Orifice/Grate X 2.00  C= 0.600
                                     Limited to weir flow at low heads
    #3    Device 1        434.00'    2.000 in/hr Exfiltration over Surface area
    #4    Primary         435.00'    5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow  Max=1.15 cfs @ 12.22 hrs  HW=434.92'  (Free Discharge)
 ├─1=Culvert  (Barrel Controls 1.15 cfs @ 5.88 fps)
 │  ├─2=Orifice/Grate  (Passes < 4.88 cfs potential flow)
 │  └─3=Exfiltration  (Passes < 0.07 cfs potential flow)
 └─4=Sharp-Crested Rectangular Weir ( Controls 0.00 cfs)
```

Stage-Area-Storage for Pond 4P: BMP-4

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
434.00	1,020	0
434.01	1,024	10
434.02	1,029	20
434.03	1,033	31
434.04	1,038	41
434.05	1,042	52
434.06	1,047	62
434.07	1,051	72
434.08	1,056	83
434.09	1,061	94
434.10	1,065	104
434.11	1,070	115
434.12	1,074	126
434.13	1,079	136
434.14	1,083	147
434.15	1,088	158
434.16	1,093	169
434.17	1,097	180
434.18	1,102	191
434.19	1,107	202
434.20	1,111	213
434.21	1,116	224
434.22	1,121	235
434.23	1,125	247
434.24	1,130	258
434.25	1,135	269
434.26	1,139	281
434.27	1,144	292
434.28	1,149	303
434.29	1,154	315
434.30	1,158	327
434.31	1,163	338
434.32	1,168	350
434.33	1,173	361
434.34	1,177	373
434.35	1,182	385
434.36	1,187	397
434.37	1,192	409
434.38	1,197	421
434.39	1,201	433
434.40	1,206	445
434.41	1,211	457
434.42	1,216	469
434.43	1,221	481
434.44	1,226	493
434.45	1,231	506
434.46	1,236	518
434.47	1,240	530
434.48	1,245	543
434.49	1,250	555
434.50	1,255	568
434.51	1,260	580
434.52	1,265	593
434.53	1,270	606
434.54	1,275	618
434.55	1,280	631
434.56	1,285	644
434.57	1,290	657
434.58	1,295	670
434.59	1,300	683
434.60	1,305	696
434.61	1,310	709
434.62	1,315	722
434.63	1,320	735
434.64	1,326	748
434.65	1,331	762
434.66	1,336	775
434.67	1,341	788
434.68	1,346	802
434.69	1,351	815
434.70	1,356	829
434.71	1,361	842
434.72	1,367	856
434.73	1,372	870
434.74	1,377	884
434.75	1,382	897
434.76	1,387	911
434.77	1,393	925
434.78	1,398	939
434.79	1,403	953
434.80	1,408	967
434.81	1,413	981
434.82	1,419	995
434.83	1,424	1,010
434.84	1,429	1,024
434.85	1,435	1,038
434.86	1,440	1,053
434.87	1,445	1,067
434.88	1,450	1,081
434.89	1,456	1,096
434.90	1,461	1,111
434.91	1,466	1,125
434.92	1,472	1,140
434.93	1,477	1,155
434.94	1,483	1,169
434.95	1,488	1,184
434.96	1,493	1,199
434.97	1,499	1,214
434.98	1,504	1,229
434.99	1,510	1,244
435.00	**1,515**	**1,259**

Summary for Pond 5P: Peak Flow Detention

Inflow Area = 1.374 ac, 5.27% Impervious, Inflow Depth = 2.65" for 100 yr event
Inflow = 3.17 cfs @ 12.21 hrs, Volume= 0.304 af
Outflow = 0.44 cfs @ 13.26 hrs, Volume= 0.304 af, Atten= 86%, Lag= 62.6 min
Primary = 0.44 cfs @ 13.26 hrs, Volume= 0.304 af
Routed to Link DP-2 : Washington Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 431.57' @ 13.26 hrs Surf.Area= 6,755 sf Storage= 4,948 cf

Plug-Flow detention time= 107.4 min calculated for 0.304 af (100% of inflow)
Center-of-Mass det. time= 107.4 min (965.8 - 858.4)

Volume	Invert	Avail.Storage	Storage Description
#1	430.00'	8,575 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
430.00	1,335	0	0	1,335
431.00	3,150	2,179	2,179	3,157
432.00	10,335	6,397	8,575	10,348

Device	Routing	Invert	Outlet Devices
#1	Primary	428.00'	**4.0" Round Culvert** L= 75.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 428.00' / 427.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.09 sf
#2	Device 1	430.00'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.44 cfs @ 13.26 hrs HW=431.57' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.44 cfs @ 5.02 fps)
  └─**2=Orifice/Grate** (Passes 0.44 cfs of 2.11 cfs potential flow)

Stage-Area-Storage for Pond 5P: Peak Flow Detention

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
430.00	1,335	0
430.02	1,364	27
430.04	1,393	55
430.06	1,422	83
430.08	1,452	111
430.10	1,482	141
430.12	1,512	171
430.14	1,543	201
430.16	1,574	232
430.18	1,605	264
430.20	1,637	297
430.22	1,668	330
430.24	1,701	363
430.26	1,733	398
430.28	1,766	433
430.30	1,799	468
430.32	1,832	505
430.34	1,866	542
430.36	1,900	579
430.38	1,934	618
430.40	1,969	657
430.42	2,004	696
430.44	2,039	737
430.46	2,075	778
430.48	2,110	820
430.50	2,147	862
430.52	2,183	906
430.54	2,220	950
430.56	2,257	994
430.58	2,294	1,040
430.60	2,332	1,086
430.62	2,370	1,133
430.64	2,408	1,181
430.66	2,447	1,230
430.68	2,486	1,279
430.70	2,525	1,329
430.72	2,564	1,380
430.74	2,604	1,432
430.76	2,644	1,484
430.78	2,685	1,537
430.80	2,726	1,592
430.82	2,767	1,646
430.84	2,808	1,702
430.86	2,850	1,759
430.88	2,892	1,816
430.90	2,934	1,874
430.92	2,977	1,934
430.94	3,019	1,993
430.96	3,063	2,054
430.98	3,106	2,116
431.00	3,150	2,179
431.02	3,253	2,243
431.04	3,358	2,309
431.06	3,464	2,377
431.08	3,572	2,447
431.10	3,682	2,520
431.12	3,793	2,595
431.14	3,906	2,672
431.16	4,021	2,751
431.18	4,137	2,832
431.20	4,255	2,916
431.22	4,375	3,003
431.24	4,496	3,091
431.26	4,619	3,182
431.28	4,744	3,276
431.30	4,870	3,372
431.32	4,998	3,471
431.34	5,128	3,572
431.36	5,259	3,676
431.38	5,392	3,783
431.40	5,526	3,892
431.42	5,663	4,004
431.44	5,800	4,118
431.46	5,940	4,236
431.48	6,081	4,356
431.50	6,224	4,479
431.52	6,369	4,605
431.54	6,515	4,734
431.56	6,663	4,865
431.58	6,812	5,000
431.60	6,963	5,138
431.62	7,116	5,279
431.64	7,271	5,423
431.66	7,427	5,570
431.68	7,585	5,720
431.70	7,744	5,873
431.72	7,905	6,029
431.74	8,068	6,189
431.76	8,232	6,352
431.78	8,398	6,518
431.80	8,566	6,688
431.82	8,736	6,861
431.84	8,907	7,038
431.86	9,079	7,217
431.88	9,254	7,401
431.90	9,430	7,588
431.92	9,608	7,778
431.94	9,787	7,972
431.96	9,968	8,169
431.98	10,151	8,371
432.00	**10,335**	**8,575**

Summary for Link DP-1: Wetland

```
Inflow Area =       16.303 ac,  43.42% Impervious,  Inflow Depth =   2.47"    for  100 yr event
Inflow      =       27.76 cfs @   12.40 hrs,  Volume=           3.351 af
Primary     =       27.76 cfs @   12.40 hrs,  Volume=           3.351 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: Washington Street

```
Inflow Area =          2.959 ac,  15.26% Impervious,  Inflow Depth =   3.08"    for  100 yr event
Inflow        =          4.88 cfs @   12.16 hrs,  Volume=             0.759 af
Primary      =          4.88 cfs @   12.16 hrs,  Volume=             0.759 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP-3: Hastings Street

```
Inflow Area =          0.504 ac,  78.26% Impervious,  Inflow Depth =   5.63"    for  100 yr event
Inflow       =          3.07 cfs @   12.09 hrs,  Volume=            0.236 af
Primary      =          3.07 cfs @   12.09 hrs,  Volume=            0.236 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Appendix F

Drawdown Calculations

Hastings Street Plaza
Hastings Street and Washington Street
Mendon, Massachusetts

Drawdown Time Calculations Summary

Description	Storage Volume (Cubic Feet)	NRCS Hydraulic Soil Group (HSG)	K (Inches/Hour)	Bottom Area (Square Feet)	Drawdown Time (Hours)	Outlet Invert Elevation
BMP #1 - Infiltration Basin	19,727	A - Loamy Sand	2.41	8,364	11.7	428.9
BMP #2 - Subsurface Infiltration	6,435	A - Loamy Sand	2.41	3,248	9.9	435.5

Notes:

1. Saturated hydraulic conductivity based on Rawls Rates Table.

Rawls Rates Table

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate (inches/hour)
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

$$\text{Time}_{\text{drawdown}} = \frac{\text{Rv}}{(\text{K})(\text{Bottom Area})}$$

Where:

$\text{Time}_{\text{drawdown}}$ = time it takes the basin to drain completely (hours)
Rv = storage volume (cubic feet)
K = saturated hydraulic conductivity (feet/hour)
Bottom Area = bottom area of recharge structure (square feet)

1. Refer to Massachusetts Stormwater Handbook Volume 3, Chapter 1, Page 22 dated February 2008.

Appendix G

TSS Removal Calculations

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin BMP-1 (Residential Pretreatment)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Sediment Forebay	**0.25**	**1.00**	**0.25**	**0.75**
Sediment Forebay	**0.25**	**0.75**	**0.19**	**0.56**
	0.00	**0.56**	**0.00**	**0.56**
	0.00	**0.56**	**0.00**	**0.56**
	0.00	**0.56**	**0.00**	**0.56**

Total TSS Removal = 44%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Hastings Street Plaza**
Mendon, MA
Prepared By: **NRK**
Date: **4/21/2022**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

TSS Removal Calculation Worksheet

Location: Infiltration Basin BMP-1 (Commercial WQS-1)

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.85**	**0.75**	**0.63**	**0.12**
	0.00	**0.12**	**0.00**	**0.12**
	0.00	**0.12**	**0.00**	**0.12**
	0.00	**0.12**	**0.00**	**0.12**

Total TSS Removal = **88%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Hastings Street Plaza**
Mendon, MA
Prepared By: **NRK**
Date: **4/21/2022**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

V

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin BMP-1 (Commercial WQS-2)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.81**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = **85%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Hastings Street Plaza**
Mendon, MA
Prepared By: **NRK**
Date: **4/21/2022**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin BMP-1

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Basin	**0.80**	**1.00**	**0.80**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**

Total TSS Removal = **80%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Hastings Street Plaza**
Mendon, MA
Prepared By: **NRK**
Date: **4/21/2022**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Rain Garden BMP-3 Pretreatment

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Sediment Forebay	**0.25**	**1.00**	**0.25**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**

Total TSS Removal = 25%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Hastings Street Plaza**
Mendon, MA
Prepared By: **NRK**
Date: **4/21/2022**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed

[1] From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Rain Garden BMP-3

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Rain Garden	**0.90**	**1.00**	**0.90**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**

Total TSS Removal = **90%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Hastings Street Plaza**
Mendon, MA

Prepared By: **NRK**

Date: **4/21/2022**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Rain Garden BMP-4 Pretreatment

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Sediment Forebay	**0.25**	**1.00**	**0.25**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**

Total TSS Removal = 25%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Hastings Street Plaza**
Mendon, MA
Prepared By: **NRK**
Date: **4/21/2022**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed

[1] From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

V

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

TSS Removal Calculation Worksheet

Location: Rain Garden BMP-4

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Rain Garden	**0.90**	**1.00**	**0.90**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**

Total TSS Removal = **90%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Hastings Street Plaza**
Mendon, MA
Prepared By: **NRK**
Date: **4/21/2022**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

Detailed Stormceptor Sizing Report – Parking lot

Project Information & Location			
Project Name	Mendon Driving Range Commercial	**Project Number**	49463
City		**State/ Province**	Massachusetts
Country	United States of America	**Date**	3/28/2022
Designer Information		**EOR Information (optional)**	
Name	Clayton Mason	**Name**	
Company	Tetra Tech	**Company**	
Phone #	508-786-2321	**Phone #**	
Email	clayton.mason@tetratech.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Parking lot
Recommended Stormceptor Model	STC 4800
Target TSS Removal (%)	25.0
TSS Removal (%) Provided	85
PSD	Fine Distribution
Rainfall Station	WORCESTER WSO AP

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 450i	68	56
STC 900	77	72
STC 1200	77	72
STC 1800	77	72
STC 2400	81	82
STC 3600	82	82
STC 4800	85	90
STC 6000	86	90
STC 7200	88	94
STC 11000	91	97
STC 13000	91	97
STC 16000	93	98

Detailed Stormceptor Sizing Report – Commercial Drive

Project Information & Location			
Project Name	Mendon Driving Range Commercial	**Project Number**	49463
City		**State/ Province**	Massachusetts
Country	United States of America	**Date**	3/28/2022
Designer Information		**EOR Information (optional)**	
Name	Clayton Mason	**Name**	
Company	Tetra Tech	**Company**	
Phone #	508-786-2321	**Phone #**	
Email	clayton.mason@tetratech.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Commercial Drive
Recommended Stormceptor Model	STC 2400
Target TSS Removal (%)	25.0
TSS Removal (%) Provided	81
PSD	Fine Distribution
Rainfall Station	WORCESTER WSO AP

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 450i	68	56
STC 900	77	72
STC 1200	77	72
STC 1800	77	72
STC 2400	81	82
STC 3600	82	82
STC 4800	85	90
STC 6000	86	90
STC 7200	88	94
STC 11000	91	97
STC 13000	91	97
STC 16000	93	98

Appendix H

Long-Term Pollution Prevention Plan and Stormwater Operation & Maintenance Plan

Long-Term Pollution Prevention and Stormwater Operation & Maintenance Plan

Hastings Street Plaza
Mendon, Massachusetts

Prepared for:

Hastings Street Plaza, LLC
PO Box 444
Mendon, MA 01756

Prepared by:

Tetra Tech, Inc.
100 Nickerson Road
Marlborough, MA 01752

TETRA TECH

April 2022

TABLE OF CONTENTS

LIST OF APPENDICIES

INTRODUCTION

The Long-Term Pollution Prevention (LTPP) and Stormwater Operation and Maintenance (O&M) Plan, filed with the Town of Mendon, shall be implemented at the Hastings Street Plaza development located along Hastings Street (Route 16) and Washington Street to ensure long-term functioning of the stormwater management system (System), and to provide suitable practices for source control of pollutants.

The System has been designed in accordance with the ten (10) MassDEP Stormwater Management Standards provided in the Stormwater Management Policy and Massachusetts Wetlands Protection Act, which relate to the protection of wetlands and water bodies, control of water quantity, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control and stormwater maintenance. Preventative maintenance of the System is essential in the protection of these interests.

1.1 RESPONSIBLE PARTY

The Owner possesses the primary responsibility for overseeing and implementing the LTPP and Stormwater O&M Plan. When necessary the Owner shall designate responsibility to a professional engineer or other technical professional with expertise and experience with stormwater management facilities for the proper operation and maintenance of the System.

Operator Name and Address:
Hastings Street Plaza, LLC
PO Box 444
Mendon, MA 1756

1.2 DOCUMENTATION

An Inspection and Maintenance Log and Schedule shall be kept by the Owner or designated responsible party summarizing inspections, maintenance, repairs and any corrective actions taken. At a minimum, the Inspection and Maintenance Log Forms shall include the date on which each inspection or maintenance task was performed, date and the amount of the last storm event in excess of 0.1 inches of rain in a 24-hour period, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task.

1.3 REFERENCES

The LTPP and Stormwater O&M Plan references the following documents:

Special Permit and Site Plan Review Plans:
Plans titled “Special Permit and Site Plan Review, Hastings Street Plaza, LLC, Hastings Street and Washington Street, Mendon, MA” dated April 25, 2022 (or as amended), prepared by Tetra Tech, Inc.

Stormwater Management Report:
Report titled “Stormwater Management Report” prepared for Hastings Street Plaza, LLC dated April 25, 2022 (or as amended), prepared by Tetra Tech, Inc.

OPERATIONS AND MAINTENANCE PROGRAM

The Owner or designated responsible party shall conduct the Stormwater O&M Program set forth in this document, ensure that inspections and record keeping are timely and accurate, and that cleaning and maintenance are performed in accordance with the recommended frequency for each System component. The Owner or designated responsible party shall also maintain all System components to function as they were designed to. Estimated annual cost of the Stormwater O&M Program is $15,000.

Inspection and Maintenance Log Forms shall include the date on which each inspection or maintenance task was performed, date and the amount of the last storm event in excess of 0.1 inches of rain in a 24-hour period, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. Inspection findings shall include items such as physical conditions of the System components, depth of sediment in structures, evidence of overtopping or debris blockage, and maintenance required for each System component. Refer to Appendix A, Inspection and Maintenance Log Form for a sample form.

2.1 INSPECTION AND MAINTENANCE FREQUENCY AND CORRECTIVE ACTIONS

The following areas and System components shall be inspected by the Owner or designated responsible party and maintained as specified below. The inspection and maintenance frequencies described below may be adjusted based on results gathered during inspections. Any adjustments to the below-mentioned inspection and maintenance schedule shall be relayed to proper authorities to ensure reporting requirements are met.

Any identified deficiencies to the following areas and System components shall be corrected upon discovery. Accumulated sediments and debris shall be properly handled and disposed of off-site in accordance with local, state and federal guidelines and regulations.

2.1.1 Paved Site Access Drive and Parking Areas

Street sweeping of paved site access drives and parking areas shall be performed bi-annually, with sweeping scheduled primarily in spring, after winter snowmelt, and fall to control the amount of sediment that enter the System.

2.1.2 Deep Sump Catch Basin

Deep sump catch basins shall be inspected on a quarterly basis, including at the end of the foliage and snow-removal seasons, and cleaned whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the sump to the invert of the lowest pipe in the structure. Inspections shall also include ensuring the catch basin, casting and frame are in good structural condition. Common corrective actions include removal of litter and accumulated sediment.

2.1.3 Water Quality Structure

Water quality structures shall be inspected on a quarterly and maintained according to the manufacturer's recommendations. Refer to Appendix B for the Stormceptor® STC Operations and Maintenance Guide. Common corrective actions include removal of litter, accumulated sediment, and hydrocarbons.

2.1.4 Drain Manhole

Drain manholes shall be inspected on an annual basis and cleaned or maintained as necessary. Inspections shall include ensuring the manhole, casting and cover are in good structural condition, and checking if litter or accumulated sediment is obstructing flow through the structure. Common corrective actions include removal of litter and accumulated sediment.

2.1.5 Storm Drain Piping

Storm drain piping shall be inspected on an annual basis and cleaned or maintained as necessary. Inspection shall include checking if litter or accumulated sediment is obstructing flow. Typical observations that would indicate the storm drain piping is not functioning properly are roof gutter overflows or no discharge of runoff into the infiltration basin during a storm event. Common corrective actions include removal of litter and accumulated sediment.

2.1.6 Flared End Section and Stone Apron

Flared end sections and stone aprons shall be inspected on a quarterly basis and cleaned or maintained as necessary. Inspection shall include checking if litter or accumulated sediment is obstructing flow, and if there are signs of soil erosion or dislodged stone. Common corrective actions include removal of litter and accumulated sediment, replenishing of stone, and restabilization of eroded areas.

2.1.7 Vegetated Drainage Swale

Vegetated drainage swales shall be inspected bi-annually and mowed, cleaned, or restabilized as necessary. Inspections shall include ensuring vegetation is adequate, checking for woody vegetation, checking if litter or accumulated sediment is obstructing flow, and checking if there are signs of erosion. Common corrective actions include removal of litter and accumulated sediment, mowing, removal of woody vegetation, and restabilization of eroded areas.

2.1.8 Sediment Forebay

Sediment forebays shall be inspected monthly and cleaned whenever sediment depth is equal to or greater than six (6) inches. Inspections shall include checking for litter or sediment buildup, woody vegetation, and signs of erosion. Common corrective actions include removal of litter and accumulated sediment, removal of woody vegetation, and restabilization of eroded areas.

2.1.9 Level Spreader

Level spreaders shall be inspected monthly and cleaned or maintained as necessary. Inspections shall include checking for litter or sediment buildup, woody vegetation, signs of erosion or lows spots in the spreader. Common corrective actions include removal of litter and accumulated sediment, removal of woody vegetation, restabilization of eroded areas, and releveling of lows spots in the spreader.

2.1.10 Vegetated Embankment Areas

Vegetated Embankment Areas shall be inspected annually, early in the growing season, to identify active or potential erosion problems. Inspections shall include checking for bare areas, areas with sparse growth, or sign of erosion. Common corrective actions include reseeding bare areas or areas with sparse growth, or if reoccurring erosion is evident armoring the area with an appropriate lining or stone.

2.1.11 Rain Garden

Rain gardens shall be inspected monthly and mowed, cleaned, or restabilized as necessary. Inspections shall include ensuring vegetation is healthy, if litter or accumulated sediment is obstructing the overflow pipe, and checking if there are signs of erosion. Common corrective actions include re-mulching, pruning, removal and replacement of dead vegetation, removal of litter and accumulated sediment, mowing, and restabilization of eroded areas.

2.1.12 Infiltration Basin

Infiltration basins shall be inspected bi-annually as well as when there are discharges through the high outlet orifice and mowed, cleaned, or restabilized as necessary. Inspections shall include ensuring vegetation is adequate, checking for woody vegetation, checking if litter or accumulated sediment is obstructing flow, and checking if there are signs of erosion. Common corrective actions include removal of litter and accumulated sediment, mowing, removal of woody vegetation, and restabilization of eroded areas.

2.1.13 Subsurface Infiltration System (Rooftop Runoff)

Subsurface infiltration systems capturing only rooftop runoff shall be inspected annually and maintained as needed. Due to a lack of sediment sources on rooftops corrective actions are uncommon.

PRACTICES FOR LONG-TERM POLLUTION PREVENTION

The Owner or designated responsible party shall implement the LTPP practices set forth in this document.

3.1 GOOD HOUSEKEEPING MEASURES

The Owner or designated responsible party shall implement the following good housekeeping measures to ensure long-term pollution prevention and provide suitable practices for source control of pollutants.

3.1.1 Snow Management Guidelines

Snow shall not be dumped directly into water bodies, wetlands and surrounding buffer zones, or stormwater BMPs. Snow pile sites shall be in areas with relatively level slopes with stabilized groundcover, and a linear sedimentation control barrier shall be placed securely on the downgradient side of a snow pile. At the end of the snow season, debris accumulated sediment shall be cleared from the snow pile site and properly disposed of in accordance with local, state and federal guidelines and regulations.

3.1.2 Mosquito Control Guidelines

If evidence of mosquitos is found in any of the sediment forebays, larvicide may be applied by a licensed pesticide applicator in compliance with all pesticide label requirements, as well as any applicable local, state, or federal guidelines and regulations.

3.1.3 Pet Waste Management

Scoop up and seal pet waste in a plastic bag and dispose of properly in a closed solid waste container.

3.1.4 Solid Waste Management

Dispose of or recycle solid waste in closed containers and in accordance with any applicable local, state and federal guidelines and regulations.

3.1.5 Material Storage and Spill Prevention

Deicing chemicals, fertilizers, herbicides, pesticides, or other hazardous materials shall be stored under a roof or other structure and shall be kept in original containers unless they are not resealable. Manufacturer's labels and material safety data sheets shall be retained. Try to store only enough product required for the job, and when possible all of a product shall be used before disposing of the container. Manufacturer, local, state and federal guidelines and regulations for proper use and disposal shall be followed.

Manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be made aware of the procedures and the location of the information and cleanup supplies. Materials and equipment necessary for spill cleanup shall be kept in the material storage area on-site. Equipment and materials shall include, but not be limited to, brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand or sawdust, as well as plastic and metal containers specifically for this purpose. All spills shall be cleaned up immediately after discovery.

3.1.6 Routine Inspection and Maintenance of Stormwater BMPs

Conduct inspection and maintenance of the stormwater BMPs in accordance with the Stormwater O&M Program discussed above.

3.1.7 Maintenance of Landscaped Areas

Routine mowing shall be conducted on a consistent basis with grass cut to an adequate height to maintain a healthy and full vegetative cover. Bare areas, areas of sparse growth, and signs of erosion shall be addressed in accordance with the Stormwater O&M Program discussed above.

3.1.8 Prohibition of Illicit Discharges

Illicit discharges are discharges that do not entirely consist of stormwater, except for certain specified non-stormwater discharges such as firefighting activities, water line flushing, irrigation systems, lawn watering, and wash water from buildings without detergents. There are no known or proposed illicit connections associated with the Project, however if a potential illicit discharge is detected it shall be investigated to determine the nature and source of the discharge, and if required action shall be taken to eliminate the illicit discharge.

Appendix A

Inspection and Maintenance Log Form

Hastings Street Plaza, LLC
35-37 Hastings Street, 12 and 20 Washington Street
Mendon, Massachusetts 01756

SAMPLE Inspection and Maintenance Log Form

Inspector or Maintenance Personnel Name: ____ Date: ________________________

☐ Routine ☐ Response to Rainfall Event (________ inches) ☐ Other (describe) ____

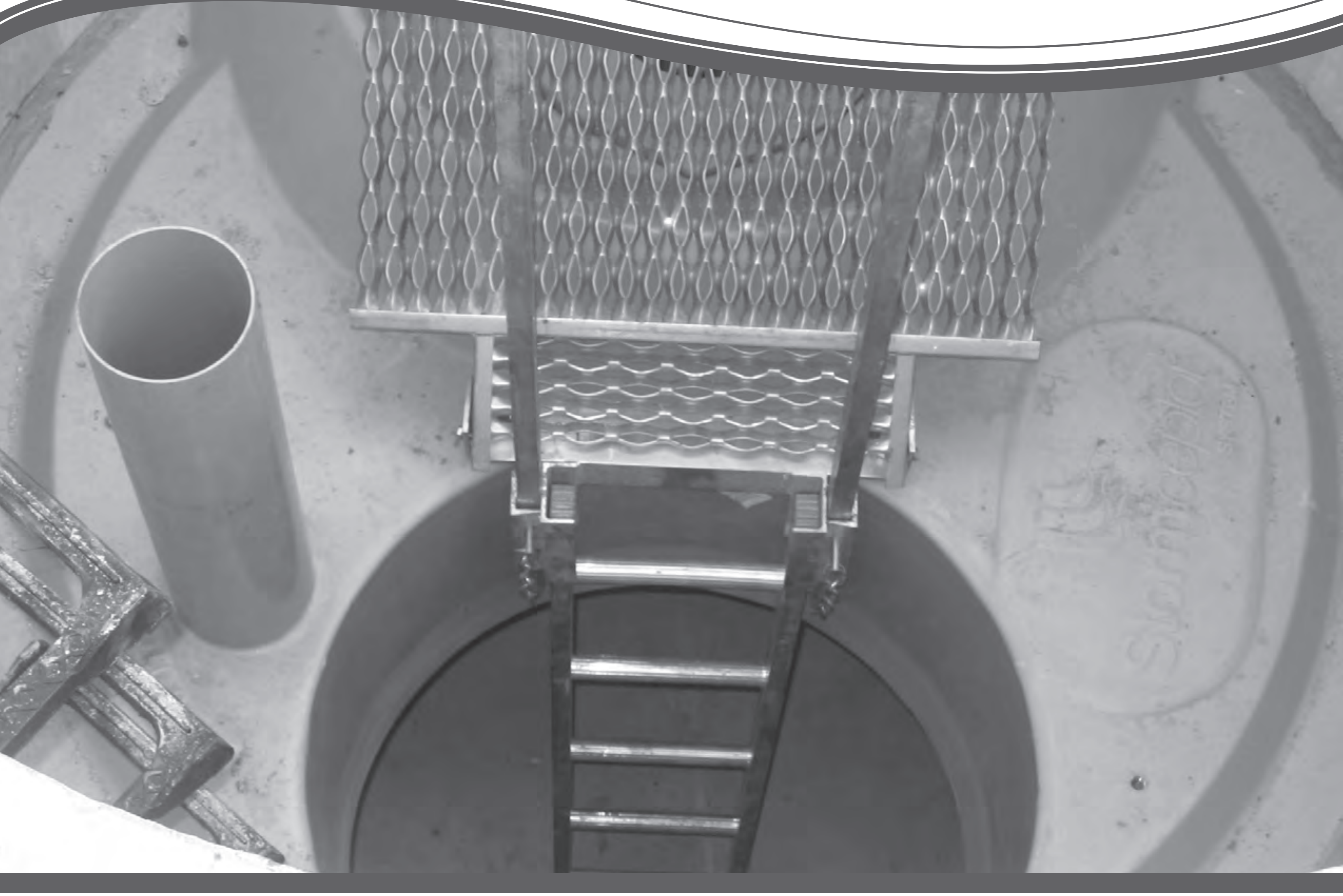
BMP	Required Inspection Frequency	Maintenance Frequency	Comments	Follow-up Action Required (Yes / No)
Street Sweeping	Not Applicable	Primarily in spring, after winter snowmelt, and fall		
Deep Sump Catch Basin	Quarterly	When sediment depth is greater than or equal to one half the sump volume		
Water Quality Structure	Quarterly	As Needed		
Drain Manhole	Annually	As Needed		
Storm Drain Piping	Annually	As Needed		
Flared End Section and Stone Apron	Quarterly	As Needed		
Vegetated Drainage Swale	Bi-annually	As Needed		
Sediment Forebay	Monthly	When sediment depth is greater than or equal to 6 inches		
Level Spreader	Monthly	As Needed		
Vegetated Embankment Areas	Annually; Early in the growing season	As Needed		
Rain Garden	Monthly	As Needed		
Infiltration Basin	Bi-annually	As Needed		
Subsurface Infiltration System (Rooftop Runoff)	Annually	As Needed		

Appendix B

Stormceptor® STC
Operation and Maintenance Guide

CONTECH®
ENGINEERED SOLUTIONS

Stormceptor® STC
Operation and Maintenance Guide



Stormceptor® STC

Stormceptor Design Notes

- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.

Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences			
Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in. (75 mm)	1 in. (25 mm)	3 in. (75 mm)
Multiple inlet pipes	3 in. (75 mm)	3 in. (75 mm)	Only one inlet pipe.

Maximum inlet and outlet pipe diameters:

Inlet/Outlet Configuration	Inlet Unit STC 450i	In-Line Unit STC 900 to STC 7200	Series* STC 11000 to STC 16000
Straight Through	24 inch (600 mm)	42 inch (1050 mm)	60 inch (1500 mm)
Bend (90 degrees)	18 inch (450 mm)	33 inch (825 mm)	33 inch (825 mm)

- The inlet and in-line Stormceptor units can accommodate turns to a maximum of 90 degrees.
- Minimum distance from top of grade to crown is 2 feet (0.6 m)
- Submerged conditions. A unit is submerged when the standing water elevation at the proposed location of the Stormceptor unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact your local Stormceptor representative and provide the following information:
- Top of grade elevation
- Stormceptor inlet and outlet pipe diameters and invert elevations
- Standing water elevation
- Stormceptor head loss, K = 1.3 (for submerged condition, K = 4)

OPERATION AND MAINTENANCE GUIDE
Table of Content

1. About Stormceptor

The Stormceptor® STC (Standard Treatment Cell) was developed by Imbrium™ Systems to address the growing need to remove and isolate pollution from the storm drain system before it enters the environment. The Stormceptor STC targets hydrocarbons and total suspended solids (TSS) in stormwater runoff. It improves water quality by removing contaminants through the gravitational settling of fine sediments and floatation of hydrocarbons while preventing the re-suspension or scour of previously captured pollutants.

The development of the Stormceptor STC revolutionized stormwater treatment, and created an entirely new category of environmental technology. Protecting thousands of waterways around the world, the Stormceptor System has set the standard for effective stormwater treatment.

1.1. Patent Information

The Stormceptor technology is protected by the following patents:

- Australia Patent No. 693,164 • 693,164 • 707,133 • 729,096 • 779401
- Austrian Patent No. 289647
- Canadian Patent No 2,009,208 •2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending)
- China Patent No 1168439
- Denmark DK 711879
- German DE 69534021
- Indonesian Patent No 16688
- Japan Patent No 9-11476 (Pending)
- Korea 10-2000-0026101 (Pending)
- Malaysia Patent No PI9701737 (Pending)
- New Zealand Patent No 314646
- United States Patent No 4,985,148 • 5,498,331 • 5,725,760 • 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690
- Stormceptor OSR Patent Pending • Stormceptor LCS Patent Pending

2. Stormceptor Design Overview

2.1. Design Philosophy

The patented Stormceptor System has been designed to focus on the environmental objective of providing long-term pollution control. The unique and innovative Stormceptor design allows for continuous positive treatment of runoff during all rainfall events, while ensuring that all captured pollutants are retained within the system, even during intense storm events.

An integral part of the Stormceptor design is PCSWMM for Stormceptor - sizing software developed in conjunction with Computational Hydraulics Inc. (CHI) and internationally acclaimed expert, Dr. Bill James. Using local historical rainfall data and continuous simulation modeling, this software allows a Stormceptor unit to be designed for each individual site and the corresponding water quality objectives.

By using PCSWMM for Stormceptor, the Stormceptor System can be designed to remove a wide range of particles (typically from 20 to 2,000 microns), and can also be customized to remove a specific particle size distribution (PSD). The specified PSD should accurately reflect what is in the stormwater runoff to ensure the device is achieving the desired water quality objective. Since stormwater runoff contains small particles (less than 75 microns), it is important to design a treatment system to remove smaller particles in addition to coarse particles.

2.2. Benefits

The Stormceptor System removes free oil and suspended solids from stormwater, preventing spills and non-point source pollution from entering downstream lakes and rivers. The key benefits, capabilities and applications of the Stormceptor System are as follows:

- Provides continuous positive treatment during all rainfall events
- Can be designed to remove over 80% of the annual sediment load
- Removes a wide range of particles
- Can be designed to remove a specific particle size distribution (PSD)
- Captures free oil from stormwater
- Prevents scouring or re-suspension of trapped pollutants
- Pre-treatment to reduce maintenance costs for downstream treatment measures (ponds, swales, detention basins, filters)
- Groundwater recharge protection
- Spills capture and mitigation
- Simple to design and specify
- Designed to your local watershed conditions
- Small footprint to allow for easy retrofit installations
- Easy to maintain (vacuum truck)
- Multiple inlets can connect to a single unit
- Suitable as a bend structure
- Pre-engineered for traffic loading (minimum AASHTO HS-20)
- Minimal elevation drop between inlet and outlet pipes
- Small head loss
- Additional protection provided by an 18” (457 mm) fiberglass skirt below the top of the insert, for the containment of hydrocarbons in the event of a spill.

2.3. Environmental Benefit

Freshwater resources are vital to the health and welfare of their surrounding communities. There is increasing public awareness, government regulations and corporate commitment to reducing the pollution entering our waterways. A major source of this pollution originates from stormwater runoff from urban areas. Rainfall runoff carries oils, sediment and other contaminants from roads and parking lots discharging directly into our streams, lakes and coastal waterways.

The Stormceptor System is designed to isolate contaminants from getting into the natural environment. The Stormceptor technology provides protection for the environment from spills that occur at service stations and vehicle accident sites, while also removing contaminated sediment in runoff that washes from roads and parking lots.

3. Key Operation Features

3.1. Scour Prevention

A key feature of the Stormceptor System is its patented scour prevention technology. This innovation ensures pollutants are captured and retained during all rainfall events, even extreme storms. The Stormceptor System provides continuous positive treatment for all rainfall events, including intense storms. Stormceptor slows incoming runoff, controlling and reducing velocities in the lower chamber to create a non-turbulent environment that promotes free oils and floatable debris to rise and sediment to settle.

The patented scour prevention technology, the fiberglass insert, regulates flows into the lower chamber through a combination of a weir and orifice while diverting high energy flows away through the upper chamber to prevent scouring. Laboratory testing demonstrated no scouring when tested up to 125% of the unit's operating rate, with the unit loaded to 100% sediment capacity (NJDEP, 2005). Second, the depth of the lower chamber ensures the sediment storage zone is adequately separated from the path of flow in the lower chamber to prevent scouring.

3.2. Operational Hydraulic Loading Rate

Designers and regulators need to evaluate the treatment capacity and performance of manufactured stormwater treatment systems. A commonly used parameter is the "operational hydraulic loading rate" which originated as a design methodology for wastewater treatment devices.

Operational hydraulic loading rate may be calculated by dividing the flow rate into a device by its settling area. This represents the critical settling velocity that is the prime determinant to quantify the influent particle size and density captured by the device. PCSWMM for Stormceptor uses a similar parameter that is calculated by dividing the hydraulic detention time in the device by the fall distance of the sediment.

$$v_{SC} = \frac{H}{6_H} = \frac{Q}{A_S}$$

Where:

v_{SC} = critical settling velocity, ft/s (m/s)

H = tank depth, ft (m)

$Ø_H$ = hydraulic detention time, ft/s (m/s)

Q = volumetric flow rate, ft3/s (m3/s)

A_S = surface area, ft^2 (m^2)

(Tchobanoglous, G. and Schroeder, E.D. 1987. Water Quality. Addison Wesley.)

Unlike designing typical wastewater devices, stormwater systems are designed for highly variable flow rates including intense peak flows. PCSWMM for Stormceptor incorporates all of the flows into its calculations, ensuring that the operational hydraulic loading rate is considered not only for one flow rate, but for all flows including extreme events.

3.3. Double Wall Containment

The Stormceptor System was conceived as a pollution identifier to assist with identifying illicit discharges. The fiberglass insert has a continuous skirt that lines the concrete barrel wall for a depth of 18 inches (457 mm) that provides double wall containment for hydrocarbons storage. This protective barrier ensures that toxic floatables do not migrate through the concrete wall into the surrounding soils.

4. Stormceptor Product Line

4.1. Stormceptor Models

A summary of Stormceptor models and capacities are listed in Table 1.

Table 1. Stormceptor Models

Stormceptor Model	Total Storage Volume U.S. Gal (L)	Hydrocarbon Storage Capacity U.S. Gal (L)	Maximum Sediment Capacity ft^3 (L)
STC 450i	470 (1,780)	86 (330)	46 (1,302)
STC 900	952 (3,600)	251 (950)	89 (2,520)
STC 1200	1,234 (4,670)	251 (950)	127 (3,596)
STC 1800	1,833 (6,940)	251 (950)	207 (5,861)
STC 2400	2,462 (9,320)	840 (3,180)	205 (5,805)
STC 3600	3,715 (1,406)	840 (3,180)	373 (10,562)
STC 4800	5,059 (1,950)	909 (3,440)	543 (15,376)
STC 6000	6,136 (23,230)	909 (3,440)	687 (19,453)
STC 7200	7,420 (28,090)	1,059 (4,010)	839 (23,757)
STC 11000	11,194 (42,370)	2,797 (10, 590)	1,086 (30,752)
STC 13000	13,348 (50,530)	2,797 (10, 590)	1,374 (38,907)
STC 16000	15,918 (60,260)	3,055 (11, 560)	1,677 (47,487)

NOTE: Storage volumes may vary slightly from region to region. For detailed information, contact your local Stormceptor representative.

4.2. Inline Stormceptor

The Inline Stormceptor, Figure 1, is the standard design for most stormwater treatment applications. The patented Stormceptor design allows the Inline unit to maintain continuous positive treatment of total suspended solids (TSS) year-round, regardless of flow rate. The Inline Stormceptor is composed of a precast concrete tank with a fiberglass insert situated at the invert of the storm sewer pipe, creating an upper chamber above the insert and a lower chamber below the insert.

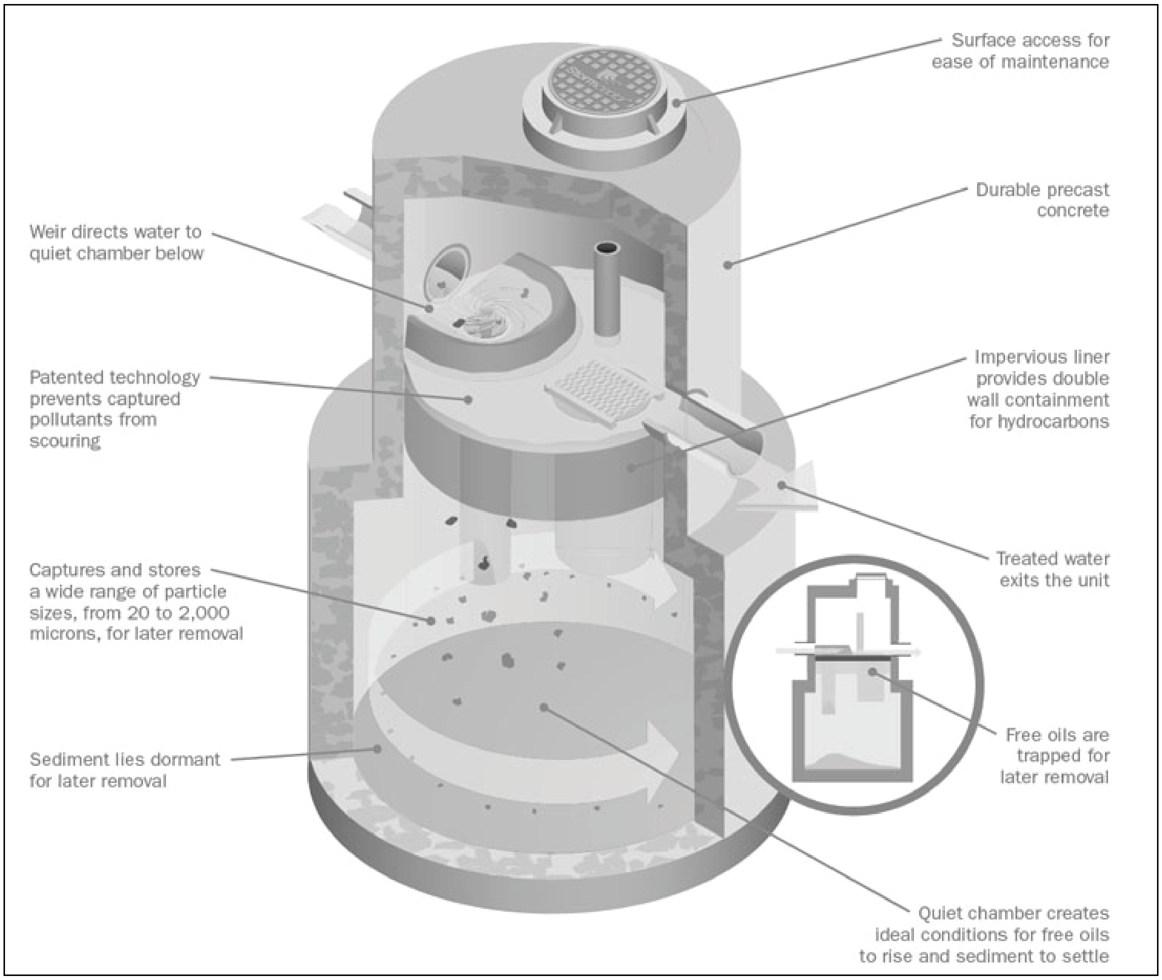


Figure 1. Inline Stormceptor

Operation

As water flows into the Stormceptor unit, it is slowed and directed to the lower chamber by a weir and drop tee. The stormwater enters the lower chamber, a non-turbulent environment, allowing free oils to rise and sediment to settle. The oil is captured underneath the fiberglass insert and shielded from exposure to the concrete walls by a fiberglass skirt. After the pollutants separate, treated water continues up a riser pipe, and exits the lower chamber on the downstream side of the weir before leaving the unit. During high flow events, the Stormceptor System's patented scour prevention technology ensures continuous pollutant removal and prevents re-suspension of previously captured pollutants.

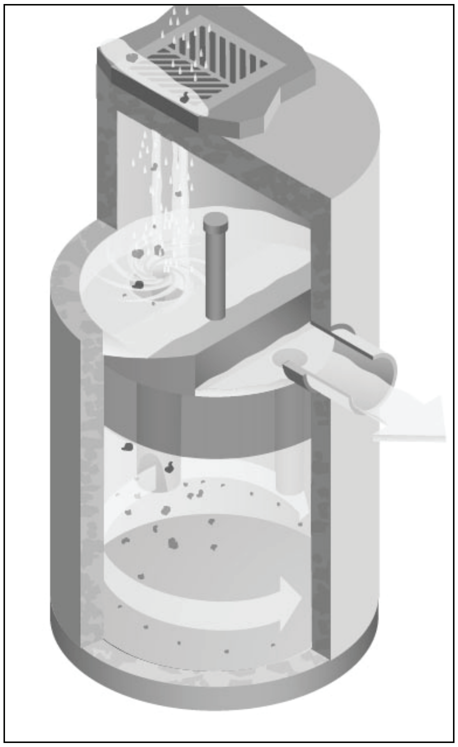


Figure 2. Inlet Stormceptor

4.3. Inlet Stormceptor

The Inlet Stormceptor System, Figure 2, was designed to provide protection for parking lots, loading bays, gas stations and other spill-prone areas. The Inlet Stormceptor is designed to remove sediment from stormwater introduced through a grated inlet, a storm sewer pipe, or both.

The Inlet Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

4.4. Series Stormceptor

Designed to treat larger drainage areas, the Series Stormceptor System, Figure 3, consists of two adjacent Stormceptor models that function in parallel. This design eliminates the need for additional structures and piping to reduce installation costs.

Figure 3. Series System

The Series Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

5. Sizing the Stormceptor System

The Stormceptor System is a versatile product that can be used for many different aspects of water quality improvement. While addressing these needs, there are conditions that the designer needs to be aware of in order to size the Stormceptor model to meet the demands of each individual site in an efficient and cost-effective manner.

PCSWMM for Stormceptor is the support tool used for identifying the appropriate Stormceptor model. In order to size a unit, it is recommended the user follow the seven design steps in the program. The steps are as follows:

STEP 1 – Project Details

The first step prior to sizing the Stormceptor System is to clearly identify the water quality objective for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a particle size distribution.

STEP 2 – Site Details

Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of imperviousness based on paved surfaces, sidewalks and rooftops.

STEP 3 – Upstream Attenuation

The Stormceptor System is designed as a water quality device and is sometimes used in conjunction with onsite water quantity control devices such as ponds or underground detention systems. When possible, a greater benefit is typically achieved when installing a Stormceptor unit upstream of a detention facility. By placing the Stormceptor unit upstream of a detention structure, a benefit of less maintenance of the detention facility is realized.

STEP 4 – Particle Size Distribution

It is critical that the PSD be defined as part of the water quality objective. PSD is critical for the design of treatment system for a unit process of gravity settling and governs the size of a treatment system. A range of particle sizes has been provided and it is recommended that clays and silt-sized particles be considered in addition to sand and gravel-sized particles. Options and sample PSDs are provided in PCSWMM for Stormceptor. The default particle size distribution is the Fine Distribution, Table 2, option.

Table 2. Fine Distribution

Particle Size	Distribution	Specific Gravity
20	20%	1.3
60	20%	1.8
150	20%	2.2
400	20%	2.65
2000	20%	2.65

If the objective is the long-term removal of 80% of the total suspended solids on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (greater than 75 microns) would provide relatively poor removal efficiency of finer particles that may be naturally prevalent in runoff from the site.

Since the small particle fraction contributes a disproportionately large amount of the total available particle surface area for pollutant adsorption, a system designed primarily for coarse particle capture will compromise water quality objectives.

STEP 5 – Rainfall Records

Local historical rainfall has been acquired from the U.S. National Oceanic and Atmospheric Administration, Environment Canada and regulatory agencies across North America. The rainfall data provided with PCSMM for Stormceptor provides an accurate estimation of small storm hydrology by modeling actual historical storm events including duration, intensities and peaks.

STEP 6 – Summary

At this point, the program may be executed to predict the level of TSS removal from the site. Once the simulation has completed, a table shall be generated identifying the TSS removal of each Stormceptor unit.

STEP 7 – Sizing Summary

Performance estimates of all Stormceptor units for the given site parameters will be displayed in a tabular format. The unit that meets the water quality objective, identified in Step 1, will be highlighted.

5.1. PCSWMM for Stormceptor

The Stormceptor System has been developed in conjunction with PCSWMM for Stormceptor as a technological solution to achieve water quality goals. Together, these two innovations model, simulate, predict and calculate the water quality objectives desired by a design engineer for TSS removal.

PCSWMM for Stormceptor is a proprietary sizing program which uses site specific inputs to a computer model to simulate sediment accumulation, hydrology and long-term total suspended solids removal. The model has been calibrated to field monitoring results from Stormceptor units that have been monitored in North America. The sizing methodology can be described by three processes:

1. Determination of real time hydrology
2. Buildup and wash off of TSS from impervious land areas
3. TSS transport through the Stormceptor (settling and discharge). The use of a calibrated model is the preferred method for sizing stormwater quality structures for the following reasons:
   - » The hydrology of the local area is properly and accurately incorporated in the sizing (distribution of flows, flow rate ranges and peaks, back-to-back storms, inter-event times)
   - » The distribution of TSS with the hydrology is properly and accurately considered in the sizing
   - » Particle size distribution is properly considered in the sizing
   - » The sizing can be optimized for TSS removal
   - » The cost benefit of alternate TSS removal criteria can be easily assessed
   - » The program assesses the performance of all Stormceptor models. Sizing may be selected based on a specific water quality outcome or based on the Maximum Extent Practicable

For more information regarding PCSWMM for Stormceptor, contact your local Stormceptor representative, or visit www.imbriumsystems.com to download a free copy of the program.

5.2. Sediment Loading Characteristics

The way in which sediment is transferred to stormwater can have a considerable effect on which type of system is implemented. On typical impervious surfaces (e.g. parking lots) sediment will build over time and wash off with the next rainfall. When rainfall patterns are examined, a short intense storm will have a higher concentration of sediment than a long slow drizzle. Together with rainfall data representing the site's typical rainfall patterns, sediment loading characteristics play a part in the correct sizing of a stormwater quality device.

Typical Sites

For standard site design of the Stormceptor System, PCSWMM for Stormceptor is utilized to accurately assess the unit's performance. As an integral part of the product's design, the program can be used to meet local requirements for total suspended solid removal. Typical installations of manufactured stormwater treatment devices would occur on areas such as paved parking lots or paved roads. These are considered "stable" surfaces which have non – erodible surfaces.

Unstable Sites

While standard sites consist of stable concrete or asphalt surfaces, sites such as gravel parking lots, or maintenance yards with stockpiles of sediment would be classified as "unstable". These types of sites do not exhibit first flush characteristics, are highly erodible and exhibit atypical sediment loading characteristics and must therefore be sized more carefully. Contact your local Stormceptor representative for assistance in selecting a proper unit sized for such unstable sites.

6. Spill Controls

When considering the removal of total petroleum hydrocarbons (TPH) from a storm sewer system there are two functions of the system: oil removal, and spill capture.

'Oil Removal' describes the capture of the minute volumes of free oil mobilized from impervious surfaces. In this instance relatively low concentrations, volumes and flow rates are considered. While the Stormceptor unit will still provide an appreciable oil removal function during higher flow events and/or with higher TPH concentrations, desired effluent limits may be exceeded under these conditions.

‘Spill Capture’ describes a manner of TPH removal more appropriate to recovery of a relatively high volume of a single phase deleterious liquid that is introduced to the storm sewer system over a relatively short duration. The two design criteria involved when considering this manner of introduction are overall volume and the specific gravity of the material. A standard Stormceptor unit will be able to capture and retain a maximum spill volume and a minimum specific gravity.

For spill characteristics that fall outside these limits, unit modifications are required. Contact your local Stormceptor Representative for more information.

One of the key features of the Stormceptor technology is its ability to capture and retain spills. While the standard Stormceptor System provides excellent protection for spill control, there are additional options to enhance spill protection if desired.

6.1. Oil Level Alarm

The oil level alarm is an electronic monitoring system designed to trigger a visual and audible alarm when a pre-set level of oil is reached within the lower chamber. As a standard, the oil

level alarm is designed to trigger at approximately 85% of the unit’s available depth level for oil capture. The feature acts as a safeguard against spills caused by exceeding the oil storage capacity of the separator and eliminates the need for manual oil level inspection.

The oil level alarm installed on the Stormceptor insert is illustrated in Figure 4.

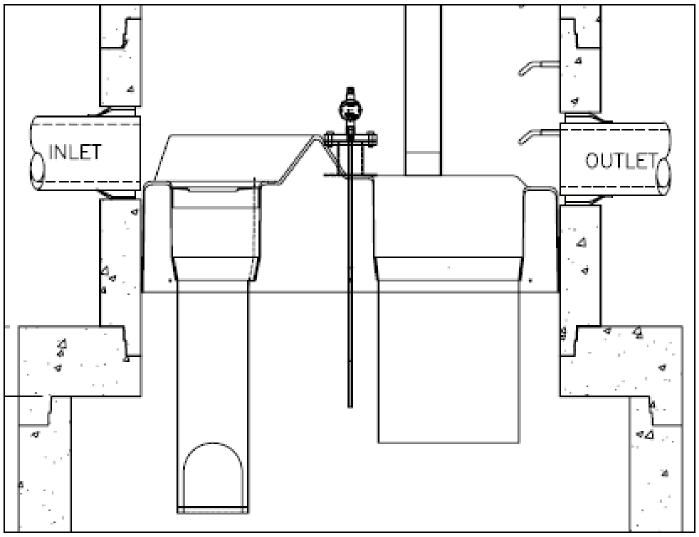


Figure 4. Oil level alarm

6.2. Increased Volume Storage Capacity

The Stormceptor unit may be modified to store a greater spill volume than is typically available. Under such a scenario, instead of installing a larger than required unit, modifications can be made to the recommended Stormceptor model to accommodate larger volumes. Contact your local Stormceptor representative for additional information and assistance for modifications.

7. Stormceptor Options

The Stormceptor System allows flexibility to incorporate to existing and new storm drainage infrastructure. The following section identifies considerations that should be reviewed when installing the system into a drainage network. For conditions that fall outside of the recommendations in this section, please contact your local Stormceptor representative for further guidance.

7.1. Installation Depth Minimum Cover

The minimum distance from the top of grade to the crown of the inlet pipe is 24 inches (600 mm). For situations that have a lower minimum distance, contact your local Stormceptor representative.

7.2. Maximum Inlet and Outlet Pipe Diameters

Maximum inlet and outlet pipe diameters are illustrated in Figure 5. Contact your local Stormceptor representative for larger pipe diameters

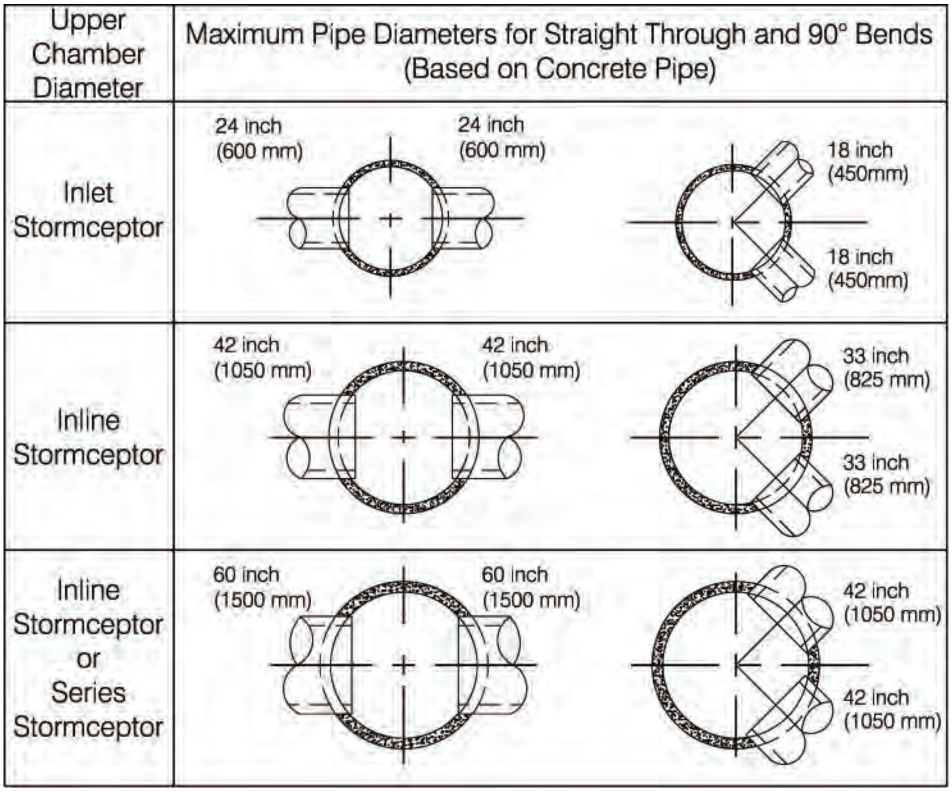


Figure 5. Maximum pipe diameters for straight through and bend applications

*****The bend should only be incorporated into the second structure (downstream structure) of the Series Stormceptor System

7.3. Bends

The Stormceptor System can be used to change horizontal alignment in the storm drain network up to a maximum of 90 degrees. Figure 6 illustrates the typical bend situations of the Stormceptor System. Bends should only be applied to the second structure (downstream structure) of the Series Stormceptor System.

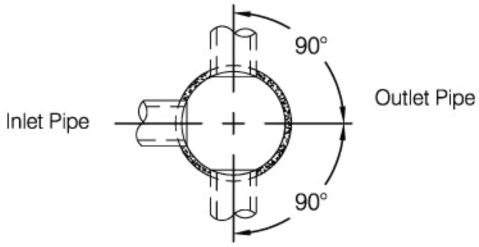
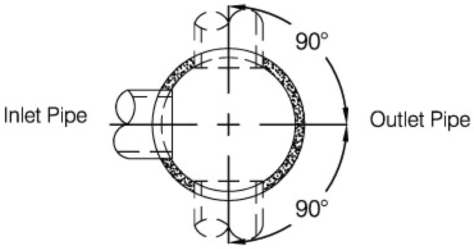
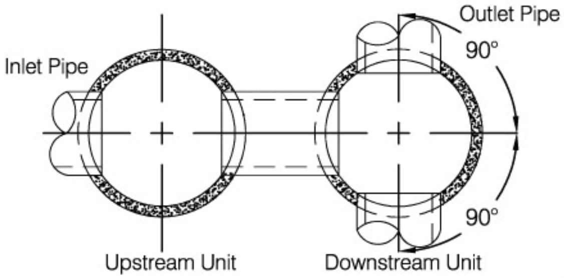
Stormceptor System	Maximum Bend Configurations
Inlet Stormceptor	
Inline Stormceptor	
Series Stormceptor	

Figure 6. Maximum bend angles

7.4. Multiple Inlet Pipes

The Inlet and Inline Stormceptor System can accommodate two or more inlet pipes. The maximum number of inlet pipes that can be accommodated into a Stormceptor unit is a function of the number, alignment and diameter of the pipes and its effects on the structural integrity of the precast concrete. When multiple inlet pipes are used for new developments, each inlet pipe shall have an invert elevation 3 inches (75 mm) higher than the outlet pipe invert elevation.

7.5. Inlet/Outlet Pipe Invert Elevations

Recommended inlet and outlet pipe invert differences are listed in Table 3.

Table 3. Recommended Drops Between Inlet and Outlet Pipe Inverts

Number of Inlet Pipes	Inlet System	In-Line System	Series System
1	3 inches (75 mm)	1 inch (25 mm)	3 inches (75 mm)
>1	3 inches (75 mm)	3 inches (75 mm)	Not Applicable

7.6. Shallow Stormceptor

In cases where there may be restrictions to the depth of burial of storm sewer systems. In this situation, for selected Stormceptor models, the lower chamber components may be increased in diameter to reduce the overall depth of excavation required.

7.7. Customized Live Load

The Stormceptor system is typically designed for local highway truck loading (AASHTO HS- 20). When the project requires live loads greater than HS-20, the Stormceptor System may be customized structurally for a pre-specified live load. Contact your local Stormceptor representative for customized loading conditions.

7.8. Pre-treatment

The Stormceptor System may be sized to remove sediment and for spills control in conjunction with other stormwater BMPs to meet the water quality objective. For pretreatment applications, the Stormceptor System should be the first unit in a treatment train. The benefits of pre-treatment include the extension of the operational life (extension of maintenance frequency) of large stormwater management facilities, prevention of spills and lower total life- cycle maintenance cost.

7.9. Head loss

The head loss through the Stormceptor System is similar to a 60 degree bend at a manhole. The K value for calculating minor losses is approximately 1.3 (minor loss = k*1.3v2/2g).

However, when a Submerged modification is applied to a Stormceptor unit, the corresponding K value is 4.

7.10. Submerged

The Submerged modification, Figure 7, allows the Stormceptor System to operate in submerged or partially submerged storm sewers. This configuration can be installed on all models of the Stormceptor System by modifying the fiberglass insert. A customized weir height and a secondary drop tee are added.

Submerged instances are defined as standing water in the storm drain system during zero flow conditions. In these instances, the following information is necessary for the proper design and application of submerged modifications:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

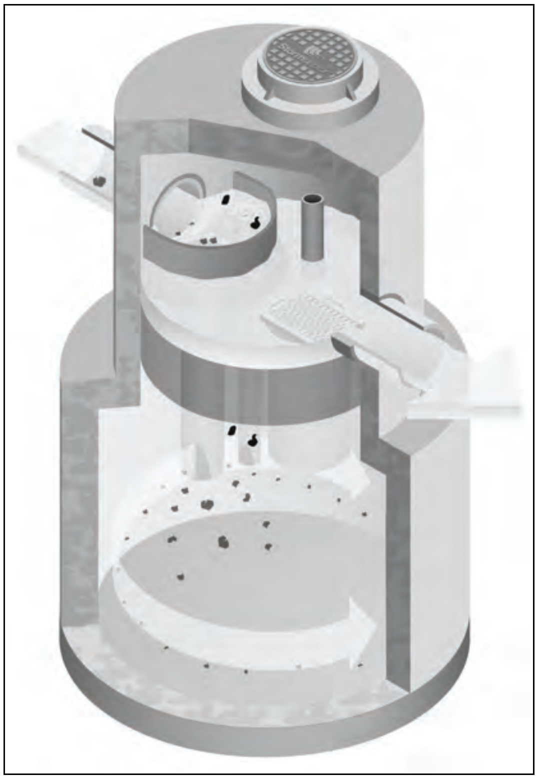


Figure 7. Submerged Stormceptor

8. Comparing Technologies

Designers have many choices available to achieve water quality goals in the treatment of stormwater runoff. Since many alternatives are available for use in stormwater quality treatment it is important to consider how to make an appropriate comparison between "approved alternatives". The following is a guide to assist with the accurate comparison of differing technologies and performance claims.

8.1. Particle Size Distribution (PSD)

The most sensitive parameter to the design of a stormwater quality device is the selection of the design particle size. While it is recommended that the actual particle size distribution (PSD) for sites be measured prior to sizing, alternative values for particle size should be selected to represent what is likely to occur naturally on the site. A reasonable estimate of a particle size distribution likely to be found on parking lots or other impervious surfaces should consist of a wide range of particles such as 20 microns to 2,000 microns (Ontario MOE, 1994).

There is no absolute right particle size distribution or specific gravity and the user is cautioned to review the site location, characteristics, material handling practices and regulatory requirements when selecting a particle size distribution. When comparing technologies, designs using different PSDs will result in incomparable TSS removal efficiencies. The PSD of the TSS removed needs to be standard between two products to allow for an accurate comparison.

8.2. Scour Prevention

In order to accurately predict the performance of a manufactured treatment device, there must be confidence that it will perform under all conditions. Since rainfall patterns cannot be predicted, stormwater quality devices placed in storm sewer systems must be able to withstand extreme events, and ensure that all pollutants previously captured are retained in the system.

In order to have confidence in a system's performance under extreme conditions, independent validation of scour prevention is essential when examining different technologies. Lack of independent verification of scour prevention should make a designer wary of accepting any product's performance claims.

8.3. Hydraulics

Full scale laboratory testing has been used to confirm the hydraulics of the Stormceptor System. Results of lab testing have been used to physically design the Stormceptor System and the sewer pipes entering and leaving the unit. Key benefits of Stormceptor are:

- Low head loss (typical k value of 1.3)
- Minimal inlet/outlet invert elevation drop across the structure
- Use as a bend structure
- Accommodates multiple inlets

The adaptability of the treatment device to the storm sewer design infrastructure can affect the overall performance and cost of the site.

8.4. Hydrology

Stormwater quality treatment technologies need to perform under varying climatic conditions. These can vary from long low intensity rainfall to short duration, high intensity storms. Since a treatment device is expected to perform under all these conditions, it makes sense that any system's design should accommodate those conditions as well.

Long-term continuous simulation evaluates the performance of a technology under the varying conditions expected in the climate of the subject site. Single, peak event design does not provide this information and is not equivalent to long-term simulation. Designers should request long-term simulation performance to ensure the technology can meet the long-term water quality objective.

9. Testing

The Stormceptor System has been the most widely monitored stormwater treatment technology in the world. Performance verification and monitoring programs are completed to the strictest standards and integrity. Since its introduction in 1990, numerous independent field tests and studies detailing the effectiveness of the Stormceptor System have been completed.

- Coventry University, UK – 97% removal of oil, 83% removal of sand and 73% removal of peat
- National Water Research Institute, Canada, - scaled testing for the development of the Stormceptor System identifying both TSS removal and scour prevention.
- New Jersey TARP Program – full scale testing of an STC 900 demonstrating 75% TSS removal of particles from 1 to 1000 microns. Scour testing completed demonstrated that the system does not scour. The New Jersey Department of Environmental Protection was followed.
- City of Indianapolis – full scale testing of an STC 900 demonstrating over 80% TSS removal of particles from 50 microns to 300 microns at 130% of the unit's operating rate. Scour testing completed demonstrated that the system does not scour.
- Westwood Massachusetts (1997), demonstrated >80% TSS removal
- Como Park (1997), demonstrated 76% TSS removal
- Ontario MOE SWAMP Program – 57% removal of 1 to 25 micron particles
- Laval Quebec – 50% removal of 1 to 25 micron particles

10. Installation

The installation of the concrete Stormceptor should conform in general to state highway, or local specifications for the installation of manholes. Selected sections of a general specification that are applicable are summarized in the following sections.

10.1. Excavation

Excavation for the installation of the Stormceptor should conform to state highway, or local specifications. Topsoil removed during the excavation for the Stormceptor should be stockpiled in designated areas and should not be mixed with subsoil or other materials.

Topsoil stockpiles and the general site preparation for the installation of the Stormceptor should conform to state highway or local specifications.

The Stormceptor should not be installed on frozen ground. Excavation should extend a minimum of 12 inches (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

In areas with a high water table, continuous dewatering may be required to ensure that the excavation is stable and free of water.

10.2. Backfilling

Backfill material should conform to state highway or local specifications. Backfill material should be placed in uniform layers not exceeding 12 inches (300mm) in depth and compacted to state highway or local specifications.

11. Stormceptor Construction Sequence

The concrete Stormceptor is installed in sections in the following sequence:

1. Aggregate base
2. Base slab
3. Lower chamber sections
4. Upper chamber section with fiberglass insert
5. Connect inlet and outlet pipes
6. Assembly of fiberglass insert components (drop tee, riser pipe, oil cleanout port and orifice plate
7. Remainder of upper chamber
8. Frame and access cover

The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

Adjustment of the Stormceptor can be performed by lifting the upper sections free of the excavated area, re-leveling the base and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the Stormceptor has been constructed, any lift holes must be plugged with mortar.

12. Maintenance

12.1. Health and Safety

The Stormceptor System has been designed considering safety first. It is recommended that confined space entry protocols be followed if entry to the unit is required. In addition, the fiberglass insert has the following health and safety features:

- Designed to withstand the weight of personnel
- A safety grate is located over the 24 inch (600 mm) riser pipe opening
- Ladder rungs can be provided for entry into the unit, if required

12.2. Maintenance Procedures

Maintenance of the Stormceptor system is performed using vacuum trucks. No entry into the unit is required for maintenance (in most cases). The vacuum service industry is a well- established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean a Stormceptor will vary based on the size of unit and transportation distances.

The need for maintenance can be determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port.

Similarly, the depth of sediment can be measured from the surface without entry into the Stormceptor via a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe. Maintenance should be performed once the sediment depth exceeds the guideline values provided in the Table 4.

Table 4. Sediment Depths Indicating Required Servicing*

Particle Size	Specific Gravity
Model	Sediment Depth inches (mm)
450i	8 (200)
900	8 (200)
1200	10 (250)
1800	15 (381)
2400	12 (300)
3600	17 (430)
4800	15 (380)
6000	18 (460)
7200	15 (381)
11000	17 (380)
13000	20 (500)
16000	17 (380)
* based on 15% of the Stormceptor unit's total storage	

Although annual servicing is recommended, the frequency of maintenance may need to be increased or reduced based on local conditions (i.e. if the unit is filling up with sediment more quickly than projected, maintenance may be required semi-annually; conversely once the site has stabilized maintenance may only be required every two or three years).

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower the oil level below the drop pipes.

The following procedures should be taken when cleaning out Stormceptor:

1. Check for oil through the oil cleanout port
2. Remove any oil separately using a small portable pump
3. Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank
4. Remove the sludge from the bottom of the unit using the vacuum truck
5. Re-fill Stormceptor with water where required by the local jurisdiction

12.3. Submerged Stormceptor

Careful attention should be paid to maintenance of the Submerged Stormceptor System. In cases where the storm drain system is submerged, there is a requirement to plug both the inlet and outlet pipes to economically clean out the unit.

12.4. Hydrocarbon Spills

The Stormceptor is often installed in areas where the potential for spills is great. The Stormceptor System should be cleaned immediately after a spill occurs by a licensed liquid waste hauler.

12.5. Disposal

Requirements for the disposal of material from the Stormceptor System are similar to that of any other stormwater Best Management Practice (BMP) where permitted. Disposal options for the sediment may range from disposal in a sanitary trunk sewer upstream of a sewage treatment plant, to disposal in a sanitary landfill site. Petroleum waste products collected in the Stormceptor (free oil/chemical/fuel spills) should be removed by a licensed waste management company.

12.6. Oil Sheens

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (<10 mg/L). Stormceptor will remove over 98% of all free oil spills from storm sewer systems for dry weather or frequently occurring runoff events.

The appearance of a sheen at the outlet with high influent oil concentrations does not mean the unit is not working to this level of removal. In addition, if the influent oil is emulsified the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified conditions.

SUPPORT

Drawings and specifications are available at www.ContechES.com.

Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, and earth stabilization products. For information, visit www.ContechES.com or call 800.338.1122

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Appendix I

Illicit Discharge Compliance Statement

TETRA TECH

ILLICIT DISCHARGE COMPLIANCE STATEMENT

Owner Name: Hastings Street Plaza, LLC

Site Address: 35-37 Hastings Street, 12 and 20 Washington Street
Mendon, Massachusetts 01756

Date: April 25, 2022

This statement is provided in accordance with the provisions of Massachusetts Stormwater Management Standards (the Standards), Standard 10, and the Massachusetts Stormwater Handbook.

To the best of the Owners and Engineers knowledge, no illicit discharges exist on the Project Site and no illicit discharges are proposed as part of the Project. The facility’s Operation & Maintenance Plans are designed to prevent non-stormwater discharge to on-site stormwater Best Management Practices. Any illicit discharges identified during or after construction will be immediately disconnected in accordance with the Standards.

Signed: ______________________________
Sean P. Reardon, P.E.
Vice President

Marlborough Technology Park
100 Nickerson Road, Marlborough, MA 01752
Tel 508.786.2200 Fax 508.786.2201 tetratech.com

Appendix J

Drainage Collection System Design Calculations

Hastings Street Plaza

Hastings Street and Washington Street
Mendon, Massachusetts

Element ID	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Peak Flow (cfs)
CB-01	437.00	442.00	0.00
CB-02	433.40	440.40	1.53
CB-03	433.40	440.40	1.79
CB-04	433.40	440.40	1.76
CB-05	433.40	440.40	2.16
CB-06	433.40	440.40	1.47
CB-07	436.25	443.25	1.55
CB-08	436.25	443.25	1.50
CB-09	438.40	445.40	0.28
CB-10	438.00	445.00	0.52
CB-11	438.50	445.50	0.63
CB-12	437.45	444.45	1.00
CB-13	438.50	445.50	0.86
CB-14	438.50	445.50	1.40
CB-15	434.50	441.50	0.39
CB-16	435.40	442.40	0.74
CB-17	434.80	441.80	1.02
CB-18	431.10	438.10	2.95

Hastings Street Plaza
Hastings Street and Washington Street
Mendon, Massachusetts

Area (acres)	Drainage Node ID	Weighted Runoff Coefficient	Total Runoff (inches)	Peak Runoff (cfs)	Rainfall Intensity (inches/hr)	Time of Concentration (days hh:mm:ss)
0.28	CB-01	0.8800	0.55	1.53	6.194	0 00:06:00
0.34	CB-02	0.8500	0.53	1.79	6.194	0 00:06:00
0.33	CB-03	0.8600	0.53	1.76	6.194	0 00:06:00
0.40	CB-04	0.8700	0.54	2.16	6.194	0 00:06:00
0.27	CB-05	0.8800	0.55	1.47	6.194	0 00:06:00
0.33	CB-06	0.7600	0.47	1.55	6.194	0 00:06:00
0.31	CB-07	0.7800	0.48	1.50	6.194	0 00:06:00
0.07	CB-08	0.6400	0.40	0.28	6.194	0 00:06:00
0.10	CB-09	0.8400	0.52	0.52	6.194	0 00:06:00
0.12	CB-10	0.8500	0.53	0.63	6.194	0 00:06:00
0.20	CB-11	0.8100	0.50	1.00	6.194	0 00:06:00
0.18	CB-12	0.7700	0.48	0.86	6.194	0 00:06:00
0.26	CB-13	0.8700	0.54	1.40	6.194	0 00:06:00
0.21	CB-14	0.3000	0.19	0.39	6.194	0 00:06:00
0.15	CB-15	0.8000	0.50	0.74	6.194	0 00:06:00
0.19	CB-16	0.8700	0.54	1.02	6.194	0 00:06:00
0.17	CB-17	0.9000	0.56	0.95	6.194	0 00:06:00
0.36	CB-17	0.9000	0.56	2.01	6.194	0 00:06:00
0.41	CB-18	0.9000	0.56	2.29	6.194	0 00:06:00
1.48	RoofDrains	0.9000	0.56	8.25	6.194	0 00:06:00

Hastings Street Plaza

Hastings Street and Washington Street

Mendon, Massachusetts

Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Peak Inflow (cfs)	Maximum HGL Elevation Attained (ft)	Maximum HGL Depth Attained (ft)	Minimum Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)
DMH-01	436.48	440.70	3.30	437.16	0.68	3.54	436.56	0.08
DMH-02	435.03	440.70	4.96	435.81	0.78	4.89	435.12	0.09
DMH-03	433.71	440.70	7.05	434.74	1.03	5.96	433.84	0.13
DMH-04	437.59	443.10	3.01	438.16	0.57	4.94	437.67	0.08
DMH-05	431.78	440.70	11.28	433.13	1.35	7.57	431.96	0.18
DMH-06	429.20	434.00	11.33	430.42	1.22	3.58	429.37	0.17
DMH-07	441.81	444.80	0.71	442.10	0.29	2.70	441.84	0.03
DMH-08	441.33	445.00	2.16	441.90	0.57	3.10	441.41	0.08
DMH-09	440.42	445.50	2.88	441.27	0.85	4.23	440.53	0.11
DMH-10	437.95	443.37	2.49	438.56	0.61	4.81	438.03	0.08
DMH-11	435.66	444.55	5.17	436.65	0.99	7.90	435.80	0.14
DMH-12	434.76	441.75	6.01	435.80	1.04	5.95	434.91	0.15
DMH-13	433.58	438.20	5.90	434.80	1.23	3.40	433.75	0.18
DMH-14	433.25	438.20	7.59	434.34	1.09	3.86	433.43	0.18
DMH-15	431.86	438.70	9.11	433.25	1.39	5.45	432.10	0.24
WQS-1	431.37	440.98	11.29	432.44	1.07	8.54	431.51	0.14
WQS-2	431.55	438.50	9.11	432.79	1.24	5.71	431.76	0.21

Hastings Street Plaza
Hastings Street and Washington Street
Mendon, Massachusetts

From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Pipe Diameter or Height (inches)	Peak Flow (cfs)	Max Flow Velocity (ft/sec)	Design Flow Capacity (cfs)	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Max Flow Depth (ft)
CB-01	DMH-01	46.00	437.40	436.48	2.0000	12.000	1.52	3.78	5.46	0.28	0.54	0.54
CB-02	DMH-01	15.00	437.40	437.10	2.0000	12.000	1.78	4.96	5.46	0.33	0.47	0.46
CB-03	DMH-02	15.00	437.40	437.10	2.0000	12.000	1.75	4.93	5.46	0.32	0.46	0.46
CB-04	DMH-03	15.00	437.40	437.10	2.0000	12.000	2.14	5.16	5.46	0.39	0.52	0.52
CB-05	DMH-05	16.00	437.40	437.08	2.0000	12.000	1.46	4.78	5.46	0.27	0.41	0.41
CB-06	DMH-04	133.00	440.25	437.59	2.0000	12.000	1.53	5.14	5.46	0.28	0.46	0.46
CB-07	DMH-04	15.00	440.25	439.95	2.0000	12.000	1.49	4.76	5.46	0.27	0.42	0.42
CB-08	DMH-07	28.00	442.40	442.12	1.0000	12.000	0.24	2.55	3.86	0.06	0.18	0.18
CB-09	DMH-07	19.00	442.00	441.81	1.0000	12.000	0.55	4.13	3.86	0.14	0.28	0.28
CB-10	DMH-08	148.00	442.50	441.02	1.0000	12.000	0.61	2.17	3.43	0.18	0.42	0.42
CB-11	DMH-08	30.00	441.45	441.15	1.0000	12.000	0.98	4.37	2.44	0.40	0.55	0.55
CB-12	DMH-09	60.00	442.50	441.90	1.0000	12.000	0.84	3.67	3.86	0.22	0.33	0.33
CB-13	DMH-10	40.00	442.50	440.30	5.5000	12.000	1.39	7.57	9.05	0.15	0.28	0.28
CB-14	DMH-10	55.00	438.50	437.95	1.0000	12.000	0.38	1.32	3.86	0.10	0.41	0.41
CB-15	DMH-10	67.00	439.40	438.73	1.0000	12.000	0.72	3.55	3.86	0.19	0.31	0.31
CB-16	DMH-12	8.00	438.80	438.72	1.0000	12.000	1.02	3.40	3.86	0.26	0.41	0.40
CB-17	DMH-14	33.00	435.10	434.77	1.0000	12.000	2.91	4.66	3.86	0.75	0.75	0.74
CB-18	DMH-15	103.00	434.50	433.47	1.0000	12.000	2.22	4.74	3.86	0.57	0.58	0.58
DMH-01	DMH-02	60.00	436.48	435.28	2.0000	12.000	3.26	6.42	5.46	0.60	0.62	0.62
DMH-02	DMH-03	66.00	435.03	433.71	2.0000	15.000	4.97	5.23	9.90	0.50	0.72	0.90
DMH-03	DMH-05	59.00	433.71	432.53	2.0000	15.000	7.00	7.40	9.90	0.71	0.72	0.90
DMH-04	DMH-05	140.00	437.59	434.79	2.0000	12.000	2.91	6.67	5.46	0.53	0.54	0.54
DMH-05	WQS-1	16.00	431.78	431.62	1.0000	24.000	11.29	6.03	24.51	0.46	0.58	1.15
DMH-06	FES-2	60.00	429.20	428.60	1.0000	24.000	11.21	6.44	24.51	0.46	0.54	1.09
DMH-07	DMH-08	48.00	441.81	441.33	1.0000	12.000	0.70	2.18	3.86	0.18	0.43	0.43
DMH-08	DMH-09	91.00	441.33	440.42	1.0000	12.000	2.12	3.57	3.86	0.55	0.71	0.71
DMH-09	DMH-11	26.00	440.42	440.16	1.0000	12.000	2.85	4.56	3.86	0.74	0.74	0.74
DMH-10	DMH-11	179.00	437.95	436.16	1.0000	12.000	2.34	4.92	3.86	0.61	0.58	0.58
DMH-11	DMH-12	181.00	435.66	434.76	0.5000	18.000	5.18	4.11	8.05	0.64	0.67	1.01
DMH-12	DMH-13	236.00	434.76	433.58	0.5000	18.000	5.90	4.26	8.05	0.73	0.75	1.12
DMH-13	DMH-14	66.00	433.58	433.25	0.5000	18.000	5.75	3.94	8.05	0.71	0.77	1.16
DMH-14	DMH-15	89.00	433.25	432.36	1.0000	18.000	7.58	6.10	11.38	0.67	0.66	1.00
DMH-15	WQS-2	12.00	431.86	431.80	0.5000	24.000	9.11	4.58	17.33	0.53	0.61	1.21
WQS-1	DMH-06	217.00	431.37	429.20	1.0000	24.000	11.33	6.18	24.51	0.46	0.57	1.14
WQS-2	FES-1	95.00	431.55	431.07	0.5000	24.000	9.14	4.96	17.33	0.53	0.57	1.14
RoofDrains	Infiltration	40.00	435.80	435.00	2.0000	18.000	8.23	7.40	16.09	0.51	0.61	0.91
AreaDrain	DMH-14	81.80	437.00	435.36	2.0000	12.000	0.00	0.00	5.46	0.00	0.00	0.00

Appendix G

Fiscal Impact Assessment Memo

TETRA TECH

MEMO

To:	John Nenart, Hastings Street Plaza LLC
From:	Sean P. Reardon, PE – Tetra Tech, Inc.
Date:	April 20, 2022
Subject:	**Fiscal Impact Assessment** Mixed Use Development Project 35-37 Hastings Street 18-20 Washington Street Mendon, Massachusetts

The following summarizes the estimated Fiscal Impact of the proposed mixed-use re-development of an 18.3-acre assemblage of land located at the intersection of Hastings Street and Millville Road and extending north to Washington Street.

Please note, the home on the 18 Washington Street parcel has a street address of 12 Washington Street. The parcel reference is being used in this document for consistency with Assessor's data.

Project Description

The Project includes the construction of a 63,000 square-foot (sf) shopping center with a supermarket, 3,600 sf full-service bank with a drive thru, and 27 single-family homes on an 18.3-acre assemblage of land currently occupied by a driving range, a restaurant and two single family homes. The existing home at 18 Washington Street will be preserved while all other existing uses at the site will be discontinued and structures demolished as part of the redevelopment.

The Project Site comprises four (4) separate parcels:

- 35 Hastings Street (Parcel ID: 11-142-35-0)
- 37 Hastings Street (Parcel ID: 11-142-37-0)
- 18 Washington Street (Parcel ID: 8-242-18-0)
- 20 Washington Street (Parcel ID: 8-242-20-0)

The Project is also expected to include construction of a new roundabout at the Hastings Street/Uxbridge Road/Millville Road intersection that will address existing deficiencies at the intersection while accommodating the proposed new uses and associated traffic demands. Although the roadway improvements have no direct fiscal impact, addressing existing capacity and safety issues at the intersection will have a significant quality of life benefit.

Current Annual Town Revenue

For the purposes of this analysis Annual Town Revenue is calculated as the sum of Property Tax, Excise Tax and Building Permit Fees. Other actual or potential revenue sources are considered inconsequential and have been omitted for the purpose of clarity and simplicity.

Property Taxes for 2021 and 2022 for each of the development parcels are summarized in Table 1.

Table 1 – Project Site Current Property Tax

Tax History								
Property ID			2021			2022		
Address	Map	Parcel	Property Value	Tax Rate	Tax	Property Value	Tax Rate	Tax
35 Hastings	11	142-35	$ 314,000	$ 16.79	$ 5,272	$ 321,200	$ 15.41	$ 4,950
37 Hastings	11	142-37	$ 1,019,700	$ 16.79	$ 17,121	$ 1,051,200	$ 15.41	$ 16,199
18 Washington	8	242-18	$ 291,400	$ 16.79	$ 4,893	$ 333,500	$ 15.41	$ 5,139
20 Washington	8	242-20	$ 259,800	$ 16.79	$ 4,362	$ 285,800	$ 15.41	$ 4,404
			$ 1,884,900		**$ 31,647**	$ 1,991,700		**$ 30,692**

Excise tax was estimated by assuming 1.5 vehicles/home with an average vehicle value of $10,000. Applying the town excise tax rate of $25 per $1,000 vehicle value results in an Excise Tax of $375 per household. Given there are two homes currently located on the project site the estimated current excise tax revenue is $750/year.

No significant Building Permit Fees were paid in 2021 or are expected in 2022

Town Revenue from the subject parcels was **$32,397** in 2021 and **$31,442** in 2022.

Estimated Project Property Value

The Property Value will increase substantially at the Project Site due to the significant investment in building improvements. For the purposes of this analysis Project Property Value was estimated by applying a unit valuation to each property based on its anticipated use. Unit valuations were determined based on the expected cost of construction and comparison to assessed values of similar facilities in Mendon. The unit valuations and corresponding developed property values are presented in Table 2.

Table 2 – Project Site Developed Value

Project Estimated Property Value							
Address	Map	Parcel	Use	Size		Value/unit	Property Value
35 Hastings	11	142-35	Bank	3,600	s.f.	$ 125	$ 450,000
37 Hastings	11	142-37	Shopping Center	63,000	s.f.	$ 175	$ 11,025,000
18 Washington	8	242-18	Residential	27	homes	$ 400,000	$ 10,800,000
20 Washington	8	242-20	Land	44,000	s.f.	$ 5	$ 220,000
							$ 22,495,000

Based on a comparison of pre- and post-development conditions, the Project is estimated to result in more than $20 million of added property value.

Comparison of Town Revenue (With and Without the Project)

Table 3 and Table 4 compare estimated Town Revenue with and without the Project for the 10-year period from 2021 to 2030. The estimates incorporate a permitting and construction schedule forecast as follows:

- 2022 - Design and Permitting
- 2023 - Demolition and Construction Start
- 2024 - 75% Project Completion
- 2025 - 100% Project Completion

The estimates carry forward an expected 9% year-to-year property value increase which is in line with Massachusetts residential and commercial property value increases over the last decade and reasonably consistent with 2021 and 2022 Mendon tax assessments. The table also incorporates expected changes in property value during the construction period as well as the expected impact of building permit fees and excise task increases.

Table 3- Town Revenue Projection (without Project)

Town Revenue Projection - Without Project										
Item	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Property Value	$ 1,884,900	$ 1,991,700	$ 2,170,953	$ 2,366,339	$ 2,579,309	$ 2,811,447	$ 3,064,477	$ 3,340,280	$ 3,640,906	$ 3,968,587
Property Tax Rate	$ 16.79	$ 15.41	$ 16.75	$ 16.75	$ 16.75	$ 16.75	$ 16.75	$ 16.75	$ 16.75	$ 16.75
Property Tax	$ 31,647	$ 30,692	$ 36,363	$ 39,636	$ 43,203	$ 47,092	$ 51,330	$ 55,950	$ 60,985	$ 66,474
Excise Tax	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750
Permit Fees	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Revenue	**$ 32,397**	**$ 31,442**	**$ 37,113**	**$ 40,386**	**$ 43,953**	**$ 47,842**	**$ 52,080**	**$ 56,700**	**$ 61,735**	**$ 67,224**

Table 4 - Town Revenue Projection (with Project)

Town Revenue Projection - With Project										
Item	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Property Value	$ 1,884,900	$ 1,991,700	$ 1,500,000	$ 16,871,250	$ 22,495,000	$ 24,519,550	$ 26,726,310	$ 29,131,677	$ 31,753,528	$ 34,611,346
Property Tax Rate	$ 16.79	$ 15.41	$ 16.75	$ 16.75	$ 16.75	$ 16.75	$ 16.75	$ 16.75	$ 16.75	$ 16.75
Property Tax	$ 31,647	$ 30,692	$ 25,125	$ 282,593	$ 376,791	$ 410,702	$ 447,666	$ 487,956	$ 531,872	$ 579,740
Excise Tax	$ 750	$ 750	$ -	$ 7,500	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000
Permit Fees	$ -	$ -	$ 201,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Revenue	**$ 32,397**	**$ 31,442**	**$ 226,125**	**$ 290,093**	**$ 386,791**	**$ 420,702**	**$ 457,666**	**$ 497,956**	**$ 541,872**	**$ 589,740**

As shown in Tables 3 and 4, the Project will result in a substantial increase in Town Revenue beginning immediately at the start of construction. Any temporary loss in property value due to demolition of existing uses will be easily offset by expected Building Permit Fees paid during that same period.

Table 5 shows the anticipated increase in annual Town Revenue resulting from the proposed Mixed-Use Development.

Table 5 - Project Net Revenue Impact

	2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Revenue Increase	**$ -**	**$ -**	**$ 189,012**	**$ 249,707**	**$ 342,838**	**$ 372,860**	**$ 405,586**	**$ 441,256**	**$ 480,137**	**$ 522,516**

Summary of Fiscal Impact

The Project proposes the re-development of existing land and despite the increased density is not expected to significantly increase administration or operational costs for the Town of Mendon. All Project roads and infrastructure will be maintained by the Project and no additional Police or Fire Department personnel, training or equipment are required to serve the proposed uses.

The only significant increased cost to the Town of Mendon is the cost of educating children that may live in the Project's 25 additional single-family homes. The homes being proposed are limited to two-bedrooms which generate far fewer school-aged children than the typical Mendon household with 3-4 bedrooms. Existing Mendon households generate approximately 1 student per household. Given the reduced likelihood of school aged children in 2-bedroom homes, we have assumed 1 student for every 2 housing units for the purposes of this analysis.

Table 6 summarizes the net Project Fiscal Impact through 2030 assuming an annual 7% increase in education cost per student.

Table 6 – Project Net Fiscal Impact

Project Impact on Town Reveue										
	2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Add'l Students (FTE)	0	0	-2	10	13	13	13	13	13	13
Cost/Student	$10,000.00	$10,700.00	$11,449.00	$12,250.43	$13,107.96	$14,025.52	$15,007.30	$16,057.81	$17,181.86	$18,384.59
Add'l Education Cost	$ -	$ -	$ (22,898)	$ 122,504	$ 170,403	$ 182,332	$ 195,095	$ 208,752	$ 223,364	$ 239,000
Revenue Increase	$ -	$ -	$ 189,012	$ 249,707	$ 342,838	$ 372,860	$ 405,586	$ 441,256	$ 480,137	$ 522,516
Net Fiscal Impact	**$ -**	**$ -**	**$ 211,910**	**$ 127,203**	**$ 172,434**	**$ 190,528**	**$ 210,491**	**$ 232,504**	**$ 256,773**	**$ 283,517**

As demonstrated in Table 6, the Project will result in a significant positive Fiscal Impact for the town of Mendon based on anticipated Property/Excise Taxes and Permit Fees alone. When combined with the other Project-related economic benefits from increased construction and permanent jobs and increased demand for local services, the Project will result in a consistent and significant positive fiscal impact for the Town of Mendon.

P:\305225\143-305225-20004 (35-37 HASTINGS)\DOCS\SPECIAL PERMIT AND SITE PLAN REVIEW\FISCAL IMPACT ANALYSIS.DOCX

Appendix H

Certified Abutters List and Mailing Labels

TOWN OF MENDON
BOARD OF ASSESSORS
20 MAIN STREET
MENDON, MA 01756
508-473-2738
508-478-8241 (Fax)
e-mail: assessor@mendonma.gov

March 23, 2022

PROPERTY LOCATION(S):	*35 Hastings Street, Mendon, Massachusetts*
	Assessor's Map #11-142-35
	AND
	37 Hastings Street, Mendon, Massachusetts
	Assessor's Map #11-142-37
PROPERTY OWNER(S):	*Hastings Street Plaza LLC*
OWNER(S) ADDRESS:	*P. O. Box 444*
	Mendon, MA 01756-0444
RECORDED:	*Worcester Registry of Deeds*
	December 31, 2018, Book #59891, Page #137
	AND
PROPERTY LOCATION:	*18 Washington Street, Mendon, Massachusetts*
	Assessor's Map # 8-242-18
PROPERTY OWNER(S):	*Hastings Street Plaza LLC*
OWNER(S) ADDRESS:	*P. O. Box 444*
	Mendon, MA 01756-0444
RECORDED:	*Worcester Registry of Deeds*
	June 12, 2020, Book #62576, Page #72
	AND
PROPERTY LOCATION:	*20 Washington Street, Mendon Massachusetts*
	Assessor's Map #8-242-20
PROPERTY OWNER(S):	*Determination, Inc.*
OWNER(S) ADDRESS:	*8 Uxbridge Road*
	Mendon, MA 01756
RECORDED:	*Worcester Registry of Deeds*
	December 7, 2021, Book #66688, Page #264

The attached 300' abutter's list is true and accurate to the best of our knowledge.

Sincerely,

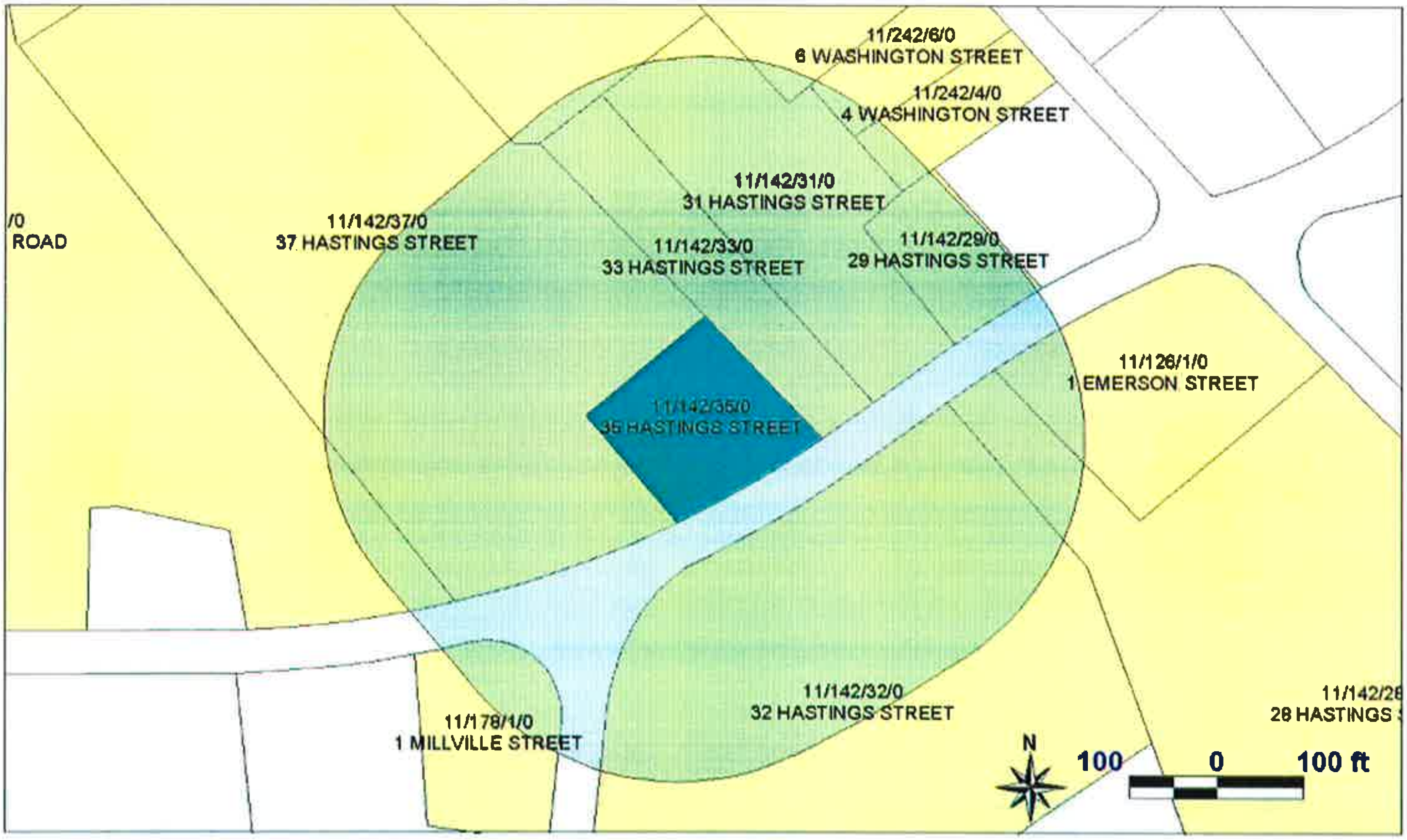
Jean M. Berthold, MAA
Principal Assessor

Attachments

This list is valid for 30 days from the date of certification.

TOWN OF MENDON, MA
BOARD OF ASSESSORS
20 Main Street, Mendon, MA 01756

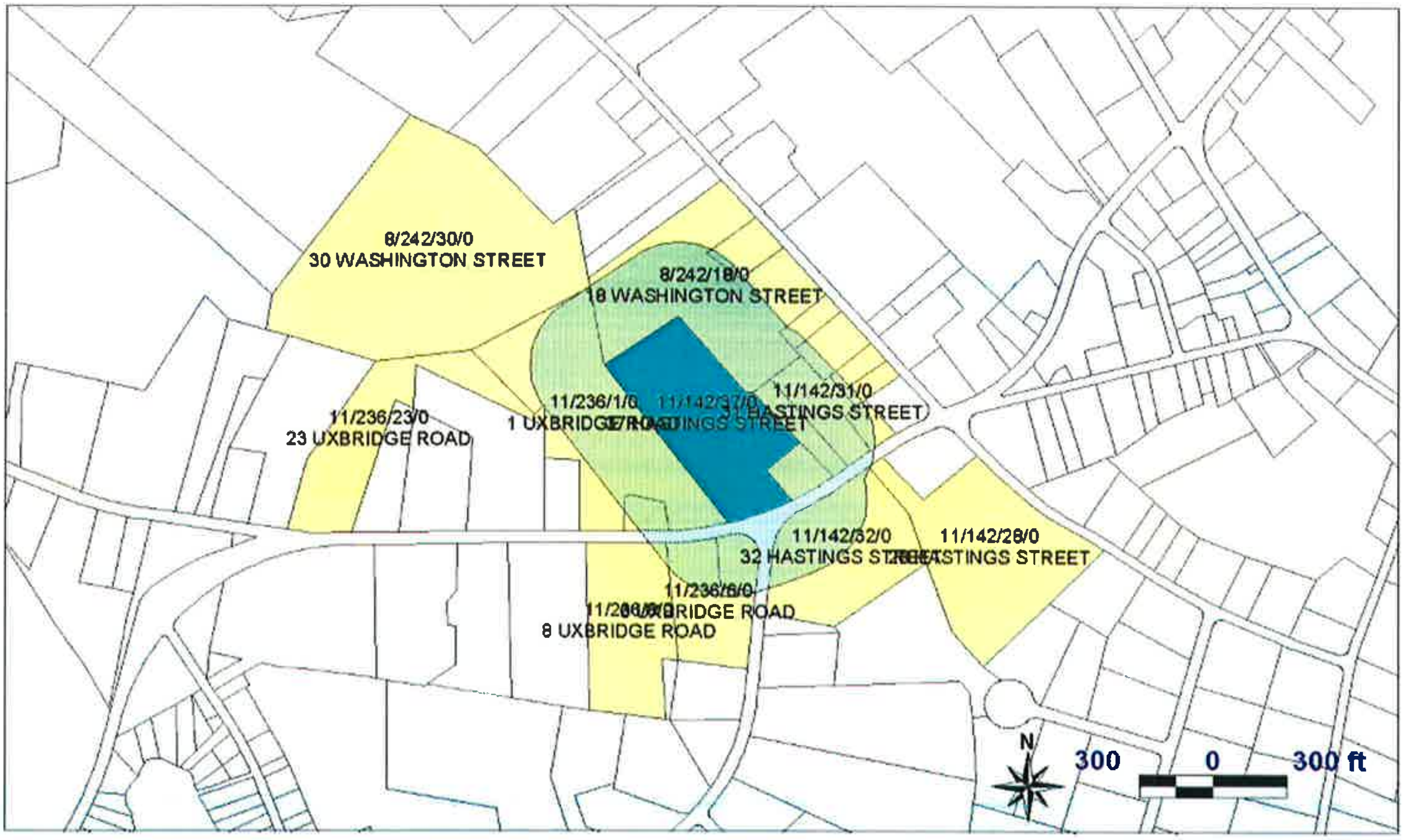
Abutters List Within 300 feet of Parcel 11/142/35/0



Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
413	8-242-18-0-R	HASTINGS STREET PLAZA LLC	18 WASHINGTON STREET	P O BOX 444	MENDON	MA	01756-0444
731	11-126-1-0-R	ONE EMERSON STREET INC	1 EMERSON STREET	46 MISCOE ROAD	MENDON	MA	01756
770	11-142-28-0-R	28 HASTINGS STREET CORP	28 HASTINGS STREET	46 MISCOE ROAD	MENDON	MA	01756
771	11-142-29-0-R	AMBRO DEVELOPMENT LLC	29 HASTINGS STREET	25 HASTINGS STREET	MENDON	MA	01756
772	11-142-31-0-R	COFFIN PETER & JULIE N	31 HASTINGS STREET	3 OLD SAW MILL ROAD	MENDON	MA	01756
773	11-142-32-0-R	COUNTRY PLAZA LLC	32 HASTINGS STREET	P O BOX 444	MENDON	MA	01756-0444
774	11-142-33-0-R	BUTZ DAVID E	33 HASTINGS STREET	33 HASTINGS STREET	MENDON	MA	01756
775	11-142-35-0-R	HASTINGS STREET PLAZA LLC	35 HASTINGS STREET	P O BOX 444	MENDON	MA	01756-0444
776	11-142-37-0-R	HASTINGS STREET PLAZA LLC	37 HASTINGS STREET	P O BOX 444	MENDON	MA	01756-0444
842	11-178-1-0-R	UXBRIDGE ROAD LLC	1 MILLVILLE STREET	P O BOX 444	MENDON	MA	01756-0444
948	11-236-1-0-R	D FRANCIS MURPHY INSURANCE AGENCY INC	1 UXBRIDGE ROAD	50 MAIN STREET	HUDSON	MA	01749
994	11-242-4-0-R	BUTLER DOROTHY M (LE) & TRUDY A BUTLER	4 WASHINGTON STREET	4 WASHINGTON STREET	MENDON	MA	01756
996	11-242-6-0-R	WHITE WILLIAM D & JANET L	6 WASHINGTON STREET	6 WASHINGTON STREET	MENDON	MA	01756
998	11-242-8-0-R	DEHEY KATHRYN A	8 WASHINGTON STREET	8 WASHINGTON STREET	MENDON	MA	01756

TOWN OF MENDON, MA
BOARD OF ASSESSORS
20 Main Street, Mendon, MA 01756

Abutters List Within 300 feet of Parcel 11/142/37/0

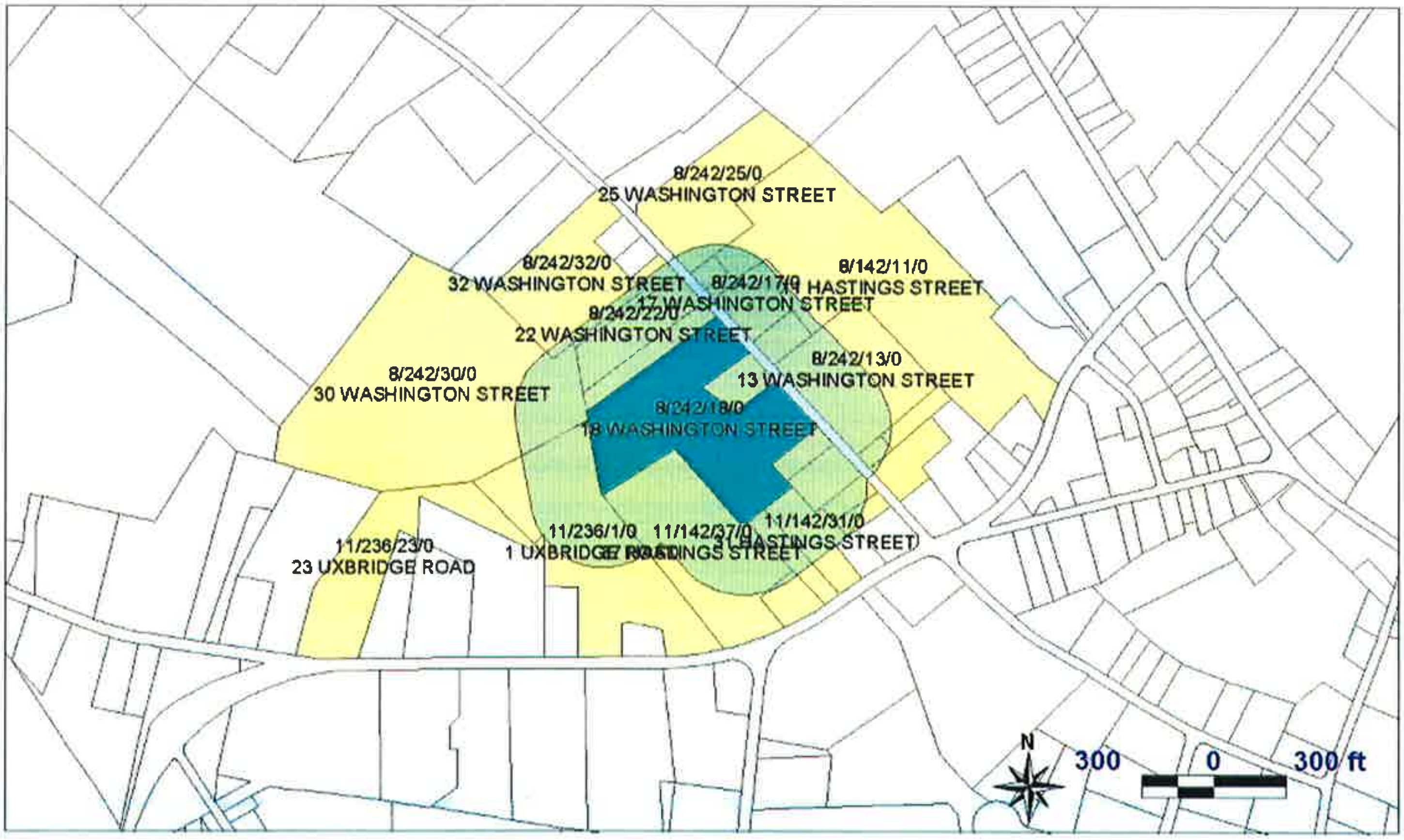


Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
411	8-242-16-0-R	CHENELLE BRENDAN F & CAILIN E	16 WASHINGTON STREET	16 WASHINGTON STREET	MENDON	MA	01756
413	8-242-18-0-R	HASTINGS STREET PLAZA LLC	18 WASHINGTON STREET	P O BOX 444	MENDON	MA	01756-0444
422	8-242-30-0-R	QUIRK JOHN E SR TRUSTEE QUIRK FAMILY REALTY TRUST	30 WASHINGTON STREET	14 PARK STREET	MENDON	MA	01756
770	11-142-28-0-R	28 HASTINGS STREET CORP	28 HASTINGS STREET	46 MISCOE ROAD	MENDON	MA	01756
771	11-142-29-0-R	AMBRO DEVELOPMENT LLC	29 HASTINGS STREET	25 HASTINGS STREET	MENDON	MA	01756
772	11-142-31-0-R	COFFIN PETER & JULIE N	31 HASTINGS STREET	3 OLD SAW MILL ROAD	MENDON	MA	01756
773	11-142-32-0-R	COUNTRY PLAZA LLC	32 HASTINGS STREET	P O BOX 444	MENDON	MA	01756-0444
774	11-142-33-0-R	BUTZ DAVID E	33 HASTINGS STREET	33 HASTINGS STREET	MENDON	MA	01756
775	11-142-35-0-R	HASTINGS STREET PLAZA LLC	35 HASTINGS STREET	P O BOX 444	MENDON	MA	01756-0444
776	11-142-37-0-R	HASTINGS STREET PLAZA LLC	37 HASTINGS STREET	P O BOX 444	MENDON	MA	01756-0444
842	11-178-1-0-R	UXBRIDGE ROAD LLC	1 MILLVILLE STREET	P O BOX 444	MENDON	MA	01756-0444
948	11-236-1-0-R	D FRANCIS MURPHY INSURANCE AGENCY INC	1 UXBRIDGE ROAD	50 MAIN STREET	HUDSON	MA	01749
949	11-236-5-0-R	QUIRK JOHN E JR	5 UXBRIDGE ROAD	14B PARK STREET	MENDON	MA	01756
950	11-236-6-0-R	FINO MATTHEW J & LENA M TRS FINO REALTY TRUST II	6 UXBRIDGE ROAD	21 NORTHBRIDGE STREET	MENDON	MA	01756
951	11-236-8-0-R	LEAHPATRICK LLC	8 UXBRIDGE ROAD	P O BOX 444	MENDON	MA	01756-0444

Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
957	11-236-23-0-R	QUIRK JAMES M & JOHN E JR.	23 UXBRIDGE ROAD	23 UXBRIDGE ROAD	MENDON	MA	01756
994	11-242-4-0-R	BUTLER DOROTHY M (LE) & TRUDY A BUTLER	4 WASHINGTON STREET	4 WASHINGTON STREET	MENDON	MA	01756
996	11-242-6-0-R	WHITE WILLIAM D & JANET L	6 WASHINGTON STREET	6 WASHINGTON STREET	MENDON	MA	01756
998	11-242-8-0-R	DEHEY KATHRYN A	8 WASHINGTON STREET	8 WASHINGTON STREET	MENDON	MA	01756
1000	11-242-10-0-R	VARTABEDIAN HELEN V TRUSTEE VARTABEDIAN FAMILY TRUST	10 WASHINGTON STREET	10 WASHINGTON STREET	MENDON	MA	01756

TOWN OF MENDON, MA
BOARD OF ASSESSORS
20 Main Street, Mendon, MA 01756

Abutters List Within 300 feet of Parcel 8/242/18/0

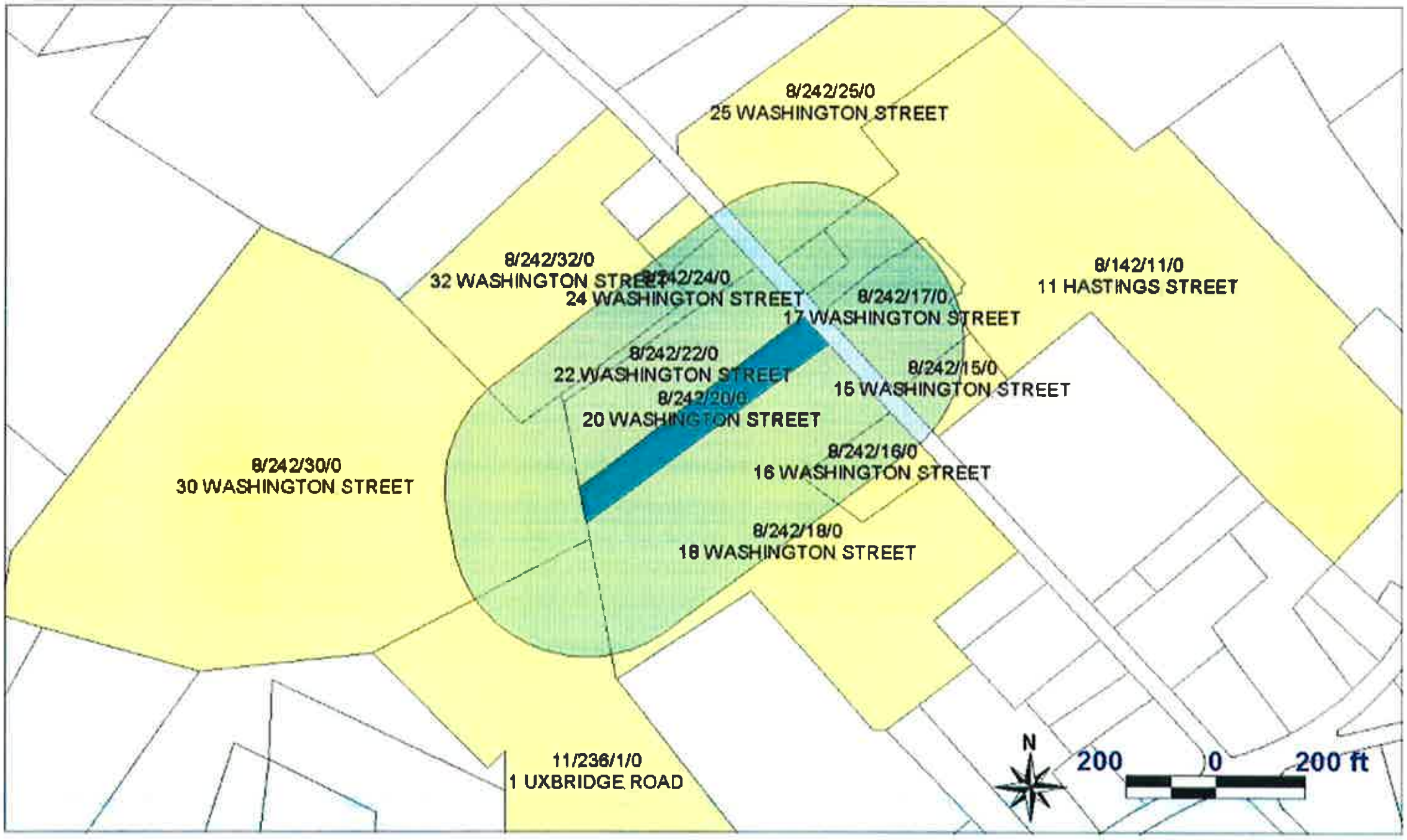


Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
298	8-142-11-0-R	PETERSON BRENNA K TRUSTEE MCSHANE WASHINGTON ST LEG TRST	11 HASTINGS STREET	19 WASHINGTON STREET	MENDON	MA	01756
409	8-242-13-0-R	GANNETT JOHN D JR & UTE D	13 WASHINGTON STREET	60 WASHINGTON STREET	MENDON	MA	01756
410	8-242-15-0-R	FALCONE DANIEL JAMES & STACY LAUREN FALCONE	15 WASHINGTON STREET	15 WASHINGTON STREET	MENDON	MA	01756
411	8-242-16-0-R	CHENELLE BRENDAN F & CAILIN E	16 WASHINGTON STREET	16 WASHINGTON STREET	MENDON	MA	01756
412	8-242-17-0-R	KRAUSS JASON E & KARA J	17 WASHINGTON STREET	17 WASHINGTON STREET	MENDON	MA	01756
413	8-242-18-0-R	HASTINGS STREET PLAZA LLC	18 WASHINGTON STREET	P O BOX 444	MENDON	MA	01756-0444
414	8-242-20-0-R	DETERMINATION INC	20 WASHINGTON STREET	8 UXBRIDGE ROAD	MENDON	MA	01756
415	8-242-21-0-R	MYERS CHARLES H & MARCIA A.	21 WASHINGTON STREET	PO BOX 362	MENDON	MA	01756
416	8-242-22-0-R	DONOHUE TIMOTHY & LAURA	22 WASHINGTON STREET	22 WASHINGTON STREET	MENDON	MA	01756
418	8-242-24-0-R	SWAN BARBARA J	24 WASHINGTON STREET	24 WASHINGTON STREET	MENDON	MA	01756
417	8-242-25-0-R	HACKENSON THOMAS JR & KATHRYN	25 WASHINGTON STREET	25 WASHINGTON STREET	MENDON	MA	01756
422	8-242-30-0-R	QUIRK JOHN E SR TRUSTEE QUIRK FAMILY REALTY TRUST	30 WASHINGTON STREET	14 PARK STREET	MENDON	MA	01756
424	8-242-32-0-R	GOURIEV VICTOR & ANNA	32 WASHINGTON STREET	32 WASHINGTON STREET	MENDON	MA	01756
772	11-142-31-0-R	COFFIN PETER & JULIE N	31 HASTINGS STREET	3 OLD SAW MILL ROAD	MENDON	MA	01756
774	11-142-33-0-R	BUTZ DAVID E	33 HASTINGS STREET	33 HASTINGS STREET	MENDON	MA	01756

Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
775	11-142-35-0-R	HASTINGS STREET PLAZA LLC	35 HASTINGS STREET	P O BOX 444	MENDON	MA	01756-0444
776	11-142-37-0-R	HASTINGS STREET PLAZA LLC	37 HASTINGS STREET	P O BOX 444	MENDON	MA	01756-0444
948	11-236-1-0-R	D FRANCIS MURPHY INSURANCE AGENCY INC	1 UXBRIDGE ROAD	50 MAIN STREET	HUDSON	MA	01749
957	11-236-23-0-R	QUIRK JAMES M & JOHN E JR.	23 UXBRIDGE ROAD	23 UXBRIDGE ROAD	MENDON	MA	01756
994	11-242-4-0-R	BUTLER DOROTHY M (LE) & TRUDY A BUTLER	4 WASHINGTON STREET	4 WASHINGTON STREET	MENDON	MA	01756
995	11-242-5-0-R	KLEIN TIMOTHY J & VOACH C	5 WASHINGTON STREET	5 WASHINGTON STREET	MENDON	MA	01756
996	11-242-6-0-R	WHITE WILLIAM D & JANET L	6 WASHINGTON STREET	6 WASHINGTON STREET	MENDON	MA	01756
997	11-242-7-0-R	MURPHY MARTHA	7 WASHINGTON STREET	101 ADIN STREET	HOPEDALE	MA	01747
998	11-242-8-0-R	DEHEY KATHRYN A	8 WASHINGTON STREET	8 WASHINGTON STREET	MENDON	MA	01756
999	11-242-9-0-R	MURPHY MARTHA	9 WASHINGTON STREET	10 ADIN STREET	HOPEDALE	MA	01747
1000	11-242-10-0-R	VARTABEDIAN HELEN V TRUSTEE VARTABEDIAN FAMILY TRUST	10 WASHINGTON STREET	10 WASHINGTON STREET	MENDON	MA	01756

TOWN OF MENDON, MA
BOARD OF ASSESSORS
20 Main Street, Mendon, MA 01756

Abutters List Within 300 feet of Parcel 8/242/20/0



Key	Parcel ID	Owner	Location	Mailing Street	Mailing City	ST	ZipCd/Country
298	8-142-11-0-R	PETERSON BRENNA K TRUSTEE MCSHANE WASHINGTON ST LEG TRST	11 HASTINGS STREET	19 WASHINGTON STREET	MENDON	MA	01756
410	8-242-15-0-R	FALCONE DANIEL JAMES & STACY LAUREN FALCONE	15 WASHINGTON STREET	15 WASHINGTON STREET	MENDON	MA	01756
411	8-242-16-0-R	CHENELLE BRENDAN F & CAILIN E	16 WASHINGTON STREET	16 WASHINGTON STREET	MENDON	MA	01756
412	8-242-17-0-R	KRAUSS JASON E & KARA J	17 WASHINGTON STREET	17 WASHINGTON STREET	MENDON	MA	01756
413	8-242-18-0-R	HASTINGS STREET PLAZA LLC	18 WASHINGTON STREET	P O BOX 444	MENDON	MA	01756-0444
414	8-242-20-0-R	DETERMINATION INC	20 WASHINGTON STREET	8 UXBRIDGE ROAD	MENDON	MA	01756
415	8-242-21-0-R	MYERS CHARLES H & MARCIA A.	21 WASHINGTON STREET	PO BOX 362	MENDON	MA	01756
416	8-242-22-0-R	DONOHUE TIMOTHY & LAURA	22 WASHINGTON STREET	22 WASHINGTON STREET	MENDON	MA	01756
418	8-242-24-0-R	SWAN BARBARA J	24 WASHINGTON STREET	24 WASHINGTON STREET	MENDON	MA	01756
417	8-242-25-0-R	HACKENSON THOMAS JR & KATHRYN	25 WASHINGTON STREET	25 WASHINGTON STREET	MENDON	MA	01756
420	8-242-26-0-R	MALNATI PAULA J	26 WASHINGTON STREET	117 HIGHLAND STREET	MILFORD	MA	01757
422	8-242-30-0-R	QUIRK JOHN E SR TRUSTEE QUIRK FAMILY REALTY TRUST	30 WASHINGTON STREET	14 PARK STREET	MENDON	MA	01756
424	8-242-32-0-R	GOURIEV VICTOR & ANNA	32 WASHINGTON STREET	32 WASHINGTON STREET	MENDON	MA	01756
948	11-236-1-0-R	D FRANCIS MURPHY INSURANCE AGENCY INC	1 UXBRIDGE ROAD	50 MAIN STREET	HUDSON	MA	01749

8-142-11-0

PETERSON BRENNA K TRUSTEE
MCSHANE WASHINGTON ST LEG TRST
19 WASHINGTON STREET
MENDON, MA 01756

8-242-13-0

GANNETT JOHN D JR & UTE D
60 WASHINGTON STREET
MENDON, MA 01756

8-242-15-0

FALCONE DANIEL JAMES &
STACY LAUREN FALCONE
15 WASHINGTON STREET
MENDON, MA 01756

8-242-16-0

CHENELLE BRENDAN F & CAILIN E
16 WASHINGTON STREET
MENDON, MA 01756

8-242-17-0

KRAUSS JASON E & KARA J
17 WASHINGTON STREET
MENDON, MA 01756

8-242-18-0

HASTINGS STREET PLAZA LLC
P O BOX 444
MENDON, MA 01756-0444

8-242-20-0

DETERMINATION INC
8 UXBRIDGE ROAD
MENDON, MA 01756

8-242-21-0

MYERS CHARLES H
& MARCIA A.
PO BOX 362
MENDON, MA 01756

8-242-22-0

DONOHUE TIMOTHY &
LAURA
22 WASHINGTON STREET
MENDON, MA 01756

8-242-24-0

SWAN BARBARA J
24 WASHINGTON STREET
MENDON, MA 01756

8-242-25-0

HACKENSON THOMAS JR &
KATHRYN
25 WASHINGTON STREET
MENDON, MA 01756

8-242-26-0

MALNATI PAULA J
117 HIGHLAND STREET
MILFORD, MA 01757

8-242-30-0

QUIRK JOHN E SR TRUSTEE
QUIRK FAMILY REALTY TRUST
14 PARK STREET
MENDON, MA 01756

8-242-32-0

GOURIEV VICTOR & ANNA
32 WASHINGTON STREET
MENDON, MA 01756

11-142-28-0

28 HASTINGS STREET CORP
46 MISCOE ROAD
MENDON, MA 01756

11-142-29-0

AMBRO DEVELOPMENT LLC
25 HASTINGS STREET
MENDON, MA 01756

11-142-31-0

COFFIN PETER & JULIE N
3 OLD SAW MILL ROAD
MENDON, MA 01756

11-142-32-0

COUNTRY PLAZA LLC
P O BOX 444
MENDON, MA 01756-0444

11-142-33-0

BUTZ DAVID E
33 HASTINGS STREET
MENDON, MA 01756

11-178-1-0

UXBRIDGE ROAD LLC
P O BOX 444
MENDON, MA 01756-0444

11-236-1-0

D FRANCIS MURPHY INSURANCE
AGENCY INC
50 MAIN STREET
HUDSON, MA 01749

11-236-5-0

QUIRK JOHN E JR
14B PARK STREET
MENDON, MA 01756

11-236-6-0

FINO MATTHEW J & LENA M TRS
FINO REALTY TRUST II
21 NORTHBRIDGE STREET
MENDON, MA 01756

11-236-8-0

LEAHPATRICK LLC
P O BOX 444
MENDON, MA 01756-0444

11-242-4-0

BUTLER DOROTHY M (LE)
& TRUDY A BUTLER
4 WASHINGTON STREET
MENDON, MA 01756

11-242-5-0

KLEIN TIMOTHY J & VOACH C
5 WASHINGTON STREET
MENDON, MA 01756

11-242-6-0

WHITE WILLIAM D & JANET L
6 WASHINGTON STREET
MENDON, MA 01756

11-242-7-0

MURPHY MARTHA
101 ADIN STREET
HOPEDALE, MA 01747

11-242-8-0

DEHEY KATHRYN A
8 WASHINGTON STREET
MENDON, MA 01756

11-242-10-0

VARTABEDIAN HELEN V TRUSTEE
VARTABEDIAN FAMILY TRUST
10 WASHINGTON STREET
MENDON, MA 01756

8-142-11-0

PETERSON BRENNA K TRUSTEE
MCSHANE WASHINGTON ST LEG TRST
19 WASHINGTON STREET
MENDON, MA 01756

8-242-13-0

GANNETT JOHN D JR & UTE D
60 WASHINGTON STREET
MENDON, MA 01756

8-242-15-0

FALCONE DANIEL JAMES &
STACY LAUREN FALCONE
15 WASHINGTON STREET
MENDON, MA 01756

8-242-16-0

CHENELLE BRENDAN F & CAILIN E
16 WASHINGTON STREET
MENDON, MA 01756

8-242-17-0

KRAUSS JASON E & KARA J
17 WASHINGTON STREET
MENDON, MA 01756

8-242-18-0

HASTINGS STREET PLAZA LLC
P O BOX 444
MENDON, MA 01756-0444

8-242-20-0

DETERMINATION INC
8 UXBRIDGE ROAD
MENDON, MA 01756

8-242-21-0

MYERS CHARLES H
& MARCIA A.
PO BOX 362
MENDON, MA 01756

8-242-22-0

DONOHUE TIMOTHY &
LAURA
22 WASHINGTON STREET
MENDON, MA 01756

8-242-24-0

SWAN BARBARA J
24 WASHINGTON STREET
MENDON, MA 01756

8-242-25-0

HACKENSON THOMAS JR &
KATHRYN
25 WASHINGTON STREET
MENDON, MA 01756

8-242-26-0

MALNATI PAULA J
117 HIGHLAND STREET
MILFORD, MA 01757

8-242-30-0

QUIRK JOHN E SR TRUSTEE
QUIRK FAMILY REALTY TRUST
14 PARK STREET
MENDON, MA 01756

8-242-32-0

GOURIEV VICTOR & ANNA
32 WASHINGTON STREET
MENDON, MA 01756

11-142-28-0

28 HASTINGS STREET CORP
46 MISCOE ROAD
MENDON, MA 01756

11-142-29-0

AMBRO DEVELOPMENT LLC
25 HASTINGS STREET
MENDON, MA 01756

11-142-31-0

COFFIN PETER & JULIE N
3 OLD SAW MILL ROAD
MENDON, MA 01756

11-142-32-0

COUNTRY PLAZA LLC
P O BOX 444
MENDON, MA 01756-0444

11-142-33-0

BUTZ DAVID E
33 HASTINGS STREET
MENDON, MA 01756

11-178-1-0

UXBRIDGE ROAD LLC
P O BOX 444
MENDON, MA 01756-0444

11-236-1-0

D FRANCIS MURPHY INSURANCE
AGENCY INC
50 MAIN STREET
HUDSON, MA 01749

11-236-5-0

QUIRK JOHN E JR
14B PARK STREET
MENDON, MA 01756

11-236-6-0

FINO MATTHEW J & LENA M TRS
FINO REALTY TRUST II
21 NORTHBRIDGE STREET
MENDON, MA 01756

11-236-8-0

LEAHPATRICK LLC
P O BOX 444
MENDON, MA 01756-0444

11-242-4-0

BUTLER DOROTHY M (LE)
& TRUDY A BUTLER
4 WASHINGTON STREET
MENDON, MA 01756

11-242-5-0

KLEIN TIMOTHY J & VOACH C
5 WASHINGTON STREET
MENDON, MA 01756

11-242-6-0

WHITE WILLIAM D & JANET L
6 WASHINGTON STREET
MENDON, MA 01756

11-242-7-0

MURPHY MARTHA
101 ADIN STREET
HOPEDALE, MA 01747

11-242-8-0

DEHEY KATHRYN A
8 WASHINGTON STREET
MENDON, MA 01756

11-242-10-0

VARTABEDIAN HELEN V TRUSTEE
VARTABEDIAN FAMILY TRUST
10 WASHINGTON STREET
MENDON, MA 01756

8-142-11-0

PETERSON BRENNA K TRUSTEE
MCSHANE WASHINGTON ST LEG TRST
19 WASHINGTON STREET
MENDON, MA 01756

8-242-13-0

GANNETT JOHN D JR & UTE D
60 WASHINGTON STREET
MENDON, MA 01756

8-242-15-0

FALCONE DANIEL JAMES &
STACY LAUREN FALCONE
15 WASHINGTON STREET
MENDON, MA 01756

8-242-16-0

CHENELLE BRENDAN F & CAILIN E
16 WASHINGTON STREET
MENDON, MA 01756

8-242-17-0

KRAUSS JASON E & KARA J
17 WASHINGTON STREET
MENDON, MA 01756

8-242-18-0

HASTINGS STREET PLAZA LLC
P O BOX 444
MENDON, MA 01756-0444

8-242-20-0

DETERMINATION INC
8 UXBRIDGE ROAD
MENDON, MA 01756

8-242-21-0

MYERS CHARLES H
& MARCIA A.
PO BOX 362
MENDON, MA 01756

8-242-22-0

DONOHUE TIMOTHY &
LAURA
22 WASHINGTON STREET
MENDON, MA 01756

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