



**LEBANON PLANNING BOARD
SEPTEMBER 25, 2023 - 6:30 PM
COUNCIL CHAMBERS, CITY HALL OR
REMOTE VIA VIRTUAL PLATFORM
LEBANONNH.GOV/LIVE**

-
- 1. Call to Order**
 - 2. Notice of Regional Impact**
 - 3. Public Hearing Items**
 - A. Quail I, LP, 69 Lily Lane (Tax Map 8, Lot 2, Plot 200), zoned R-3:**
Request for Site Plan Review to renew a previously approved Site Plan Approval (PB2019-13-SPR) to construct a new 32-unit, 50,000 square foot building for senior housing, together with associated site improvements, to be operated as part of the existing Quail Hollow Senior Living Community. **PB2023-30-SPR - Continued from September 25, 2023**
 - B. City of Lebanon, 160 Mechanic Street (Tax Map 105, Lot 27), zoned R-2:** Request for Site Plan Review to convert the use of the property to an emergency winter shelter. **PB2023-33-SPR** (NOTE: This application will be reviewed as a Governmental Land Use pursuant to RSA 674:54)
 - 4. Study Items**
 - A.** Review of proposed amendments to the Site Plan Review Regulations re: electric vehicle (EV) charging infrastructure - **Continued from July 24, 2023**
 - B.** Zoning Amendments - Review of proposed amendments to the Zoning Ordinance and Zoning Map
 - 5. Committee Reports**
 - A. City Council Subcommittees:**
 - Class VI Roads Advisory Committee
 - Lebanon Energy Advisory Committee
 - B. Other Subcommittees:**
 - City Council Representative
 - Heritage Commission
 - Pedestrian & Bicyclist Advisory Committee
 - Upper Valley Lake Sunapee Regional Planning Commission
 - UV Subcommittee of the Connecticut River Joint Commissions
 - Upper Valley Transportation Management Association
 - Mascoma River Local Advisory Committee
 - West Lebanon Revitalization Advisory Committee
 - Planning & Development Department – Task Status

- C. **Planning Board Subcommittees:**
 - Planning Board Capital Improvement Program
 - Planning Board Development Regulations Update
- D. Minor Site Plan Committee
- 6. **Other Business**
- 7. **Approval of Minutes**
 - A. None
- 8. **Adjournment**

The order of agenda items is subject to change.

Meetings are open for in-person and remote attendance. Members of the public that wish to attend remotely may do so by going to LebanonNH.gov/Live where you will find instructions on how to enter the meeting. Members of the public will be able to participate and ask questions through the City's virtual platform or by phone. Please note: Should technical difficulties occur during the meeting that disrupts virtual or phone connection(s), the meeting will continue without remote access capabilities.

CITY OF LEBANON
APPLICATION FOR

SPECIAL EXCEPTION	☐	☐	SITE PLAN REVIEW
VARIANCE	☐	☐	SUBDIVISION
MOTION FOR REHEARING	☐	☐	LOT LINE ADJUSTMENT
APPEAL OF AN ADMIN. DECISION	☐	☐	CONDITIONAL USE PERMIT
☐ OTHER _____			

PROPERTY OWNER (APPLICANT):			
NAME: <u>Quail 1, LP</u>		TEL.#: <u>802-999-7254</u>	
MAILING ADDRESS: <u>7 Aspen Drive, South Burlington, VT 05403</u>			
E-MAIL ADDRESS: <u>jgietink@summitpng.com</u>			
CO-APPLICANT, AGENT, OR LESSEE:			
NAME:		TEL.#:	
MAILING ADDRESS:			
E-MAIL ADDRESS:			
PROJECT LOCATION:			
TAX MAP #:	<u>8</u>	LOT#:	<u>2</u>
PLOT #:	<u>200</u>	ZONE:	<u>R-3</u>
STREET ADDRESS OF PROJECT: <u>69 Lily Lane</u>			
IS THIS PROPERTY LOCATED IN THE:			
WETLANDS		☐ YES	☒ NO
HISTORIC DISTRICT		☐ YES	☒ NO
FLOOD PLAIN		☐ YES	☒ NO
SCOPE OF PROJECT:			
<u>Renew a prior Planning Approval: PB2019-13-STR to conform to current zoning regulations</u>			
TYPE OF OCCUPANCY:			
EXISTING	☐ VACANT	☐ ONE FAMILY	☐ TWO FAMILY
PROPOSED	☐ VACANT	☐ ONE FAMILY	☐ TWO FAMILY
	☐ MULTI-FAMILY	☐ COMMERCIAL	☐ INDUSTRIAL
IF USE IS COMMERCIAL OR INDUSTRIAL , PLEASE NOTE SPECIFIC			
USE: <u>Senior Housing - 32 units</u>			
SIGNATURE BLOCK:			
FOR PLANNING BOARD APPLICATIONS ONLY: I, the undersigned, hereby submit this application on the date noted below with the knowledge and understanding that the Planning Board shall determine if the submitted application is complete according to its regulations at its next regularly scheduled meeting on _____, 20____, unless I personally request, in writing, that the Board delay its determination of completeness to a later date.			
PROPERTY OWNER: <u>Quail 1, LP by [Signature]</u>		DATE: <u>8/2/2023</u>	
NOTE: IF, AS OWNER, YOU WISH TO DESIGNATE AN AGENT TO ACT ON YOUR BEHALF, PLEASE READ THE FOLLOWING AND SIGN BELOW: I hereby designate the person listed above as my agent for the purpose of procuring the necessary local permits for the proposed work as described herein. Representations made by my agent may be accepted as though made by me personally, and I understand that I am bound by any official decision made on the basis of such representation.			
PROPERTY OWNER:		DATE:	
DATE RECEIVED	FILE # (MAP/LOT)	APPLICATION #	
<u>8/7/2023</u>	<u>8-2-200</u>	<u>PB2023-</u>	
		<u>30-SPR</u>	

(Last Revised 4/04/18)

PATHWAYS CONSULTING, LLC

Planning • Civil & Environmental Engineering • Surveying • Construction Assistance
240 Mechanic Street • Suite 100
Lebanon, New Hampshire 03766
(603) 448-2200 • Fax: (603) 448-1221

September 13, 2023

Tim Corwin, Zoning Administrator
Planning and Development Office
City of Lebanon
51 North Park Street
Lebanon, New Hampshire 03766

RE: APPLICATION FOR SITE PLAN REVIEW, QUAIL HOLLOW SENIOR LIVING
COMMUNITY, 69 LILY LANE, WEST LEBANON, NEW HAMPSHIRE
(Project No. 10112)

Dear Tim:

Please find enclosed application materials for Site Plan Review for the referenced project, in accordance with Section 9.1 of the City of Lebanon (City) Site Plan Review Regulations (Regulations). The application includes this cover letter, an application, a certified notification list, a technical checklist, a Project Narrative, Zoning Board Approval, Planning Board Site Plan Review approvals, the New Hampshire Department of Environmental Services (NHDES) permits for Alteration of Terrain, Sewer Discharge and Wetlands, NHDOT Driveway Permit, drainage analysis, other supplemental information, and an electronic version of the plans. One full-sized set of plans will be provided under separate cover.

The site is identified on the City Assessors' Map 8, Lot 2-200 containing 11.93 acres located in the Residential Three (R-3) Zoning District. The site is currently occupied by a Senior Living Complex, containing Quail Hollow Phases I & II. The Quail Hollow Phase I & II building is 115,944 square feet (SF) with 114 units. The applicant proposes to construct a 50,000 SF building with 32 units, an interior parking garage, an access drive, and additional surface parking spaces. On March 19, 2018 the applicant received approval from the City Zoning Board of Adjustment (ZBA) for a Special Exception to allow the construction of a 40-unit senior housing complex. After subsequent discussions with residents, the owners reduced the scope and size of the project to 32 units.

On September 9, 2019, Quail I, LP (Applicant) received Site Plan Review approval to construct a new 32 unit - 50,000 square foot building for senior housing with associated site improvements to be operated as part of the existing Quail Hollow Senior Living Community. On May 10, 2021, Quail I, LP received an extension of time to September 9, 2023 to obtain a building permit. Due to the economic and construction related impacts of the pandemic the Applicant is unable to start construction this fall. Since the Applicant cannot get another two year extension to the original Site Plan Review approval, the Applicant is requesting a new site plan review and approval under the current site plan review regulations.

A Sewer Use Permit and Sewer Allocation has been obtained from the City. All required fees have been paid by the Applicant and copy of the permit and allocation are included with this submission. In addition, a sewer permit has been obtained from NHDES for the new 32 units and a copy is included in this submission. Pathways previously prepared a memorandum for the Sewer and Wastewater Pump Station Capacity for Quail Hollow and determined that the critical design element for the flow rate (including the new 32 units) requires six hours of emergency storage volume in the event of a prolonged power failure. The required holding volume is more than the available emergency storage. It was recommended that an emergency standby generator be installed to address the emergency storage requirement.

The proposed site plan includes a design for the treatment of the additional stormwater created by the new building, associated access drive, and parking area. The Applicant requested a waiver to treating the stormwater from the existing Phase I & II building, drives, and parking areas. The City Department of Public Works (DPW) supported the waiver request provided the Applicant addresses the new stormwater flows from the new building and associated improvements. An Alteration of Terrain Permit has been obtained from NHDES for the stormwater associated with the new building, associated access drive and parking. A copy of the permit is included. The discussion included off-site drainage issues at East Wilder Road. The Applicant prepared a plan to address the off-site drainage and met with Christina Hall to review the concept. Christina agreed with the design and required the Applicant to pay for the improvements. In addition, the East Wilder Road improvements required review and approval from the NHDES Wetland Bureau. A Wetland Permit has been obtained from NHDES and a copy of the permit is included with this submission.

We are pleased to provide this Support Statement for Site Plan Review for the project on behalf of the Applicant. The following information is provided as required in accordance with Section 5.1 of the Regulations.

1. **Names and Addresses of Contributing Persons and Firms:** All names of contributing parties to the assembly of the Site Plan, supporting data, or submission materials have been included on the Site Plan and the certified notification list.
2. **Conservation Easements on Abutting Parcels:** There are no known conservation or agricultural easements on the property and abutting properties.
3. **Timetable for Construction and Completion of Project:** The Applicant plans to begin construction after receipt of all necessary permits and approvals from the City. It is anticipated that construction will begin in the fall of 2024.
4. **Request for Waivers:** In accordance with Article VII of the Site Plan Review Regulations, we have included an Application for Waivers.

We look forward to discussing this project at staff review and presenting this application to the Planning Board. Please do not hesitate to contact us if you have any questions.

Sincerely,

PATHWAYS CONSUTLING, LLC



Patrick A. Buccellato
Project Manager

PAB:meb

Enclosures

cc: John Giebink w/enclosures

QUAIL 1, LP
7 ASPEN DRIVE
SOUTH BURLINGTON, VT 05403
802-999-7254

Lebanon Planning Board
51 North Park Street
Lebanon, NH 03766

RE: Renewal of Approval for Quail 1, LP's project of 32 Senior Housing Units known as "Quail 5"; PB2019-13-SPR

Dear Board Members,

Quail 1, LP received your approval for a 32-unit senior housing addition to its Quail Hollow project in 2019. This approval was extended for 2 years in 2021 in the midst of the pandemic but the continued economic and construction related impacts from the pandemic have made it impossible to start the project this fall. In conversations with Tim Corwin, we were not able to further extend the original permit for another 2 years under the current regulations. We therefore respectfully request issuance of a renewed (new) permit under the new regulations. There has been no construction related changes to the Quail 5 project except to conform to the new regulations. Per Pat Buccellato of Pathways Engineering, the revisions are:

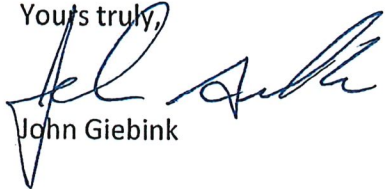
- Updating the parking chart on the cover,
- Updating the abutters on the context plan,
- Adding EV spaces and bicycle spaces on the layout plan. He found a spot for the short-term bicycle rack (5 required) but looking at the floor plan he did not see an area for the bicycle storage – we are requesting a waiver for this inside storage although I am sure that we can find spaces for inside bike racks down the road.

In the past 1.5 years, we have completed a substantial amount of work to the tune of about \$250,00. We have completed the following since the last extension:

1. 100% of the civil, architectural, structural, mechanical, electrical, fire system, etc plans have been completed and we have had initial pre-construction reviews with the Building Department, the Fire Department, DPW and other offices in preparation for commencement of construction. Nothing has changed on these plans.
2. Received and paid for the Sewer Allocation
3. Received and paid for the Lebanon Sewer Use Permit
4. Received the NHDES Sewer Connection Permit
5. Received the NHDES Wetlands and Non-Site Specific Permit
6. Received the NHDOT Driveway Permit

Bottom line is that everything is complete to pull a building permit, BUT pandemic and post-pandemic costs and availability of contractors and sub-contractors make the project not economically feasible to construct yet. I am guessing it will take another year plus for everything to settle down a bit more. But we are ready to go when that happens.

Yours truly,

A handwritten signature in blue ink, appearing to read 'John Giebink', written over the printed name.

John Giebink

CITY OF LEBANON, NEW HAMPSHIRE
SITE PLAN APPROVAL APPLICATION
For
THE LAKE HOUSE AT QUAIL HOLLOW

ATTACHMENT 1 - PROJECT NARRATIVE

I. PROJECT OVERVIEW

Quail I, L.P. (the “Applicant”) is requesting Site Plan Approval for the Lake House at Quail Hollow Senior Housing project (the “Project”). A Zoning Permit and Special Exception for the project was issued on March 19, 2018. We are seeking approval for this addition to Quail Hollow’s senior housing complex with congregate living facilities based on Lebanon’s ever-increasing need for senior housing, as well as the desire to allow residents to take advantage of the existing amenities at Quail Hollow.

Providing senior housing with supportive services for the elderly has been recognized as one of the highest priorities in the Lebanon and upper valley area. Lebanon has a growing senior population and a need for senior housing (*See Master Plan at §1C-3a*). The Project was approved as a single 40-unit senior housing building, containing 20 1-bedroom units and 20 2-bedroom units, with congregate living facilities located on the same parcel as the existing River House in the Quail Hollow Community in Lebanon (the “Property”). The Project will operate as an extension of the existing Quail Hollow Senior Living Community, which provides independent living with a wide range of optional support services. After discussing the project further with our existing residents post approval, we have decided to reduce the size and scope of the project to 32 units, containing 16 1-bedroom units and 16 2-bedroom units.

To meet the needs of the senior population in Lebanon and Grafton County, the Project integrates rental housing with the availability of optional on-site supportive services including nursing care and medical referrals, congregate meals, social and educational activities, health and wellness activities, 24-hour security and emergency response systems, housekeeping, informal legal and financial counseling, transportation coordination and other personal health services. With these optional services available in conjunction with their housing, seniors can “age in place” with dignity and security and defer or avoid the move into an expensive institutional facility or setting. The Project will bridge the gap between fully independent living and a nursing home. Quite simply, Quail Hollow has been a major a success and the Lake House Senior Housing project will enhance the character of the community.

While the primary benefit of the Project will be to meet the needs of Lebanon’s senior population, one significant secondary impact will be to free up additional housing for Lebanon’s

low to moderate income families. The City has a need for additional affordable workforce housing opportunities and despite recent efforts has concluded that it may not be keeping pace with demand (See Master Plan at §1C-3a; §§7C-1 and 2). Many seniors who live in the Quail Hollow community moved into Quail Hollow from low and moderately priced housing in the Lebanon area. With the development of an additional 32 units of senior housing at Lake House, more existing affordable housing units in Lebanon will be freed up for workforce families.

The Project will not only bring the standard municipal benefits of a senior living community (i.e. no impact on the school systems) but will further minimize impacts by taking advantage of the services and infrastructure associated with the existing Quail Hollow community. For example, in addition to the meals and other services discussed above, the Quail Hollow Community utilizes the Grafton County Senior Citizens Council to use their transportation services for Quail Hollow residents.

II. LOW MUNICIPAL AND AESTHETIC IMPACT OF THE PROJECT

a. Coverage

As shown on the site plans, the proposed senior housing building will be nestled amongst the existing Quail Hollow buildings and require far less coverage than a similar stand-alone senior project. The existing infrastructure at Quail Hollow allows the Lake House to offer high quality senior housing with minimal impacts when compared to a project on an undeveloped lot. A similar project that provides the same access to supportive services as Quail Hollow would have far greater impacts if built anywhere else in Lebanon.

b. Water and Sewer Consumption

The Property currently has a wastewater connection permit authorizing a flow of 25,500 gpd. This permit is based on standard multifamily flows of 150 gpd/bedroom. But It should be noted that the project actually only uses about 75 gpd/bedroom as calculated over 18 years of use because all units are occupied by seniors and occupancy is generally by a single senior (actual numbers are based on water consumption billings from Lebanon). Thus, the existing project of 114 units, while calculated to use 20,700 gpd, actually only uses approximately 10,350 gpd. The new project of 32 units, calculated to use 7,200 gpd, will actually only use about 3,600 gpd. Thus, while the total calculated sewer use is 27,900 gpd, the actual use will only be 13,950 gpd. Pathways previously prepared a memorandum for the Sewer and Wastewater Pump Station Capacity for Quail Hollow and determined that an appropriate design element for the flow rate (including the new 32 units) is to add an emergency standby generator in the event of a prolonged power failure.

c. Traffic

As set forth in the RSG Lake House Traffic Impact Assessment, the traffic impacts from the senior housing Project will be minimal. The proposed senior housing Project will generate fewer than 10 new vehicle trips per hour, which is well below the NHDOT and City of Lebanon standard threshold for requiring a traffic impact study of 100 or more peak hour vehicle trips. In fact, the overall peak hour site generated traffic from the entire Quail Hollow community will remain below this 100-trip threshold after the proposed expansion. The Traffic Assessment concludes that the Project “will not adversely impact traffic congestion or safety on the surrounding road network.” A State of New Hampshire DOT Driveway Permit was issued on 2/12/2018.

d. Schools

The Project would incorporate restrictions on school age children so there would be zero impact on the municipal school system.

e. Information from Fire Department

As set forth in the letter from Chris Christopoulos, Lebanon Fire Chief, dated January 31, 2018 and follow-up email of the same date, this Project will not create an undue burden on the Fire Department. Mr. Christopoulos confirmed:

- i) There are no impacts from the proposed Lake House on the City’s Fire and EMS services that would be different from or greater than a proposed 40-unit senior apartment building anywhere else in the City of Lebanon.
- ii) Currently there are 136 calls per year for the 359 residents at Quail Hollow. Adding 40 units would increase the number of calls to the Fire Department by 20 calls per year with an estimated personnel cost to the Fire Department of \$8,000. This equates to .08 Full Time Equivalent employees.
- iii) Quail Hollow generates only 38 calls per 100 residents, whereas comparable senior communities at the Woodlands and Harvest Hill generate 41 calls per 100 residents.
- iv) Call volume at Quail Hollow has increased in the past 10 years at a rate slower than the increase in the number of units at the community. Between 2007-2017, 118 apartments were added to Quail Hollow. This represented a 72% increase in the number of units in the community (from 164 units in 2006 to the current 282 units). Per Mr. Christopoulos’ letter, call volume at Quail Hollow increased during the past 10 years by only 65%, thus increasing at a slower rate than the number of units added.

f. Density

A Zoning Permit and Special Exception was issued on March 19, 2018 because the property can easily support the proposed 32 senior housing units (actually permitted for 40 units). The Ordinance specifically permitted the Zoning Board to grant a special exception for this senior housing complex to have greater density than that specified in the applicable zoning district (See §603). This makes good sense when looking at the impacts of this Project and the significant demand for senior housing in the area.

g. Information Confirming Slope Stability

The Zoning Board requested a letter from a soils engineer confirming that the Project could be built safely with respect to the hillside behind the building. As set forth on the letter from Randall Rhoades, PE of M&W Soils Engineering, Inc., it is Mr. Rhoades' opinion that "the excavation, construction, and grading of this project can be done in a manner which will not create a hazard to the hillside, and that it can be contained to the [subject parcel]."

h. Affordability

The Quail Hollow Senior Living Community is unique in its ability to offer high-quality independent senior living with optional services at affordable rates. For purposes of comparison, rents at Quail Hollow for 1-bedroom units range from \$703/month up to \$1,261/month. Rents for 2-bedroom units range from \$845/month up to \$1,570/month. This monthly rent includes all utilities, on-site activities and resident events and transportation. These rents make the units affordable to seniors with incomes from 30% of median income to median income. Additional services such as meals, wellness services through the Visiting Nurses, and cable/phone are offered at significantly reduced rates to residents who want them.

There are very few options for independent, service-enriched senior living in the Upper Valley Area, and even fewer that are available to moderate to lower income seniors. For example, The Woodlands Independent Senior Living Community in Lebanon requires an entrance fee in excess of \$300,000 plus a monthly fee in excess of \$3,500. For the independent senior living apartments at Harvest Hill in Lebanon a 1-bedroom apartment requires a monthly fee of over \$6,000 plus a security deposit over \$6,000. This is typical for a community that offers independent senior living with additional services.

This final phase of the Quail Hollow Community represents a rare opportunity to add high-quality, affordable price senior housing to Lebanon with minimal impacts.

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This final phase of the Quail Hollow Community represents a rare opportunity to add high-quality, affordable price senior housing to Lebanon with minimal impacts.

**QUAIL I, LP
7 ASPEN DRIVE
SOUTH BURLINGTON, VT 05403**

September 19, 2023

To: City of Lebanon Planning and Development Board

From: John Giebink
Quail I, LP

Re: Response to Regional Planning Letter Regarding the Quail Phase 5 Application

Dear Lebanon Planning Board:

Upon review of the Regional Planning Board letter of September, it appears that they did not fully read the entire current application as many of the items they list are incorrect. Following are my responses numbered to coincide with their letter (also attached).

1. The entire Quail Hollow project was approved and zoned for senior housing only with a minimum age restriction of 55 years and older so workforce housing is not applicable in this location.
2. As stated in the RSG Traffic Study:

Based on the projected trip generation, along with recent observations of site operations and sight distances at the NH-10 & Quail Hollow intersection, we project the proposed addition of 40 new senior housing units will not adversely impact traffic congestion or safety on the surrounding road network.

In addition, NHDOT issued a permit stating:

No changes to Quail Hollow Road required due to additional units.

3. We have asked Advance Transit numerous times to come into Quail Hollow, but they have declined on all occasions. We have an existing contract with Grafton Senior Center for their transportation services picking up and dropping seniors at the front doors of the buildings.
4. This project and its stormwater flows have been completely vetted by the City Engineering Department and the State of Vermont. All plans including improvements on East Wilder Road have been approved by the City Engineer and New Hampshire Department of Environmental Services (NHDES) has issued permits for Alteration of Terrain, Sewer Discharge and Wetlands (all are included in the application package).

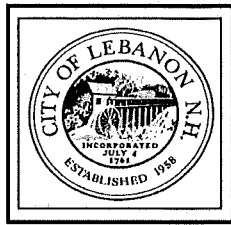
5. We are NOT requesting a waiver for indoor bicycle storage. We have planned space for this in the garage.
6. See #4 above. All plans have been completely vetted by City Engineering and New Hampshire Department of Environmental Services (NHDES) with permits issued.
7. We have included the number of EV spaces as required by the current regulations.
8. See #1 above. The entire Quail Hollow project area is permitted and zoned for senior housing only.

The final statement about “unmitigated erosion and runoff” is very unwarranted considering the years of engineering, planning, reviews by City Engineering and reviews by NHDES that have gone into plans for this project.

Supporting evidence for all the above is included in the complete application.

Thank You.

John Giebink
Quail 1, LP



CITY OF LEBANON ~ PLANNING & DEVELOPMENT

LEBANON PLANNING BOARD NOTICE OF ACTION PB2019-13-SPR

Notice is hereby given that on **SEPTEMBER 9, 2019**, the following action was taken by a majority of the Lebanon Planning Board in accordance with the City of Lebanon Site Plan Review Regulations:

Matthew Hall moved that the Lebanon Planning Board **APPROVE** waivers for the application of **QUAIL I, LP, #PB2019-13-SPR**, from the following sections of the Site Plan Review Regulations:

- Section 5.1.E.5 – *requiring a current survey of the property certified by a licensed NH land surveyor (9-0)*
- Section 5.1.E.12 – *requiring lighting plan to include average and minimum foot-candle measurements (6-3)*
- Section 5.1.E.15 – *requiring landscaping plan to depict existing trees of a certain size, include calculations for square footage of perimeter landscaping, and provide parking lot shading calculations (6-3)*
- Section 5.1.E.19 – *requiring plans to include the location of all existing transit routes and transit stops located or passing within 1/4 mile (1,320 feet) of the property (7-2)*
- Section 6.2.B.1-5 – *perimeter landscaping requirements (6-3)*
- Section 6.2.D – *landscaping around buildings requirements (9-0)*
- Section 6.2.E.1, 3, & 4 – *landscaping of parking areas requirements (9-0)*
- Section 6.6.C.C.2.1 – *requiring drainage analysis that includes calculations comparing pre- and post-development stormwater runoff rates and volumes based on a 1-inch rainstorm, and the 2-year, 25-year, 50-year, and 100-year, 24-hour frequency storms (9-0)*

Note: The Board considered each waiver request separately and all were approved. The vote for each is noted above in parentheses.

Notice is hereby given that on **SEPTEMBER 9, 2019**, the following action was taken by a majority of the Lebanon Planning Board in accordance with the City of Lebanon Site Plan Review Regulations:

Matthew Hall moved that the Lebanon Planning Board **APPROVE** the application of **QUAIL I, LP** for Site Plan Review to construct a new 32-unit, 50,000 square foot building for senior housing, together with associated site improvements, to be operated as part of the existing Quail Hollow Senior Living Community, in the R-3 zone, **#PB2019-13-SPR**, as shown on a set titled "Site Plan for Quail Hollow Senior Living Community – Phase V"

prepared by Pathways Consulting, LLC, dated June 10, 2019, revised August 28, 2019, Proj. No. 10112, including any and all submissions and testimony provided for and during the public hearing, with the following conditions:

Conditions to be Satisfied Prior to Application for a Building Permit

1. The applicant shall schedule and hold a pre-building permit application meeting with the Planning Department, City Building Inspectors, City Engineer/ Department of Public Works, and Fire Department, in order to help streamline the building permit review process.
2. The applicant shall obtain approval from the City Council or the City Manager's office for any additional water and/or sewer flows per Chapter 181.
3. The applicant shall address comments 3, 4, and 9 as set forth in the attached memo from Christina Hall, P.E., dated August 28, 2019, to the satisfaction of the City Engineer.

Conditions to be Satisfied Prior to the Issuance of a Building Permit

4. The applicant shall work with the Department of Public Works and the City Engineer to evaluate whether the existing on-site drainage improvements are functioning as designed and shall correct any deficiencies.
5. The applicant shall submit engineered plans for the proposed retaining wall for review and approval by the Building Inspector and City Engineer.
6. In accordance with Chapter 181 of the City Code and Section 8.3 of the Site Plan Review Regulations, the City shall retain the services of an independent third-party inspector, for which the applicants shall be responsible for all inspection fees related to the construction sewer, water, and drainage improvements both on-site and off-site, and for all work within the City's right-of-way, and for the construction of the retaining walls constructed in accordance with the plans approved pursuant to condition #4 above. The applicant shall provide funding for inspection services in a form acceptable to the City.
7. The construction of the building shall be subject to City of Lebanon Impact Fees, pursuant to Section 213 of the Zoning Ordinance. The Impact Fee shall be calculated at the time of Building Permit issuance based on the Impact Fee Schedule adopted on August 13, 2018. In accordance with RSA 674:39, the approved site plan shall be exempt from any future changes in impact fees and methodology for five years from the date of approval; however, any building permits which are issued after the end of that five-year period shall be fully subject to whatever impact fees and methodology are in effect at the time of building permit issuance.
8. All water and sewer fees shall be paid.
9. The applicant shall obtain an Excavation Permit from the Department of Public Works for any site work in the public right-of-way prior to any work in the right-of-way.
10. The applicant shall obtain or update (if appropriate) any required State approvals including, but not limited to, the following:
 - NHDES Discharge Permit, if necessary

- NHDES Alteration of Terrain Permit, if necessary
- NHDOT Driveway and/or Excavation Permit, if necessary

Conditions to be Satisfied Prior to the Issuance of a Certificate of Occupancy

11. The applicant shall dedicate and convey the completed water main and any hydrants within the Richardson Place right-of-way to NH Route 10, to the City for ownership and maintenance, subject to appropriate easements. Said conveyance and easements shall be approved by the City Attorney and the Department of Public Works and recorded in the Grafton County Registry of Deeds prior to acceptance of any utility improvements by the City.
12. Third-party engineer or design engineer inspection reports and as-built drawings provided by the applicants (PDF format and CAD .dwg format, using the NH State Plane Coordinate System), including tie sheets, shall be reviewed and approved by the City Engineer prior to acceptance of any utility improvements by the City.
13. The impact fee calculated pursuant to Condition of Approval #7 shall be paid.
14. Pavement and gravels must meet NHDOT specification requirements. The applicant shall provide compaction tests and borings prepared by a licensed engineer to the Department of Public Works to certify that compaction and thickness requirements are met.
15. All improvements depicted on the plan shall be completed, and shall be constructed as depicted on the plan.

General Conditions

16. The applicant shall implement and maintain NHDES Site Specific Best Management Practices before, during, and after construction.
17. The applicant shall install landscaping along the face of the retaining wall behind the building using plantings suitable for the location in accordance with Section 6.2.H of the Site Plan Review Regulations, and shall relocate the community garden to a suitable location.
18. The applicant shall coordinate with the City Engineer on the installation of at least one (1) additional suitable shade tree pursuant to Section 6.2.H adjacent to the building in a location that does not conflict with underground utilities.

The motion was seconded by Matthew Cole. The vote on the motion was 9-0.

THE CITY OF LEBANON PLANNING BOARD

By: Bruce Garland DATE: 2/10/20
Bruce Garland, Chair
DocuSigned by:
John Giblin
2/16/2020

q:\development_review\2019_applications\pb2019-13-spr_69 lily lane_8-2-200_quail i, lp\motion & notice of action\8-2-200_pb2019-13-spr_noa.docx



CITY OF LEBANON ~ PLANNING & DEVELOPMENT

NOTICE OF ACTION LEBANON PLANNING BOARD

Notice is hereby given that on **May 10, 2021**, the following action was taken by a majority of the Lebanon Planning Board in accordance with the City of Lebanon Site Plan Review Regulations:

Jeremy Rutter moved that the Lebanon Planning Board finds the application of Quail I, LP, PB2021-12-EXT, regarding a proposed extension of an approved Site Plan for 69 Lily Lane (Tax Map 82, Lot 2, Plot 200) (PB2019-13-SPR), is complete enough to accept jurisdiction and commence review.

The motion was seconded Kathie Romano. The vote on the motion was unanimous in favor, 9-0.

Notice is hereby given that on May 10, 2021, the following action was taken by a majority of the Lebanon Planning Board in accordance with the City of Lebanon Site Plan Review Regulations:

Matthew Hall moved that the Lebanon Planning Board APPROVE the application of Quail I, LP, PB2021-12-EXT, for an extension of time per Section 4.10.B of the Site Plan Review Regulations to obtain a building permit pursuant to an approved Site Plan for a 32-unit, 50,000 square foot building for senior housing, together with associated site improvements, to be operated as part of the existing Quail Hollow Senior Living Community (PB2019-13-SPR), originally approved by the Planning Board on September 9, 2019, including any and all supplemental submissions and testimony provided during the public hearing, with the following conditions:

1. The applicant shall be required to obtain a Building Permit from the Planning and Development Department by September 9, 2023.
2. The applicant shall satisfy and comply with the Planning Board Notice of Action for PB 2019-13-SPR, dated September 9, 2019, and all conditions of approval thereof.

The motion was seconded by Jeremy Rutter. The vote on the motion was in favor, 9-0.

THE CITY OF LEBANON

By: 
Planning Board Chair

DATE: 6/28/21



City of Lebanon, New Hampshire APPLICATION FOR WAIVERS

Office Use Only

Date Received: _____

File No.: _____

PROJECT INFORMATION

Name of Applicant: Quail I, LP

Project Name: Quail Hollow Senior Living Community - Phase V

Project Address: Lilly Lane - West Lebanon

WAIVER REGULATIONS

In order to grant a Waiver from a requirement of the City of Lebanon Site Plan Review or Subdivision Regulations, the Planning Board must find that the Waiver is justified under one of the following criteria (See Article VII of the Site Plan Review Regulations and Section 7.15 of the Subdivision Regulations):

Criteria A. Strict conformity would pose an unnecessary hardship to the Applicant and waiver would not be contrary to the spirit and intent of the regulations;

OR

Criteria B. Specific circumstances relative to the site plan, or conditions of the land in such site plan, indicate that the waiver will properly carry out the spirit and intent of the regulations.

WAIVER REQUEST(S)

I (we) hereby request a Waiver from:

[You can respond in the space provided, or attach a separate statement. Please be prepared to address each request during your public hearing. You must show that you have justified granting the Waiver(s).]

5.1.E(5) - Current Boundary Survey

1. Section ____ of the (circle one) **Site Plan Review** / Subdivision Regulations. A Waiver of this Section meets (circle one) **Criteria A** / **Criteria B** because boundary information was taken from a plan recorded at the Grafton County Registry of Deeds. The west boundary as shown on the recorded plan adjacent to the proposed building will be verified by a Licensed Land Surveyor.

5.1.E(16) - Location of trees > than 12" diameter.

2. Section ____ of the (circle one) **Site Plan Review** / Subdivision Regulations. A Waiver of this Section meets (circle one) **Criteria A** / **Criteria B** because existing trees greater than 12" diameter associated with the Phase I and 2 building, access drive, and parking will not be disturbed with the exception of six deciduous trees adjacent to the Phase I building by the proposed access drive. A landscape plan has been provided showing new trees for the proposed building and parking.

5.1.E(16) - Calculation for square footage of perimeter landscaping

3. Section ____ of the (circle one) **Site Plan Review / Subdivision Regulations**. A Waiver of this Section meets (circle one) **Criteria A / Criteria B** because the existing perimeter landscaping for the existing facility will not be impacted. No new landscaping is proposed for the perimeter of the site.

5.1.E(16) Parking lot shading

4. Section ____ of the (circle one) **Site Plan Review / Subdivision Regulations**. A Waiver of this Section meets (circle one) **Criteria A / Criteria B** because no new deciduous trees are proposed for the existing Phase I and II parking lots and the parking area associated with the new building.
Shrubs have been provided adjacent to the new building and walkway.

5. Section ____ of the (circle one) **Site Plan Review / Subdivision Regulations**. A Waiver of this Section meets (circle one) **Criteria A / Criteria B** because _____

6. Section ____ of the (circle one) **Site Plan Review / Subdivision Regulations**. A Waiver of this Section meets (circle one) **Criteria A / Criteria B** because _____

7. Section ____ of the (circle one) **Site Plan Review / Subdivision Regulations**. A Waiver of this Section meets (circle one) **Criteria A / Criteria B** because _____

8. Section ____ of the (circle one) **Site Plan Review / Subdivision Regulations**. A Waiver of this Section meets (circle one) **Criteria A / Criteria B** because _____

SIGNATURE

I (we) hereby submit this application to the Planning Board and attest that to the best of my (our) knowledge all of the information on this application form and in the accompanying application materials and documentation is true and accurate. As the applicant or as the agent of the applicant, I attest that I am duly authorized to act in this capacity.

Signature of Applicant: _____ Date: _____

CITY OF LEBANON, NH SITE PLAN REVIEW REGULATIONS TECHNICAL CHECKLIST	
PROJECT NAME: Quail Hollow Senior Living Community - Phase V	
APPLICANT: Quail I, LP	DATE: September 5, 2023
GENERAL SUBMISSION REQUIREMENTS:	

All applications to the Planning Board for Site Plan Review must be submitted by 12:00 Noon on the day of the filing cutoff. [§4.7.B] Submissions must be accompanied by the following information or review of the application may be delayed:

A properly completed and signed Application Form *(available at www.lebanonnh.gov)*. [§5.1.A]

The appropriate filing fees. [§5.1.B]

A written project description. [§5.1.C]

A list of the names and mailing addresses of all persons to be notified, by certified mail, of the public hearing. [§5.1.D]

A completed and signed Application for Waivers *(available at www.lebanonnh.gov)* [§5.1.G.3]

A completed and signed Technical Checklist *(available at www.lebanonnh.gov)*. [§4.7.B]
[Applicants must complete the entire checklist to ensure that all necessary information and materials have been provided with the application or that written requests for waivers have been properly provided in accordance with Article VII of the Site Plan Review Regulations, as appropriate.]

Two (2) full-size sets of the Site Plan set. [§5.1.E]

A digital copy of the Site Plan set in .PDF format. [§5.1.F]

NOTE: Applications shall contain sufficient information to enable the City Staff and the Planning Board to evaluate the proposed development for compliance with the Zoning Ordinance, the Planning Board's Regulations, and other applicable City Codes, and for the Planning Board to make an informed decision.

All required application materials shall be submitted as a single inclusive package, including any appropriate waiver requests as permitted by the Regulations. Submission of a complete application package ensures that the review process by City Staff is as efficient and effective as possible.

The purpose of the filing deadline is to provide adequate time for City review of the proposal. Submission of any altered, additional, or substitute application materials required by Article V of these Regulations, subsequent to the filing deadline, other than as directed by City Staff, shall cause the application to be deemed untimely filed, and such application shall not be heard until a subsequent month.

CITY OF LEBANON, NH
SITE PLAN REVIEW REGULATIONS
TECHNICAL CHECKLIST & STORMWATER CHECKLIST

PLAN SUBMITTAL TECHNICAL CHECKLIST:

NOTE: Site plan drawings shall include the information described below pursuant to Article V of the Lebanon Site Plan Review Regulations. Plans shall be submitted on sheets no larger than 24" x 36". Plan sets with multiple sheets shall include sheets of uniform size and be bound on the left edge. When more than three (3) sheets are required, an additional cover sheet shall be attached including a table of contents. A scale of not smaller than one (1) inch equals 40 feet is suggested. All lettering shall be of a size and type that is legible.

In order to facilitate the use of the City's Geographic Information System (GIS) for planning purposes, all surveys and engineered plans submitted for Site Plan Review shall utilize the NH State Plane Coordinate system and shall reference the North American Vertical Datum of 1988 (NAVD 88), unless prior approval to use an alternate coordinate system and/or vertical datum is granted by the Planning & Development Department.

A written request for waiver shall be required, pursuant to Article VII of the Site Plan Review Regulations, for any submission requirement for which the information or data is not provided by the applicant. [§5.1.G(4)] NOTE: The submission requirements described in paragraphs 5.1.E(1) through 5.1.E(4) shall not be waivable under the procedures of Article VII of the Site Plan Review Regulations. [§5.1.E]

[Checklist begins on following page]

CITY OF LEBANON, NH
SITE PLAN REVIEW REGULATIONS
TECHNICAL CHECKLIST & STORMWATER CHECKLIST

[illegible]

CITY OF LEBANON, NH
SITE PLAN REVIEW REGULATIONS
TECHNICAL CHECKLIST & STORMWATER CHECKLIST

Plan Requirements (cont.)	Info. Provided	Waiver Sought
5.1.E(6) - Existing and proposed grades, including topographic contours, with spot elevations. Where the grade is less than 20%, the contours shall be at 2-foot intervals; otherwise they shall be at 5-foot intervals. All contours shall be referenced to USGS or FEMA Flood Insurance Rate Map (FIRM) datums, as appropriate. Existing topographic information shall be prepared by a professional engineer registered in New Hampshire or land surveyor licensed in New Hampshire.	☒	☐
5.1.E(7) - Shape, size, height, and location of all existing structures located on site and within 200 feet of site.	☒	☐
5.1.E(7) - Elevation views indicating shape, size, height, and location of all proposed structures, including expansions of or additions to existing buildings. Such elevation views shall provide sufficient detail to allow for review by the Board and City staff of the adequacy of proposed access and egress points, walkways, lighting, and other site-related improvements.	☒	☐
5.1.E(8) - Location of existing natural features such as streams, marshes, lakes, ponds, wetlands, rock outcrops, or wooded areas, and existing man-made features such as roads and structures. Indicate those natural and man-made features that are to be removed, retained, or altered.	☒	☐
5.1.E(8) - Wetlands on the property shall be delineated by a NH Certified Wetlands Scientist, whose seal and signature shall appear on the plan. Documentation in the form of U.S. Army Corps of Engineers New England District Wetlands Delineation Data Sheets and/or other field notes and materials concerning the delineation shall be submitted.	N/A ☐	☐
5.1.E(9) - Zoning District, Tax Map and Lot number, and use of abutting properties within 200 feet of property.	☒	☐
5.1.E(9) - Location of streets, pedestrian paths/trails, and bicycle routes within 200 feet of the site boundary; and the location of curb cuts and vehicle accesses within 200 feet of the site boundary.	☒	☐
5.1.E(10) - Proposed streets, driveways, emergency vehicle accesses, parking spaces, and sidewalks, with indication of dimensions and direction of travel. Show required sight distances at curb cuts and dimensions for the inside radii of all curves.	☒	☐
5.1.E(10) - Vehicle and bicycle parking spaces shall be numbered.	☒	☐
5.1.E(10) - Loading spaces and facilities used in connection with any structures on the site shall be shown	☒	☐
5.1.E(10) - Total square footage and percentage of the lot covered by impervious cover shall be shown.	☒	☐
5.1.E(11) - Parking area safety measures including raised crosswalks/speed tables, signage, walkway lighting, striping and similar markings such as dedicated pedestrian/bicycle crossings and lanes through parking areas, fire lanes, compact and/or electric vehicle parking/charging, parking wayfinding, ADA signage and access aisles.	☒	☐
5.1.E(12) - Size and location of all existing and proposed public and private utilities. <i>(Note: the applicant is encouraged to submit a Sewer Use Permit Application and obtain a Notice of Permitted Allocation, and to obtain a Water Use Permit prior to submission of the Site Plan Review application.)</i>	☒	☐

CITY OF LEBANON, NH
SITE PLAN REVIEW REGULATIONS
TECHNICAL CHECKLIST & STORMWATER CHECKLIST

Plan Requirements (cont.)	Info. Provided	Waiver Sought
5.1.E(13) - Plan for outdoor lighting showing proposed location, mounting height, fixture type, lamp type, color correlated temperature (CCT), and wattage of all exterior free-standing lighting or building-mounted fixtures.	☒	☐
5.1.E(13) - Analyses and illuminance-level diagrams, to include average and minimum foot-candle measurements, showing that proposed installation conforms to the lighting-level standards in Site Plan Review Regulations.	☒	☐
5.1.E(13) - Manufacturer's specification information for each proposed light fixture and lamp (NOTE: This information may be provided on the plan or as a separate attachment).	☒	☐
5.1.E(13) - Drawings of all relevant building elevations showing location and height of all building-mounted fixtures, the portions of any walls or architectural features to be illuminated, illumination levels of walls or architectural features, and aiming points for any remote light fixtures.	☒	☐
5.1.E(14) - Plan for location of free-standing or building-mounted signs, including location, mounting, aiming, and shielding of any remote light fixtures for externally-lit signs.	N/A ☐	☐
5.1.E(14) - For internally-lit signs, relevant information concerning the method of illumination and the opacity of the sign background, showing that the proposed installation conforms to the requirements of the Regulations.	N/A ☐	☐
5.1.E(15) - The location and boundaries of any Overlay Districts established pursuant to Article IV of the Zoning Ordinance (including but not limited to the Wetlands Conservation District, Riverbank Protection District, Steep Slopes District, and Floodplain District) and, if applicable, protected shorelands pursuant to the Shoreland Water Quality Protection Act (NH RSA 483-B).	N/A ☐	☐
5.1.E(15) - For properties located within the Floodplain District, the 100-year flood elevation, floodway, shoreland protection zone, and flood plain limits shall be identified.	N/A ☐	☐
5.1.E(16) - Landscaping plan showing proposed new plantings to be installed and existing natural vegetation to be retained. Plan shall show in detail the number, size (height and/or caliper), and species (botanical and common names) of all proposed shrubs and trees.	☒	☐
5.1.E(16) - Existing trees over 12 inches in diameter (measured 4.5 feet above ground surface) within 25 feet of the disturbed area, must be counted and shown on the plan, if included towards fulfilling landscaping requirements.	☐	☒
5.1.E(16) - Calculations for square footage of perimeter landscaping.	☐	☒
5.1.E(16) - Parking lot shading calculations shall be provided by depicting new trees and shrubs at 10-year crown size.	☐	☒
5.1.E(17) - Existing and proposed surface and subsurface storm drainage facilities, including City storm drainage facilities located within 200' of site.	☒	☐
5.1.E(17) - Plans for retention, detention, slow release, and treatment of storm water shall be provided shall be provided in accordance with the requirements of Section 6.6.	☒	☐
5.1.E(18) - Section 6.6. Stormwater Management submission requirements.	See Stormwater Checklist	
5.1.E(19) - Plans for snow removal and storage.	☒	☐

CITY OF LEBANON, NH
SITE PLAN REVIEW REGULATIONS
TECHNICAL CHECKLIST & STORMWATER CHECKLIST

Plan Requirements (cont.)	Info. Provided	Waiver Sought
5.1.E(20) - A plan for the development showing provisions for automobile, transit, bicyclist, and pedestrian access and circulation. Such plan shall show both existing and proposed means of access to the site including connections with, public streets, sidewalks, transit stops, and formal paths/trails. Plans shall include any traffic calming and traffic control devices necessary in conjunction with the site development, as well as the location of all existing transit routes and transit stops located or passing within 1/4 mile (1,320 feet) of the property.	☒	☐
5.1.E(21) - Construction detail drawings including, but not limited to, pavements, walks, steps, curbing, drainage structures, water and/or sewer utilities, ground-mounted signage (e.g., fire lanes, ADA parking, commercial), surface treatments, transit shelters, energy generation units (e.g., solar), bike rack style, electric vehicle charging, outdoor lighting, outdoor furniture, retaining walls, tree boxes and other site systems or structures. Accompanying specifications and cutsheets may be required.	☒	☐
5.1.E(21) - Where applicable, roadway, drainage, water and sewer utility profile drawings shall be provided at a scale of 1"=40 feet (horizontal) and 1"=4 feet (vertical) and typical cross-section drawings shall be provided at a scale of 1"=5 feet (horizontal and vertical), unless prior approval to use an alternate scale is granted by the Reviewing Engineer. (NOTE: Ordinarily, only two (2) sets of such construction drawings shall be provided to the Planning and Development Department with the application submission.)	☒	☐
5.1.E(22) - Depict any current and proposed easements, rights-of-way, and deed restrictions including those related to sewer, electrical utility, shared access, etc.	☒	☐
5.1.E(23) - For multi-family structures, plans for on-site recreational facilities.	N/A ☐	☐
5.1.E(24) - Where a fire, emergency equipment, or similar vehicle turnaround area is provided, it must have an adequate turn radius. Provide CAD Autoturn data or a similar basis of design for the turn radius, if requested by Lebanon Fire or Engineering staff. City staff may also ask for this information at any time.	☒	☐
Supporting Documents and Information, Where Applicable	Info. Provided	Not Applicable
5.1.G(1) - An estimated timetable, to include phasing schedules, for construction and completion of buildings, parking, facilities, landscaping, and other required improvements.	☒	☐
5.1.G(2) - Any development estimated to generate a net increase of 100 peak hour trips or 1,000 average daily trips (based upon the most current edition of the ITE Trip Generation Manual) shall prepare and submit a Traffic Impact Study in accordance with standard traffic analysis conventions as set forth by the NHDOT. The Board may, at its discretion, require the submission of a Traffic Impact Study for developments estimated to generate less than 100 peak hour trips or 1,000 average daily trips if the Board has reason to believe such development could adversely affect levels of service or have other adverse impacts.	N/A ☐	☐
5.1.G(3) - Written requests for waivers from all applicable provisions of these Regulations shall be provided pursuant to Article VII - "Waiver Procedure". (note: use Application for Waivers form).	☒	☐
5.1.G(4) - For multi-family dwelling developments and mixed-use developments resulting in a net increase of 50 dwelling units or more, the application shall include the information and impact statements identified in Section 6.9.B.	N/A ☐	☐

NOTE: THE APPLICANT IS RESPONSIBLE FOR PROVIDING THE REQUIRED INFORMATION PURSUANT TO ARTICLE V OF THE SITE PLAN REVIEW REGULATIONS. PLEASE BE AWARE THAT THIS CHECKLIST IS FOR INFORMATION AND GUIDANCE ONLY AND DOES NOT REPRESENT THE LAW DICTATING SUBMITTAL REQUIREMENTS NOR IS IT COMPLETE AND INCLUSIVE THEREOF.

Completed By: Patrick Buccellato For Pathways Consulting

**CITY OF LEBANON, NH
SITE PLAN REVIEW REGULATIONS
TECHNICAL CHECKLIST & STORMWATER CHECKLIST**

CITY OF LEBANON, NH STORMWATER REVIEW REGULATIONS TECHNICAL CHECKLIST	
PROJECT NAME: Quail Hollow Senior Living - Phase V	
APPLICANT: Quail I, LP	DATE: September 5, 2023

NOTE: Stormwater plans shall include the information described below pursuant to Article VI of the Lebanon Site Plan Review Regulations. Plans shall be submitted on sheets no larger than 24" x 36". Plan sets with multiple sheets shall include sheets of uniform size and be bound on the left edge. When more than three (3) sheets are required, an additional cover sheet shall be attached including a table of contents. A scale of not smaller than one (1) inch equals 40 feet is suggested. All lettering shall be of a size and type that is legible.

In order to facilitate the use of the City's Geographic Information System (GIS) for planning purposes, all surveys and engineered plans submitted shall utilize the NH State Plane Coordinate system and shall reference the North American Vertical Datum of 1988 (NAVD 88), unless prior approval to use an alternate coordinate system and/or vertical datum is granted by the Planning Office.

A written request for waiver shall be required, pursuant to Article VII of the Site Plan Review Regulations, for any submission requirement for which the information or data is not provided by the applicant. [§6.6.I]

[Stormwater checklist begins on following page]

**CITY OF LEBANON, NH
SITE PLAN REVIEW REGULATIONS
TECHNICAL CHECKLIST & STORMWATER CHECKLIST**

Plan Requirements	Info. Provided	Waiver Sought
6.6.C.1 (1) - An Existing Conditions S.M.P showing all pre-development: a. Surface water bodies and wetlands b. Drainage patterns c. Flood plains and floodways (with elevations) d. Watershed boundaries e. Buffer zones f. Topographic contours with minimum 2-foot intervals g. Buildings / structures h. Pavement i. Utilities j. Soils information with coding as HSG-A, B, C, or D (High Intensity Soil Survey (HISS) mapping may be required per request of the City Engineer). 1. The plan shall also include the following elements: a. scale bar b. north arrow c. title block with project name d. applicant's name e. map and parcel number f. designer's stamp g. soil and/or wetland scientist's stamp (if applicable) h. legend i. locus plan j. benchmarks k. notes with datum and other plan references l. instructions m. detail descriptions	☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ N/A ☐ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
6.6.C.1 (2) - A Proposed Conditions SMP showing all proposed post-development temporary and permanent stormwater management system elements, erosion and sediment control Best Management Practices (BMP), and all important hydrologic features. The Proposed Conditions S.M.P must be at the same scale as the Existing Conditions SMP, with consistent title block, plan features, and descriptors including but not limited to the following: a. Existing and proposed topographic contours (2-foot minimum contour interval; 1-foot contour intervals may be required for sites with limited relief and/or where proposed stormwater outfalls are located adjacent to buffer zones. b. Proposed areas of disturbance with total area of disturbance clearly labeled in square feet c. Existing and proposed buildings and structures d. Stormwater discharge locations labeled and matched to the drainage analyses e. Wells and sanitary protective radii, if applicable f. Septic systems, if applicable	☒ ☒ ☒ ☒ N/A ☐ N/A ☐	☐ ☐ ☐ ☐ ☐ ☐

CITY OF LEBANON, NH
SITE PLAN REVIEW REGULATIONS
TECHNICAL CHECKLIST & STORMWATER CHECKLIST

Plan Requirements (cont.)	Info. Provided	Waiver Sought
g. Plan references and notes (including sequence of soil disturbance)	☒	☐
h. Proposed and existing public and private utilities	☒	☐
i. Proposed project components to become property of or the responsibility of the City shall be labeled as such	N/A ☐	☐
j. Existing and proposed impervious cover, with areas used to calculate effective impervious cover (EIC, as defined herein) clearly identified and the square footage of each type identified and labeled.	☒	☐
k. Test Pit(s) locations and data where stormwater practices are proposed, as appropriate.	☒	☐
l. Details of individual design elements shown on separate plan sheets following the Proposed Conditions SMP.	☒	☐
The Existing Conditions SMP & the Proposed Conditions SMP shall be provided on sheets no larger than 24" x 36", at a scale of one (1) inch = 20 feet for urban areas, and one (1) inch = 40 feet for non-urban areas. The City Engineer will make the final determination as to the appropriate scale, ensuring that all important site and hydrologic features are easily recognized. If plan shall encompass more than two (2) sheets, at the required 1:40 or 1:20 scale, a separate large scale representation plan sheet (e.g. 1:100) is required to be provided, so as to show entirety of site, as well as off-site contributing areas.		
6.6.C.2 - In addition to the above described SMP plan sheets, the following SMP supplemental information is required: 1. A drainage analysis that includes calculations comparing pre- and post-development stormwater runoff rates (cubic feet per minute) and volumes (cubic feet) based on a 1-inch rainstorm, and the 2-year, 25-year, 50-year, and 100-year, 24-hour frequency storms. Calculations shall include, but not be limited to, the sizing of all structures and BMPs, including sizing of emergency overflow structures based on the 50-year 24-hour frequency storm discharge rate, with 1-foot of free-board. Storm rates shall be based on current design depths from the Northeast Regional Climate Center - http://precip.eas.cornell.edu. <i>Any site that was primarily wooded in the last five years shall be considered undisturbed woods Any site from which wooded vegetation has been removed within 5 years prior to the first submission to the planning board with respect to a proposed development, or upon which, at some earlier time, clearing has occurred in anticipation of development, shall be treated as undisturbed woodland for purposes of calculating pre-development runoff volumes. For purposes of this paragraph any tree cutting which occurred without leaving stands of healthy, growing trees within areas near waters and highways, as required by RSA 227-J:9, I, shall be presumed to have occurred in anticipation of development</i>	☒	☐

**CITY OF LEBANON, NH
SITE PLAN REVIEW REGULATIONS
TECHNICAL CHECKLIST & STORMWATER CHECKLIST**

Plan Requirements (cont.)	Info. Provided	Waiver Sought
2. A drainage analysis results summary tabulated (pre & post) for each proposed outfall or catchment outlet point including runoff rates and volumes for each storm event analyzed above.	☒	☐
3. An Erosion and Sediment Control Plan for all proposed construction activities in accordance with the NH Stormwater Management Manual Volume 3, (December 2008 or current revision; downloadable from the website)	☒	☐
4. A comprehensive Operation and Maintenance Plan for long-term maintenance of all proposed stormwater management elements and BMPs including the proposed schedule of inspections and anticipated maintenance (see section H.2 Operations & Maintenance Plan for detailed requirements).	☒	☐
<u>6.6.D</u> - Phased Development: For phased developments, the plans and calculation requirements under this section (6.6) shall apply as though the development of the entire parcel were being proposed in one single application. The review and approval process for phased development applications is provided in section 4.9 of the Lebanon Site Plan Regulations.	N/A ☐	☐

NOTE: THE APPLICANT IS RESPONSIBLE FOR PROVIDING THE REQUIRED INFORMATION PURSUANT TO ARTICLE VI OF THE SITE PLAN REVIEW REGULATIONS. PLEASE BE AWARE THAT THIS CHECKLIST IS FOR INFORMATION AND GUIDANCE ONLY AND DOES NOT REPRESENT THE LAW DICTATING SUBMITTAL REQUIREMENTS NOR IS IT COMPLETE AND INCLUSIVE THEREOF.

Completed By: Patrick Buccellato For Pathways Consulting

(Last Revised 9/20/2021)

Planning office Use Only:

Date Received ___/___/___ Checklist Complete YES or NO Checked by: _____



The State of New Hampshire
Department of Environmental Services

Robert R. Scott, Commissioner



April 29, 2020

John Giebink
Quail I, LP
7 Aspen Drive, Suite 1
South Burlington, VT 05403
sent via email: (jgiebink@summitpmg.com)

Permit: AoT-1803

RE: Quail Hollow, Phase V
Tax Map 8, Block 2, Lot 200
Lebanon, NH

Dear Applicant:

Based upon the plans and application, approved on April 29, 2020, we are hereby issuing RSA 485-A:17 Alteration of Terrain Permit AoT-1803. The permit is subject to the following conditions:

As part of the processing of this application, DES waived specific requirements of Rule Env-Wq 1507.04 requiring the applicant to capture and infiltrate the groundwater recharge volume (GRV) in accordance with Env-Wq 1508.16. Granting this waiver will not have an adverse impact on the environment, public health, public safety, or abutting properties, and granting the request is consistent with the intent and purpose of the rules waived. Additional documentation relative to the waiver is contained within the file.

PROJECT SPECIFIC CONDITIONS:

1. The approved plans, latest revision dated March 23, 2020, and supporting documentation in the permit file are a part of this approval.
2. **This permit expires on April 29, 2025.** No earth moving activities shall occur on the project after this expiration date unless the permit has been extended by the Department. If requesting an extension, the request must be received by the department before the permit expires. The Amendment Request form is available at:
<http://des.nh.gov/organization/divisions/water/aot/categories/forms.htm>

GENERAL CONDITIONS:

1. Activities shall not cause or contribute to any violations of the surface water quality standards established in Administrative Rule Env-Wq 1700.
2. You must submit revised plans for permit amendment prior to any changes in construction details or sequences. You must notify the Department in writing within ten days of a change in ownership.

3. You must notify the Department in writing prior to the start of construction and upon completion of construction. Forms can be submitted electronically at: <https://forms.nh.gov/onlineforms/> . Paper forms are available at that same web page.
4. **All stormwater practices shall be inspected and maintained in accordance with Env-Wq 1507.07 and the project Inspection and Maintenance (I&M) Manual.** All record keeping required by the I&M Manual shall be maintained by the identified responsible party, and be made available to the department upon request. Photographs of the site and BMPs must accompany the I&M submittals.
5. This permit does not relieve the applicant from the obligation to obtain other local, state or federal permits that may be required (e.g., from US EPA, US Army Corps of Engineers, etc.). Projects disturbing over 1 acre may require a federal stormwater permit from EPA. Information regarding this permitting process can be obtained at: <http://des.nh.gov/organization/divisions/water/stormwater/construction.htm>.
6. In accordance with Env-Wq 1503.21 (c)(1), a written notice signed by the permit holder and a qualified engineer shall be submitted to DES stating that the project was completed in accordance with the approved plans and specifications. If deviations were made, the permit holder shall review the requirements in Env-Wq 1503.21(c)(2).
7. If applicable, no activity shall occur in wetland areas until a Wetlands Permit is obtained from the Department. Issuance of this permit does not obligate the Department to approve a Wetlands Permit for this project.
8. This project has been screened for potential impact to known occurrences of protected species and exemplary natural communities in the immediate area. Since many areas have never been surveyed, or have not been surveyed in detail, unidentified sensitive species or communities may be present. This permit does not absolve the permittee from due diligence in regard to state, local or federal laws regarding such communities or species. This permit does not authorize in any way the take of threatened or endangered species, as defined by RSA 212-A:2, or of any protected species or exemplary natural communities, as defined in RSA 217-A:3.

Sincerely,



Gloria S. Andrews, PE
Alteration of Terrain Bureau

cc: Lebanon Planning Board (planning@lebanonnh.gov)
Jim Kennedy, Conn River Upper Valley LAC (jimkennedy321@gmail.com)
Daniel Moss, PE; Pathways Consulting (dan.moss@pathwaysconsult.com)
Rod Finley, PE; Pathways Consulting (rod.finley@pathwaysconsult.com)



State of New Hampshire
Department of Environmental Services
29 Hazen Drive, P.O. Box 95, Concord, NH 03302-0095
(603) 271-3503 FAX (603) 271-4128



SEWER CONNECTION PERMIT

Project Name: Quail Hollow Senior Living Community
Location : Lily Lane
Engineer : Pathways Consulting, LLC - Rodrick J. Finley, PE

Municipality/POTW : Lebanon
Official Signature : Peter Kulbacki, Hanover - Director of Public Wor
Date of Request : 6/30/2020

PERMIT/REQUEST NUMBER

D2020-0714

FLOW : **7,200** gallons/day

APPROVAL DATE **8/28/2020**

The New Hampshire Department of Environmental Services (NHDES) has reviewed and hereby approves the request as follows:

Approval of the connection to the municipality's wastewater facilities is based on a review of the supporting information submitted and is subject to the conditions indicated below.

CONDITIONS :

Approval applies only to the sewerage plans and sewer connection application received by NHDES.

This approval will become void if the sewerage construction or discharge has not begun within three years of the approval date.

All sewerage construction must comply with the requirements of Chapter Env-Wq 700, the Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities.

No deviations from approved plans or specifications shall be made without prior written approval from DES.

DES approves design plans and specifications for sewer extension (495 LF 8" PVC, SDR35)

Issued by :

Robert A. Daniel, P.E.

WATER DIVISION - WASTEWATER ENGINEERING BUREAU - DESIGN REVIEW SECTION

cc: Pathways Consulting, LLC - Rodrick J. Finley, PE



SEWER USE PERMIT

This Sewer Use Permit is issued for this location for the estimated flows enumerated below. The permit allows discharge of wastewater into the City's sewer system in accordance with the provisions of Chapter 136 of the City Code as well as applicable federal and state laws, rules and regulations. This permit is valid unless otherwise revoked for the property and buildings as approved by the Lebanon Planning Board (Project Number: PB2019-13, Date: September 9, 2019, Address: 69 Lily Lane). Any planned modifications to this property which result in additional sewer usage above the allocated amounts detailed below require the property owner to seek a permit modification from the Department of Public Works. Allocation shall be assessed as part of the Building Permit Process or Site Plan review. This permit shall remain valid regardless of a change in ownership of the property unless otherwise revoked by the City in accordance with the provisions of Chapter 136 of the Code of the City of Lebanon and applicable federal and state laws, rules or regulations.

Sewer Use Permit Number: 2020-11

Property location: 69 Lily Lane, West Lebanon, NH

Tax Map: 8 **Lot:** 2-200

Permittee: Quail I, LP

Type of Sewer use (i.e. Commercial, Residential, etc.): Addition of a 32-Unit to Quail Hollow

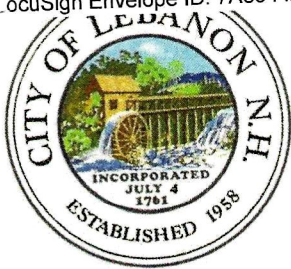
Average Daily Permitted Flow: 2,400 gpd

Sewer Units: 12

Issued By: DocuSigned by:
Shaun Mulholland
AE8C225904D9436... **Date:** 2/26/2021

Shaun Mulholland, City Manager

*In order to reserve this Sewer Use Permit you must remit the Sewer Development Charge within 90 days of this notice. Failure to do so will result in revocation of this Sewer Use Permit.



NOTICE OF ALLOCATION

This Notice of Allocation reserves sewer capacity for the applicants use while other land use permits are attained in accordance with the provisions of Chapter 136 of the City Code. This Notice of Allocation is only valid for a period of two years. To retain this Allocation the applicant must still apply for a Sewer Use Permit from the City of Lebanon.

Property location: 69 Lily Lane, West Lebanon, NH

Tax Map: 8 **Lot:** 2-200

Applicant: Quail I, LP

Type of Sewer use (i.e. Commercial, residential, etc.): Addition of a 32-Unit to Quail Hollow

Average Daily Flow Reserved: 2,400 gpd*

Sewer Units: 12

Issued By: DocuSigned by:
Shaun Mulholland
AE8C225904D9436...

Shaun Mulholland, City Manager

Date Issued: 2/26/2021

Date Expires: 2/26/2023

*In order to reserve this allocation you must remit 20% of the anticipated Sewer Development Charge within 30 days of this notice. Failure to do so will result in revocation of this allocation.

The issuance of a Notice of Allocation or Sewer Use Permit shall not be deemed to create any kind of vested or property right in the City-owned sewer system. The privileges conferred by such permits may not be assigned, traded, exchanged among properties, or applied to a materially different development without the approval of the City Manager acting on a revised application submitted under this section.

INVOICE

CITY OF LEBANON
51 NORTH PARK STREET
LEBANON, NH 03766-1381

Customer No: D2501
Invoice No: 13271
Reference No: 2020-11
Invoice Date: 2/26/2021
Due Date: 5/27/2021
Terms: 90 Days

SOLD TO: Quail I, LP
7 Aspen Drive, Suite 1
South Burlington, VT 05403

Contact:
Desc: Sewer Dev Charge 100%

DETAIL

SDC - 100%	10,864.20
Note:	
Invoice Total:	10,864.20

IF YOU HAVE ANY QUESTIONS REGARDING THIS BILL, PLEASE CONTACT DPW 603-448-3112

INVOICE

CITY OF LEBANON
51 NORTH PARK STREET
LEBANON, NH 03766-1381

Customer No: D2501
Invoice No: 13270
Reference No: 2020-11
Invoice Date: 2/26/2021
Due Date: 5/27/2021
Terms: 90 Days

SOLD TO: Quail I, LP
7 Aspen Drive, Suite 1
South Burlington, VT 05403

Contact:
Desc: SewerDev Fees-Hanover

DETAIL

Sewer Development Fees - Hanover	34,472.00
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Note:

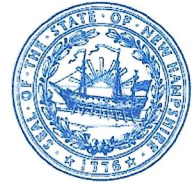
Invoice Total:	34,472.00
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IF YOU HAVE ANY QUESTIONS REGARDING THIS BILL, PLEASE CONTACT DPW 603-448-3112



The State of New Hampshire
Department of Environmental Services

Robert R. Scott, Commissioner



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WETLANDS AND NON-SITE SPECIFIC PERMIT 2020-02338

NOTE CONDITIONS

PERMITTEE: QUAIL I LP
C/O JOHN GIEBINK
7 ASPEN DR STE 1
SOUTH BURLINGTON VT 05403

PROJECT LOCATION: LAKEVIEW DR, WEST LEBANON
TAX MAP #13, LOT #1

WATERBODY: UNNAMED WETLANDS

APPROVAL DATE: DECEMBER 30, 2020

EXPIRATION DATE: DECEMBER 30, 2025

=====

Based upon review of the above referenced application, in accordance with RSA 482-A and RSA 485-A:17, a Wetlands Permit and Non-Site Specific Permit was issued by the New Hampshire Department of Environmental Services (NHDES). This permit shall not be considered valid unless signed as specified below.

PERMIT DESCRIPTION: Dredge and fill 535 square feet within palustrine emergent wetlands to install a new stormwater outfall and rip-rap outlet protection.

THIS APPROVAL IS SUBJECT TO THE FOLLOWING PROJECT SPECIFIC CONDITIONS:

1. In accordance with Env-Wt 307.16, all work shall be in accordance with the revised plans dated December 3, 2020 by Pathways Consulting, LLC, with Sheet 2 revised December 7, 2020, as received by NHDES on December 15, 2020.
2. Per email communication from the NH DNCR, Natural Heritage Bureau ("NHB"), to the applicant on December 4, 2020 regarding NHB20-3433, the applicant shall continue to coordinate with the NHB to mitigate potential impacts to protected species identified in the vicinity of the project.
3. In accordance with Env-Wt 307.18(c), within 60 days following construction completion, a post-construction report shall be submitted to the NHDES Wetlands Bureau that describes the monitoring conducted and date(s) of inspections, and includes photos showing the extent of jurisdictional impacts and progress of plantings.
4. In accordance with Env-Wt 307.03(b), all work, including management of soil stockpiles, shall be conducted so as to minimize erosion, minimize sediment transfer to surface waters or wetlands, and minimize turbidity in surface waters and wetlands using the techniques described in Env-Wq 1505.02, Env-Wq 1505.04, Env-Wq 1506, and Env-Wq 1508; the applicable BMP manual; or a combination thereof, if the BMP manual provides less protection to jurisdictional areas than the provisions of Env-Wq 1500.
5. In accordance with Env-Wt 307.03(c)(1), water quality control measures shall be selected and implemented based on the size and nature of the project and the physical characteristics of the site, including slope, soil type, vegetative cover, and proximity to jurisdictional areas.
6. In accordance with Env-Wt 307.03(c)(3), water quality control measures shall be installed prior to start of work and in accordance with the manufacturer's recommended specifications or, if none, the applicable requirements of Env-Wq 1506 or Env-Wq 1508.
7. In accordance with Env-Wt 307.03(c)(4), water quality control measures shall be capable of minimizing erosion; collecting sediment and suspended and floating materials; and filtering fine sediment.

www.des.nh.gov

29 Hazen Drive • PO Box 95 • Concord, NH 03302-0095
NHDES Main Line: (603) 271-3503 • Subsurface Fax: (603) 271-6683 • Wetlands Fax: (603) 271-6588
TDD Access: Relay NH 1 (800) 735-2964

8. In accordance with Env-Wt 307.03(c)(5), water quality control measures shall be maintained so as to ensure continued effectiveness in minimizing erosion and retaining sediment on-site during and after construction.
9. In accordance with Env-Wt 307.03(c)(6), water quality control measures shall remain in place until all disturbed surfaces are stabilized to a condition in which soils on the site will not experience accelerated or unnatural erosion by achieving and maintaining a minimum of 85% vegetative cover using an erosion control seed mix, whether applied in a blanket or otherwise, that is certified by its manufacturer as not containing any invasive species; or placing and maintaining a minimum of 3 inches of non-erosive material such as stone.
10. In accordance with Env-Wt 307.03(c)(7), temporary water quality control methods shall be removed upon completion of work when compliance with Env-Wt 307.03(c)(6) is achieved.
11. In accordance with Env-Wt 307.03(d), any sediment collected by water quality control measures shall be removed with sufficient frequency to prevent the discharge of sediment; and placed in an upland location in a manner that prevents its erosion into a surface water or wetland.
12. In accordance with Env-Wt 307.03(e), all exposed soils and other fills shall be permanently stabilized within 3 days following final grading.
13. In accordance with Env-Wt 307.03(g)(1), the person in charge of construction equipment shall inspect such equipment for leaking fuel, oil, and hydraulic fluid each day prior to entering surface waters or wetlands or operating in an area where such fluids could reach groundwater, surface waters, or wetlands.
14. In accordance with Env-Wt 307.03(g)(2), the person in charge of construction equipment shall repair any leaks prior to using the equipment in an area where such fluids could reach groundwater, surface waters, or wetlands.
15. In accordance with Env-Wt 307.03(g)(3) and (4), the person in charge of construction equipment shall maintain oil spill kits and diesel fuel spill kits, as applicable to the type(s) and amount(s) of oil and diesel fuel used, on site so as to be readily accessible at all times during construction; and train each equipment operator in the use of the spill kits.
16. In accordance with Env-Wt 307.03(h), equipment shall be staged and refueled outside of jurisdictional areas (unless allowed) and in accordance with Env-Wt 307.15.
17. In accordance with Env-Wt 307.05(e), to prevent the use of soil or seed stock containing nuisance or invasive species, the contractor responsible for work shall follow Best Management Practices for the Control of Invasive and Noxious Plant Species (Invasive Plant BMPs).
18. In accordance with Env-Wt 307.10(b), work shall be done during low flow or in the dry unless a dredge dewatering, diversion, or cofferdam plan has been approved as part of the project.
19. In accordance with Env-Wt 307.11(a), fill shall be clean sand, gravel, rock, or other material that meets the project's specifications for its use; and does not contain any material that could contaminate surface or groundwater or otherwise adversely affect the ecosystem in which it is used.
20. In accordance with Env-Wt 307.11(b), limits of fill shall be clearly identified prior to commencement of work and controlled in accordance with Env-Wt 307.03 to ensure that fill does not spill over or erode into any area where filling is not authorized.
21. In accordance with Env-Wt 307.11(c), slopes shall be immediately stabilized by a method specified in Env-Wq 1506 or Env-Wq 1508, as applicable, to prevent erosion into adjacent wetlands or surface waters.
22. In accordance with Env-Wt 307.15(a), heavy equipment shall not be operated in any jurisdictional area unless specifically authorized by this permit.

GENERAL CONDITIONS THAT APPLY TO ALL NHDES WETLANDS PERMITS:

1. Pursuant to RSA 482-A:12, a copy of the permit shall be posted in a secure manner in a prominent place at the site of the approved project.
2. In accordance with Env-Wt 313.01(a)(5), and as required by RSA 482-A:11, II, work shall not infringe on the property rights or unreasonably affect the value or enjoyment of property of abutting owners.
3. In accordance with Env-Wt 314.01, a standard permit shall be signed by the permittee and the principal contractor who will build or install the project prior to start of construction; and will not be valid until signed.
4. In accordance with Env-Wt 314.03(a), the permittee shall notify the department in writing at least one week prior to commencing any work under the permit.

5. In accordance with Env-Wt 314.08(a), the permittee shall file a completed notice of completion of work and certificate of compliance with the department within 10 working days of completing the work authorized by the permit.
6. In accordance with Env-Wt 314.06, transfer of this permit to a new owner shall require notification to and approval by NHDES.
7. In accordance with Env-Wt 307.02, in order to be in compliance with federal requirements, all work in areas under the jurisdiction of the U.S. Army Corps of Engineers (US ACE) shall comply with all conditions of the applicable state general permit (see attached notice).
8. In accordance with Env-Wt 307.06(a) through (c), no activity shall jeopardize the continued existence of a threatened or endangered species, a species proposed for listing as threatened or endangered, or designated or proposed critical habitat under the Federal Endangered Species Act, 16 U.S.C. §1531 et seq.; State Endangered Species Conservation Act, RSA 212-A; or New Hampshire Native Plant Protection Act, RSA 217-A. A copy of this permit shall be posted on site during construction in a prominent location visible to inspecting personnel.

APPROVED:

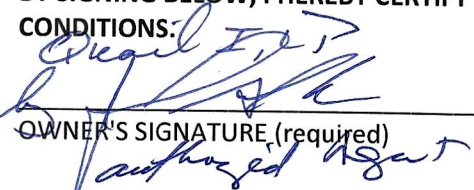


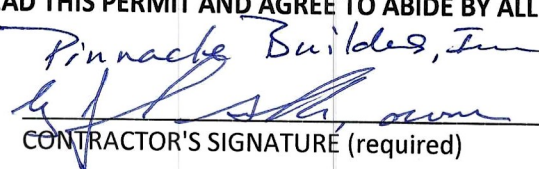
Seta A. Detzel

Land Resources Management, Water Division

=====

BY SIGNING BELOW, I HEREBY CERTIFY THAT I HAVE FULLY READ THIS PERMIT AND AGREE TO ABIDE BY ALL PERMIT CONDITIONS:


OWNER'S SIGNATURE (required)


CONTRACTOR'S SIGNATURE (required)



Victoria F. Sheehan
Commissioner

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

District 2 Office, 8 Eastman Hill Rd., Enfield, NH 03748 (603) 448-2654



William Cass, P.E.
Assistant Commissioner

DRIVEWAY PERMIT

To: John Glebink
Quail Townhomes, LLC
7 Aspen Drive - Suite 1
South Burlington, VT 05403

City/Town: Lebanon
Route/Road: NH 10 (S0000010)
Patrol Section: 207
Tax Map: 8
Lot: 1 & 2
Development: Quail Hollow

Permit #: 7120-A4
District: 02
Permit Date 2/12/2018

Permission is hereby granted to construct (alter) a driveway, entrance, exit or approach adjoining NH 10 (S0000010), pursuant to the location and specifications as described below. Failure to adhere to the standards and engineering drawings previously approved shall render this instrument null and void. Failure to start or complete construction of said facility within one calendar year of the date of this permit shall require application for permit extension or renewal in accordance with the Driveway Access Rules. Facilities constructed in violation of the permit specifications or the rules, shall be corrected immediately upon notification by a Department representative. Any cost by the State to correct deficiencies shall be fully borne by the landowner. The landowner shall defend, indemnify and hold harmless the Department and its duly appointed agents and employees against any action for personal injury and/or property damage sustained by reason of the exercise of this permit.

Drive 1

Location: Approximately 0.69 miles south of Hanover townline on the west side of NH 10 (S0000010).
SLD Station: 43965 () GPS: 43.67985 N 72.29457 W.

Specifications: This permit authorizes a paved access to be used as a SUBDIVISION drive. Any change in use, increase in use or reconstruction of the driveway requires reapplication.

The right-of-way line is located 33 feet from and parallel to the centerline of the highway.
The entrance shall be graded so that the surface of the drive drops 5 inches at a point 10 feet from NH 10 (S0000010) edge of pavement to create a drainage swale.

The driveway shall not exceed 50 feet in width. The entrance of the drive may be flared; typically the flare radius is one half the driveway width.

2-12-2018 Amendment 4: Addition of 40 senior apartments for a total of 320 units.
Revised traffic impact submitted by RSG, INC dated August 21 2017. No changes to Quail Hollow Road required due to additional units.

6-18-15 Amendment 3: Renewed permit.

6-11-2013 Amendment 2: Change previously approved 28 condominium units to one single containing 62 units for senior housing. Revised traffic impact submitted by RSG, INC dated 31 January 2013. Changes to Quail Hollow Road as per plans by Pathways Consulting, LLC dated 14 May 2013.

Other Conditions:

No structures, including buildings, permanent or portable signs, lights, displays, fences, walls, etc. shall be permitted on, over or under the Highway Right of Way.

No parking, catering or servicing shall be conducted within the Highway Right of Way.

The applicant shall comply with all applicable ordinances and regulations of the municipality or other State Agencies.

The Department has relied on the title and subdivision information provided by the landowner. The Department has not performed additional title research and makes no warranty or representation concerning landowner's legal right to access. In the event of a dispute about the landowner's legal right to the access provided herein, the landowner will defend and indemnify the Department.

Approved 
Assistant District Engineer
For Director of Administration

Copies: District, Town, Patrolman

PATHWAYS CONSULTING, LLC

Planning • Civil & Environmental Engineering • Surveying • Construction Assistance
240 Mechanic Street • Suite 100
Lebanon, New Hampshire 03766
(603) 448-2200 • Fax: (603) 448-1221

MEMORANDUM

TO: JOHN GIEBINK, GREEN MOUNTAIN DEVELOPMENT GROUP, INC.

FROM: RODRICK J. FINLEY, P.E., VICE PRESIDENT, DIRECTOR OF
ENGINEERING SERVICES

RE: SEWER AND WASTEWATER PUMP STATION CAPACITY,
QUAIL HOLLOW, LEBANON, NEW HAMPSHIRE (Project No. 10112)

DATE: AUGUST 28, 2017

As requested, we have reviewed the capacity of the existing gravity sewer, wastewater pump station, and forcemain serving the referenced site. In summary, it is our opinion that the pump station and associated sewers are capable of handling the current four phases of development, as well as the proposed addition of 20 double and 20 single units. The following findings of fact summarize the basis for our conclusion:

1. The existing wastewater pump station wetwell is precast concrete with an 8' 0" inside diameter and an inside depth of 17' 9". The inlet sewer enters the wetwell at an invert elevation of 421.5 feet (ft.). There is a removable inlet trash basket installed to screen coarse debris. The wetwell and pump retrieval system is designed in conformance with New Hampshire Department of Environmental Services (NHDES) Regulations Env-Wq 705 Sewage Pumping Stations.
2. The pump station is designed for duplex, alternating pump operation. The existing pumps are Myers 4VCX, non-clog sewage pumps. They are rated for 1,750 revolutions per minute (rpm), three phase, 230 volt operation, and they are equipped with 25 Horse Power (HP) motors. The "pumps off" elevation is 415.25 ft. and the discharge invert elevation of the forcemain is at 501.3 ft. These attributes result in an approximate elevation head of 86 ft. and a calculated frictional loss of approximately 27 ft. At a total head of 113 ft., the 4VCX pump is expected to operate at a flow rate of 150 to 200 gallons per minute (gpm), which is more than adequate for the intended flows. The pumps have an open volute design capable of passing a 3-inch diameter sphere, and they are in conformance with the above referenced NHDES Regulations.
3. The pumps are intended to alternate, and are set-up in a lead/lag configuration controlled by internal float switches. There is an elevation difference of 4' 6" between the high water alarm and the invert of the inlet pipe. This feature provides approximately 1,700 gallons of emergency storage in the wetwell between the high water alarm and the inlet sewer invert elevation.
4. The installed, separate emergency storage tank has a working volume of 4,850 gallons. The total emergency storage provided in the tank and the wetwell is 6,550 gallons, and 6 hours of holding time in accordance with the NHDES Regulations. The pump station is also equipped with a connection and manual transfer switch to allow for installation of a portable generator during prolonged power outages.

5. The discharge of the pumps is routed through a valve chamber into 4-inch diameter Class 150 PVC forcemain. At the operating flow rates of the pump station, the sewage velocity in the forcemain is approximately 3.7 ft. per second and conforms to the NHDES Regulations.
6. All gravity sewers are 8-inch diameter PVC installed with a minimum slope of 0.004-foot, per foot and in accordance with the NHDES Regulations. This size sewer is capable of flowing approximately 350 gpm at minimum slope.
7. The original pump station was designed for an average daily flow (ADF) of 25,500 gallons per day (gpd), and the equipment sized for a peaking factor of 10.0. The design ADF was based on the State published wastewater generation guidelines of 150 gpd per bedroom.
8. Actual metering data by the City of Lebanon has indicated that the flows range from 40 to 60 gpd per unit. For the purpose of this evaluation, we have assumed a design flow of 75 gpd per bedroom. This amount will allow a reasonable, but conservative, estimate of the actual flow rates to be handled by the pump station. The following table summarizes the various phases of development:

Development Phase	Number of Bedrooms	Existing Flow, Based on 75 gpd per Bedroom	Proposed Flow, Based on 75 gpd per Bedroom
Phase 1/II	138	10,350	-----
Phase III	170	12,750	-----
Phase IV	90	6,750	-----
Phase V	60	-----	4,500
Subtotal		29,850 gpd	4,500 gpd
Total Proposed Flow		34,350 gpd	

9. The proposed design operating conditions based on the conservative rate of 75 gpd per bedroom (defined based on actual metering data) are as follows:
 - Average Daily Flow Rate 34,350 gpd
 - Average Daily Flow Rate 23.8 gallons per minute
 - NHDES Peaking Factor (Env-Wq 704) 6 (for flows less than 100,000 gpd)
 - Required Design Flow Rate 143 gallons per minute
10. A review of NHDES Env-Wq 705 indicates that the critical design element for the proposed flow rate is the requirements for six hours of emergency storage in the event of prolonged power failure. Based on the ADF of 34,350 gpd noted above, the required holding volume is approximately 8,570 gallons, approximately 2,020 gallons more than the currently available emergency storage. It is recommended that a 2,500 gallon tank be installed adjacent to the existing emergency storage tank or a stand-by emergency generator.

MEMO

TO: Tom Getz, Green Mountain Development Group, Inc.
FROM: Ben Swanson
DATE: August 21, 2017
SUBJECT: Quail Hollow Traffic Assessment

Resource Systems Group (RSG) was asked to assess potential traffic impacts associated with the construction of 40 additional senior housing units at the Quail Hollow/Quail Ridge development in Lebanon, NH.

In 1997, RSG conducted a formal traffic impact study for the original Quail Hollow Development. This assessment concluded the project would not significantly impact NH-10 traffic (with minimal projected delays on NH-10) and would also result in acceptable delays and levels of service for traffic exiting the site. A northbound left-turn lane was recommended on NH-10 at the Quail Hollow driveway, and this improvement was constructed with the first round of development at Quail Hollow in 1999.

SITE OBSERVATIONS

During the AM peak period on Friday August 18, 2017, RSG conducted a site visit to the NH-10 & Quail Hollow intersection to observe stopping and intersection sight distances and to observe intersection operations. During this site visit vehicles were observed to enter and exit the site without interfering with NH-10 traffic.

Stopping and intersection sight distances, as defined in the 2011 publication *A Policy on Geometric Design of Highways and Streets*, from the American Association of State Highway and Transportation Officials (AASHTO),¹ were measured north and south of the site access intersection and in both directions were observed to exceed design standards for a 40 MPH roadway.²

FIGURE 1: SIGHT DISTANCE OBSERVATIONS

	To/From North	To/From South
Observed Stopping Sight Distance	425	450
Observed Intersection Sight Distance	~500	400
AASHTO Design Minimum	305	305

¹ American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets*, Fifth Edition (Washington D.C.: American Association of State Highway and Transportation Officials, 2011).

² The posted speed limit drops from 40 MPH south of Quail Hollow to 35 MPH north of Quail Hollow.

SITE GENERATED TRAFFIC

The Quail Hollow/Quail Ridge development currently includes a total of 280 senior housing units in a mix of condominium/townhouses and larger apartment buildings. The current proposal would increase the total number of permitted senior housing units to 320.

Using Trip Generation Rates published by the Institute of Transportation Engineers (ITE)³ for the Senior Adult Housing-Attached land use (LU 252), we project the proposed construction of these additional 40 units would generate approximately 8 new vehicle trips during the weekday AM peak hour (3 enter and 5 exit) and 10 new vehicle trips during the PM peak hour (5 enter and 5 exit).

The projected trip generation, based on ITE rates, is consistent with local data collected by RSG for the City of Lebanon as part of a Trip Generation assessment RSG recently conducted for the City. As part of this study, RSG installed an automatic traffic recorder (pneumatic road tubes) across the Quail Hollow driveway from April 24, 2017 through May 1, 2017. From this count, the current development was observed to generate 50 vehicle trips (23 enter and 27 exit) during the weekday AM peak hour and 57 vehicle trips (29 enter and 28 exit) during the weekday PM peak hour. On a per unit basis, the site generates approximately 0.18 trips per unit during the weekday AM peak hour and approximately 0.20 trips per unit during the weekday PM peak hour. Using these local rates, the proposed 40 additional senior housing units would be expected to generate approximately 7 new vehicle trips (3 enter and 4 exit) during the weekday AM peak hour and 8 new vehicle trips (4 enter and 4 exit) during the weekday PM peak hour.

Both the ITE calculations and local data calculations project fewer than 10 new vehicle trips per hour associated with the proposed addition of 40 new senior housing units at the Quail Hollow/Quail Ridge site, which is well below the NHDOT and City of Lebanon standard threshold for requiring a traffic impact study of 100 or more peak hour vehicle trips. Overall peak hour site generated traffic from the entire Quail Hollow/Quail Ridge development is also expected to remain below this 100 trip threshold with the proposed expansion.

CONCLUSIONS

Based on the projected trip generation, along with recent observations of site operations and sight distances at the NH-10 & Quail Hollow intersection, we project the proposed addition of 40 new senior housing units will not adversely impact traffic congestion or safety on the surrounding road network.

Please feel free to contact us with any questions.

³ Institute of Transportation Engineers, *Trip Generation* 9th Edition (Washington, D.C.: Institute of Transportation Engineers, 2012).

M&W Soils Engineering, Inc.

Randall Rhoades, PE

PO Box 1466, Charlestown, NH 03603

38 A Street, Wilder, VT 05088

ph: 603-826-5873

fax: 603-826-4210

March 2, 2018

John Giebink
Green Mountain Development Group, Inc.
7 Aspen Drive
Suite 1
South Burlington, VT 05403

re: Quail Hollow, Phase V Building

Dear John,

You have requested that M&W Soils Engineering provides an evaluation of your plans to construct a 40 unit residential building with a garage on the lower level. From the plans you have sent to me, I see that you plan to excavate anywhere from 0' into the slope at the south end to 22' in the middle to 15' at the north end. Your building plans will include a 15' structural concrete retaining wall for the back wall of the garage which will be designed by a registered structural engineer at the time your building plans are completed and submitted to the City of Lebanon, prior to issuance of a building permit. You also plan to construct a short block retaining wall along portions of the deepest cut, to be set back 8 feet from the foundation wall.

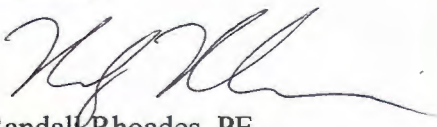
I have visited the site in question, and find the existing conditions to reflect those shown on the Schematic Site Plan prepared by Pathways Consulting, LLC. Our firm has does several projects on the larger property over the years, and we are familiar with the soil conditions. I have no concerns relative to the ability of the soils to support the proposed building.

In order for construction to be contained to your property, a combination of the permanent retaining walls and temporary shoring will be required. Shoring is commonly used in areas where there is an adjacent structure or slope which needs to be supported during construction. Plans for retaining walls or shoring would be developed during the design process, by design professionals, and submitted to Lebanon as part of the building permit review process.

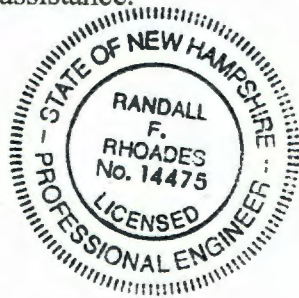
It is my opinion that the excavation, construction, and grading of this project can be done in a manner which will not create a hazard to the hillside, and that it can be contained to your property.

Please call me if I can be of further assistance.

Sincerely,



Randall Rhoades, PE



Project: _____

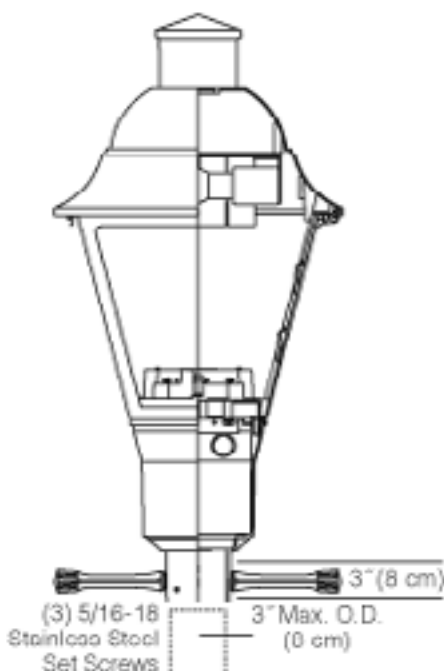
Location: _____

Cat.No: _____

Type: _____

Lamps: _____ Qty: _____

Notes: _____



Ordering Guide

Example: V151 A B3 N D 70S E

Product Code	V151	Independence
Finish	A	Black
	B	White
	G	Verde
	H	Bronze
	J	Green
Optics	B3	Type III Refractive Panels
	B5	Type V Refractive Panels
	T3	Type III Cutoff
	T5	Type V Cutoff
	V3	Vertical Rib Type III
	V5	Vertical Rib Type V
Photo Control	N	None
	B	Button Eye Photo Control
	R	Twist-lock Receptacle *1
Socket	D	Medium
	G	Mogul
Wattage	70S	70W HPS
	100S	100W HPS
	150S	150W HPS
	250S	250W HPS *2
	70H	70W MH *3
	100H	100W MH *3
	150H	150W PMH
	250H	250W PMH *2
Voltage	E	120V
	F	208V
	G	240V
	H	277V

*1 Twistlock receptacle (R) not available with 347V (K).

*2 Available with Mogul base (G) socket only.

*3 Available with Medium base (D) socket only.

NOTE: Add "-LLR" to end of fixture coding for "Less Ladder Rest" option.

Specifications

HOUSING:

360 low-copper die-cast aluminum alloy . Tool-less lamp access. Tool-less ballast access. Twistlock ballast assembly with quick disconnects for easy maintenance. A weatherproof ballast assembly isolates the ballast from water and heat for longer life. The optional photo control eye or twist-lock receptacle is located in the ballast enclosure for easy access via a removable door. Hinged roof with stainless steel spring latch. All non-ferrous fasteners prevent corrosion and ensure longer life. Decorative cast aluminum Ladder Rest. Slip Fitter Dimensions: 3" I.D. x 3" deep .

FINISH:

Thermoset polyester powdercoat is electrostatically applied after a five-stage conversion cleaning process and bonded by heat fusion thermosetting. Laboratory tested for superior weatherability and fade resistance in accordance with ASTM B117 specifications. For larger projects where a custom color is required, contact the factory for more information.

OPTICAL ASSEMBLY:

Type III Refractive Panels. Type V Refractive Panels. Optically designed, U.V. stabilized, injection molded, acrylic refractive panels. Type III Cutoff. Type V Cutoff. Precision formed, segmented specular aluminum internal cutoff reflector with horizontal lamp mounting. Decorative frosted glass chimney. U.V. stabilized, injection molded, clear acrylic panels. Type III Vertical Rib (precision formed, segmented specular aluminum internal cutoff reflector with horizontal lamp mounting). Type V Vertical Rib (specular aluminum internal cutoff reflector with horizontal lamp mounting). (NOTE: No decorative frosted glass chimney.) U.V. stabilized, injection molded ribbed acrylic panels with internal vertical ribs. Tool-less removal panels for ease of cleaning.

V151 Independence

Post top

Specifications

LAMPING:

MH and HPS Medium base: E17. MH Mogul base: ED28. 70W-150W HPS Mogul base: ED23.5. 250W HPS Mogul base: E18.

ELECTRICAL ASSEMBLY:

Twistlock Ballast Assembly with Quick Disconnects for easy maintenance. Ballasts are HPF core and coil. 4kv rated porcelain mini-can base. Nickel-plated screw shell with center contact. 4kv rated mogul base porcelain socket. Nickel-plated screw shell with center contact.

BALLAST:

All HID ballasts are core and coil and regulated with power factors better than 90% (HPF). Ballast provides +/- 5% lamp power regulation with +/- 10% input voltage regulation. Ballasts are factory pre-wired and tested. Metal halide ballasts are capable of starting at -20° F or -30° C and HPS at -40°F or -40°C. NOTE: All ballasts are EISA / Title 20 / Title 24 compliant where applicable. (NOTE: For plug-in igniter option, consult factory.).

CERTIFICATIONS:

ETL Listed to U.S. safety standards for wet locations. cETL listed to Canadian safety standards for wet locations. Manufactured to ISO 9001:2008 Standards.

WARRANTY:

Three-year limited warranty.

Height :

33 1/2" (85cm)

Width:

16 1/2" (42cm)

Max. EPA:

1.65 sq. ft.

Max. Weight:

28 lbs

IESNA Classifications:

Semi Cutoff: Refractive Panels

IESNA Classifications:

Cutoff: Cutoff optics



SITE PLAN FOR

QUAIL HOLLOW SENIOR LIVING

COMMUNITY - PHASE V

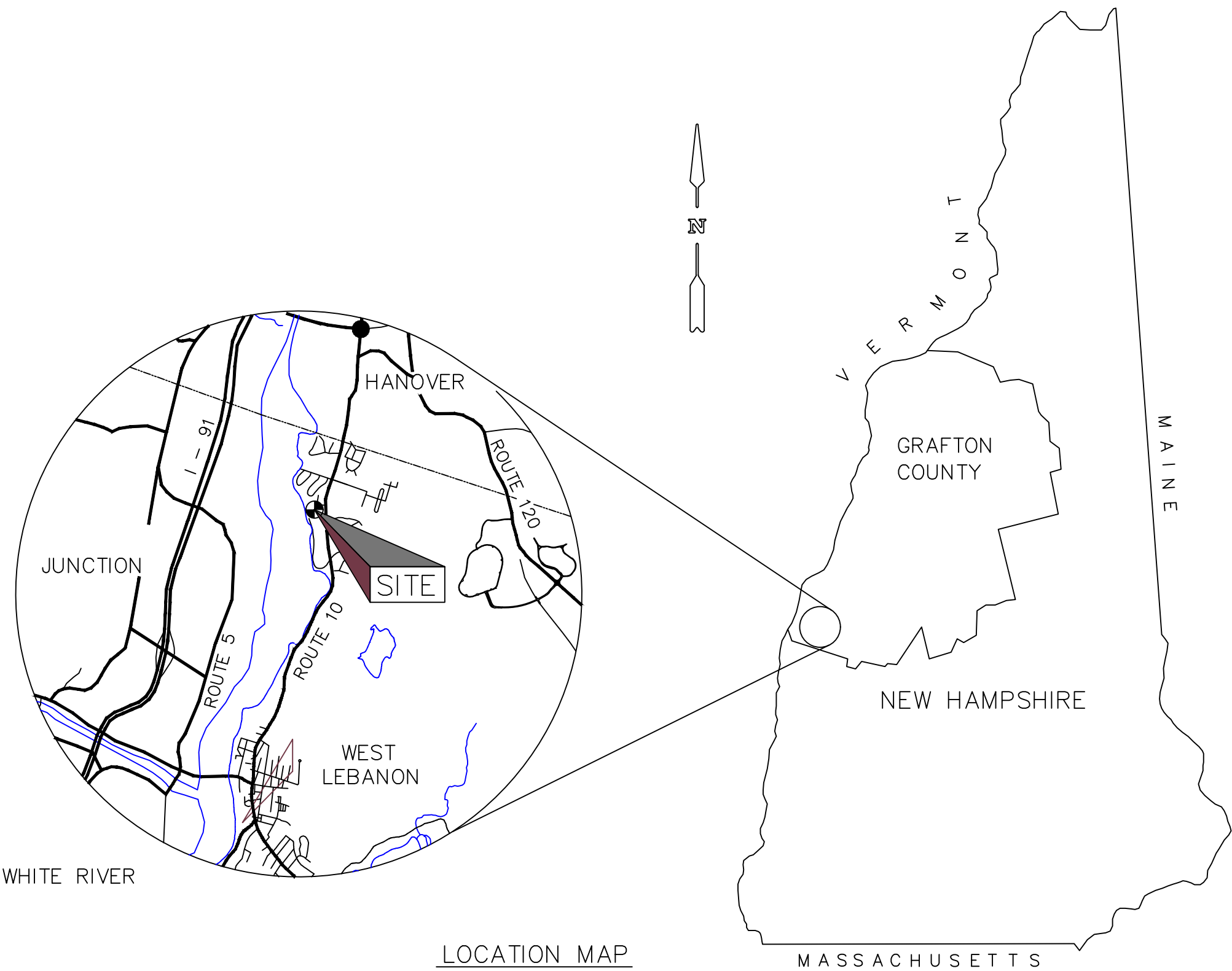
LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

JUNE 10, 2019

SITE INFORMATION			
TAX MAP & LOT NUMBER:	MAP 8 LOT 2-200		
ZONING DISTRICT:	RESIDENTIAL THREE (R-3)		
AREA OF LOT:	11.93 ACRES		
EXISTING USE:	SENIOR HOUSING COMPLEX (114 UNITS)		
PROPOSED USE:	SENIOR HOUSING COMPLEX (32 UNITS)		
GROSS AREA OF BUILDINGS:	EXISTING	ADDITIONAL	TOTAL
	115,944 SQ. FT.	50,000 SQ. FT.	165,944 SQ. FT.
PARKING: SENIOR LIVING (1 SPACE PER UNIT)	REQUIRED	EXISTING	INCLUDING 16 HANDICAP ACCESS SPACES 98 - 9'x16' PARKING SPACES)
EXISTING PHASES 1 & 2:	114	114	
PROPOSED PHASE 5:	REQUIRED	PROPOSED	GARAGE: 4 HANDICAP ACCESS SPACES, 2 - EV INSTALLED SPACES & 7 - EV READY SPACES, & 24 - 10'x20' PARKING SPACES EXTERIOR: 2 HANDICAP ACCESS SPACES & 3 - 10'x22' PARKING SPACES
	32	42	
NUMBER OF STORIES:	3 STORIES (CONTAINING 16,667 SQ. FT. EACH STORY)		
LOADING SPACES:	NA		
BUILDING HEIGHT:	REQUIRED	EXISTING	PROPOSED
	35'	35'	35'
BUILDING SETBACKS:	REQUIRED	EXISTING	PROPOSED
FRONT:	20'	89.4'	89.4'
SIDE:	15'	55.9'	19.3'
REAR:	20'	336.0'	247.3'
LOT COVERAGE (BUILDING):	ALLOWED	EXISTING	PROPOSED
	25%	8.4%	12.0%
IMPERVIOUS AREA:	EXISTING	PROPOSED	
	131,626± SQ. FT. (25.3%)	154,030± SQ. FT. (29.5%)	
WETLANDS CONSERVATION DISTRICT/FLOODPLAIN DISTRICT; SHORELAND WATER QUALITY PROTECTION JURISDICTION	THE SITE IS NOT WITHIN THE WETLANDS CONSERVATION DISTRICT/FLOODPLAIN DISTRICT. OR WITHIN THE SHORELAND WATER QUALITY PROTECTION JURISDICTION		

THERE ARE NO KNOW HOLDERS OF ANY EASEMENTS, RIGHTS OF WAY, OR OTHER RESTRICTIONS ON THE SUBJECT PROPERTY.

INDEX OF SHEETS			
SHEET	1 OF 22	-	COVER, INDEX OF SHEETS & LOCATION MAP
SHEET	2 OF 22	-	CONTEXT PLAN
SHEET	3 OF 22	-	OVERALL SITE PLAN
SHEET	4 OF 22	-	EXISTING CONDITIONS & DEMOLITION PLAN
SHEET	5 OF 22	-	LAYOUT PLAN
SHEET	6 OF 22	-	GRADING PLAN
SHEET	7 OF 22	-	DRAINAGE & UTILITY PLAN
SHEET	8 OF 22	-	WATERMAIN EXTENSION PLAN
SHEET	9 OF 22	-	LANDSCAPE & LIGHTING PLAN
SHEET	10 OF 22	-	SITE DETAILS
SHEET	11 OF 22	-	LANDSCAPE DETAILS
SHEET	12 OF 22	-	WATER & SEWER DETAILS
SHEET	13 OF 22	-	EROSION CONTROL NOTES & DETAILS
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SHEET	15 OF 22	-	DRAINAGE DETAILS
SHEET	16 OF 22	-	DRAINAGE DETAILS
SHEET	17 OF 22	-	UTILITY PROFILE ALIGNMENT PLAN
SHEET	18 OF 22	-	WATER PROFILE
SHEET	19 OF 22	-	SEWER PROFILE
SHEET	20 OF 22	-	DRAINAGE PROFILE
SHEET	21 OF 22	-	DRAINAGE PROFILE
SHEET	22 OF 22	-	EAST WILDER ROAD DRAINAGE IMPROVEMENTS BUILDING RENDERING ELEVATIONS QUAIL HOLLOW CAMPUS



REVISED: JUNE 24, 2019
REVISED: JULY 29, 2019
REVISED: AUGUST 28, 2019
REVISED: FEBRUARY 18, 2020
REVISED: MARCH 15, 2021
REVISED: JULY 10, 2023

ARCHITECT J. GRAHAM GOLDSMITH, ARCHITECTS, PC 7 KILBURN STREET BURLINGTON, VERMONT 05401 (802) 862-4053	CIVIL ENGINEER PATHWAYS CONSULTING, LLC 240 MECHANIC STREET, SUITE 100 LEBANON, NEW HAMPSHIRE 03766 (603) 448-2200	RECORD OWNER: QUAIL I LIMITED PARTNERSHIP 7 ASPEN DRIVE SOUTH BURLINGTON, VERMONT 05403	APPLICANT: QUAIL I LIMITED PARTNERSHIP 7 ASPEN DRIVE SOUTH BURLINGTON, VERMONT 05403	
--	--	--	---	--

MAP 8, LOT 3
LISA A. DAMIANI
P.O. BOX 5235
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 13, LOT 1
CHARLES L. SULLIVAN
13 GILSON ROAD
LEBANON, NEW HAMPSHIRE 03766

MAP 13, LOT 6
FREDERICK SCHOCH, TRUSTEE
18 EAST WILDER ROAD
WEST LEBANON, NEW HAMPSHIRE 03748

MAP 7, LOT 8
MAUREEN A. KESTLER
31 OAK KNOLL ROAD
MERIDITH, NEW HAMPSHIRE 03253

MAP 7, LOT 6
WALLACE AND LAURA MITCHELL
66 EAST WILDER ROAD
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 7, LOT 4
ROGER BORGGAARD
72 EAST WILDER ROAD
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 3, LOT 5
CITY OF LEBANON
51 NORTH PARK STREET
LEBANON, NEW HAMPSHIRE 03766

MAP 8, LOT 1
QUAIL IV LIMITED PARTNERSHIP
7 ASPEN DRIVE
SOUTH BURLINGTON, VERMONT 05403

MAP 8, LOT 2-100
EAST WILDER SENIOR HOUSING, LLC
7 ASPEN DRIVE
SOUTH BURLINGTON, VERMONT 05403

MAP 14, LOT 17-100
RAYMOND H. STONE
10 EAST WILDER ROAD
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 7, LOTS 10
WILDER RIDGE ESTATES, LLC
POST OFFICE BOX 2322
NEW LONDON, NEW HAMPSHIRE 03257

MAP 7, LOT 7
KATHLEEN & HENRY CLARK
62 EAST WILDER ROAD
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 7, LOT 5
SAMUEL B. ROBERTS
68 EAST WILDER ROAD
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 7, LOT 3
JAMES C. AND DEBORAH A. KEANE
78 EAST WILDER ROAD
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 3, LOT 4
GIORGIO ALBERTI
STEPHEN ORGEL
MICHAEL WYATT
21 WILDWOOD DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 3, LOT 2
PHILIP ANDERSON
MARIAM MCCUE
15 WILDWOOD DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 8, LOT 11
ALBERT LUCIAN AND SHIRLEY M. DENNIS
POST OFFICE BOX 79
NORWICH, VERMONT 05055

MAP 8, LOT 10
LINDA COLE
9 RICHARDSON PLACE
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 8, LOT 13
KENNETH BLAISDELL, JR.
77 GATES STREET
WHITE RIVER JUNCTION, VERMONT 05001

MAP 8, LOT 14
BARKAT PROPERTIES LLC
5 TENLEY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 8, LOT 7
DEACON CORPORATION
65 FOLIAGE VIEW
LEBANON, NEW HAMPSHIRE 03766

MAP 13, LOT 6
FREDERICK SCHOCH
18 EAST WILDER ROAD
WEST LEBANON, NEW HAMPSHIRE 03784

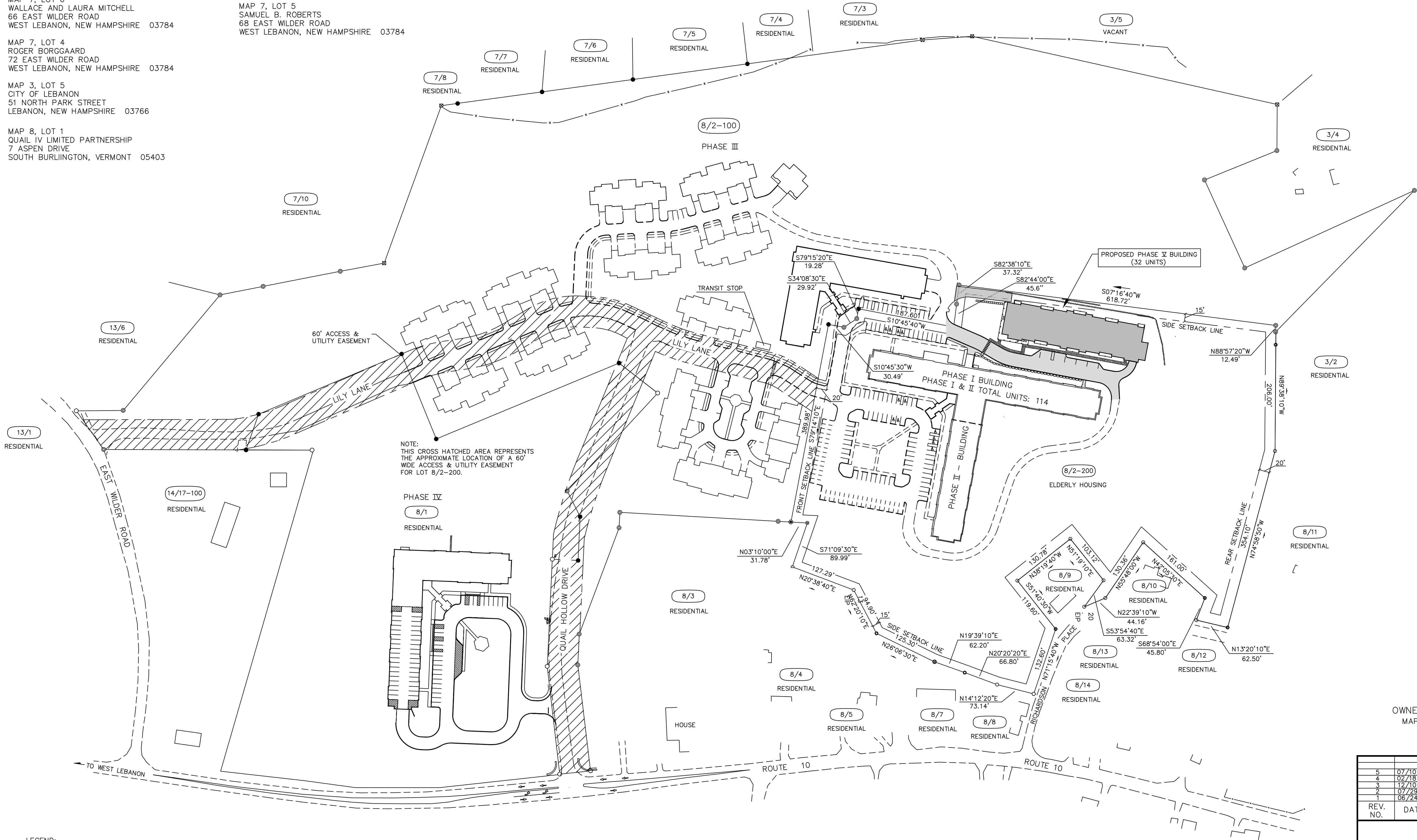
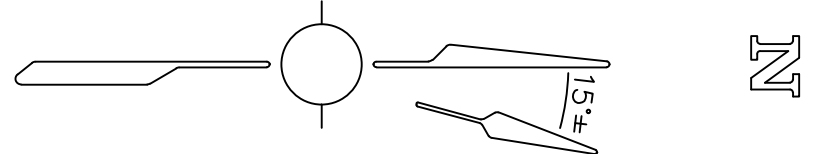
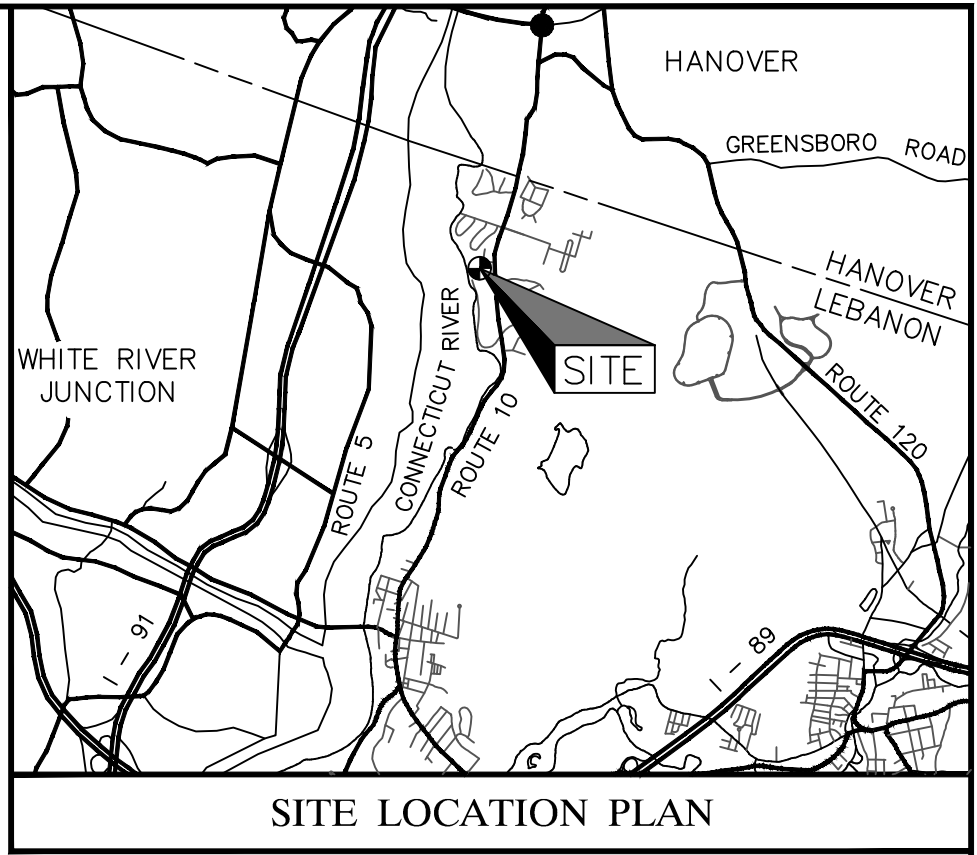
MAP 8, LOT 12
WILLIAM ROSOFF
400 PORTER ROAD
PLAINFIELD, NEW HAMPSHIRE 03781

MAP 8, LOT 4
PCF NORTH MAIN LLC
32 NORTH MAIN
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 8, LOTS 9
DIANE M. DOE
5 RICHARDSON PLACE
WEST LEBANON, NEW HAMPSHIRE 03784

MAP 8, LOT 5
357 NORTH MAN STREET
332 BURPEE HILL ROAD
NEW LONDON, NEW HAMPSHIRE 03257

MAP 8, LOT 8
THOMAS FORWARD, JR. REVOCABLE TRUST
39 RIVERSIDE DRIVE
LEBANON, NEW HAMPSHIRE 03766



LEGEND:
EXISTING IRON PIPE OR REBAR
EXISTING STONE BOUND
SET REBAR 5/8" CAPPED
"PATHWAYS
NH 618 - VT 537"
COMPUTED POINT
TAX MAP/LOT

14/17

OWNER OF RECORD:
MAP 8 LOT 2-200
QUAIL I, LIMITED PARTNERSHIP
7 ASPEN DRIVE, SUITE 1
SOUTH BURLINGTON, VERMONT 05403

REV. NO.	DATE	DESCRIPTION	MADE BY	CHKD BY	APP'D BY
5	07/10/23	UPDATED ABUTTERS	PAB	JSG	
4	02/18/20	CONSTRUCTION DOCUMENTS	PAB	RJF	
3	12/10/19	ALTERATION OF TERRAIN SUBMISSION	PAB	AKK	
2	07/29/19	DPW REVIEW COMMENTS	PAB	RJF	
1	06/24/19	STAFF REVIEW COMMENTS	PAB	RJF	
CONTEXT PLAN FOR QUAIL HOLLOW SENIOR LIVING LIVING COMMUNITY - PHASE V ROUTE 10 - CITY OF LEBANON - GRAFTON COUNTY - NH					
PATHWAYS CONSULTING, LLC					
240 MECHANIC STREET, SUITE 100 LEBANON, NEW HAMPSHIRE 03766 (603) 448-2200					
SHEET: 1 OF 22 SCALE: 1"= 100' DES. BY: PAB DRAWN BY: PAB CHKD. BY: RJF DATE: 06/10/19 PROJ. NO. 10112					

REFERENCE IS MADE TO THE FOLLOWING PLAN FOR BOUNDARY LINE INFORMATION
ENTITLED: "OVERALL SITE PLAN FOR QUAIL HOLLOW SENIOR LIVING COMMUNITY -
PHASE III, DATED: 04/11/05, PROJECT NO. 10112 PREPARED BY PATHWAYS
CONSULTING, LLC.

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE APPROVED DRAWINGS, SPECIFICATIONS, AND ANY ISSUED ADDENDA.
2. THE CONTRACTOR SHALL SCHEDULE AND ATTEND A PRE-CONSTRUCTION MEETING WITH THE OWNER AND ENGINEER PRIOR TO PROCEEDING WITH WORK.
3. WRITTEN DIMENSION SHALL HAVE PRECEDENCE OVER SCALED DIMENSIONS. THE CONTRACTOR SHALL USE CAUTION WHEN SCALING REPRODUCED PLANS. IN CASE OF CONFLICT BETWEEN THIS PLAN SET AND ANY OTHER DRAWINGS AND SPECIFICATION, THE ENGINEER OR OWNER SHALL BE NOTIFIED IMMEDIATELY FOR CLARIFICATIONS.
4. ALL EXISTING WATER MAIN AND DRAINAGE COMPONENTS LOCATED WITHIN THE PROJECT LIMITS THAT ARE TO BE REPLACED BY NEW INFRASTRUCTURE SHALL BE REMOVED, UNLESS OTHERWISE INDICATED. ANY EXISTING STORM DRAIN LINES, CULVERTS, OR WATER LINE DAMAGED DURING CONSTRUCTION AN NOT TO BE REPLACED SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING DRAINAGE FLOWS THROUGHOUT THE DURATION OF CONSTRUCTION.
5. ALL STRUCTURES AND PIPELINES LOCATED ADJACENT TO THE TRENCH EXCAVATION SHALL BE PROTECTED AND FIRMLY SUPPORTED BY THE CONTRACTOR UNTIL THE TRENCH IS BACKFILLED. DAMAGE TO ANY SUCH STRUCTURE CAUSED BY OR RESULTING FROM THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. ALL UTILITIES REQUIRING REPAIR, RELOCATION, OR ADJUSTMENT AS A RESULT OF THE PROJECT SHALL BE COORDINATED THROUGH THE RESPECTIVE UTILITY.
6. IN THOSE INSTANCES WHERE POWER OR TELEPHONE POLE SUPPORT IS REQUIRED, THE CONTRACTOR SHALL PROVIDE A MINIMUM 48 HOUR NOTIFICATION TO LIBERTY UTILITIES, COMCAST, OR CONSOLIDATED COMMUNICATIONS. NO ADDITIONAL PAYMENT WILL BE PROVIDED FOR TEMPORARY BRACING OF UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY RIGHTS-OF-WAY AND EASEMENTS. FOR CONSOLIDATED COMMUNICATIONS, COMCAST AND OTHER UTILITIES AS NEEDED. NO ADDITIONAL PAYMENT WILL BE PROVIDED TO THE CONTRACTOR DUE TO DELAYS CAUSED BY THE UTILITY COMPANIES.
7. THE CONTRACTOR SHALL INSTALL AND MAINTAIN PERMANENT AND TEMPORARY TRAFFIC CONTROL DEVICES (AS N.E.C.T.C.D.) IN MANNER CONSISTENT WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (M.U.T.C.D.).
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING TRAFFIC FLOW AT ALL TIMES. THE CONTRACTOR SHALL PROVIDE NECESSARY CERTIFIED FLAGGER'S NEEDED TO SAFELY CONTROL THE FLOW OF TRAFFIC AND CITY EXPECTATIONS.
9. THE OWNER IS RESPONSIBLE FOR OBTAINING ANY NECESSARY RIGHTS-OF-WAY AND EASEMENTS. THE CONTRACTOR SHALL VERIFY THAT HE NECESSARY EASEMENTS HAVE BEEN SECURED BY THE OWNER. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO BE FAMILIAR WITH THE APPLICABLE PROVISIONS OF EACH EASEMENT AS THEY APPLY TO THE WORK PRIOR TO BIDDING AND ABIDE BY THOSE PROVISIONS DURING CONSTRUCTION.
10. OPEN TRENCHES IN THE ROADWAY MUST BE BACKFILLED AT THE END OF EACH WORKDAY.
11. COMPACTION TESTS SHALL BE PERFORMED IN ACCORDANCE WITH THE CONTRACT. ANY SETTLEMENT OCCURRING WITHIN TWO YEARS OF SUBSTANTIAL COMPLETION OF THE PROJECT WILL BE CORRECTED BY THE CONTRACTOR IN A MANNER ACCEPTABLE TO THE ENGINEER AT NO ADDITIONAL COST TO THE OWNER.
12. THE CONTRACTOR MUST PREPARE A STORMWATER POLLUTION AND PREVENTION PLAN (SWPPP) IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT. EROSION CONTROLS (TEMPORARY/PERMANENT), INSPECTIONS, AND REPORTING, MUST COMPLY WITH THE CONDITIONS OF THE PERMIT. COPIES OF REPORTS SHALL BE PROVIDED TO THE ENGINEER AND OWNER.
13. CONTRACTOR SHALL MITIGATE FUGITIVE DUST TO A TOLERABLE LIMIT. A WATER TRUCK IS EXPECTED TO BE ON-SITE AT ALL TIMES DURING THE WORK WITH APPLICATION SEVERAL TIMES A DAY AS NEEDED TO CONTROL DUST. CONTRACTOR SHALL NOT TRACK SPILL EARTH AND DEBRIS ON PUBLIC STREETS WITHIN AND AROUND THE PROJECT AREA. STREETS OPENED TO THE PUBLIC SHALL BE KEPT SWEEPED AND FREE OF DEBRIS.
14. ALL AREAS (EXCEPT GRAVEL DRIVEWAYS) THAT ARE EXCAVATED, FILLED OR OTHERWISE DISTURBED BY THE CONTRACTOR AND ARE NOT TO BE PAVED OR FILLED WITH GRAVEL OR RIPRAP SHALL BE LOADED, GRADED, LIMED, FERTILIZED, SEEDED AND MULCHED. ALL AREAS TO RECEIVE A 4" MINIMUM OF SCREENED TOPSOIL. TOPSOIL SAMPLES MUST BE SUBMITTED FOR ANALYSIS BY A CERTIFIED LABORATORY EARLY IN CONSTRUCTION AND BEFORE ANY ADDITIONAL AMENDMENTS AND ORGANIC CONTENT. TOPSOIL FROM A MINIMUM OF 2 SOURCES SHALL BE PROVIDED.
15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESETTLEMENT ALL EXISTING PROPERTY MONUMENTATION THAT IS DISTURBED BY THEIR OPERATIONS AT NO EXPENSE TO THE CITY. THE WORK IS TO BE DONE BY A LAND SURVEYOR LICENSED IN THE STATE OF NEW HAMPSHIRE. PROPERTY BOUNDS FOUND ARE SHOWN ON THE PLANS AND MAY NOT BE INCCLUSIVE OF ALL BOUNDS THAT EXIST IN THE PROJECT AREA. IF ANY ADDITIONAL BOUNDS ARE FOUND, THE CONTRACTOR SHALL DOCUMENT THE LOCATION AND NOTIFY THE ENGINEER.
16. THE CONTRACTOR IS TO TAKE SPECIAL CARE NOT TO DAMAGE TREES, SHRUBS, OR OTHER PLANTINGS WITHIN THE CONSTRUCTION AREA UNLESS THEY ARE NOTED TO BE REMOVED.
17. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING PROPER NOTICE TO RESIDENCE IF IN ADVANCE OF AN EXPECTED SHUTDOWN OF WATER SERVICE, IMPACT TO TRAFFIC, AND BLOCKING OF DRIVEWAYS. WRITTEN NOTICES SHALL BE PLACED ON DOORS A MINIMUM OF 24 HOURS PRIOR TO EXPECTED WORK. THE NOTICE FROM OF THE PROJECT SHALL BE PLACED IN THE FRONT OF THE PROPERTY. NOTICE IS INCIDENTAL TO THE WORK. THE CONTRACTOR SHALL MAINTAIN EMERGENCY ACCESS TO ALL AREAS AFFECTED BY THEIR WORK AT ALL TIMES. ONE LANE OF TRAFFIC SHALL BE MAINTAINED AT ALL TIMES BY THE CONTRACTOR UNLESS OTHERWISE APPROVED BY THE OWNER.
18. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION AND FOR CONDITIONS OF THE PROJECT. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY CONSULTING, LLC. DO NOT EXTEND TO OR INCLUDE SYSTEMS PERTAINING TO THE SAFETY OF THE CONSTRUCTION CONTRACTOR OR THEIR EMPLOYEES, AGENTS OR CITY'S REPRESENTATIVES IN THE PERFORMANCE OF THE WORK. THE SEAL OF THE SURVEYOR OR ENGINEER HEREON DOES NOT EXTEND TO ANY SUCH SAFETY SYSTEMS THAT MAY OR MAYNOT BE INCORPORATED IN THESE PLANS. THE CONSTRUCTION CONTRACTOR SHALL PREPARE OR OBTAIN THE APPROPRIATE SAFETY SYSTEMS WHICH MAY BE REQUIRED BY THE U.S. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), LOCAL REGULATIONS, AND/OR THE BOARD OF LABOR.
19. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO FAMILIARIZE THEMSELVES WITH THE PROJECT AREA AND ALL EXISTING CONDITIONS SURROUNDING IT THEREON.
20. THE ENGINEER SHALL BE NOTIFIED PRIOR TO CONSTRUCTION IF ANY DISCREPANCIES IN PLANS OR EXISTING DATA. CONSTRUCTION SHALL NOT PROCEED WITHOUT WRITTEN PERMISSION FROM THE ENGINEER.
21. THE ENGINEER WILL PROVIDE THE CONTRACTOR WITH EXISTING CONTROL POINTS TO ESTABLISH THE CONSTRUCTION BASELINE. THE POINTS TO BE PROVIDED ARE INCLUDED WITH THESE DRAWINGS. THE CONTRACTOR SHALL MAINTAIN THE ACCURACY OF THE CONTROL POINTS THROUGHOUT THE DURATION OF THE PROJECT. CONTROL POINT AND BENCH MARK ACCURACY WAS CONFIRMED AT THE TIME OF THE SURVEY AND IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE ACCURACY OF THESE POINTS PRIOR TO USING THEM FOR CONSTRUCTION OR RECORDING RECORD INFORMATION. IF THE CONTRACTOR FINDS ANY POINT PROVIDED TO BE INACCURATE, THE CONTRACTOR MUST NOTIFY THE ENGINEER IMMEDIATELY IN WRITING. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR LAYOUT OF THE WORK AT THE PROJECT SITE.
22. PAVEMENT IS TO BE SAW-CUT AT ALL SIDE ROADS, PAVED DRIVES, AS WELL AS THE BEGINNING AND END OF THE PROJECT LIMITS. PAVEMENT GRINDINGS BEYOND THE SAW-CUT WILL BE REQUIRED AT ALL SIDE ROADS AND DRIVES AS WELL AS AT THE BEGINNING AND END OF THE PROJECTS. SEE DETAIL DRAWINGS GRIND PAVEMENT POINT. SAW-CUTTING IS INCIDENTAL TO EXCAVATION WORK.
23. ANY SURFACE OR SUBSURFACE FEATURES DAMAGED BY THE CONTRACTOR DURING CONSTRUCTION SHALL BE RESTORED TO A CONDITION AT LEAST EQUAL TO THAT IN WHICH THEY WERE FOUND IMMEDIATELY PRIOR TO THE BEGINNING OF CONSTRUCTION. ALL COSTS ASSOCIATED WITH THE RESTORATION SHALL BE AT THE CONTRACTORS SOLE EXPENSE.
24. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR WORK COMPLETED BY THE CONTRACTOR.
25. NEW WORK IS IDENTIFIED BY

1. UTILITY INFORMATION SHOWN HEREON WAS OBTAINED FROM THE BEST AVAILABLE SOURCE AND MAY OR MAY NOT BE EITHER ACCURATE OR COMPLETE. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL UTILITIES AND SHALL BE RESPONSIBLE FOR ANY DAMAGE TO ANY UTILITY, PUBLIC OR PRIVATE, SHOWN OR NOT SHOWN HEREON. CONTRACTOR SHALL CONNECT OR RECONNECT ALL UTILITIES TO THE EXISTING MAINS. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY EXCAVATION PERMITS REQUIRED TO VERIFY LOCATION AND SIZE OF EXISTING UTILITIES AND APPURTENANCES.
2. THE CONTRACTOR SHALL NOT DISTURB ANY EXISTING UTILITY SERVICE (PRIVATE OR PUBLIC) WITHOUT WRITTEN AUTHORIZATION FROM THE OWNER.
3. SUBSURFACE FEATURES SUCH AS ELECTRIC AND TELEPHONE LINES, WATER LINES, SEWER LINES, STORM DRAIN AND CULVERTS, ETC., ENCOUNTERED IN THE CONSTRUCTION OF THE PROJECT SHALL BE PROTECTED, SUPPORTED, OR REMOVED AND REPLACED BY THE CONTRACTOR AT HIS OWN RISK AND AT HIS OWN EXPENSE. THE COST OF THIS WORK SHALL BE INCIDENTAL TO THE CONTRACT. THE CONTRACTOR SHALL NOTIFY THE UTILITY COMPANIES AND/OR HIGHWAY DEPARTMENTS WHEN THE WORK INVOLVES THEIR RESPECTIVE FACILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING AND DETERMINING THE LOCATION, THE DEPTH AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO START OF ANY CONSTRUCTION. THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES FOUND INTERFERING WITH THE PROPOSED CONSTRUCTION AND REMOVED OR RELOCATED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING "DIG-SAFE" (888-610-DIG-SAFE) AT LEAST 72 HOURS PRIOR TO DIGGING.
4. THE CONTRACTOR SHALL CONTACT ALL UTILITY COMPANIES OWNING UTILITIES, EITHER OVERHEAD OR UNDERGROUND, WITHIN THE CONSTRUCTION AREA. THE PROTECTION OR RELOCATION OF UTILITIES IS ULTIMATELY THE RESPONSIBILITY OF THE CONTRACTOR.
5. THE CONTRACTOR SHALL COORDINATE MATERIALS AND INSTALLATION SPECIFICATIONS WITH ALL INDIVIDUAL UTILITY AGENCIES/COMPANIES, AND ARRANGE FOR ALL INSPECTIONS.

ELECTRIC: LIBERTY UTILITIES MEL EMERSON 409 MIRACLE MILLE #2 LEBANON, NH 03766 603-306-8215	WATER/SEWER: CITY OF LEBANON JAY CARELLI ASSISTANT PUBLIC WORKS DIRECTOR 603-448-3112
TELEPHONE: CONSOLIDATED COMMUNICATIONS JOHN POMEROY 119 GATES STREET WHITE RIVER CTR., VT. 05001 802-295-8187	FIRE DEPARTMENT: LEBANON FIRE DEPARTMENT JEFF LIBBY 603-448-8110
CABLE TELEVISION: COMCAST DAN DEZAFRA 166 HANOVER STREET LEBANON, NH 03766 603-678-8271	DRAINAGE: CITY OF LEBANON MIKE HAMMOND 603-448-3112

6	07/02/21	WATER CONNECTION & WATER EASEMENT	PAB	RJF	RJF
5	03/23/20	AOT REQUEST FOR INFORMATION	PAB	RJF	RJF
4	02/18/20	CONSTRUCTION DOCUMENTS	PAB	RJF	RJF
3	12/10/19	ALTERATION OF TERRAIN SUBMISSION	PAB	RJF	
2	07/29/19	DPW REVIEW COMMENTS	PAB	RJF	
1	06/24/19	STAFF REVIEW COMMENTS	PAB	RJF	
REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V

LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE



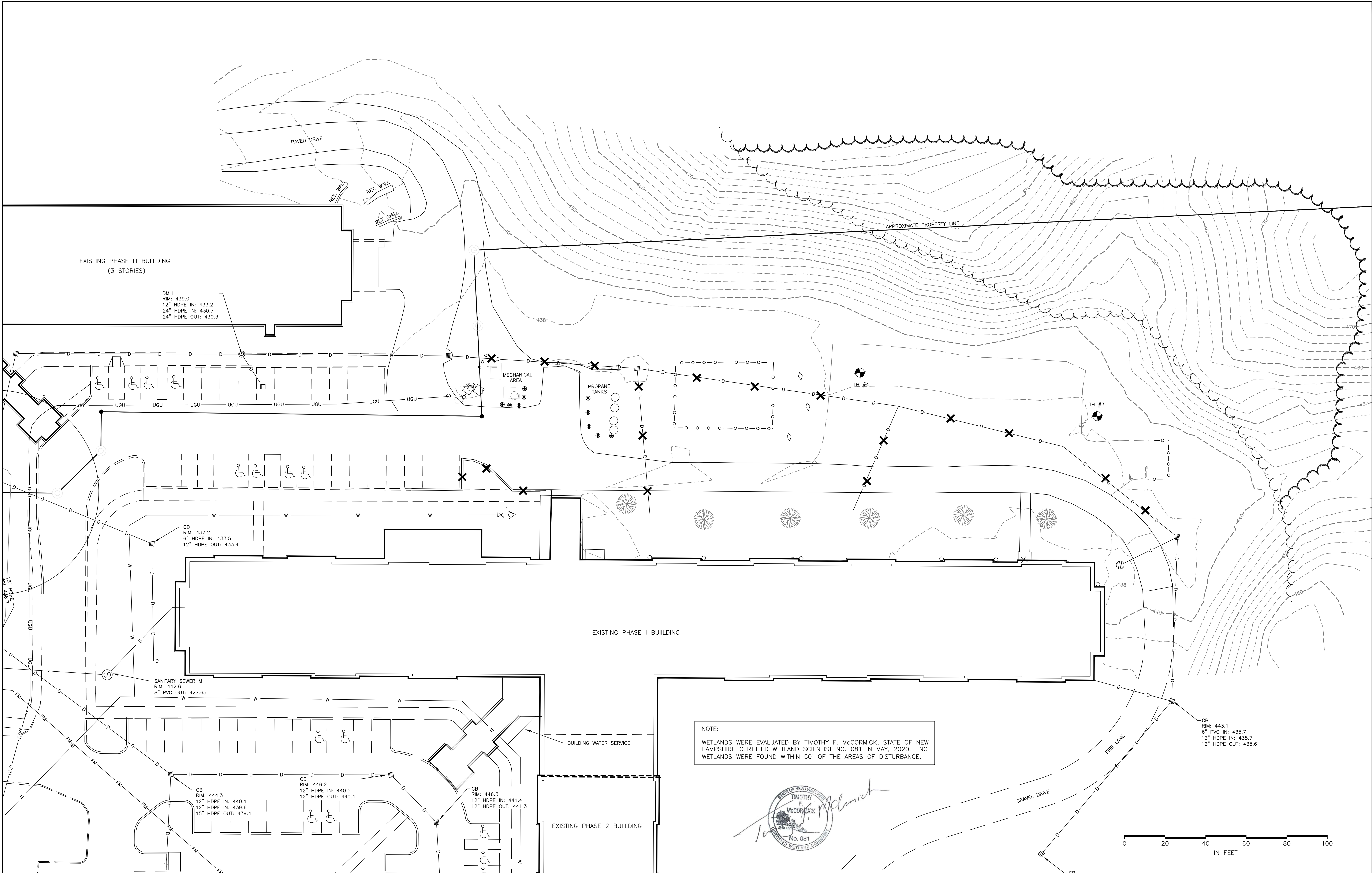
THE LOCATION OF ANY UTILITY INFORMATION SHOWN ON THIS PLAN IS APPROXIMATE. PATHWAYS CONSULTING, LLC. MAKES NO CLAIM TO THE ACCURACY OR COMPLETENESS OF UTILITIES SHOWN. 72 HOURS PRIOR TO ANY EXCAVATION ON SITE, THE CONTRACTOR SHALL CONTACT DIG-SAFE AT 1-888-DIG-SAFE.



240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

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PROJ. NO. 10112

2



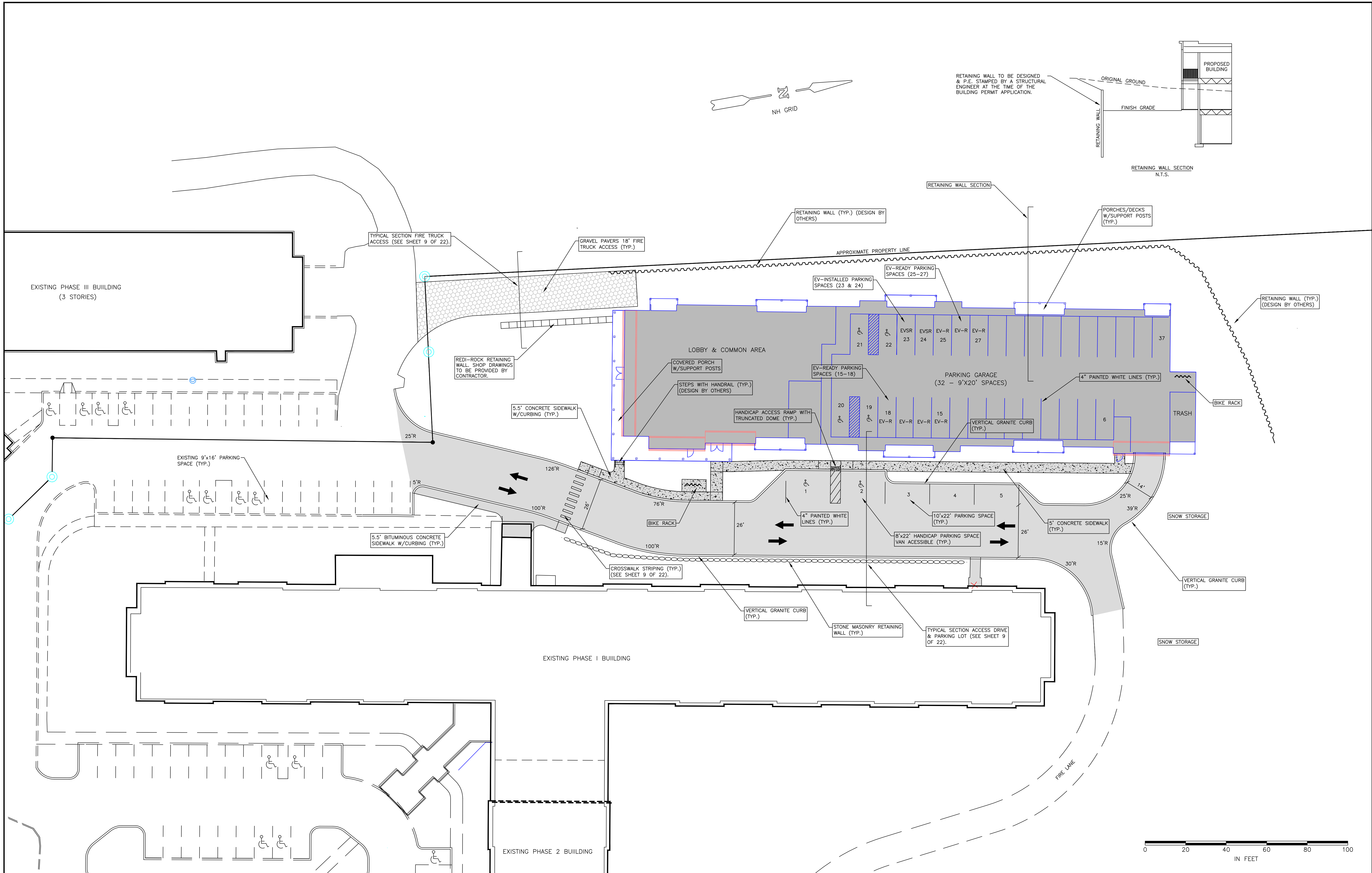
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1	06/24/19	STAFF REVIEW COMMENTS	PAB	RJF	
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EXISTING CONDITIONS & DEMOLITION PLAN FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V
LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

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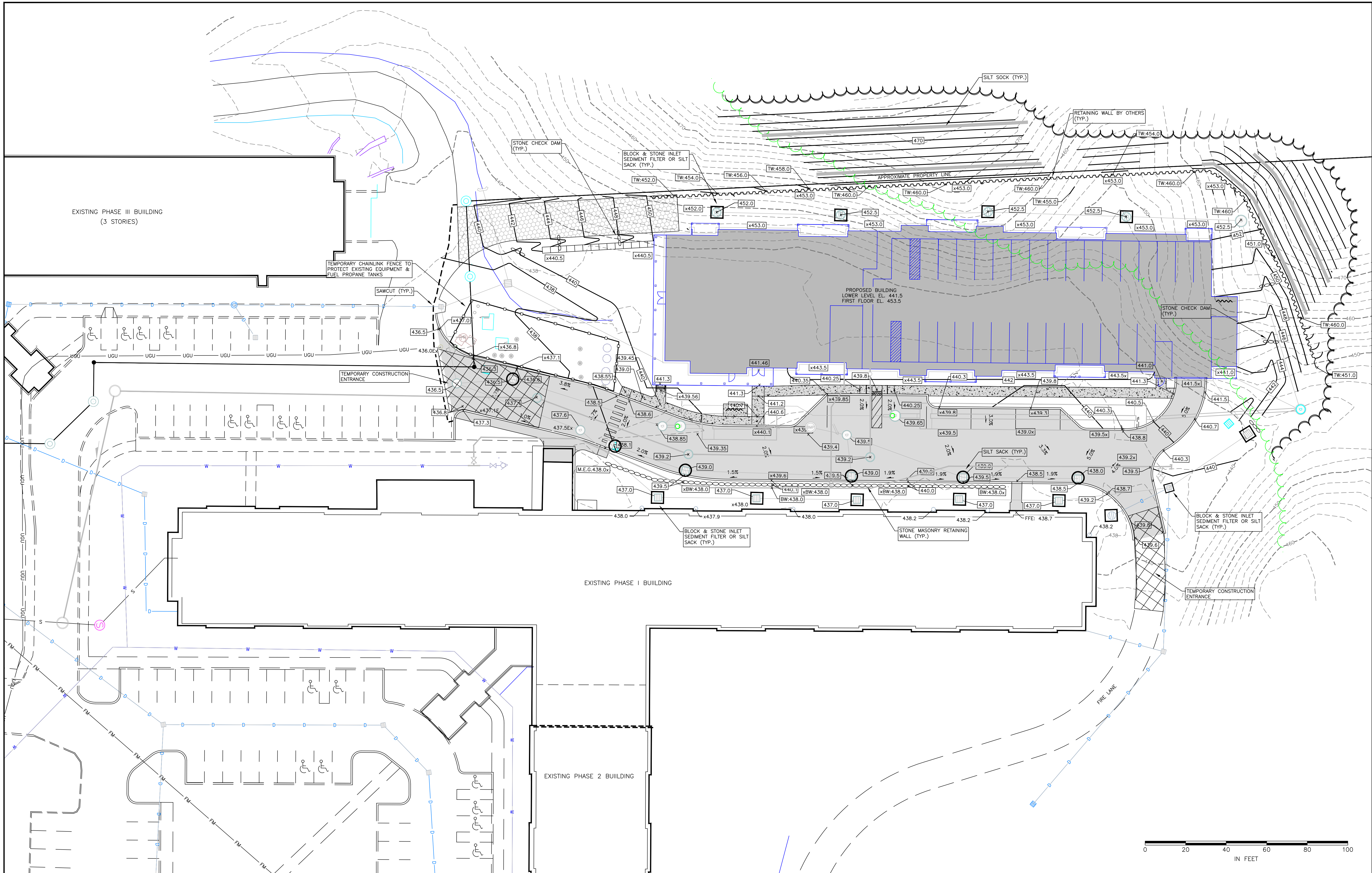
6	07/10/23	EV PARKING SPACE & SIDEWALK DIMENSIONS	PAB	JSG	RJF
5	01/11/21	BORING LOCATIONS	PAB	RJF	RJF
4	02/11/20	CONSTRUCTION DOCUMENTS	PAB	RJF	RJF
3	08/28/19	ADDITIONAL DPW COMMENTS	PAB	RJF	
2	07/29/19	RETAINING WALL REVISIONS	PAB	RJF	
1	06/24/19	STAFF REVIEW COMMENTS	PAB	RJF	
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LAYOUT PLAN FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V
LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSIRE

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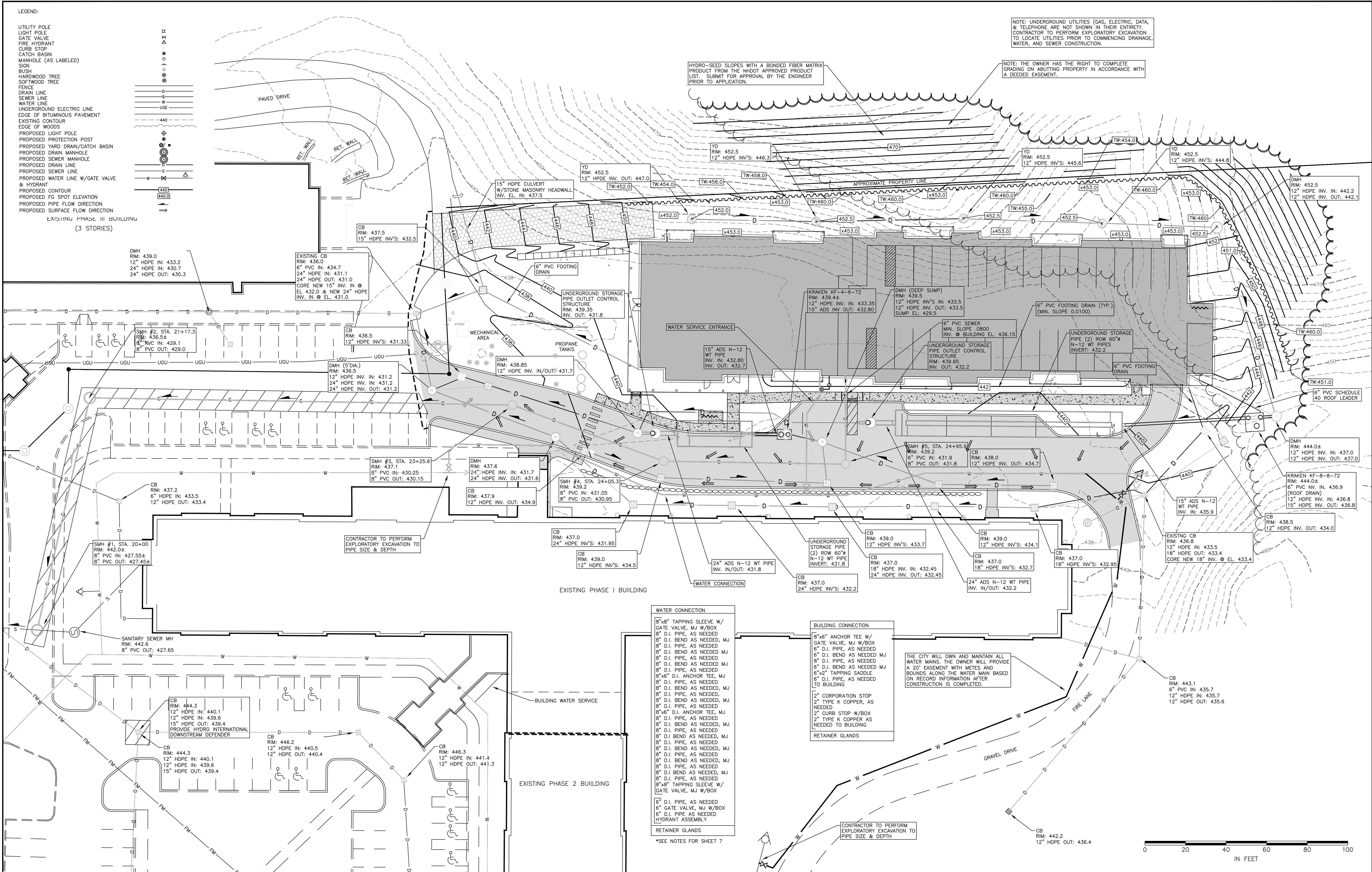


5	03/23/20	AOT REQUEST FOR INFORMATION	PAB	AGK	
4	02/18/20	CONSTRUCTION DOCUMENTS	PAB	RJF	RJF
3	12/10/19	ALTERATION OF TERRAIN SUBMISSION	PAB	AGK	
2	07/29/19	DPW REVIEW COMMENTS, RETAINING WALL, & GRADING	PAB	RJF	
1	06/24/19	STAFF REVIEW COMMENTS	PAB	RJF	
REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

GRADING & EROSION CONTROL PLAN FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V
LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

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5	03/23/20	AOT REQUEST FOR INFORMATION	PAB	AKG	RJF
4	02/18/20	CONSTRUCTION DOCUMENTS	PAB	RJF	
3	12/10/19	ALTERATION OF TERRAIN SUBMISSION	PAB	AKG	
2	07/29/19	DPW REVIEW COMMENTS, RETAINING WALL, & GRADING	PAB	RJF	
1	06/24/19	STAFF REVIEW COMMENTS	PAB	RJF	
REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

DRAINAGE & UTILITY PLAN FOR

QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V

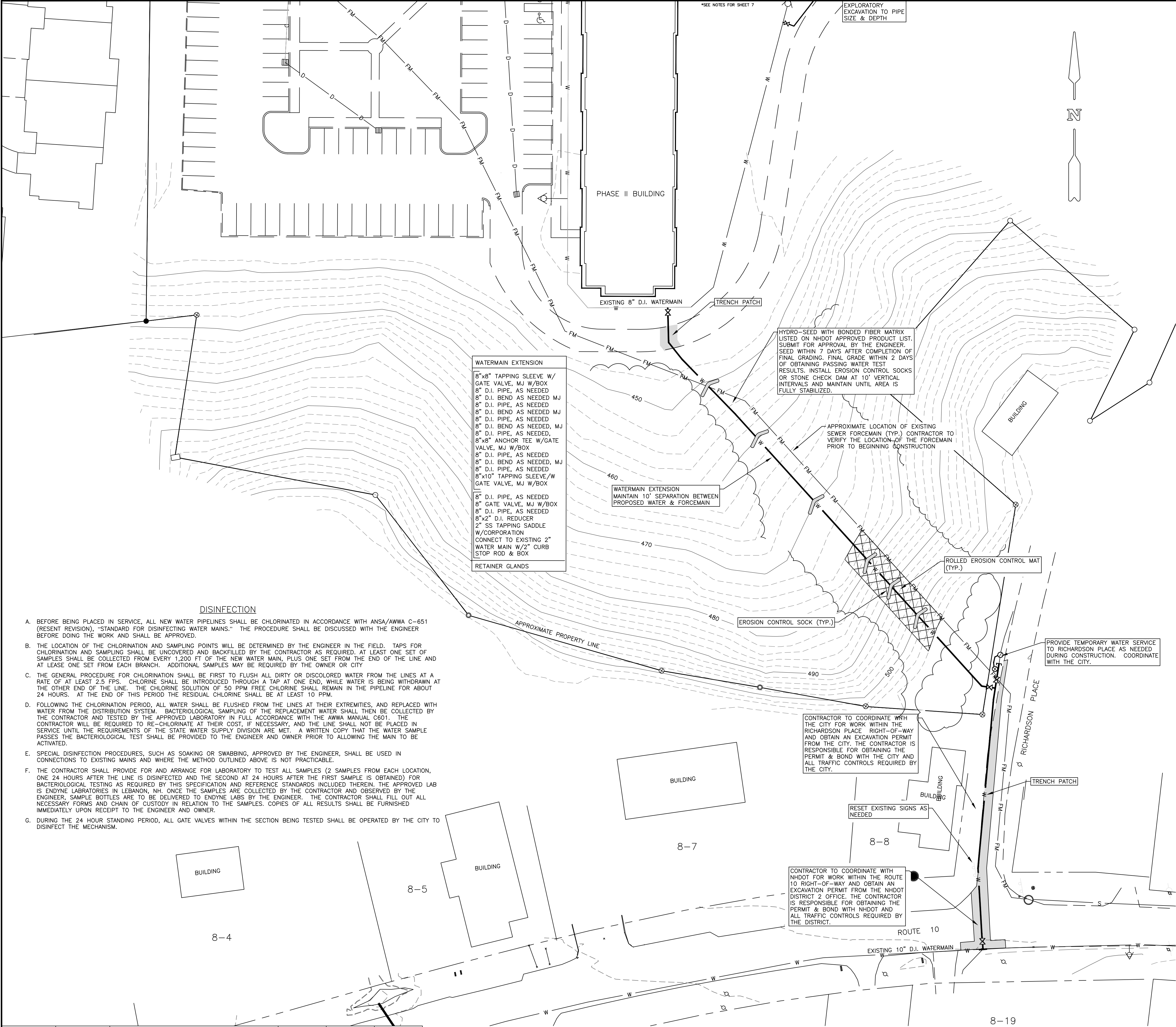
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SHEET 6 OF 22



WATER GENERAL NOTES:

- A. THE CONTRACTOR SHALL NOT OPERATE ANY VALVES OR HYDRANTS WITHIN THE LEBANON WATER SYSTEM. ALL VALVES AND OR HYDRANTS SHALL BE OPERATED ONLY BY CITY OF LEBANON UTILITY MAINTENANCE DEPARTMENT PERSONNEL.
- B. ALL WATER MAIN SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF LEBANON AND AWWA STANDARDS.
- C. PRIOR TO BACKFILLING, ALL WATER MAIN AND SERVICES SHALL BE OBSERVED BY THE ENGINEER.
- D. ALL WATER MAIN VALVES AND FITTINGS SHALL BE MECHANICAL JOINT CONSTRUCTION AND INSTALLED WITH RETAINER GLANDS AND THRUST BLOCKS.
- E. ALL WATER MAIN SHALL BE INSTALLED IN POLYETHYLENE SLEEVES DESIGNED FOR WATER MAIN INSTALLATION. ALL SLEEVES SHALL BE OVERLAPPED AT THE JOINTS.
- F. DUCTILE IRON PIPE SHALL BE AWWA SPECIFICATION C-151, CLASS 52. PIPE LENGTHS SHALL BE SUPPLIED NOT EXCEEDING TWENTY (20) FEET IN LENGTH. ALL PIPE SHALL BE PUSH ON JOINTS WITH RUBBER GASKET COMPLYING WITH AWWA C-111. ALL PIPE AND FITTINGS SHALL HAVE A CEMENT MORTAR LINING AND ONE (1) MILLIMETER THICK BITUMINOUS SEAL COATING ON THE INSIDE AND ONE (1) MILLIMETER THICK BITUMINOUS SEAL COATING ON THE OUTSIDE. THE CEMENT LININGS SHALL BE IN ACCORDANCE WITH AWWA C104 AND BE 1/8" THICKNESS.
- G. ALL VALVES SHALL BE OPEN CLOCKWISE "RIGHT".
- H. ALL BELL JOINTS SHALL HAVE TWO SILICONE BRONZE SERRATED WEDGES INSTALLED FOR CONDUCTIVITY.
- I. DUCTILE IRON FITTINGS SHALL CONFORM TO AWWA SPECIFICATIONS C-153 OR C-110. SOLID SLEEVES SHALL BE LONG BODY MECHANICAL JOINT ONLY.
- J. 90° BENDS ARE NOT ALLOWED.
- K. ALL HYDRANT BRANCHES SHALL BE INSTALLED WITH ANCHOR TEES. ALL HYDRANTS SHALL BE INSTALLED PLUMB, WITH THE BREAKAWAY MARKINGS SET EVEN WITH FINISH GRADE. GRADE ADJUSTMENT RISERS FOR HYDRANTS SHALL BE INCIDENTAL TO THE HYDRANT PAYMENT ITEMS AND ARE THE RESPONSIBILITY OF THE CONTRACTOR.
- L. HYDRANT DRAIN PLUGS SHALL BE PULLED UNLESS OTHERWISE DIRECTED BY THE ENGINEER. THE CITY REQUIRES DRAIN PLUGS TO REMAIN IN PLACE IF GROUNDWATER IS PRESENT. CONTACT THE CITY IF GROUNDWATER IS PRESENT.
- M. CHLORINATION/TESTING TAPS SHALL BE INSTALLED WITHIN 5' OF VALVES AND SHALL BE REMOVED FOLLOWING COMPLETION OF TESTING.
- N. LEDGE AND LOOSE ROCK IN TRENCHES SHALL BE REMOVED TO 1' BELOW WATER MAIN AND SERVICE PIPING. LEDGE OR ROCK REMOVED SHALL NOT BE PLACED BACK INTO THE TRENCH.
- O. ALL SERVICE LINE ADAPTORS USED TO MAKE CONNECTIONS FROM FROM NEW TO EXISTING PIPING SHALL BE COMPRESSION STYLE FITTINGS AND SHALL BE INCIDENTAL TO THE WORK.
- P. WATER LINE BEDDING/BLANKET MATERIAL (SAND) ASTM C33, FINE AGGREGATE. MATERIAL SHALL BE OBTAINED FROM APPROVED SOURCES, AND SHALL CONSIST OF SATISFACTORY GRADED, FREE DRAINING MATERIAL, REASONABLY FREE FROM LOAM, SILT, CLAY, AND ORGANIC MATERIAL. SIEVE ANALYSIS BY WEIGHT AS FOLLOWS:
- | SIEVE SIZE | % PASSING BY WEIGHT |
|------------|--|
| NO. 4 | 100% |
| NO. 200 | 0-12% (*BASED ON THE FRACTION PASSING NO. 4) |
- Q. CONTRACTOR SHALL BE REQUIRED TO PROVIDE TEMPORARY WATER SERVICE TO RESIDENTS IN THOSE PLACES WHERE UTILITIES ARE TO BE REPLACED. TEMPORARY WATER LINES SHALL BE HIGH DENSITY POLYETHYLENE (3408) OR 11 JOINED BY BUTT FUSION OR PVC. FITTINGS SHALL BE PERFORMED POLYETHYLENE, EITHER FLANGED OR BUTT FUSION TYPE. INDIVIDUAL TAPS SHALL BE MADE WITH FULL WRAP AROUND SADDLES, CORPORATION STOPS SHALL BE USED AT THE CONNECTION TO THE MAIN. TEMPORARY SERVICE CONNECTIONS SHALL BE FORD BALL VALVE ORB STOPS, CAMBRIDGE MODEL #301-NL OR EQUIVALENT. INDIVIDUAL SERVICE PIPES SHALL BE CTS POLYETHYLENE 2" MIN. AS TEMPORARY WATER LINES SHALL BECOME THE PROPERTY OF THE CONTRACTOR. TEMPORARY WATER MAIN MUST BE DISINFECTED AS DETAILED BELOW. A TEMPORARY WATER PLAN MUST BE PREPARED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER AND CITY PRIOR TO CONSTRUCTION.
- R. REPLACE ALL WATER SERVICES AND CURB STOPS WHERE WATERLINES ARE TO BE REPLACED. SERVICE CONNECTIONS ARE SHOWN FOR ESTIMATING PURPOSES ONLY AND TO INFORM THE CONTRACTOR OF THE NEED FOR A SERVICE AT THAT PROPERTY. THE ACTUAL LENGTH AND LOCATION OF THE SERVICE SHALL BE DETERMINED BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING AND VERIFYING LOCATION OF EXISTING SERVICES. THE CONTRACTOR SHALL MAKE ALL CONNECTIONS TO THE EXISTING SERVICE PIPES. SERVICES SHALL BE ONE INCH TYPE K COPPER UNLESS OTHERWISE SHOWN. ALL TAPS SHALL INCLUDE CORPORATION STOPS AND SHALL BE MADE "WET" AFTER THE NEW LINE HAS BEEN TESTED AND PLACED IN SERVICE.
- S. A MINIMUM VERTICAL SEPARATION OF 18 INCHES SHALL BE MAINTAINED BETWEEN WATER AND DRAINAGE UTILITIES, INCLUDING SERVICES, WHERE 18" OF SEPARATION CANNOT BE MAINTAINED FROM STORM DRAINAGE PIPES, 2" OF RIGID INSULATION SHALL BE INSTALLED BETWEEN THE CROSSING.
- T. THE CONTRACTOR SHALL NOTIFY RESIDENTS 48 HOURS IN ADVANCE OF DISRUPTION OF SERVICE.

WATER LINE TESTING

- A. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST 24 HOURS AND THE OWNER AT LEAST 48 HOURS IN ADVANCE OF BEGINNING TESTING OR DISINFECTION.
- B. THE CONTRACTOR SHALL FURNISH ALL NECESSARY EQUIPMENT AND LABOR FOR CARRYING OUT A PRESSURE TEST AND LEAKAGE TEST ON THE PIPELINE IN ACCORDANCE WITH AWWA STANDARDS.
- C. THE PIPE SHALL BE SUBJECTED TO A HYDROSTATIC PRESSURE OF ONE AND ONE-HALF (1½) TIMES THE WORKING PRESSURE, OR THE RATED PRESSURE, WHICHEVER IS GREATER, AND THIS PRESSURE MAINTAINED FOR AT LEAST TWO HOURS. THE LEAKAGE TEST SHALL BE CONDUCTED AT A PRESSURE AS DETERMINED BY THE ENGINEER AND THIS PRESSURE SHALL BE MAINTAINED FOR AT LEAST 120 MINUTES DURING THE TEST.
- D. THE CONTRACTOR SHALL MAKE ANY TAPS AND FURNISH ALL NECESSARY CAPS, PLUGS, ETC., AS REQUIRED IN CONJUNCTION WITH TESTING. HE SHALL ALSO FURNISH A MOTORIZED TEST PUMP, GAUGES AND ANY OTHER EQUIPMENT REQUIRED IN CONJUNCTION WITH CARRYING ON THE HYDROSTATIC TESTS. HE SHALL AT ALL TIMES PROTECT THE NEW WATER MAINS AND THE EXISTING WATER MAINS AGAINST THE ENTRANCE OF POLLUTING MATERIAL.
- E. TESTS TO BE MADE ONLY AFTER PARTIAL OR COMPLETE BACKFILLING OF TRENCHES.
- F. POSITION OF ALL VALVES (FULLY OPENED OR CLOSED) IN SECTION OF LINE TO BE TESTED SHALL BE CHECKED IN THE PRESENCE OF THE ENGINEER TO INSURE THAT:
1. ALL HYDRANT BRANCH CONNECTIONS ARE OPEN TO THE HYDRANT (HYDRANT CLOSED, BRANCH CONNECTION VALVE OPEN).
 2. ALL MAIN LINE VALVES ARE PROPERLY POSITIONED FOR SECTION OF LINE BEING TESTED.
- G. TESTS NOT TO BE PERFORMED FOR AT LEAST SEVEN (7) DAYS AFTER LAST CONCRETE BLOCK OR ANCHOR HAS BEEN CAST.
- H. FILL PIPELINES, FITTINGS, AND APPURTENANCES WITH WATER FOR TESTING SLOWLY.
- I. EXPEL ALL AIR FROM PIPELINES, FITTINGS AND APPURTENANCES PRIOR TO PERFORMING TESTS. IF PERMANENT AIR VENTS ARE NOT LOCATED AT ALL HIGH POINTS, THE CONTRACTOR SHALL INSTALL CORPORATION STOPS AT HIS EXPENSE AT SUCH POINTS SO THAT THE AIR CAN BE EXPELLED. THE LINE IS FILLED WITH WATER. THESE STOPS SHALL BE PROTECTED WITH A MASONRY BRIDGE TO PREVENT BREAKAGE DURING BACKFILLING. SUCH POINTS ARE TO BE REMOVED DOWN TO THE CORPORATION ONCE TESTING IS COMPLETE.
- J. EXAMINATION UNDER PRESSURE: ALL EXPOSED PIPES, FITTINGS, VALVES, HYDRANTS, JOINTS SHALL BE EXAMINED CAREFULLY DURING THE HYDROSTATIC AND LEAKAGE TESTS.
- K. ALLOWABLE LEAKAGE IN GALLONS PER HOUR SHALL BE AS DETERMINED BY THE FOLLOWING FORMULA:
- $$L = \frac{SDP}{148,000}$$
- WHERE L = ALLOWABLE LEAKAGE
S = LENGTH OF PIPE TESTED
D = PIPE DIAMETER IN INCHES
P = TEST PRESSURE
- FOR FLANGED JOINTS: NO LEAKAGE ALLOWABLE.
- THE CONTRACTOR AND THE ENGINEER SHALL COMPUTE THE ALLOWABLE LEAKAGE FOR EACH SECTION TO BE TESTED AND AGREE ON THE ALLOWABLE AMOUNT PRIOR TO PERFORMING ANY TESTS.
- L. EVALUATION OF RESULTS/CORRECTIVE ACTIONS:
1. EXAMINATION UNDER PRESSURE: ALL EXPOSED PIPES, FITTINGS, VALVES, HYDRANTS, JOINTS SHALL BE EXAMINED CAREFULLY DURING THE HYDROSTATIC AND LEAKAGE TESTS.
ANY DAMAGED OR DEFECTIVE PIPE, FITTINGS, VALVES OR HYDRANTS THAT ARE DISCOVERED DURING OR FOLLOWING THE HYDROSTATIC AND LEAKAGE TEST SHALL BE REPAIRED AT HIS EXPENSE AND THE TESTS SHALL BE REPEATED UNTIL THEY ARE SATISFACTORY TO THE ENGINEER.
 2. EXAMINATION OF LEAKAGE: IF ANY LEAKAGE TEST OF SECTION OF THE SYSTEM DISCLOSES A LEAKAGE GREATER THAN THAT SPECIFIED IN PARAGRAPH 3.08K, HEREIN, THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, LOCATE AND REPAIR OR REPLACE THE DEFECTIVE OR DAMAGED MATERIALS. HE SHALL THEN REPEAT THE ENTIRE TEST AND MAKE ADDITIONAL REPAIR AND TEST AND CONTINUE TO REPEAT UNTIL THE LEAKAGE IS WITHIN THE SPECIFIED ALLOWANCE.
 3. ALL VISIBLE LEAKS ARE TO BE REPAIRED BY THE CONTRACTOR, AT HIS OWN EXPENSE, REGARDLESS OF THE AMOUNT OF LEAKAGE.



7	02/11/21	WATER CONNECTION & WATER EASEMENT	PAB	RJF	RJF
6	03/23/20	AOT REQUEST FOR INFORMATION	PAB	AGK	
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4	12/10/19	ALTERATION OF TERRAIN SUBMISSION	PAB	AGK	
3	08/28/19	ADDITIONAL DPW REVIEW COMMENTS	PAB	RJF	
2	07/29/19	DPW REVIEW COMMENTS	PAB	RJF	
1	06/24/19	STAFF REVIEW COMMENTS	PAB	RJF	
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WATERMAIN EXTENSION PLAN FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V
LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC

240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN

DESIGNED BY: PAB

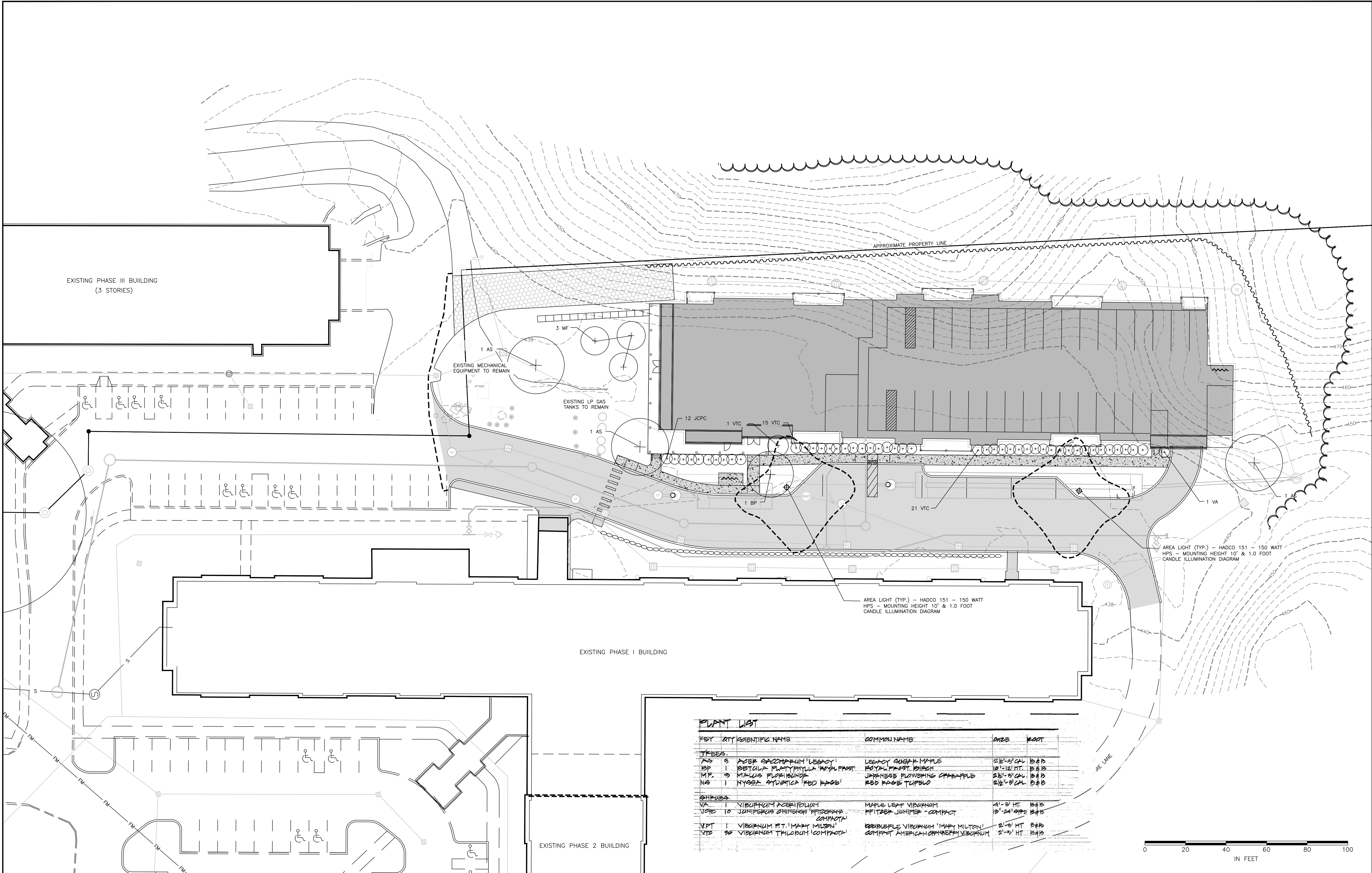
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DATE: 06/10/19

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7
SHEET 7 OF 22



PLANT LIST

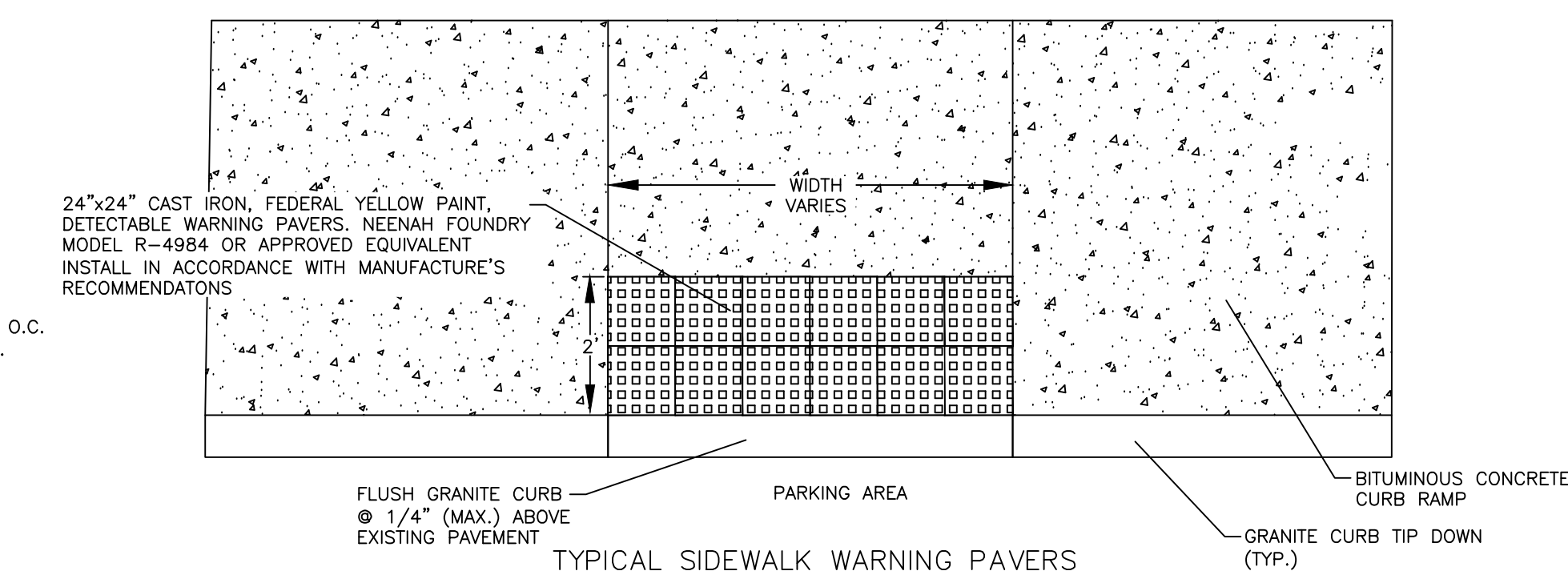
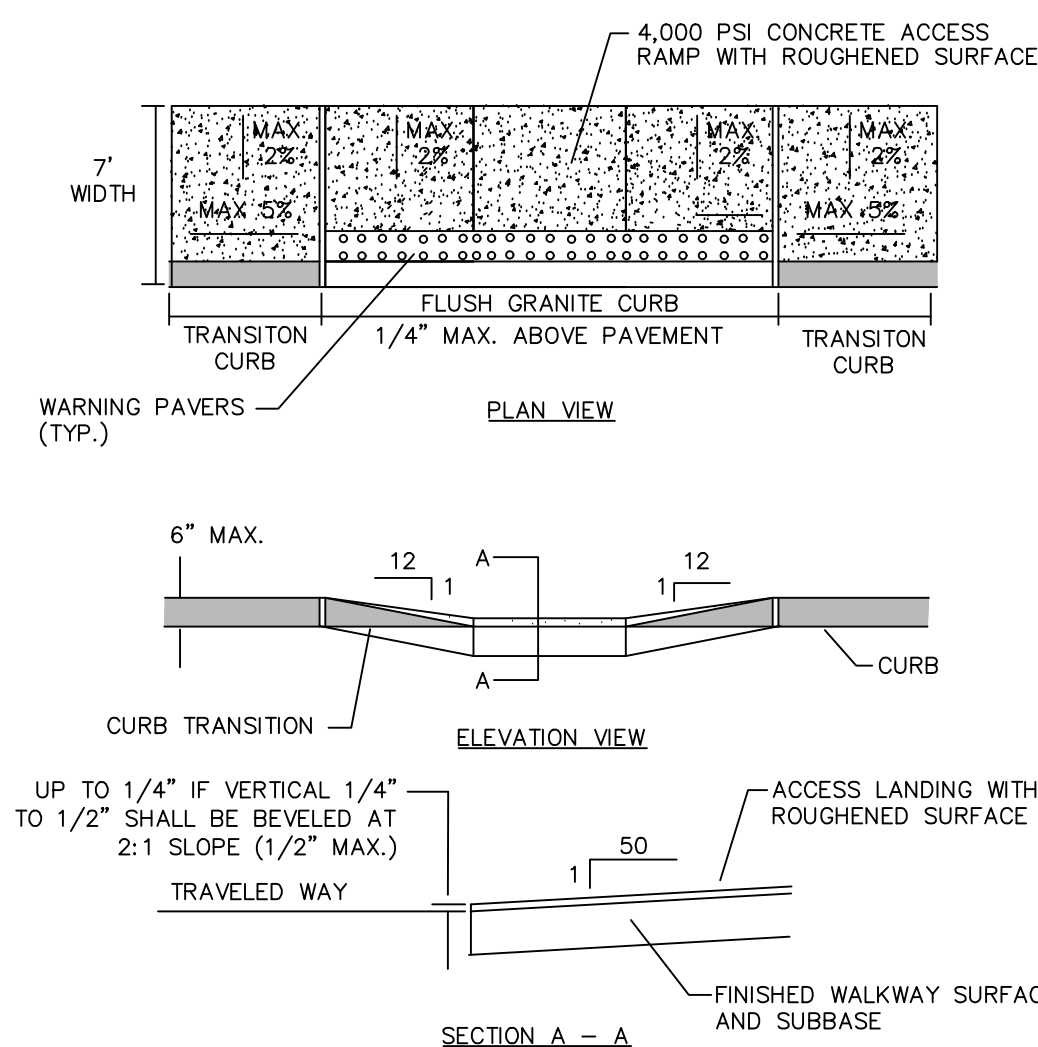
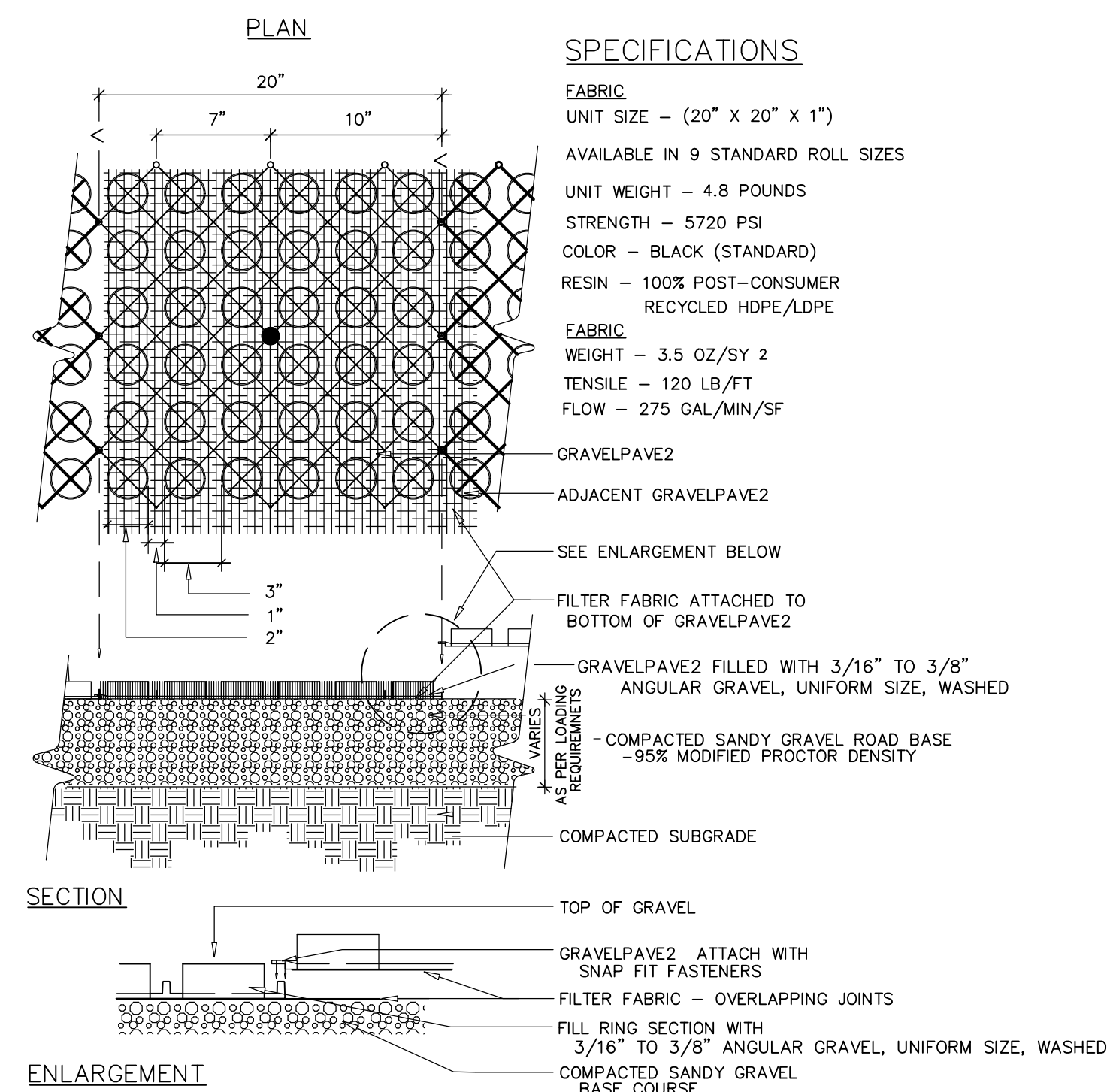
KEY	QTY	IDENTIFIC NAME	COMMON NAME	SIZE	ROOT
TREES					
AS	3	ACER GINCHAIUM 'LEGACY'	LEGACY SUGAR MAPLE	2 1/2" - 3" CAL	B&B
BP	1	BETULA PLATYPHYLLA 'ROYAL FROST'	ROYAL FROST BIRCH	10" - 12" HT.	B&B
MF	3	MAULS FLORIBUNDA	JAPANESE FLOWERING CHERRYBLOSSOM	2 1/2" - 3" CAL	B&B
NS	1	NYSSA SYLVATICA 'RED PAGE'	RED PAGE TUPLO	2 1/2" - 3" CAL	B&B
SHRUBS					
VA	1	VIBURNUM ACERIFOLIUM	MAPLE LEAF VIBURNUM	4" - 5" HT.	B&B
VTC	10	JUNIPERUS CHINENSIS 'PETER PAN'S COMPACT'	PETER PAN'S JUNIPER - COMPACT	18" - 24" HT.	B&B
VPT	1	VIBURNUM R.T. 'MARY MILTON'	BRUBBLE VIBURNUM 'MARY MILTON'	2' - 3" HT.	B&B
VTC	20	VIBURNUM THIBODUM 'COMPACT'	COMPACT AMERICAN CHERRY VIBURNUM	2' - 3" HT.	B&B

REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY
2	02/18/20	CONSTRUCTION DOCUMENTS	ANS	PAB	RJF
1	06/24/19	STAFF REVIEW COMMENTS	ANS	PAB	ANS

LANDSCAPE & LIGHTING PLAN FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V
ROUTE 10 - LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC
240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
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4	02/18/20	CONSTRUCTION DOCUMENTS	PAB	RJF	RJF
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2	08/28/19	ADDITIONAL DPW REVIEW COMMENTS	PAB	RJF	
1	07/29/19	DPW REVIEW COMMENTS	PAB	RJF	
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SITE DETAILS FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V

LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC

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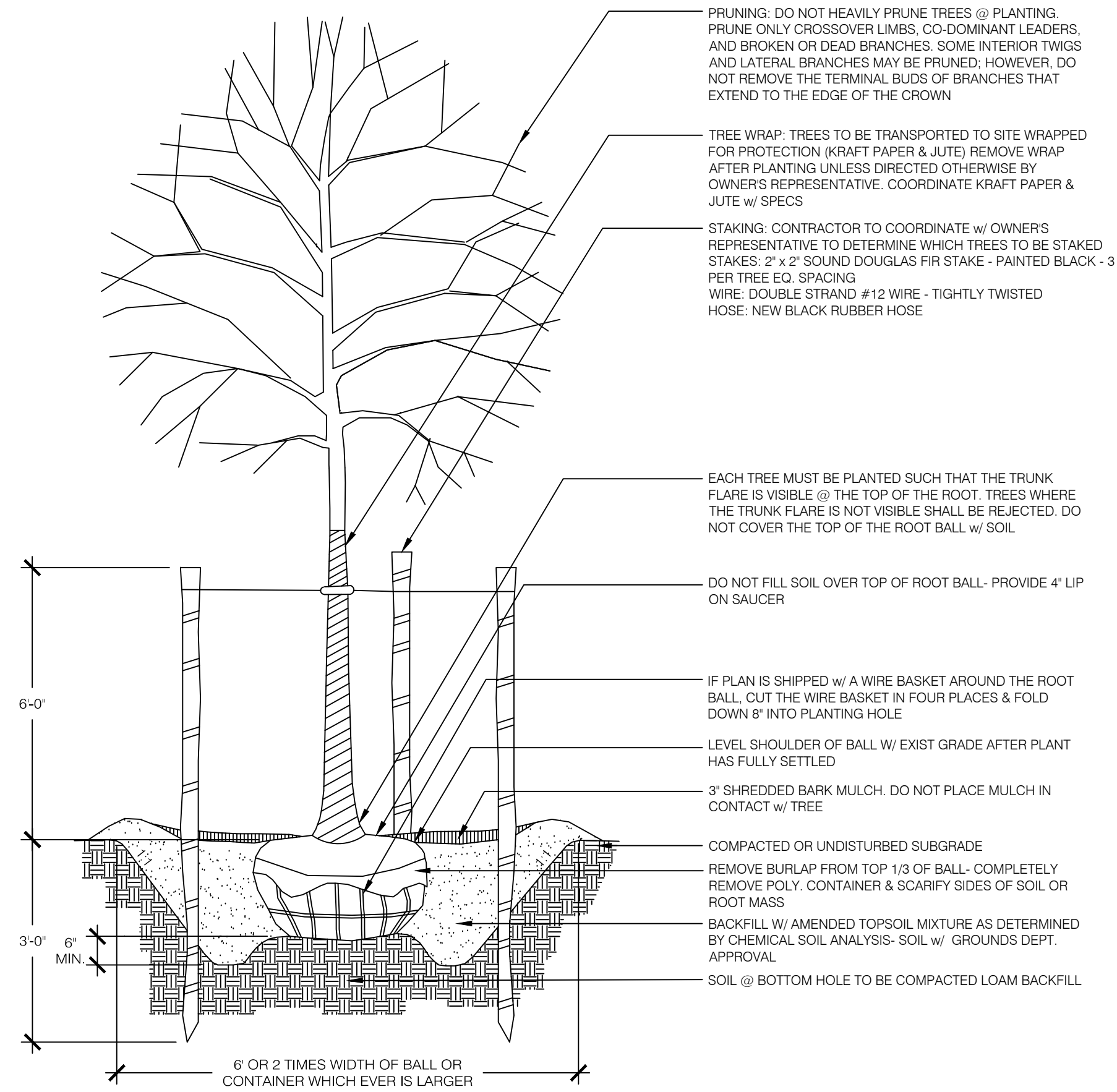
DESIGNED BY: PAB

DRAWN BY: PAB

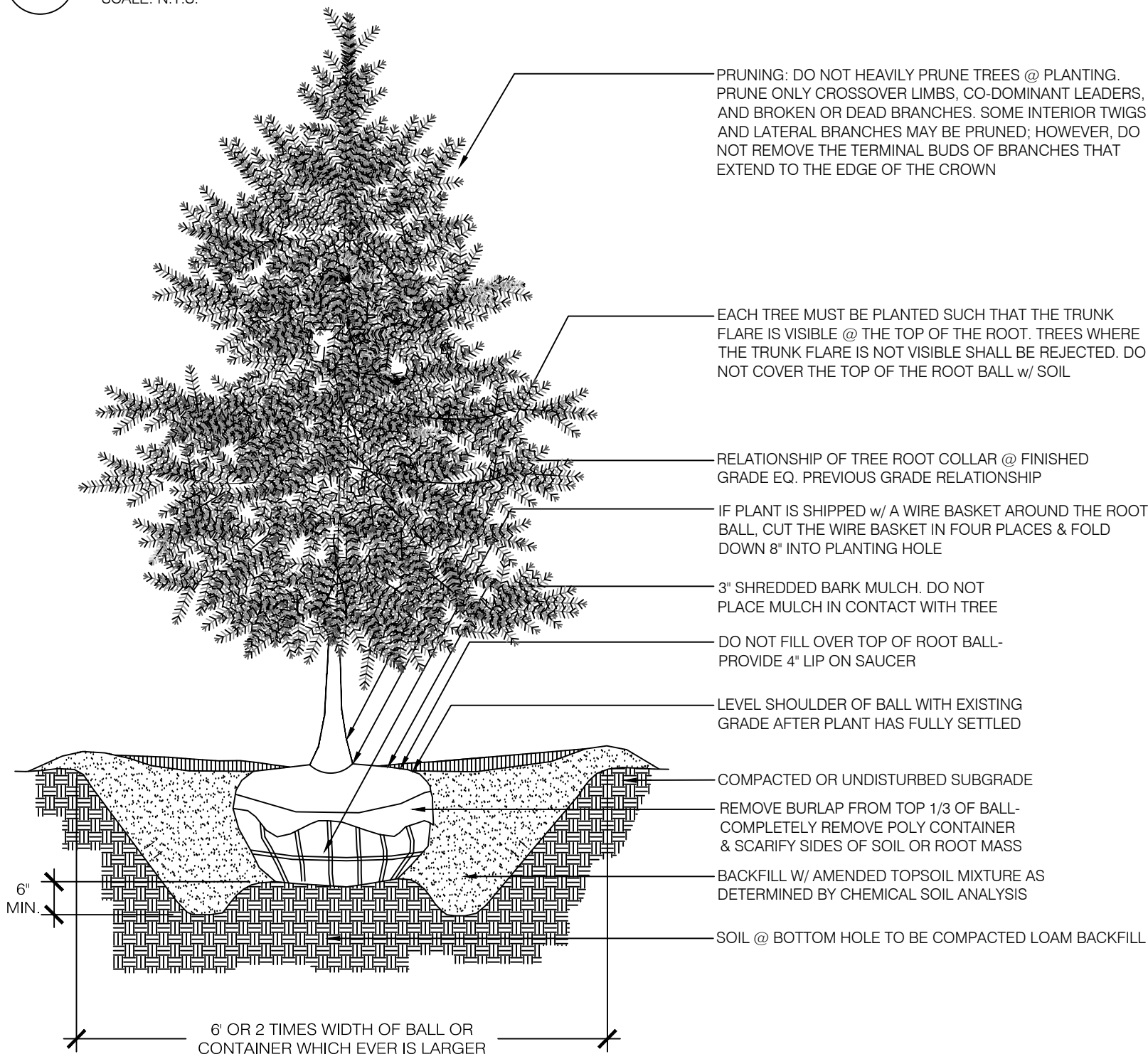
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DATE: 06/10/19

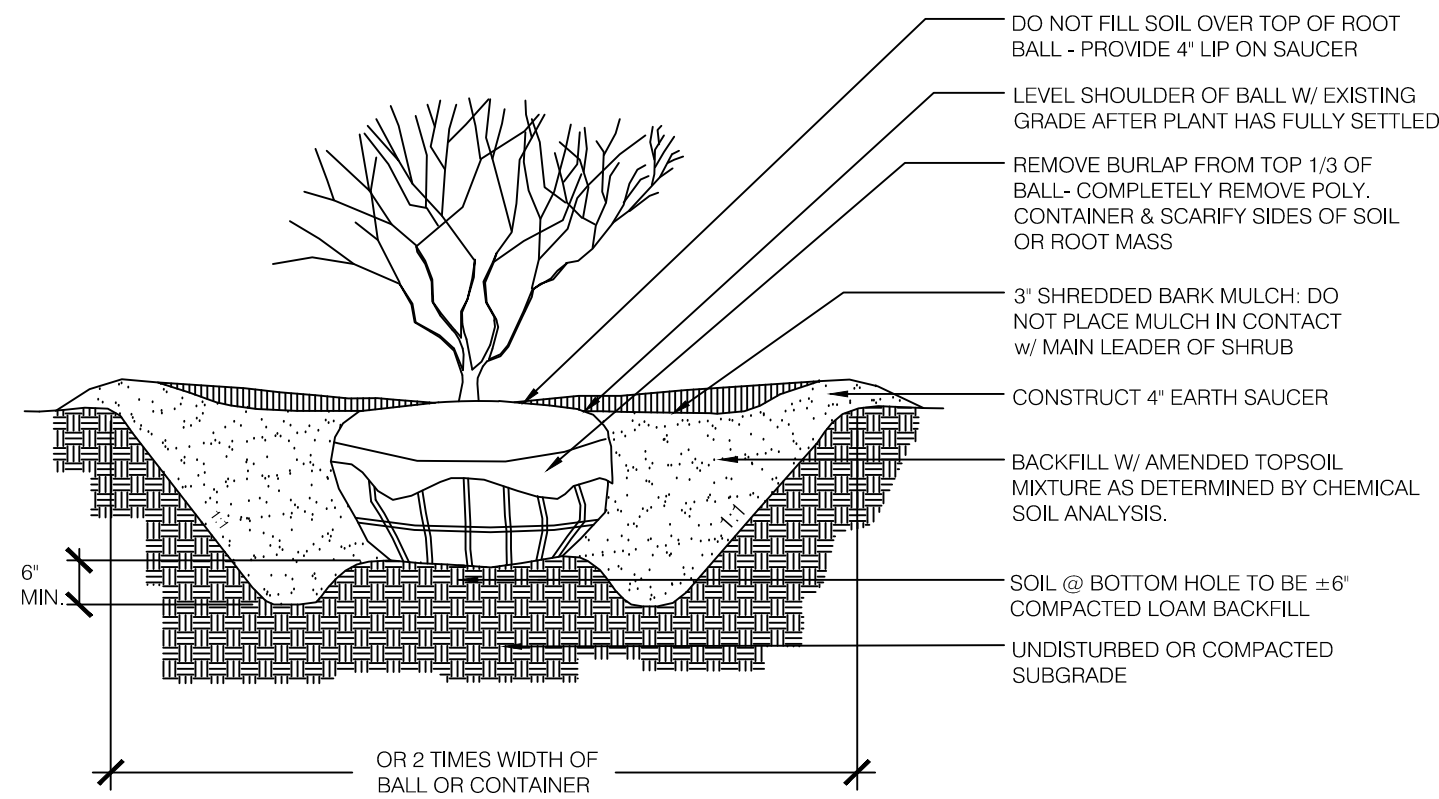
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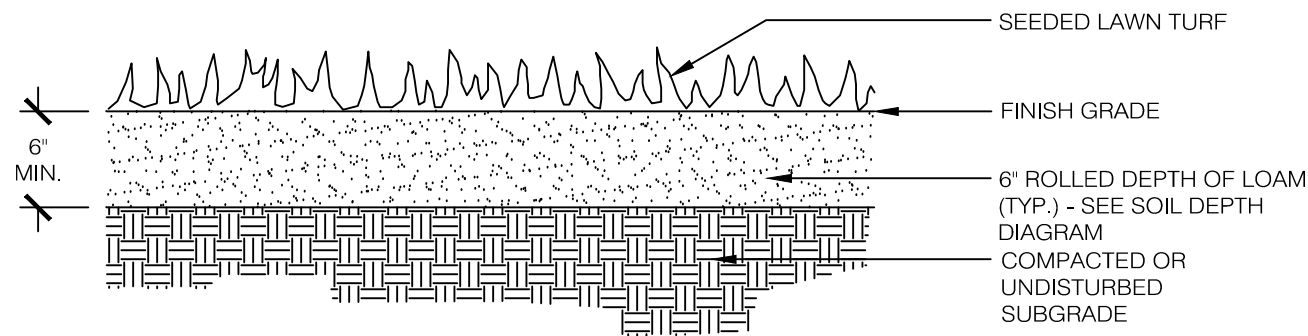
TYPICAL DECIDUOUS TREE PLANTING DETAILS
SCALE: N.T.S.



TYPICAL EVERGREEN TREE PLANTING
SCALE: N.T.S.



TYPICAL SHRUB PLANTING DETAIL
SCALE: N.T.S.



TYPICAL LOAM AND SEED DETAIL
SCALE: N.T.S.

PLANTING NOTES:

1. The Contractor shall review the written specifications for tree and shrub planting, groundcover & plants and seeding prior to submitting bid. No extraneous requirements have been included in the Specifications and Drawings. The Contractor shall also become familiar with existing and proposed site conditions prior to submitting bid.
2. The Contractor shall coordinate this work with other contractors performing work on the site.
3. The Contractor shall verify all grades, dimensions, and existing conditions and report any discrepancies to the Landscape Architect.
4. The Contractor shall locate and verify all existing and newly installed underground utilities prior to any lawn work or tree and shrub planting and shall immediately report any conflicts to the Landscape Architect.
5. The Contractor shall supply all plant material in quantities sufficient to complete the planting shown on the drawings. Quantities in Plant Schedule are for reference only.
6. All plant material shall conform to guidelines established by the "American Standards for Nursery Stock" published by the American Association of Nurserymen; latest edition (ANSI Z60.1).
7. No plant or cultivar substitutions will be acceptable.
8. Plant material shall be inspected by Owner's Representative for acceptance prior to planting.
9. Locations of new plant material shall be staked or set out by Contractor and approved and faced by the Landscape Architect prior to planting.
10. Refer to Planting Details and Specifications for information relating to planting pit dimensions and extent and composition of backfill material.
11. The trees shall bear the same relationship to tree pit finish grade as to the original grade prior to digging.
12. The Contractor shall remove all plastic materials from around the root balls of the plants after positioning in the plant pits. Remove burlap, rope, and wire from around the trunks sufficiently so that no burlap, rope, or wire will be exposed after backfilling.
13. Contractor shall exercise extreme care in working in areas of existing trees. Existing plants to remain and be protected which are injured or destroyed during construction shall be replaced by Contractor with plants of equal size and species at no cost to the Owner.
14. All areas that have been disturbed by construction activity and not paved or occupied by site structures, etc., shall be topsoiled and seeded / reconditioned as specified.
15. The trees and shrubs shall be watered by the contractor twice during the first 24 hours of planting.
16. The plants shall be maintained by the contractor during the warranty period.

1	02/16/20	CONSTRUCTION DOCUMENTS	PAB	RJF	RJF
REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

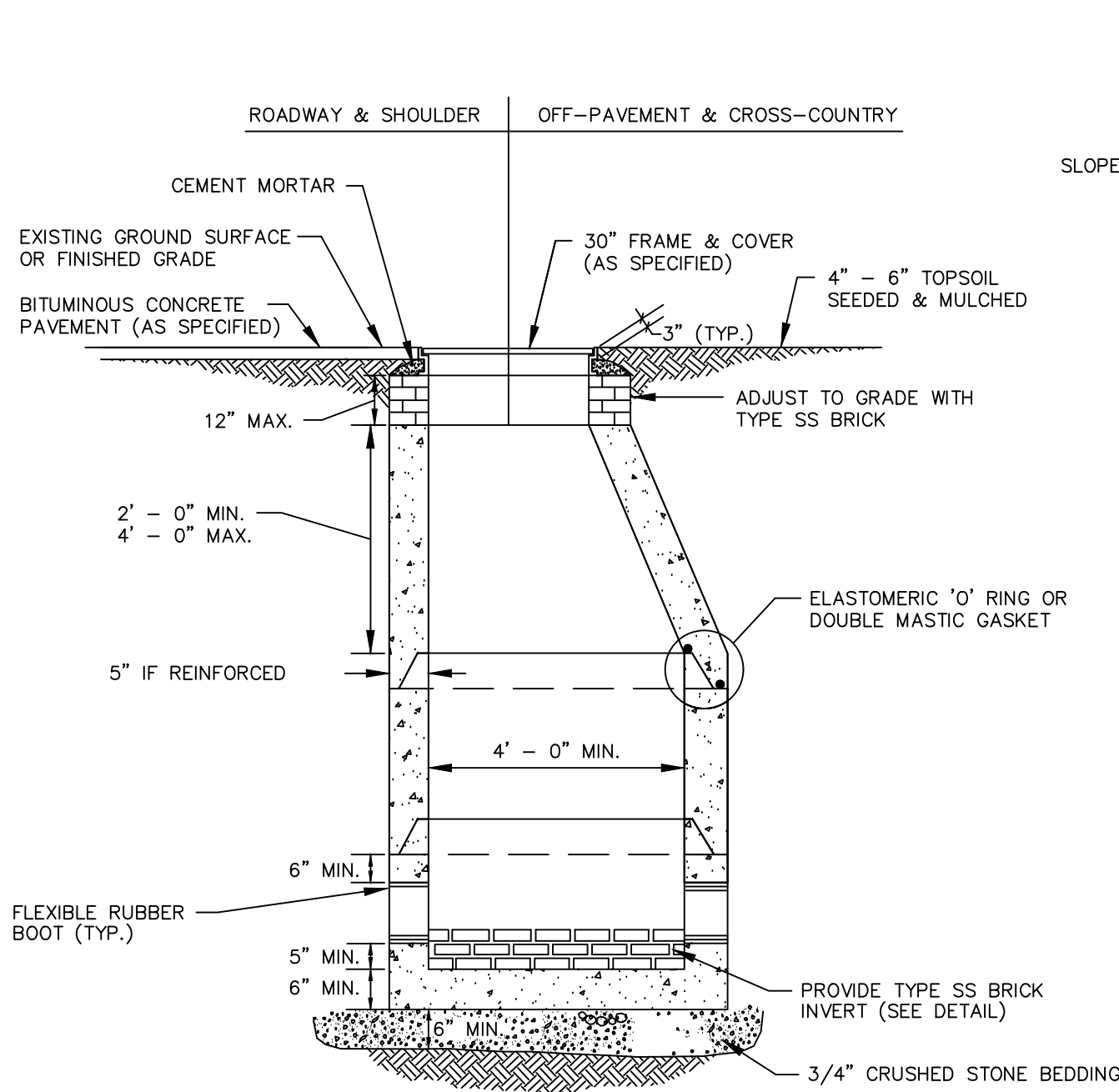
LANDSCAPE DETAILS FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V
LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC

240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

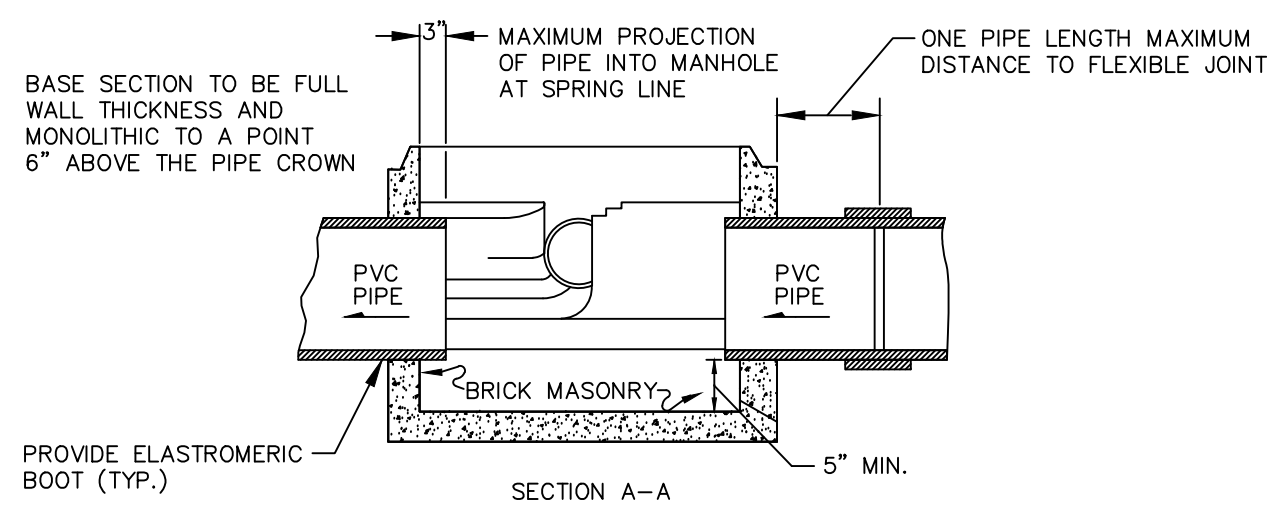
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DATE: 06/10/19
PROJ. NO. 10112

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SHEET 10 OF 22

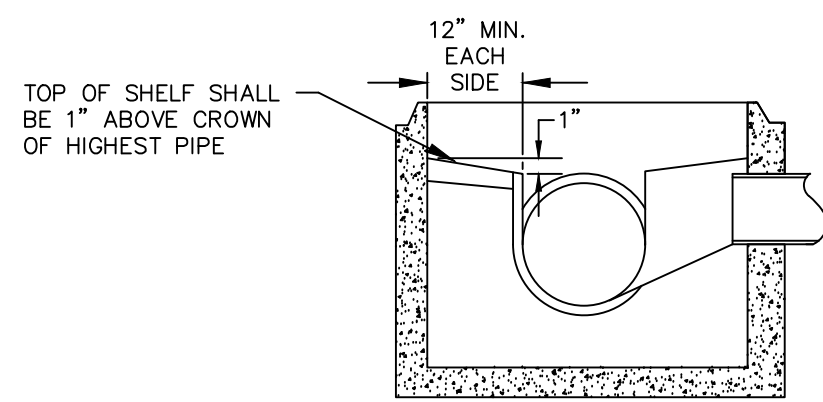


TYPICAL SEWER MANHOLE
N.T.S.

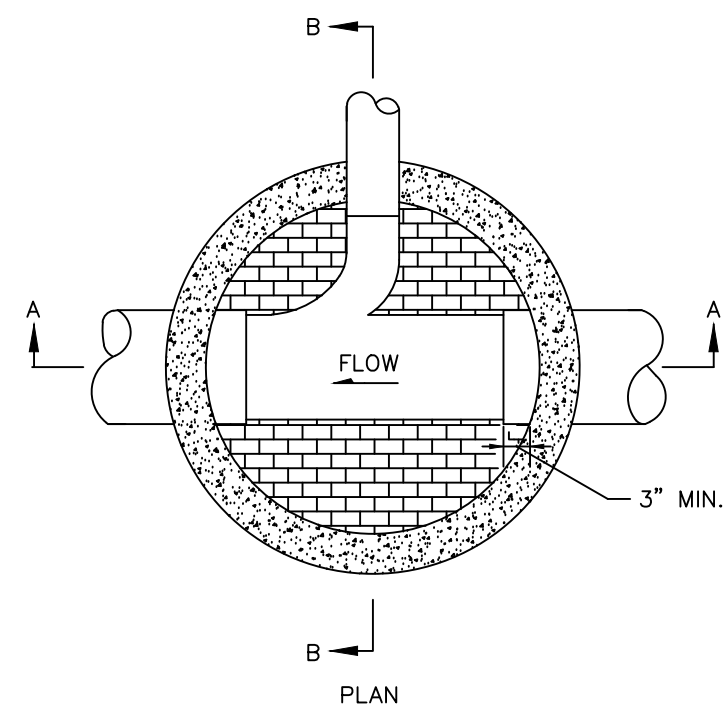
NOTE: STEPS ARE NOT ALLOWED.



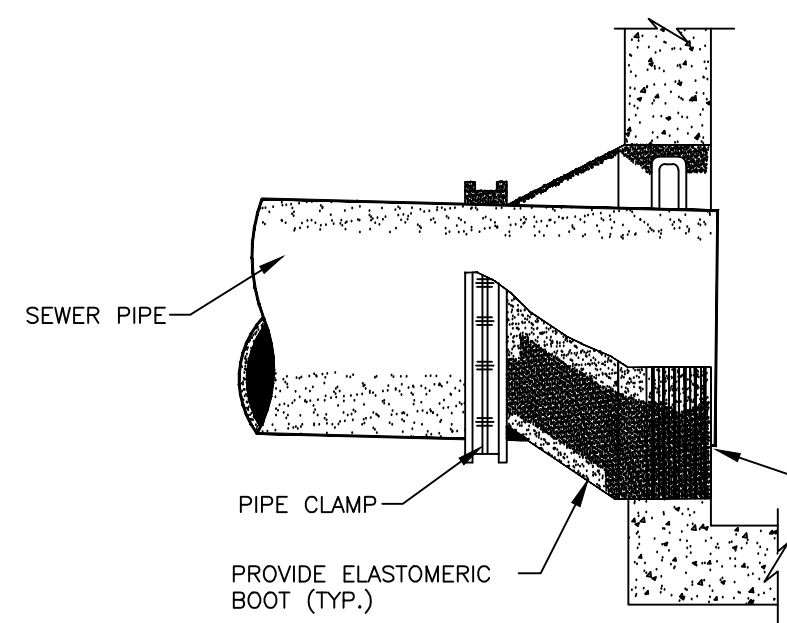
SECTION A-A



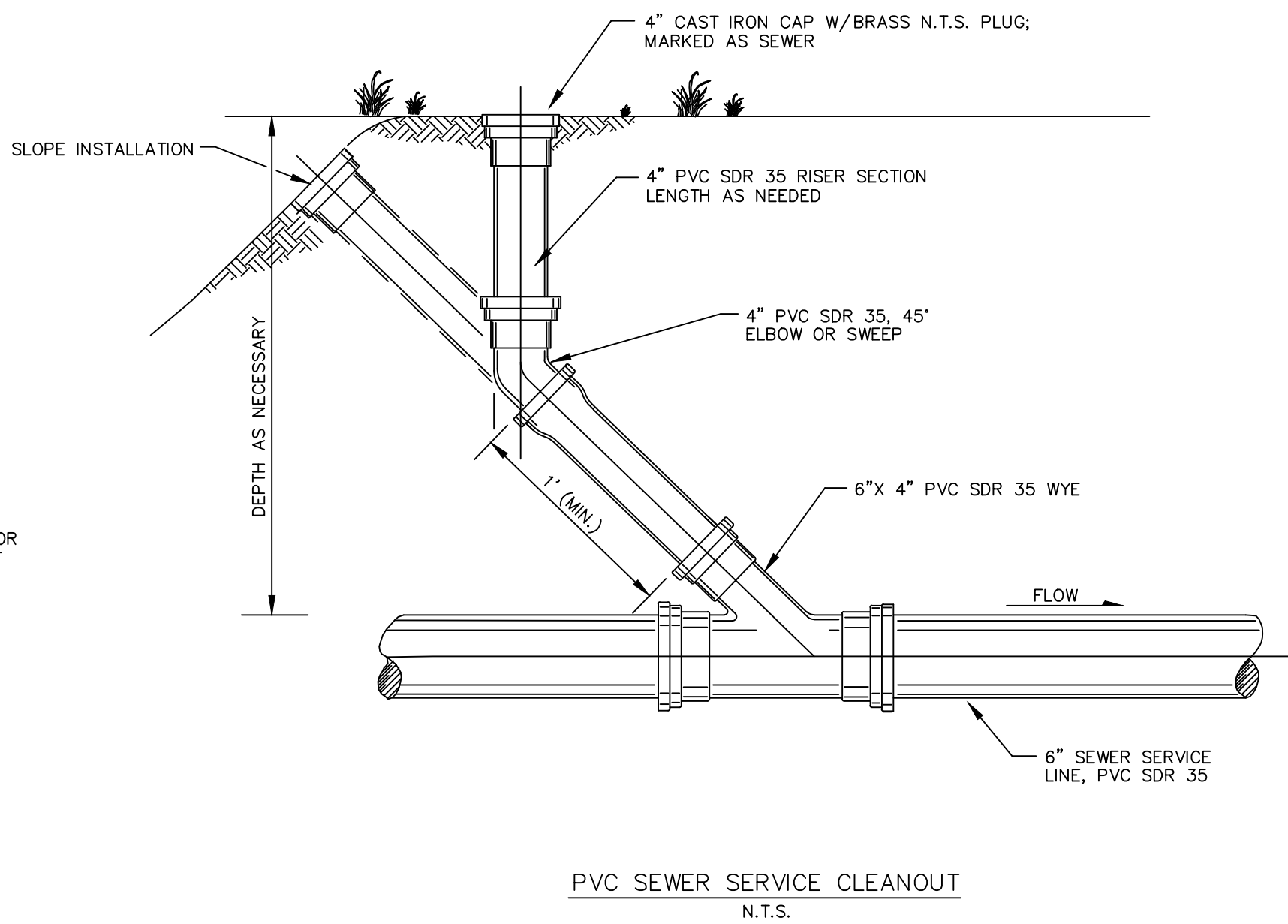
SECTION B-B



BRICK SEWER INVERT PLAN DETAIL
N.T.S.

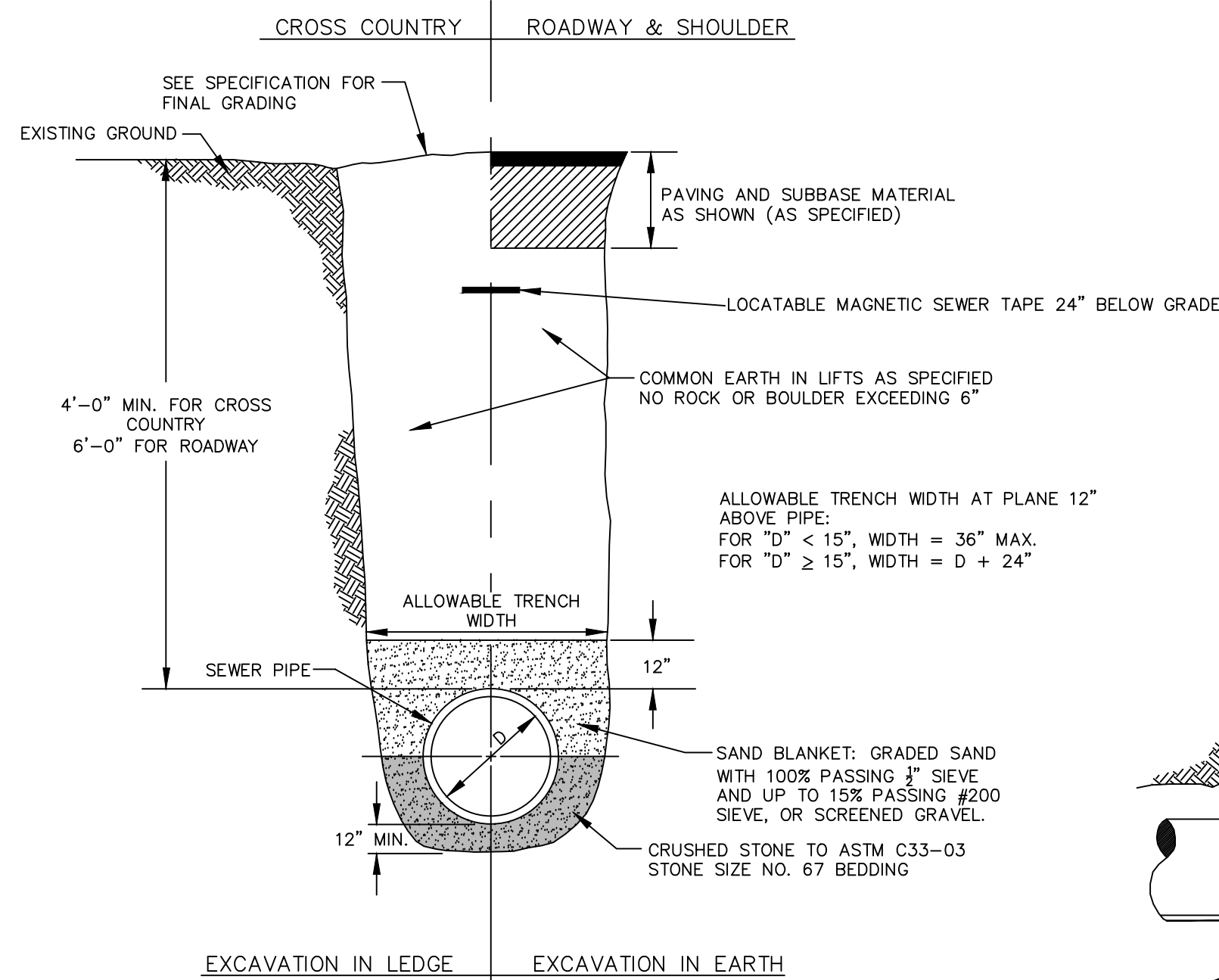


ELASTOMERIC BOOT DETAIL
N.T.S.



PVC SEWER SERVICE CLEANOUT
N.T.S.

NOTE:
OUTSIDE SEWER CLEANOUTS ARE NOT
ALLOWED IN TOWN OF HANOVER



SEWER TRENCH
N.T.S.

NOTE: COMPACT IN 12" LIFTS

ALLOWABLE TRENCH WIDTH AT PLANE 12" ABOVE PIPE:
FOR "D" < 15", WIDTH = 36" MAX.
FOR "D" ≥ 15", WIDTH = D + 24"

SAND BLANKET: GRADED SAND WITH 100% PASSING #3 SIEVE AND UP TO 15% PASSING #200 SIEVE, OR SCREENED GRAVEL.
CRUSHED STONE TO ASTM C33-03 STONE SIZE NO. 67 BEDDING

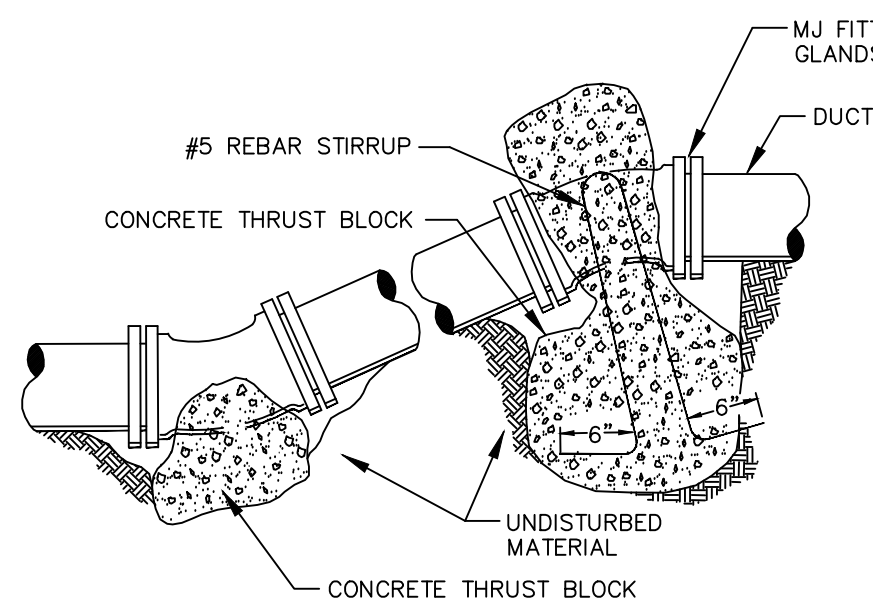
EXCAVATION IN LEDGE
EXCAVATION IN EARTH

NOTE: COMPACT IN 12" LIFTS

NOTE: CARE SHALL BE TAKEN TO ENSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE SEWER INVERT. INVERT CHANNEL BRICKS SHALL BE LAID ON EDGE. INVERT BRICK TYPE SS HARD WATERSTRUCK BRICK ASTM C-32-(84).

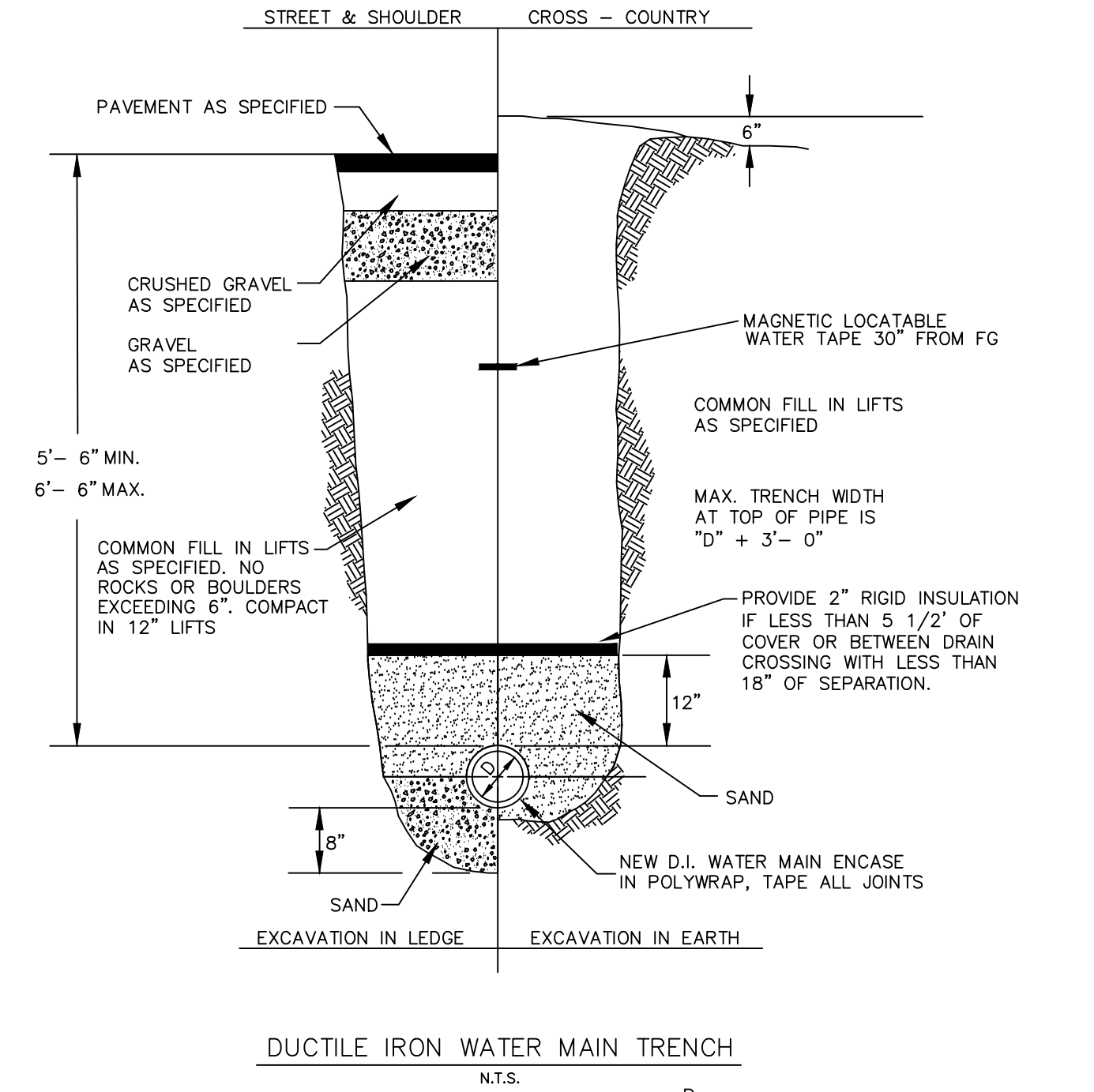
NOTE: CARE SHALL BE TAKEN TO ENSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE SEWER INVERT. INVERT CHANNEL BRICKS SHALL BE LAID ON EDGE. INVERT BRICK TYPE SS HARD WATERSTRUCK BRICK ASTM C-32-(84).

NOTE: INVERT AND SHELF TO BE PLACED AFTER LEAKAGE TEST.

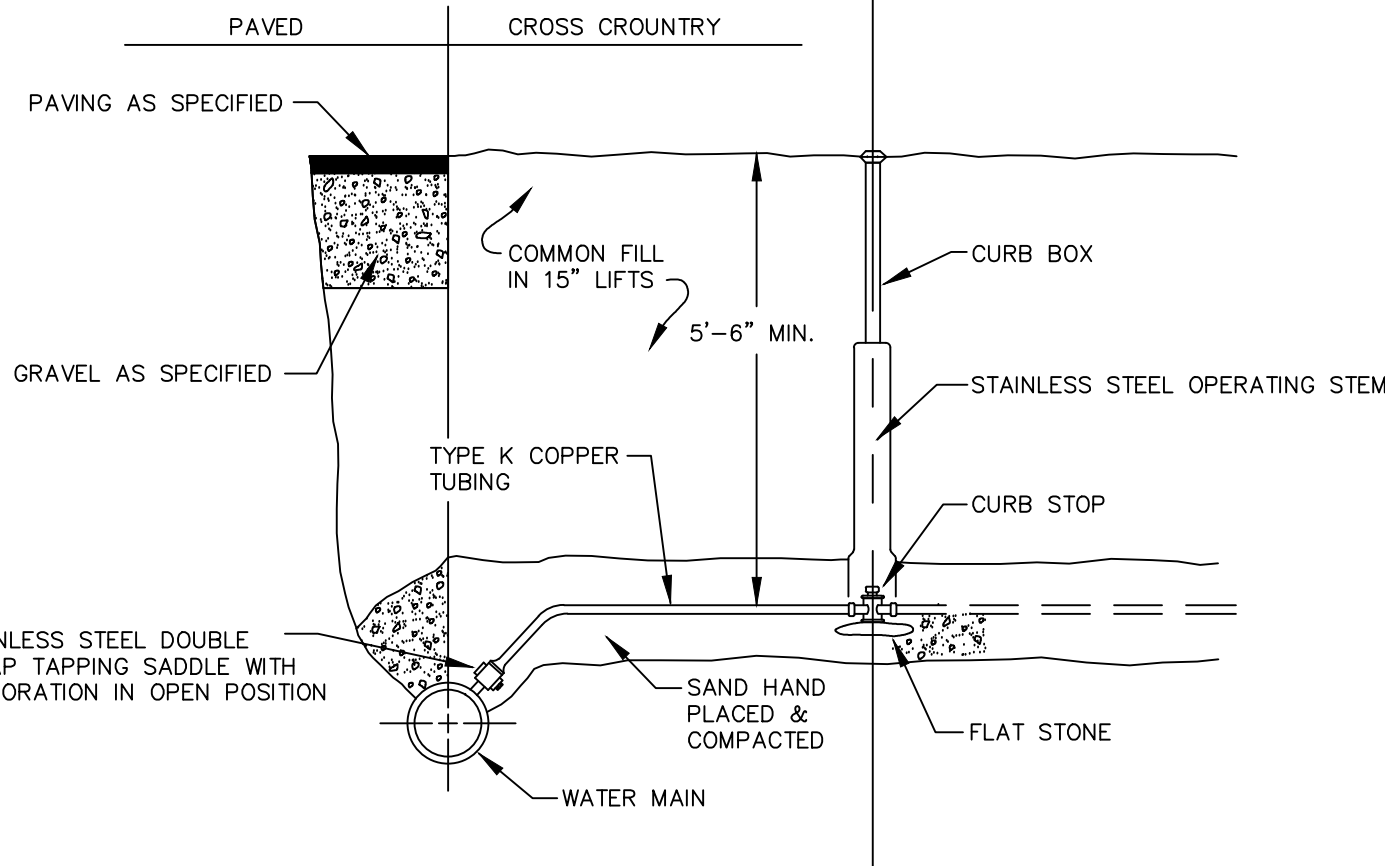


NOTE: EXTEND REINFORCED THRUST BLOCK 2' MINIMUM EITHER SIDE OF FITTING TO MAXIMIZE DOWN-PRESSURE EFFECT OF EARTH BACKFILL.

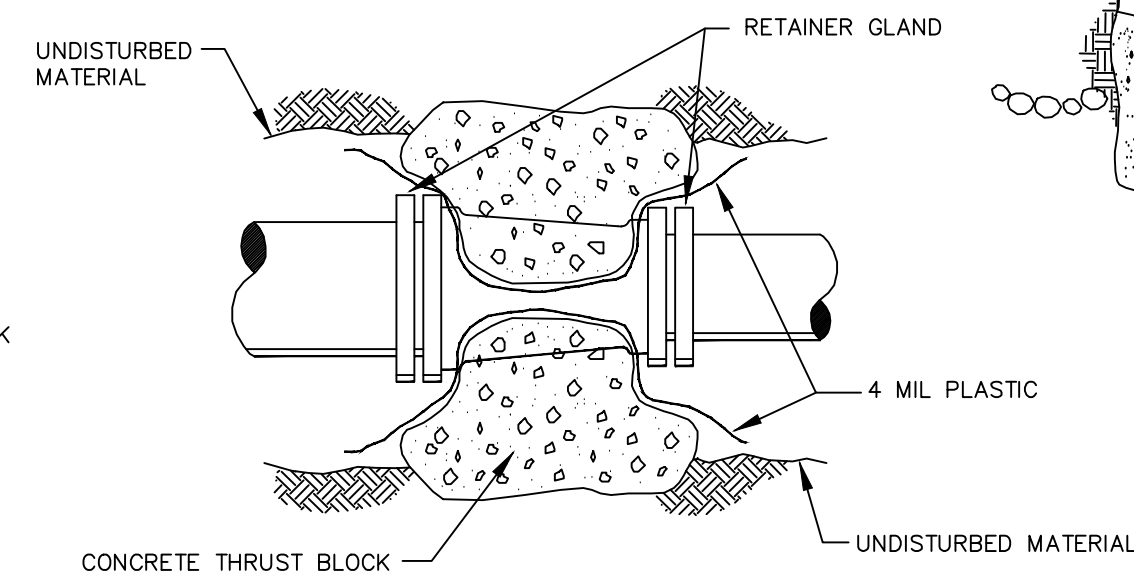
M.J. VERTICAL BENDS - ELEVATION
N.T.S.



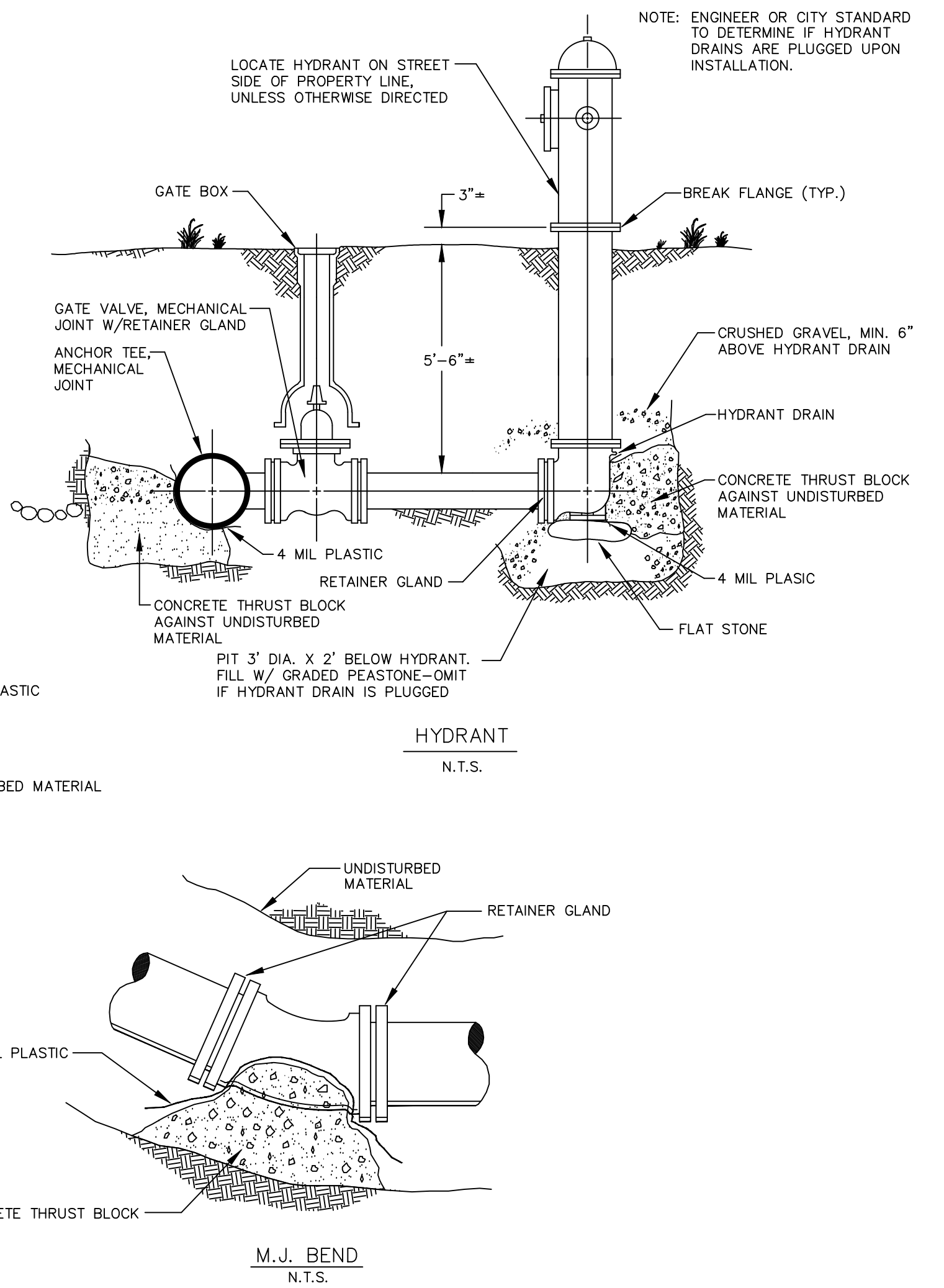
DUCTILE IRON WATER MAIN TRENCH
N.T.S.



SERVICE CONNECTION
N.T.S.



PLAN VIEW - M.J. REDUCER
N.T.S.



M.J. BEND
N.T.S.

THRUST BLOCK BEARING AREA IN SQ. FT.
(PRESSURE = 150 PSI, FACTOR OF SAFETY = 2.0)

FITTINGS	WET SILT & SOFT CLAY	SILT	SAND	COARSE SAND & GRAVEL	HARDPAN
16" TEE, CAP	60.3	30.2	20.1	15.1	12.1
1/4 BEND	85.3	42.7	28.4	21.3	17.1
1/8 BEND	46.2	23.1	15.4	11.5	9.2
1/16 BEND	23.5	11.8	7.8	5.9	4.7
1/32 BEND	11.8	5.9	3.9	3.0	2.4
12" TEE, CAP	33.9	17.0	11.3	8.5	6.8
1/4 BEND	48.0	24.0	16.0	12.0	9.6
1/8 BEND	26.0	13.0	8.7	6.5	5.2
1/16 BEND	13.2	6.6	4.4	3.3	2.6
1/32 BEND	6.7	3.3	2.2	1.7	1.5
10" TEE, CAP	23.6	11.8	7.9	5.9	4.7
1/4 BEND	33.3	16.7	11.1	8.3	6.7
1/8 BEND	18.0	9.0	6.0	4.5	3.6
1/16 BEND	9.2	4.6	3.1	2.3	1.8
1/32 BEND	4.6	2.3	1.5	1.5	1.5
8" TEE, CAP	15.1	7.5	5.0	3.8	3.0
1/4 BEND	21.3	10.7	7.1	5.3	4.3
1/8 BEND	11.5	5.8	3.6	2.9	2.3
1/16 BEND	5.9	2.9	2.0	1.5	1.5
1/32 BEND	3.0	1.5	1.5	1.5	1.5
6" TEE, CAP	8.5	4.2	2.8	2.1	1.7
1/4 BEND	12.0	6.0	4.0	3.0	2.4
1/8 BEND	6.5	3.2	2.2	1.6	1.3
1/16 BEND	3.3	1.7	1.0	1.0	1.0
1/32 BEND	1.7	1.0	1.0	1.0	1.0
4" TEE, CAP	3.8	1.9	1.3	0.9	0.8
1/4 BEND	5.3	2.7	1.8	1.3	1.5
1/8 BEND	2.9	1.4	1.0	0.7	0.6
1/16 BEND	1.5	0.7	0.5	0.5	0.5
1/32 BEND	0.7	0.5	0.5	0.5	0.5
3" TEE, CAP	2.1	1.1	0.7	0.5	0.5
1/4 BEND	3.0	1.5	1.0	0.7	0.6
1/8 BEND	1.6	0.8	0.5	0.5	0.5
1/16 BEND	0.8	0.5	0.5	0.5	0.5
1/32 BEND	0.5	0.5	0.5	0.5	0.5
2" TEE, CAP	0.9	0.5	0.5	0.5	0.5
1/4 BEND	1.3	0.7	0.5	0.5	0.5
1/8 BEND	0.7	0.5	0.5	0.5	0.5
1/16 BEND	0.5	0.5	0.5	0.5	0.5
1/32 BEND	0.5	0.5	0.5	0.5	0.5

SOIL TYPE	BEARING CAPACITY (psf)
MUCK	0-1000
WET SILT & SOFT CLAY	1000
SILT	2000
SAND	3000
COARSE SAND & GRAVEL	4000
HARDPAN	5000

NOTE: ENGINEER OR CITY STANDARD TO DETERMINE IF HYDRANT DRAINS ARE PLUGGED UPON INSTALLATION.

WATER & SEWER DETAILS FOR

QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V

LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC

240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN
DESIGNED BY: PAB
DRAWN BY: PAB
CHECKED BY: RJF
DATE: 06/10/19
PROJ. NO. 10112

11

EROSION CONTROL SPECIFICATIONS

- SOIL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN ACCORDANCE WITH "NEW HAMPSHIRE STORMWATER MANAGEMENT", VOLUMES 1, 2, & 3, DECEMBER 2008 (OR LATEST EDITION). THE CONTRACTOR SHALL HAVE REFERENCE TO THESE PUBLICATIONS.
- IMMEDIATE ATTENTION TO EROSION CONTROL PRACTICES DRAMATICALLY IMPROVES SOIL AND MOISTURE CONSERVATION AND REDUCES NEGATIVE IMPACTS ON WATER QUALITY. THE CONTRACTOR SHALL GIVE PRIORITY TO THE TIMELY INSTALLATION OF BOTH TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL MEASURES.
- THE EROSION AND SEDIMENT CONTROL PRACTICES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIRED FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE PRACTICES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS.
- THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THE PLANS SHALL BE CLEARLY FLAGGED BY SURVEY TAPE OR FENCING, IF REQUIRED, PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE CLEARING LIMITS SHALL BE MAINTAINED FOR THE DURATION OF CONSTRUCTION.
- THE SMALLEST PRACTICAL AREA SHALL BE DISTURBED DURING CONSTRUCTION, BUT SHALL NOT EXCEED 5 ACRES AT ANY ONE TIME BEFORE STABILIZATION. A CONSTRUCTION SEQUENCE HAS BEEN DEVELOPED TO FACILITATE INSTALLATION OF EROSION CONTROL MEASURES AND THE COMPLETION OF GRADING, SEEDING, AND LANDSCAPING AS SOON AS POSSIBLE WITHIN A DISTURBED AREA.
- STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES, SUCH AS CONSTRUCTED WHEEL WASH SYSTEMS OR WASH PADS, MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN AND TRACK OUT TO ROAD RIGHT OF WAY DOES NOT OCCUR FOR THE DURATION OF THE PROJECT.
- EARTH STOCKPILES SHALL BE SEEDED AND MULCHED AND HAVE A SILT FENCE INSTALLED ON THE DOWNSLOPE SIDE.
- INSTALL EROSION CONTROL MEASURES AS SHOWN. CLEAN ACCUMULATED SEDIMENT AS NECESSARY. LEAVE IN PLACE UNTIL DISTURBED AREAS HAVE BEEN ADEQUATELY STABILIZED. DISTURBED AREAS RESULTING FROM SILT FENCE REMOVAL SHALL BE PERMANENTLY SEEDED.
- CUT AND FILL SLOPES CALL FOR INTENSIVE EROSION CONTROL MEASURES. INSTALL MULCH NETTING AS SHOWN ON ALL SLOPES 3:1 (1 RISE ON 3 RUN) AND STEEPER. ALL CUT AND FILL SLOPES SHALL BE SEEDED AND MULCHED WITHIN 72 HOURS OF THEIR CONSTRUCTION.
- ALL DISTURBED AREAS SHALL HAVE TOPSOIL SPREAD (4" MINIMUM) AND BE LIMED, FERTILIZED, TILLED, SEEDED AND MULCHED (WITH ANCHORED NETTING IF REQUIRED) WITHIN 72 HOURS OF FINAL GRADING. ALL ROADWAYS AND PARKING AREAS SHALL BE STABILIZED WITHIN 72 HOURS OF ACHIEVING FINISHED GRADE. WHEN PERMANENT SEEDING CANNOT BE INSTALLED BY SEPTEMBER 15, TEMPORARY SEEDING AND MULCHING OF ALL DISTURBED AREAS SHALL BE INSTALLED IMMEDIATELY AND MAINTAINED IN THAT CONDITION UNTIL PERMANENT MEASURES CAN BE INSTALLED IN THE FOLLOWING PLANTING SEASON.
- TEMPORARY STABILIZATION OF DISTURBED AREAS:

- SEED BED PREPARATION: TILL THREE INCHES DEEP MIXING IN FERTILIZER. APPLY 2 TONS/ACRE (100#/1,000 SQ. FT.)
- FERTILIZE: UNIFORMLY APPLY NOT LESS THAN 300#/ACRE (7#/1,000 SQ. FT.) OF 10-20-20 OR EQUIVALENT.
- SEEDING: SELECT APPROPRIATE SEEDING MIXTURE FROM TABLE 1 BELOW. SPREAD SEED UNIFORMLY. FIRM SOIL BY ROLLING OR PACKING; IF NOT FEASIBLE, THEN RAKE LIGHTLY TO COVER SEEDS.
- MULCHING: MULCH ALL DISTURBED AREAS WITH 1-½ TO 2 TONS OF HAY OR STRAW PER ACRE (70-90#/1,000 SQ. FT.). ANCHOR ON ALL SLOPES 3:1 OR STEEPER AND ON SLOPES SUBJECT TO WASH OR WIND BLOWN CONDITIONS. JUTE OR OTHER BIODEGRADABLE NETTING, STAKING AND STAPLING MAY BE REQUIRED.

TABLE 1
PLANT SELECTION AND SEEDING RATES

SPECIES	PER ACRE	PER 1,000 SQ.FT.	REMARKS
WINTER RYE	2 BU OR 112 LBS.	2.5 LBS.	BEST FOR FALL SEEDING. SEED AUGUST 15 TO SEPTEMBER 15 FOR BEST COVER. SEED TO DEPTH OF ONE INCH.
OATS	2 1/2 BU OR 80 LBS.	2 LBS.	BEST FOR SPRING SEEDINGS. LATER THAN MAY 15 FOR SUMMER PROTECTION. SEED TO DEPTH OF ONE INCH.
ANNUAL RYE	40 LBS.	1 LB.	GROWS QUICKLY, BUT IS OF SHORT GRASS DURATION. USE WHERE APPEARANCES ARE IMPORTANT. COVER SEED WITH NO MORE THAN 1/4 INCH OF SOIL. WITH MULCH, SEEDING MAY BE DONE THROUGHOUT GROWING SEASON. OTHERWISE SEED EARLY SPRING OR BETWEEN AUGUST 15 & SEPTEMBER 15.

12. PERMANENT STABILIZATION OF DISTURBED AREAS:

- SEED BED PREPARATION: TOPSOIL (SANDY LOAM, LOAM, OR SILT LOAM), FRIABLE, FREE OF STUMPS, WOOD, AND ROOTS. STONES MORE THAN 1-½ INCHES IN DIAMETER OR LENGTH SHALL BE PLACED OVER ALL DISTURBED AREAS IN A 4" (MINIMUM) THICK LAYER. TOPSOIL SHALL BE FREE OF HERBICIDES AND TOXIC MATERIALS. TILL THREE INCHES DEEP, MIXING IN THE FERTILIZER AND LIME.
- FERTILIZE: UNIFORMLY APPLY NOT LESS THAN 500#/ACRE (12#/1,000 SQ. FT.) OF 10-20-20 OR EQUIVALENT.
- SEEDING: SPREAD SEED UNIFORMLY. FIRM SOIL BY ROLLING OR PACKING; IF NOT FEASIBLE, THEN RAKE LIGHTLY TO COVER SEEDS.
- MULCHING: MULCH ALL DISTURBED AREAS WITH 1-½ TO 2 TONS OF HAY OR STRAW PER ACRE (70-90#/1,000 SQ. FT.). USE STRAW MULCH ON PERMANENT SEEDING OF LAWNS. USE HAY MULCH FOR SLOPES AND PERIMETER. ANCHOR ON ALL SLOPES 3:1 OR STEEPER AND ON SLOPES SUBJECT TO WASH OR WIND BLOWN CONDITIONS. JUTE OR OTHER BIODEGRADABLE NETTING, STAKING AND STAPLING MAY BE REQUIRED.

GRASS MATERIALS (SHADY GENERAL LAWN MIX)

GRASS SEED SHALL BE FRESH, CLEAN, NEW-CROP SEED AND SHALL MEET THE PROVISIONS OF THE NEW HAMPSHIRE AGRICULTURAL AND VEGETABLE SEEDS LAW. SEED SPECIFIED IN THIS SECTION SHALL MEET THE FOLLOWING ANALYSIS:

	LBS./ACRE
CHEWING FESCUE "SR 5000"	40
CHAMPION PERENNIAL RYE GRASS	30
HARD FESCUE "SR 3000"	25
RED FESCUE - "PENNLAWN"	25
BLUEGRASS - "GLADE"	10
	130 LBS./ACRE



GRASS MATERIALS SLOPES (CONSERVATION MIX)

OTHER SEED MIXTURES AND SEEDING RATES AS RECOMMENDED BY THE USDA - SOIL CONSERVATION SERVICE AND APPROVED BY OWNER MAY BE UTILIZED ONLY UPON PRIOR WRITTEN PERMISSION FROM THE ENGINEER.

13. SEEDING MIXTURES FOR GRASSED TREATMENT SWALES AS SPECIFIED BY THE USDA SOIL CONSERVATION SERVICE, WOODSVILLE, N.H. ARE:

TABLE 0 SEEDING RATES			
MIXTURE	POUNDS PER ACRE	POUNDS PER 1,000 SQ.FT.	
A. TALL FESCUE	20	0.45	
CREeping RED FESCUE	20	0.45	
RED TOP	2	0.05	
TOTAL	42	0.95	

SITE PREPARATION, LIME, FERTILIZER, SEED AND MULCH SHALL BE AS IN ITEM 11 ABOVE.

- MAINTENANCE: DURING THE CONSTRUCTION PERIOD UNTIL SUCH TIME AS LONG TERM VEGETATION IS ESTABLISHED.
 - DISTURBED AREAS WILL BE FERTILIZED AND RESEEDED.
 - CATCH BASINS WILL BE CHECKED AND CLEANED AS NECESSARY.
 - DRAINAGE AND GRASS TREATMENT SWALES SHALL BE CHECKED FREQUENTLY AND CLEANED AS REQUIRED.
 - THE SILT FENCES AND HAYBALE DIKES WILL BE CHECKED ON A REGULAR BASIS AND REPAIRED AS NECESSARY TO CORRECT ANY DAMAGE, DETERIORATION, AND SHORT CIRCUITING.
 - THE BOTTOM OF SEDIMENT BASINS SHALL BE PERIODICALLY CLEANED, WITH THE SEDIMENT REMOVED TO A SECURE LOCATION.

- SITE VISITS: THE ENGINEER SHALL BE CONTACTED ON A REGULAR BASIS TO OBSERVE THE INSTALLATION AND MAINTENANCE OF EROSION AND SEDIMENT CONTROL PRACTICES. REFER TO CONSTRUCTION SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS. EROSION CONTROL PRACTICES SHALL BE IN STRICT ACCORDANCE WITH THE APPROVED PLANS AND SPECIFICATIONS.
- ALL PERMANENT DITCHES, SWALES, DETENTION, RETENTION AND SEDIMENTATION BASINS TO BE STABILIZED USING THE VEGETATIVE AND NON-STRUCTURAL BMPs SHALL BE STABILIZED PRIOR TO DIRECTING RUNOFF TO THEM.
- THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROLS WEEKLY AND AFTER EVERY 0.5" RAINFALL. ALL DAMAGED SILT FENCES SHALL BE REPAIRED. SEDIMENT DEPOSITS SHALL BE REMOVED AS NECESSARY.
- STABILIZATION MEASURES MUST BE INITIATED AS SOON AS PRACTICABLE IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY CEASED, BUT IN NO CASE MORE THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY CEASED.
- AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
 - BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED.
 - A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED.
 - A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIPRAP HAS BEEN INSTALLED; OR
 - EROSION CONTROL BLANKETS HAVE BEEN PROPERLY INSTALLED.

WINTER CONSTRUCTION NOTES

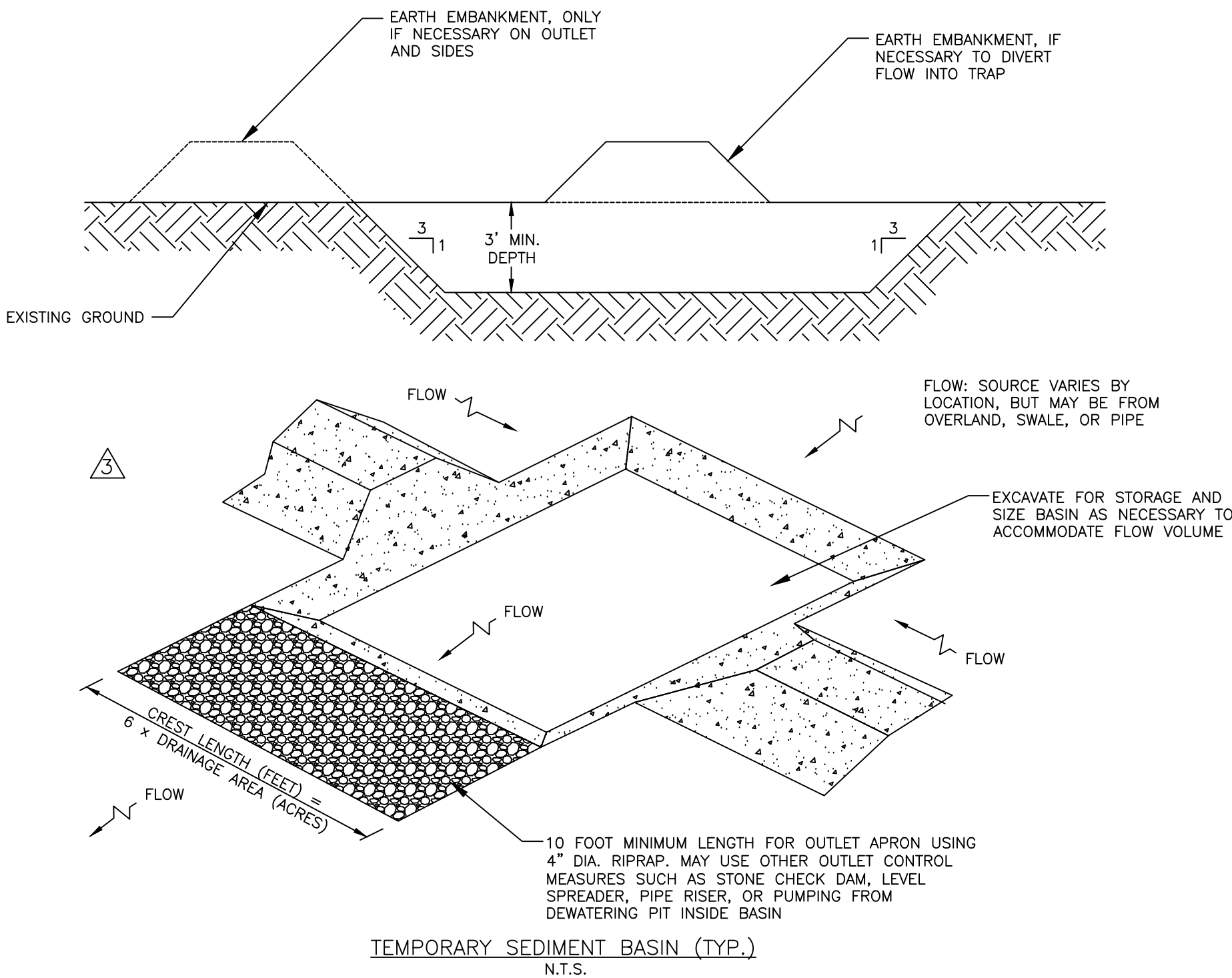
FOR SITE WORK CONSTRUCTION BETWEEN OCTOBER 15TH AND MAY 15 THE CONTRACTOR SHALL FOLLOW WINTER CONSTRUCTION EROSION PROTECTION METHODS AS DESCRIBED BELOW:

- CHECK ALL PERMETER EROSION CONTROL MEASURES AND COMPLETE ANY REQUIRED MAINTENANCE AND REPAIR BEFORE THE GROUND FREEZES.
- PUT IN PLACE ANY ADDITIONALLY NECESSARY EROSION CONTROL MEASURES; DIVERSION DIKES, HAY BALES, SILT FENCE, SEDIMENT TRAPS AND/OR BASINS, ETC. TO PROTECT DOWNSTREAM WATER QUALITY FROM ANTICIPATED WINTER WORK PRIOR TO GROUND FREEZING.
- THE AREA OF EXPOSED, UNSTABILIZED SOIL SHOULD BE LIMITED TO ONE ACRE. GENERALLY, THE EXPOSED AREA SHOULD BE LIMITED TO ONLY THOSE AREAS IN WHICH WORK WILL OCCUR DURING THE FOLLOWING 15 DAYS AND SHOULD BE PROTECTED AGAINST EROSION BY THE METHODS DESCRIBED IN THIS SECTION PRIOR TO ANY SNOW, RAINFALL, THAW OR SPRING MELT EVENT. SUBJECT TO APPLICABLE REGULATIONS, THE ALLOWABLE AREA OF EXPOSED SOIL MAY BE INCREASED IF ACTIVITIES ARE CONDUCTED ACCORDING TO A WINTER CONSTRUCTION PLAN, DEVELOPED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF NEW HAMPSHIRE OR A CERTIFIED PROFESSIONAL IN EROSION AND SEDIMENT CONTROL AS CERTIFIED BY THE CSPESC COUNCIL OF ENVIROCERT INTERNATIONAL, INC.
- SUBSEQUENT WORK AREAS SHOULD NOT BE EXPOSED UNTIL THE PREVIOUSLY EXPOSED WORK AREA HAS BEEN FULLY STABILIZED.
- STABILIZATION AS FOLLOWS SHOULD BE COMPLETED WITHIN A DAY OF ESTABLISHING THE GRADE THAT IS FINAL OR THAT OTHERWISE WILL EXIST FOR MORE THAN 5 DAYS:
 - ALL PROPOSED VEGETATED AREAS HAVING A SLOPE OF LESS THAN 15% WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15TH, OR WHICH ARE DISTURBED AFTER OCTOBER 15TH, SHOULD BE SEEDED AND COVERED WITH 3 TO 4 TONS OF HAY OR STRAW MULCH PER ACRE SECURED WITH ANCHORED NETTING, OR 2 INCHES OF EROSION CONTROL MIX.
 - ALL PROPOSED VEGETATED AREAS HAVING A SLOPE OF GREATER THAN 15% WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15TH, OR WHICH ARE DISTURBED AFTER OCTOBER 15TH, SHOULD BE SEEDED AND COVERED WITH A PROPERLY INSTALLED AND ANCHORED EROSION CONTROL BLANKET OR WITH A MINIMUM 4 INCH THICKNESS OF EROSION CONTROL MIX, UNLESS OTHERWISE SPECIFIED BY THE MANUFACTURER. NOTE THAT COMPOST BLANKETS SHOULD NOT EXCEED 2 INCHES IN THICKNESS OR THEY MAY OVERHEAT.
- ALL STONE-COVERED SLOPES MUST BE CONSTRUCTED AND STABILIZED BY OCTOBER 15.
- INSTALLATION OF ANCHORED HAY MULCH OR EROSION CONTROL MIX SHOULD NOT OCCUR OVER SNOW OF GREATER THAN ONE INCH IN DEPTH.
- ALL MULCH APPLIED DURING WINTER SHOULD BE ANCHORED (E.G., BY NETTING, TRACKING, WOOD CELLULOSE FIBER).
- STOCKPILES OF SOIL MATERIALS SHOULD BE MULCHED FOR OVER WINTER PROTECTION WITH HAY OR STRAW AT TWICE THE NORMAL RATE OR WITH A FOUR-INCH LAYER OF EROSION CONTROL MIX. MULCHING SHOULD BE DONE WITHIN 24 HOURS OF STOCKING, AND RE-ESTABLISHED PRIOR TO ANY RAINFALL OR SNOWFALL. NO SOIL STOCKPILE SHOULD BE PLACED (EVEN COVERED WITH MULCH) WITHIN 100 FEET FROM ANY WETLAND OR OTHER WATER RESOURCE AREA.
- FROZEN MATERIALS, (E.G., FROST LAYER THAT IS REMOVED DURING WINTER CONSTRUCTION), SHOULD BE STOCKPILED SEPARATELY AND IN A LOCATION THAT IS AWAY FROM ANY AREA NEEDING TO BE PROTECTED. STOCKPILES OF FROZEN MATERIAL CAN MELT IN THE SPRING AND BECOME UNWORKABLE AND DIFFICULT TO TRANSPORT DUE TO THE HIGH MOISTURE CONTENT IN THE SOIL.
- INSTALLATION OF EROSION CONTROL BLANKETS SHOULD NOT OCCUR OVER SNOW OF GREATER THAN ONE INCH IN DEPTH OR ON FROZEN GROUND.
- ALL GRASS-LINED DITCHES AND CHANNELS SHOULD BE CONSTRUCTED AND STABILIZED BY SEPTEMBER 1. ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15TH, OR WHICH ARE DISTURBED AFTER OCTOBER 15TH, SHOULD BE STABILIZED TEMPORARILY WITH STONE OR EROSION CONTROL BLANKETS APPROPRIATE FOR THE DESIGN FLOW CONDITIONS, AS DETERMINED BY A QUALIFIED PROFESSIONAL ENGINEER OR A CERTIFIED PROFESSIONAL IN EROSION AND SEDIMENT CONTROL AS CERTIFIED BY THE CSPESC COUNCIL OF ENVIROCERT INTERNATIONAL, INC. IF A STONE LINING IS NECESSARY, THE CONTRACTOR MAY NEED TO RE-GRADE THE DITCH AS REQUIRED TO PROVIDE ADEQUATE CROSS-SECTION AFTER ALLOWING FOR PLACEMENT OF THE STONE.
- ALL STONE-LINED DITCHES AND CHANNELS MUST BE CONSTRUCTED AND STABILIZED BY OCTOBER 15.
- AFTER OCTOBER 15TH, INCOMPLETE ROAD OR PARKING AREAS WHERE ACTIVE CONSTRUCTION OF THE ROAD OR PARKING AREA HAS STOPPED FOR THE WINTER SEASON SHOULD BE PROTECTED WITH A MINIMUM 3 INCH LAYER OF SAND AND GRAVEL WITH A GRADATION SUCH THAT LESS THAN 12% OF THE SAND PORTION, OR MATERIAL PASSING THE NUMBER 4 SIEVE, BY WEIGHT, PASSES THE NUMBER 200 SIEVE.
- SEDIMENT BARRIERS THAT ARE INSTALLED DURING FROZEN CONDITIONS SHOULD CONSIST OF COMPOST SOCKS, EROSION CONTROL MIX BERMS, OR CONTINUOUS CONTAINED BERMS. SILT FENCES SHOULD NOT BE INSTALLED WHEN FROZEN CONDITIONS PREVENT PROPER EMBEDMENT OF THESE BARRIERS.
- INSPECT THE EROSION AND SEDIMENT CONTROL MEASURES MORE FREQUENTLY THAN IS SPECIFIED IN THE EROSION CONTROL INSPECTION, MONITORING, AND MAINTENANCE SPECIFICATIONS FOUND ON THIS SHEET DURING THE WINTER AND SPRING THAW MONTHS TO PREVENT FAILURE AND/OR OVERLOADING.
- BEFORE PREDICTED THAWS AND/OR HEAVY RAIN EVENTS CHECK ALL MEASURES TO ENSURE THAT THEY WILL BE ABLE TO HANDLE POTENTIALLY HEAVY AND INTENSE RUNOFF AND SEDIMENTATION.
- CONTRACTOR SHALL BE PREPARED TO INSTALL A SECOND LINE OF DEFENSE IF PROBLEMS WITH IN-PLACE EROSION CONTROL MEASURES OCCUR DURING WINTER THAW AND SPRING RAIN EVENTS.
- AS EARLY AS PRACTICAL AT THE BEGINNING OF THE NEXT GROWING SEASON, CONTRACTOR SHALL STABILIZE COMPLETED AREAS WITH PERMANENT VEGETATIVE CONTROLS AS SPECIFIED ON THESE DRAWINGS.

TABLE 3800.1 NEW HAMPSHIRE PROHIBITED INVASIVE SPECIES LIST		
SCIENTIFIC NAME		COMMON NAME
	M	
Acer platanoides		Norway maple
Ailanthus altissima		tree of heaven
Alliaria petiolata		garlic mustard
Berberis thunbergii		Japanese barberry
Berberis vulgaris		European barberry
Celastrus orbiculatus		Oriental bittersweet
Centaurea biebersteinii		spotted knapweed
Cynanchum nigrum		black swallow-wort
Cynanchum rossicum		pale swallow-wort
Elaeagnus umbellata		autumn olive
Euonymus alatus		burning bush
Heracleum mantegazzianum		giant hogweed
Hesperis matronalis		dame's rocket
Iris pseudacorus		water-flag
Lepidium latifolium		perennial pepperweed
Ligustrum obtusifolium		blunt-leaved privet
Lonicera bella		showy bush honeysuckle
Lonicera japonica		Japanese honeysuckle
Lonicera morrowii		Morrow's honeysuckle
Lonicera tatarica		Tatarian honeysuckle
Microstegium vimineum		Japanese stilt grass
Polygonum cuspidatum		Japanese knotweed
Polygonum perfoliatum		mile-a-minute vine
Reynoutria x bohemica		bohemia knotweed
Rhamnus cathartica		common buckthorn
Rhamnus frangula		glossy buckthorn
Rosa multiflora		multiflora rose
INSECTS		
Acarapis woodi		honeybee tracheal mite
Adelges tsugae		hemlock woolly adelgid
Aeolesthes sarta		city longhorn beetle
Agrilus planipennis		emerald ash borer
Anaplophora glabripennis		Asian longhorned beetle
Callidiellum rufipenne		cedar longhorned beetle
Dendrolimus sibiricus		Siberian silk moth
Hylurgus ligniperda		redhaired bark beetle
Ips typographus		European spruce bark beetle
Lymantria dispar		Asian gypsy moth
Papillia japonica		Japanese beetle
Pyrrhalta viburni		viburnum leaf beetle
Rhizotrogus majalis		European chafer
Symantria monacha		nun moth
Tetropium fuscum		brown spruce longhorned beetle
Varroa destructor		varroa mite

CONSTRUCTION SEQUENCE

- PRE-CONSTRUCTION MEETING.
- INSTALL CATCH BASIN PROTECTION IF REQUIRED.
- GRADE AND INSTALL CONSTRUCTION ENTRANCE(S).
- INSTALL PERIMETER CONTROLS (SILT FENCE, BRUSH BARRIER, CONSTRUCTION FENCE, ETC.) PRIOR TO EARTH MOVING OPERATIONS.
- GRADE AND STABILIZE CONSTRUCTION ROADS.
- CONSTRUCT SURFACE WATER CONTROLS (INTERCEPTOR DIKES, PIPE SLOPE DRAINS, ETC.), IF REQUIRED, SIMULTANEOUSLY WITH CLEARING AND GRADING FOR PROJECT DEVELOPMENT.
- LAND CLEARING AND GRADING. SITE PREPARATION INCLUDING CUTTING AND FILLING, BARRIERS, DIVERSIONS, DRAINS, CULVERTS, AND SURFACE ROUGHENING.
- SURFACE STABILIZATION, TEMPORARY AND PERMANENT SEEDING, MULCHING, SODDING, RIPRAP.
- BUILDING CONSTRUCTION. BUILDINGS, DRAIN SYSTEMS, UTILITIES, AND PAVING.
- LANDSCAPING AND FINAL STABILIZATION. TOPSOILING, TREES AND SHRUBS.
- PERMANENT SEEDING, MULCHING, SODDING, RIPRAP.
- UPON COMPLETION OF THE PROJECT, ALL DISTURBED AREAS MUST BE STABILIZED.
- CONTINUOUSLY INSPECT AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES.
- REMOVE TRAPPED SEDIMENTS FROM EROSION AND SEDIMENT CONTROL MEASURES AS APPROPRIATE AND THEN REMOVE TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES.



EROSION CONTROL NOTES AND DETAILS

QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V

LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC

240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN

DESIGNED BY: PAB

DRAWN BY: PAB

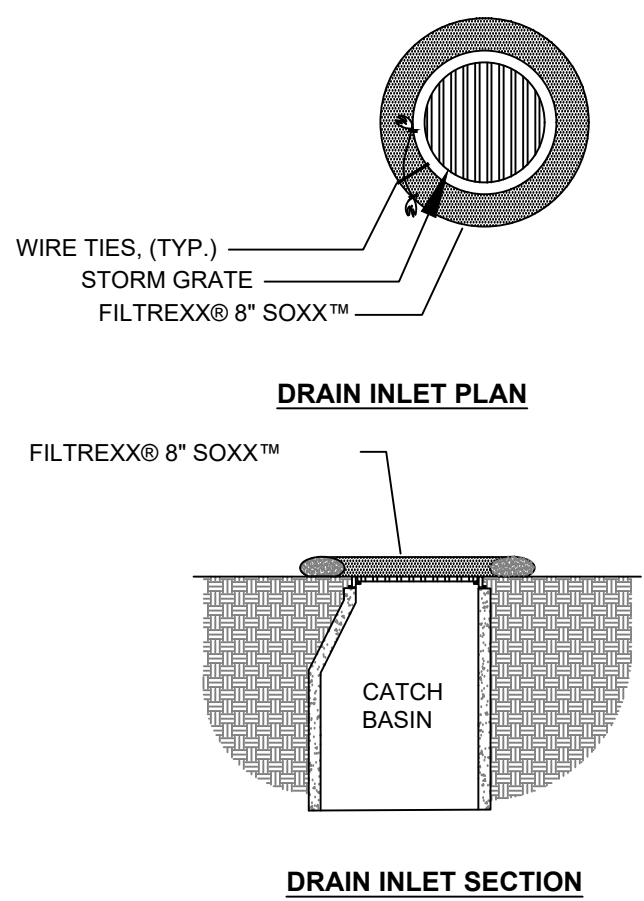
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PROJ. NO. 10112

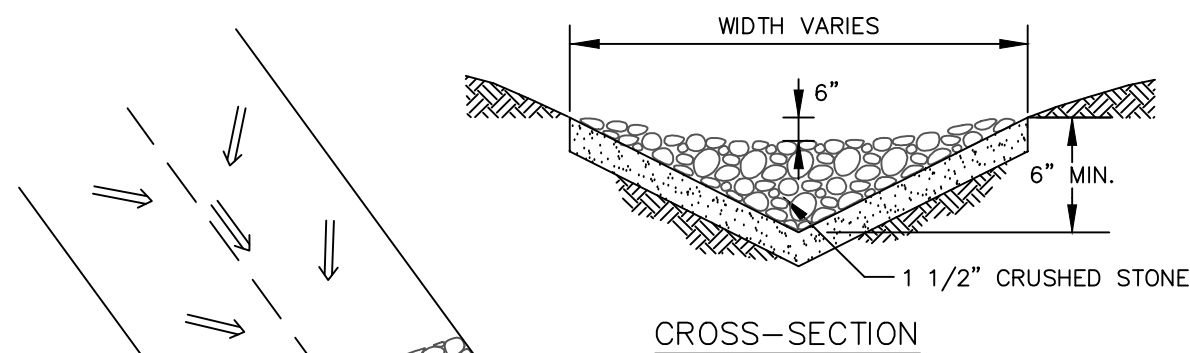
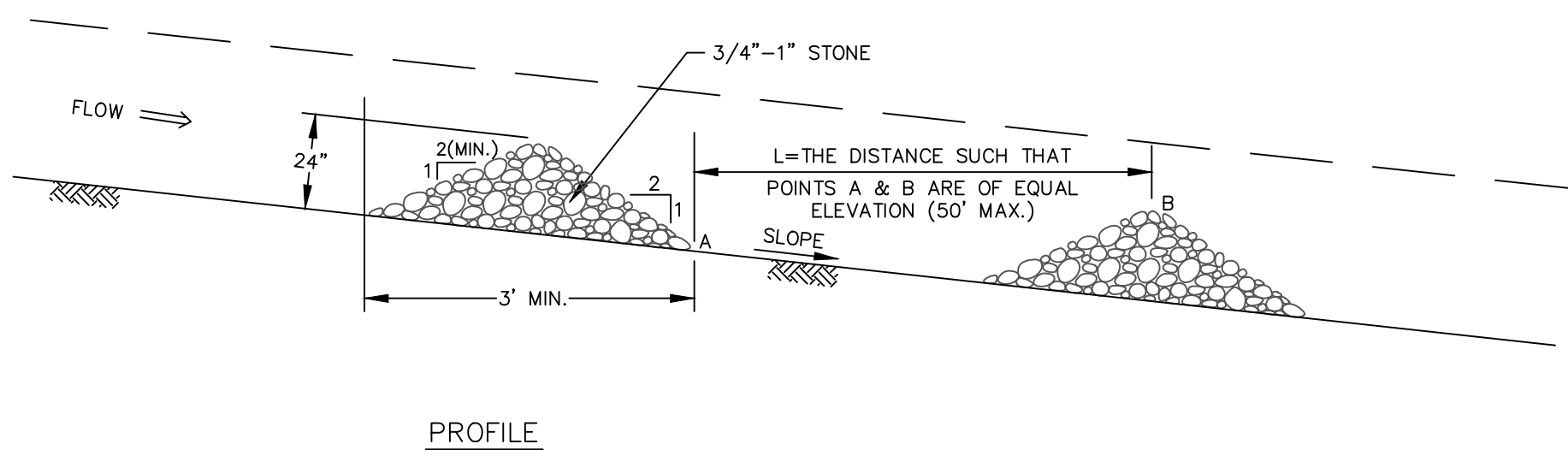
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SHEET 12 OF 22

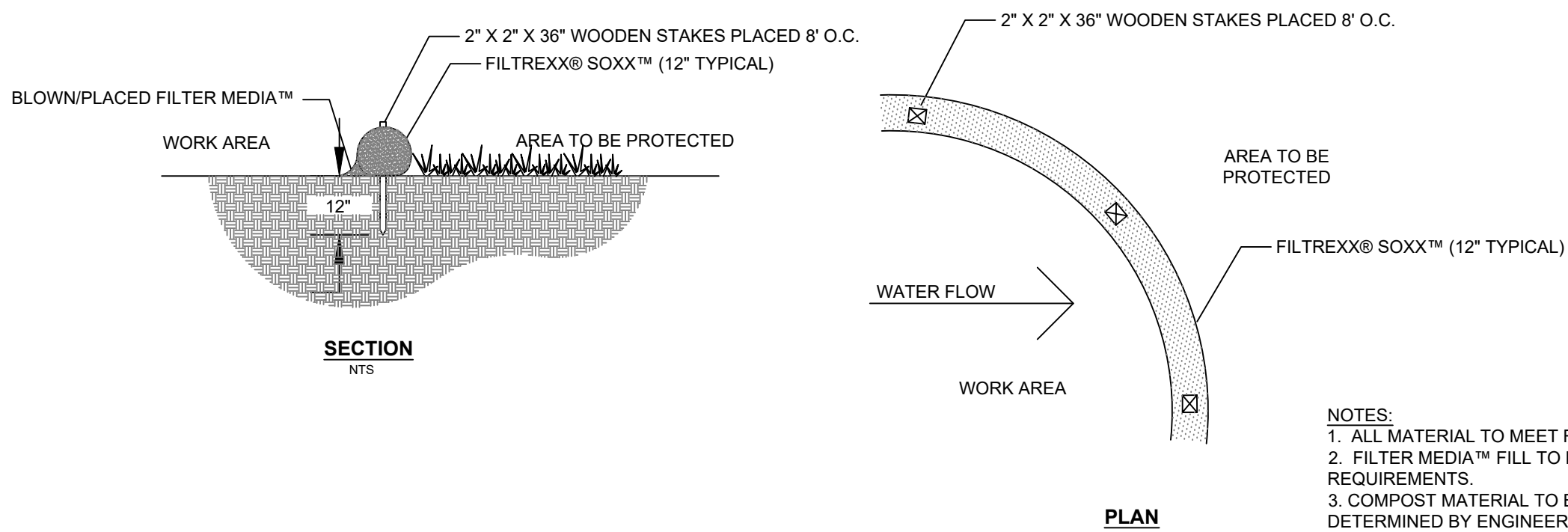


- NOTES:
1. ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
 2. FILTER MEDIA™ FILL TO MEET APPLICATION REQUIREMENTS.
 3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

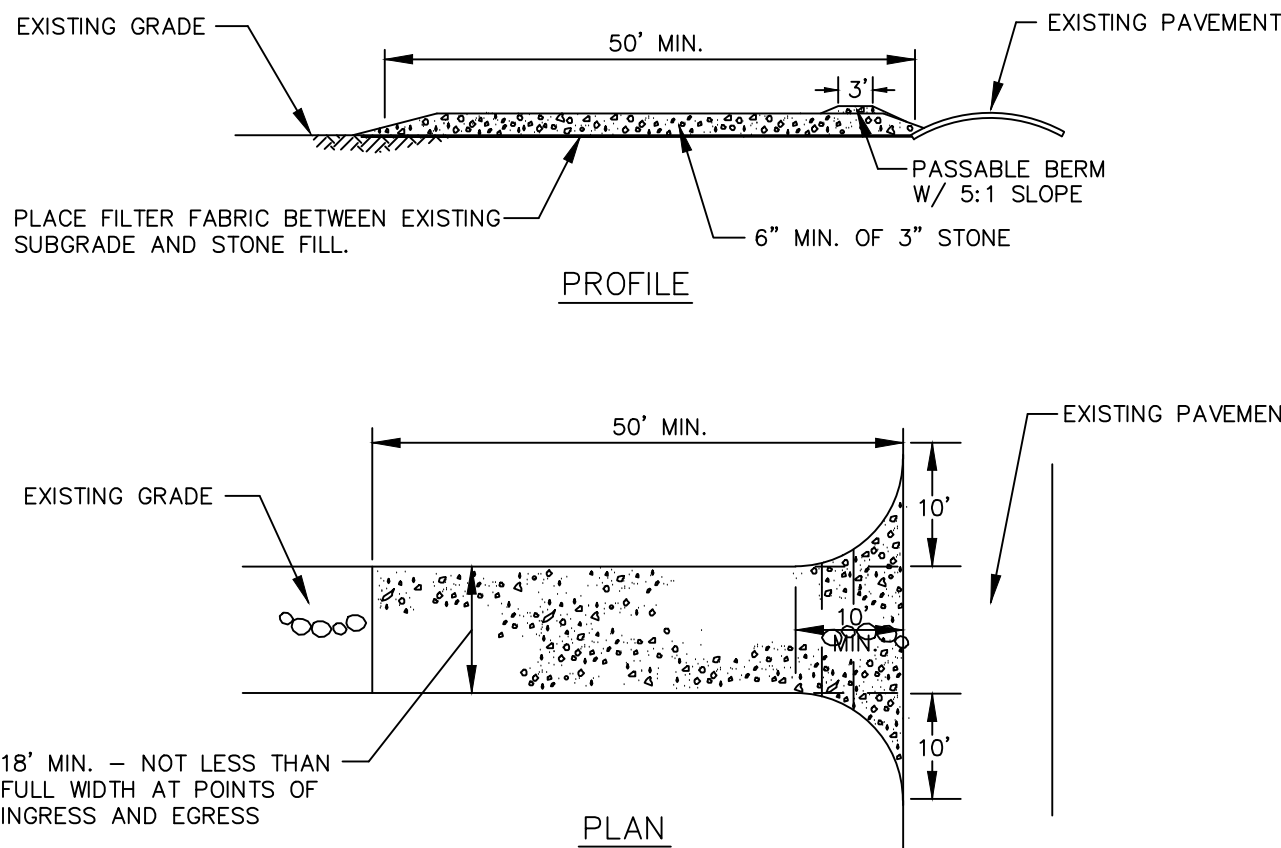
FILTREXX® INLET PROTECTION
NTS



STONE CHECK DAMS
N.T.S.

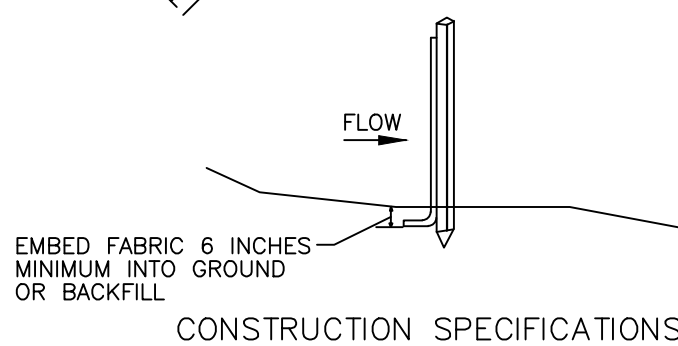
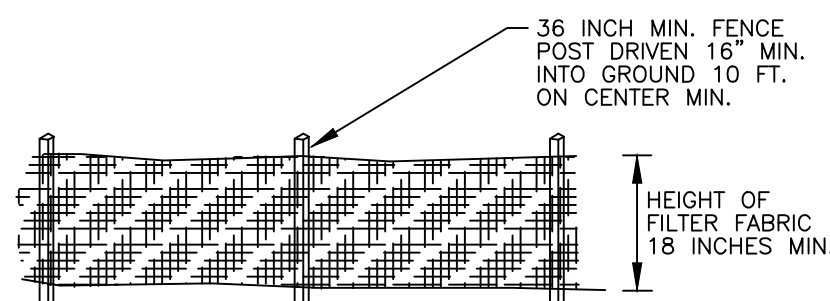


FILTREXX® SEDIMENT CONTROL
NTS



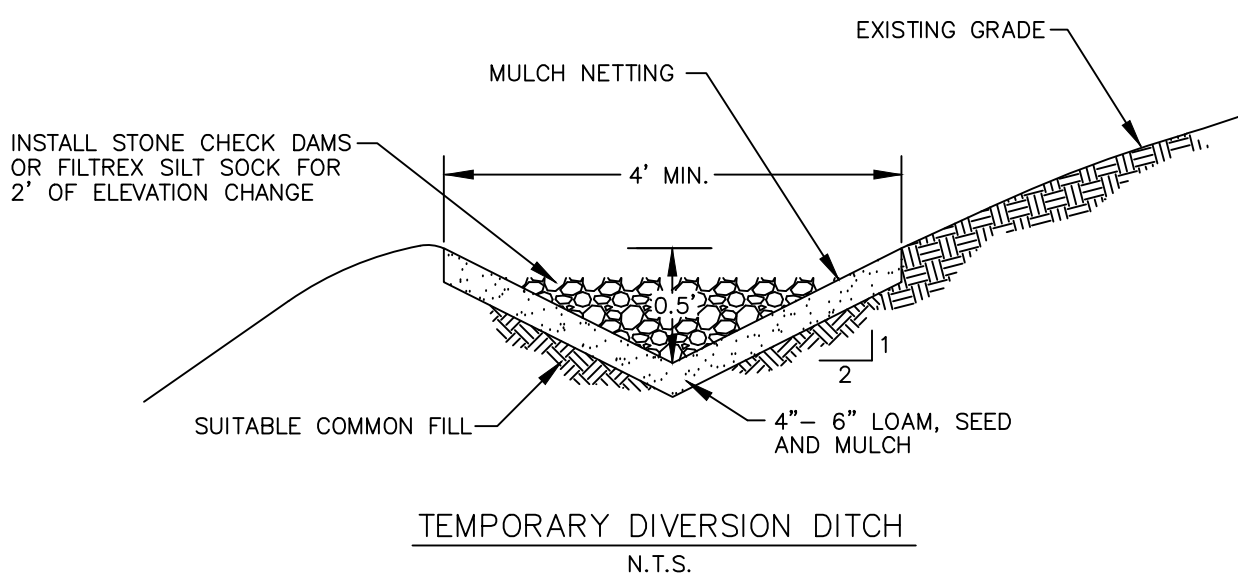
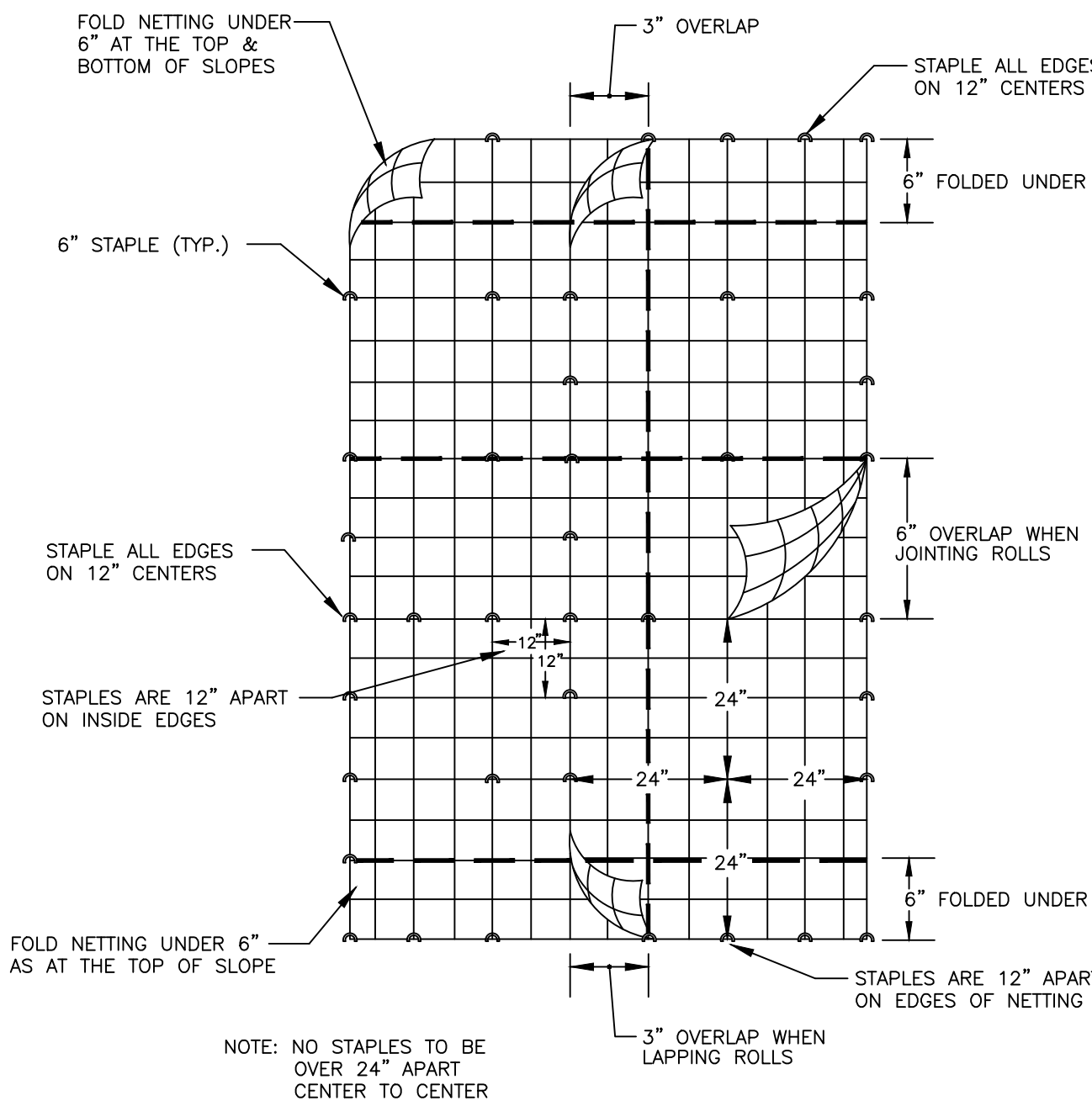
- NOTES:
- 1.) MAINTAIN ENTRANCE TO PREVENT TRACKING OF SEDIMENT INTO PUBLIC R.O.W.
REDUCE TRACKING OF SILTS ONTO PUBLIC R.O.W. BY CLEANING OR TOP DRESSING
STONE FILL.
 - 2.) PROVIDE SEPARATE WHEEL CLEANING AREA WITH SUITABLE SEDIMENTATION BASIN, AS NEEDED.

STABILIZED CONSTRUCTION ENTRANCE
N.T.S.



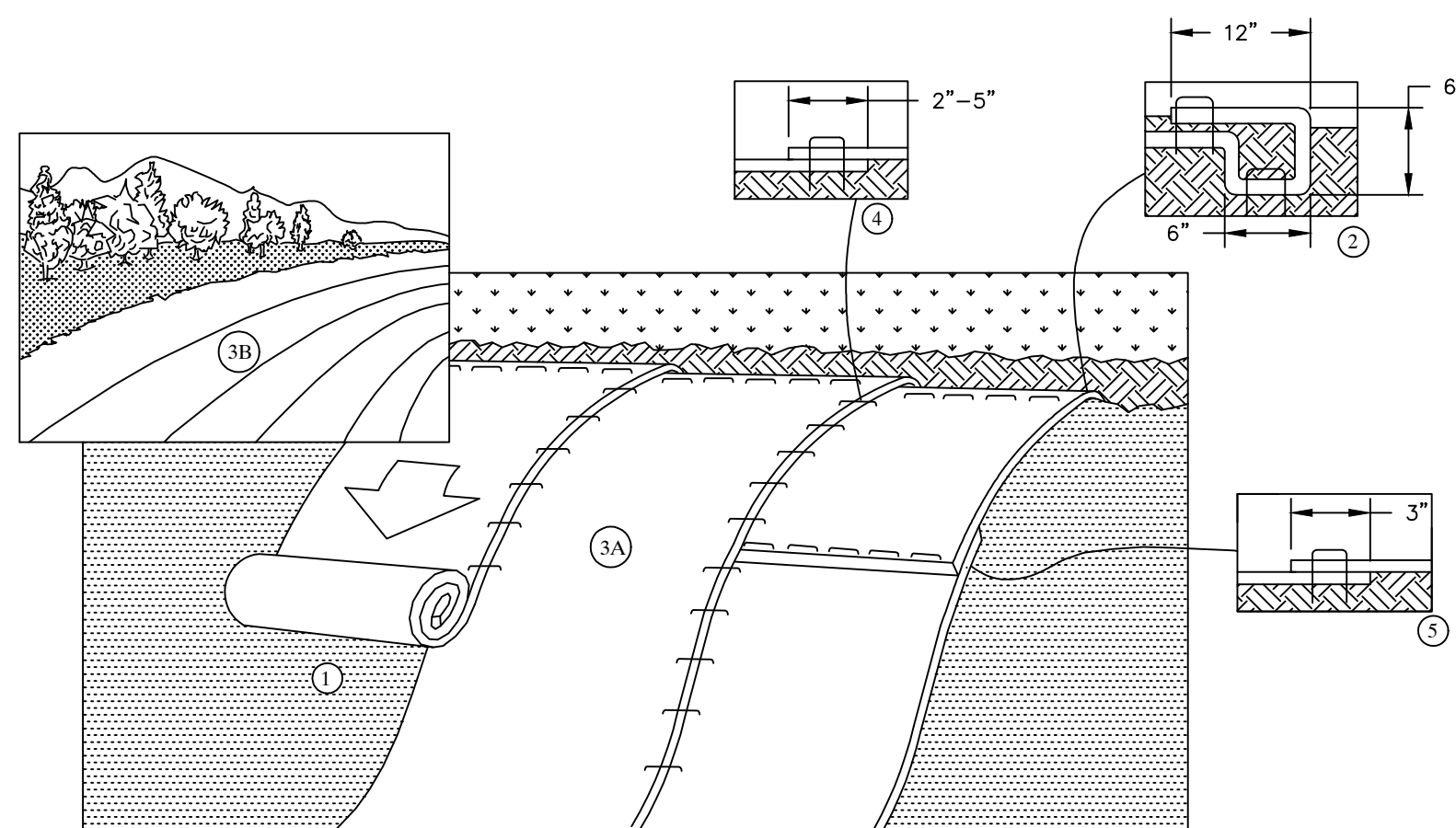
1. SILT FENCE MAY BE EITHER PREMANUFACTURED OR PREPARED ON SITE. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
2. SILT FENCE SHALL BE LOCATED AS SHOWN ON THE PLAN AND WHEREVER CONSTRUCTION ACTIVITIES MAY RESULT IN A TEMPORARY RUNOFF TO A STREAM OR WETLAND WHICH MAY CARRY SILT OR SEDIMENT.
3. THE TRENCH SHALL BE TOED IN PLACE BY PLACEMENT IN A 6 INCH TRENCH AND BACKFILLING WITH A SUITABLE MATERIAL.
4. WHEN A TRENCH CANNOT BE CONSTRUCTED, THE FABRIC MAY BE FOLDED AT THE BASE IN A MANNER SUCH THAT A MINIMUM OF 6 INCHES OF FABRIC LIES ON THE GROUND TOWARD THE DIRECTION OF FLOW. THE FOLDED FABRIC SHALL BE COVERED TO A DEPTH OF 6 INCHES WITH SUITABLE MATERIAL EXTENDING A MINIMUM OF 4 INCHES BEYOND THE FABRIC.
5. SUPPORTING STAKES SHALL BE PLACED NO MORE THAN 10 FEET APART.
6. MAINTENANCE SHALL BE PERFORMED AS NEEDED. FENCING SHALL BE REPLACED WHEN TORN, WHEN TRENCHING IS DISTURBED, WHEN THE FENCE DISPLAYS PLUGGING AS EVIDENCED BY SILT-LADEN APPEARANCE, WHEN WATER IS EXCESSIVELY RETARDED BY THE FENCE, OR WHENEVER "BULGES" APPEAR.

SILT FENCE
N.T.S.



TEMPORARY EROSION BLANKET INSTALLATION
N.T.S.

SILT SACK - INLET FILTER BAG
N.T.S.



1. PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP'S), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE RECP'S WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF RECP'S BACK OVER SEED AND COMPACTED SOIL. SECURE RECP'S OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE RECP'S.
3. ROLL THE RECP'S (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE. RECP'S WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECP'S MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE/PER THE MANUFACTURER'S GUIDELINES. WHEN USING THE DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. THE EDGES OF PARALLEL RECP'S MUST BE STAPLED WITH APPROXIMATELY 2"-5" OVERLAP DEPENDING ON RECP'S TYPE.
5. CONSECUTIVE RECP'S SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" OVERLAP, STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART ACROSS ENTIRE RECP'S WIDTH.
NOTE: IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE RECP'S.

SLOPE INSTALLATION OF TURF REINFORCEMENT MATTING (TRM)
N.T.S.

SILTSACK®
SPECIFICATIONS

NOTE: THE SILTSACK® WILL BE MANUFACTURED FROM A WOVEN POLYPROPYLENE FABRIC THAT MEETS OR EXCEEDS THE FOLLOWING SPECIFICATIONS.

REGULAR FLOW SILTSACK®

(FOR AREAS OF LOW TO MODERATE PRECIPITATION AND RUN-OFF)

PROPERTIES	TEST METHOD	UNITS
GRAB TENSILE STRENGTH	ASTM D-4632	300 LBS
GRAB TENSILE ELONGATION	ASTM D-4632	20 %
PUNCTURE	ASTM D-4833	120 LBS
MULLEN BURST	ASTM D-3786	800 PSI
TRAPEZOID TEAR	ASTM D-4533	120 LBS
UV RESISTANCE	ASTM D-4355	80 %
APPARENT OPENING SIZE	ASTM D-4751	40 US SIEVE
FLOW RATE	ASTM D-4491	40 GAL/MIN/SQ FT
PERMITTIVITY	ASTM D-4491	0.55 SEC -1

HI-FLOW SILTSACK®

(FOR AREAS OF MODERATE TO HEAVY PRECIPITATION AND RUN-OFF)

PROPERTIES	TEST METHOD	UNITS
GRAB TENSILE STRENGTH	ASTM D-4632	265 LBS
GRAB TENSILE ELONGATION	ASTM D-4632	20 %
PUNCTURE	ASTM D-4833	135 LBS
MULLEN BURST	ASTM D-3786	420 PSI
TRAPEZOID TEAR	ASTM D-4533	45 LBS
UV RESISTANCE	ASTM D-4355	90 %
APPARENT OPENING SIZE	ASTM D-4751	20 US SIEVE
FLOW RATE	ASTM D-4491	200 GAL/MIN/SQ FT
PERMITTIVITY	ASTM D-4491	1.5 SEC -1

OIL-ABSORBANT SILTSACK®

(FOR AREAS WHERE THERE IS A CONCERN FOR OIL RUN-OFF OR SPILLS)

DEPENDING ON YOUR PARTICULAR APPLICATION, THE SILTSACK CAN BE MADE FROM EITHER ONE OF THE ABOVE FABRICS WITH AN OIL-ABSORBANT PILLOW INSERT OR, MADE COMPLETELY FROM AN OIL-ABSORBANT SILTSACK® WITH A WOVEN PILLOW INSERT.

EROSION CONTROL DETAILS

QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V

LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC

240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN

DESIGNED BY: PAB

DRAWN BY: PAB

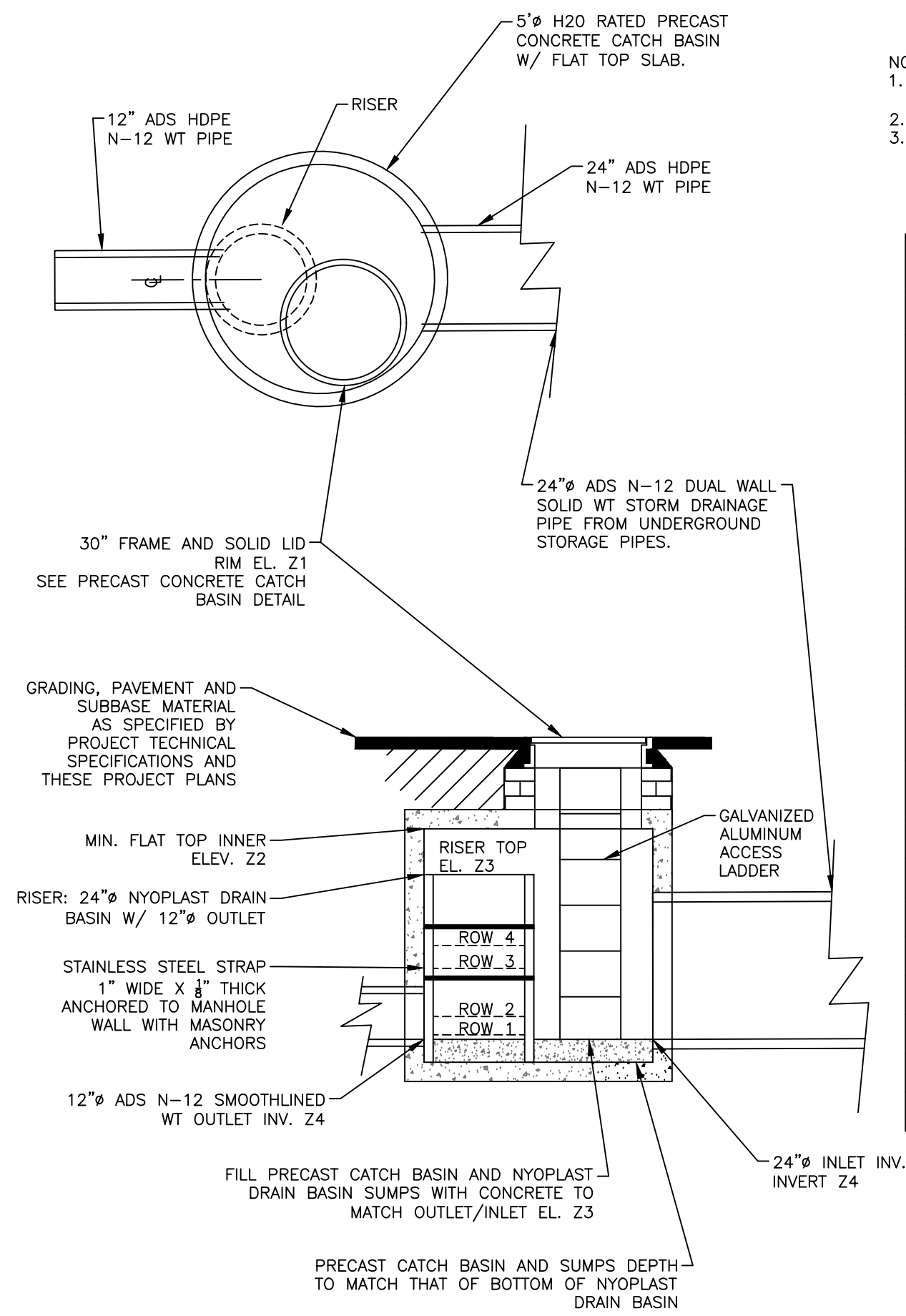
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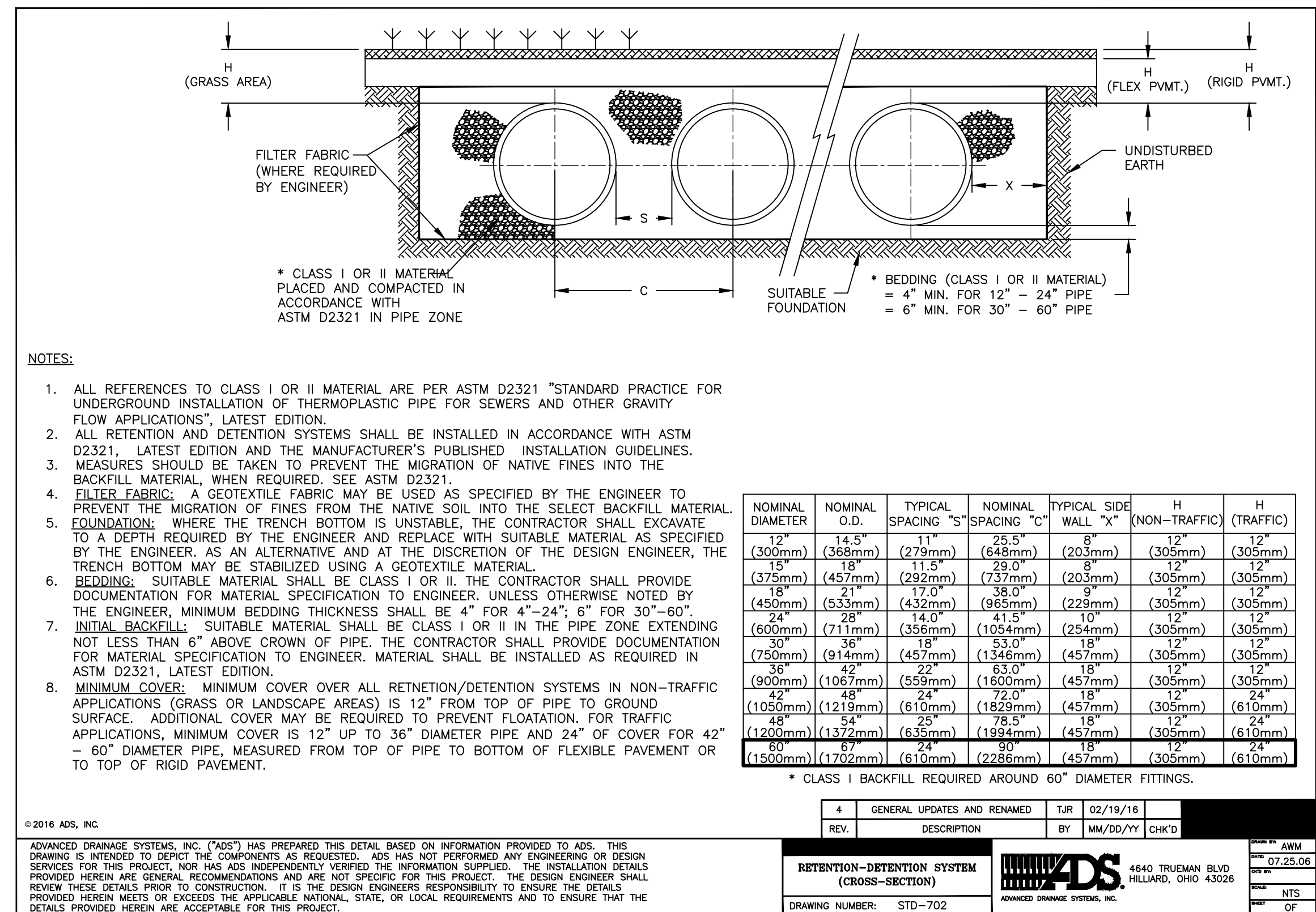
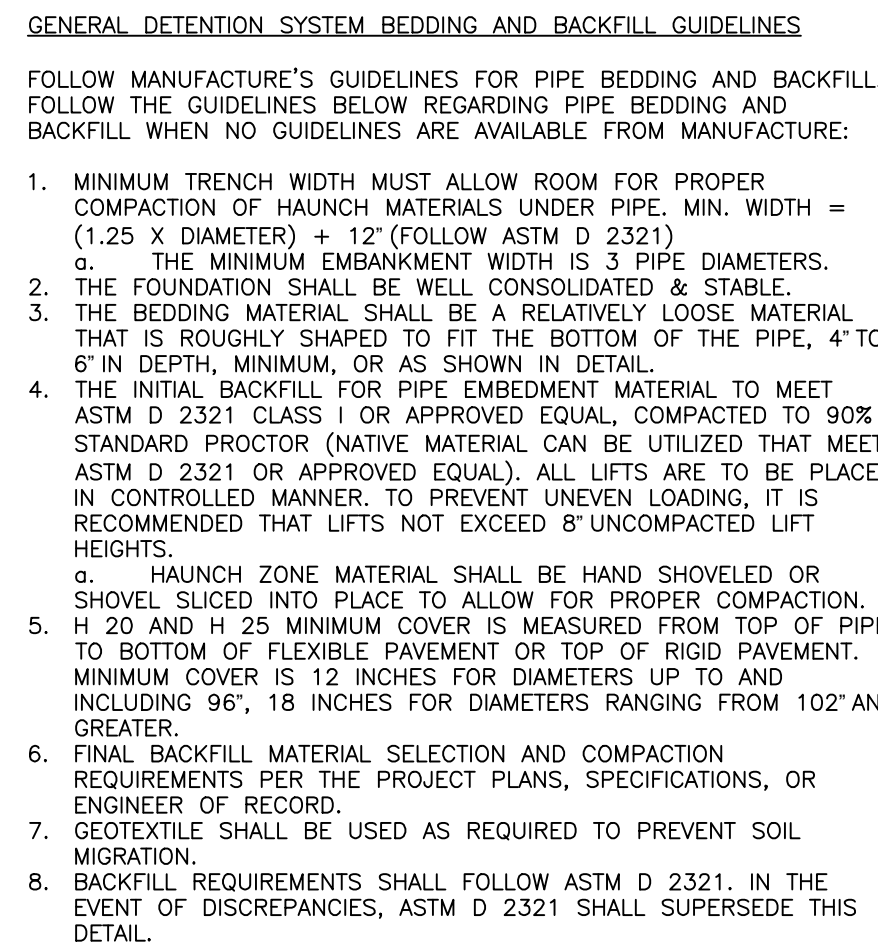
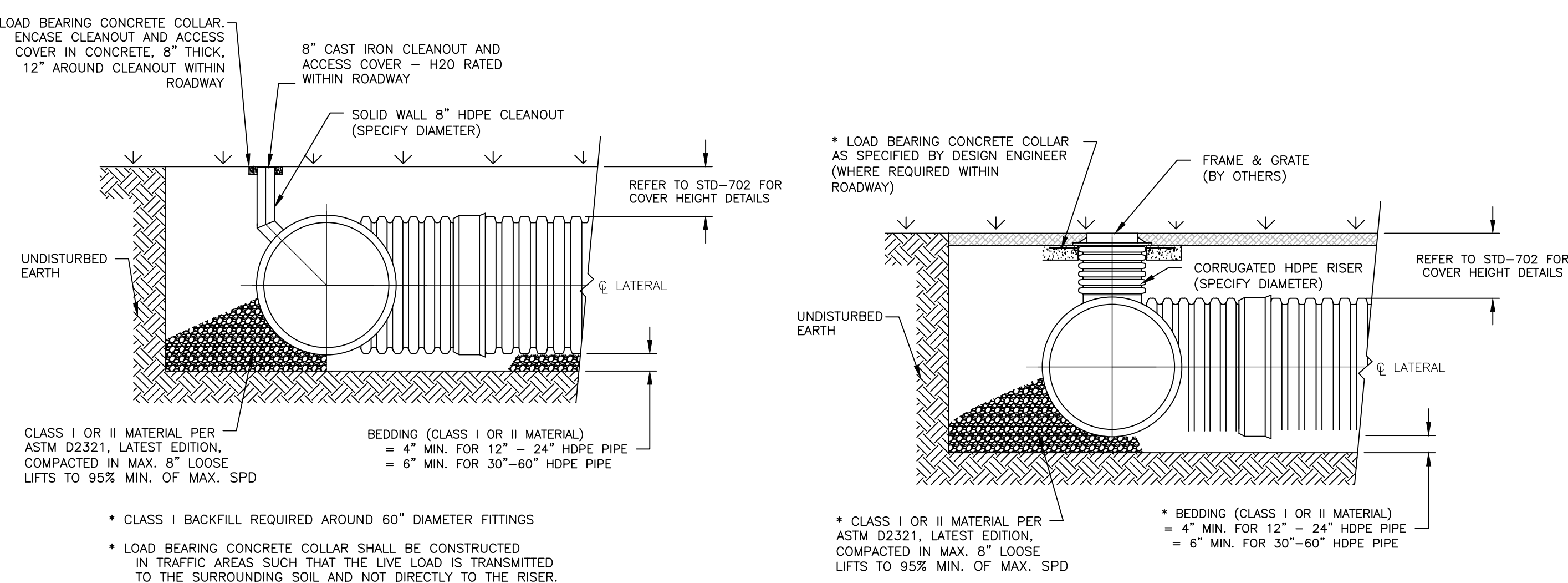
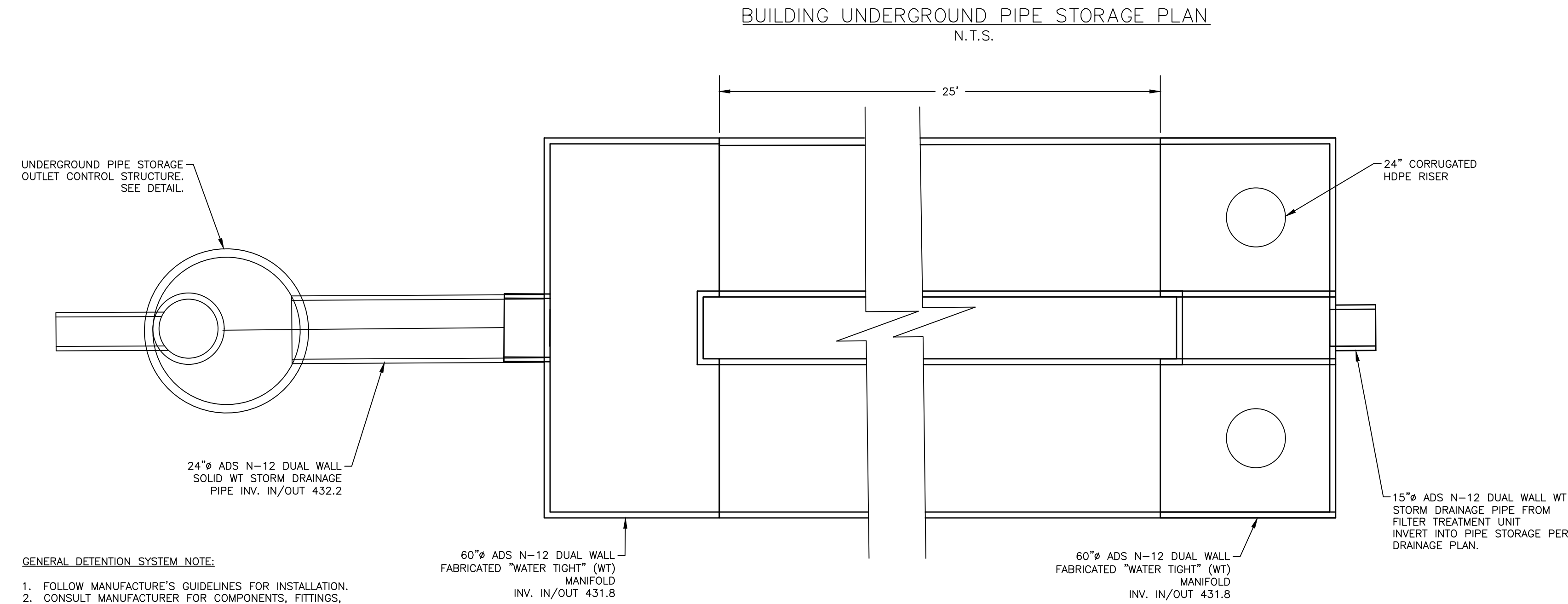
SHEET 12A OF 22



NOTES:

1. ALL PIPE TO HAVE WATERTIGHT CONNECTIONS AT JOINTS AND AT AT MANHOLES/CATCH BASINS.
2. STRUCTURE TO BE H-20 RATED.
3. ALL ORIFICES TO BE SET AT INVERTS INDICATED IN TABLE BELOW. EACH ORIFICE TO HAVE A MINIMUM OF 6" CLEARANCE TO ANY ADJACENT ORIFICE.

OUTLET CONTROL STRUCTURE INVERTS/ELEVATIONS			
ROOF UNDERGROUND PIPE STORAGE OUTLET CONTROL STRUCTURE			
STRUCTURE ELEVATION LOCATION	ELEVATION	DIAMETER OF ORIFICE	NUMBER ORIFICES
RIM EL. Z1	439.65	--	--
FLAT TOP INNER ELEV. Z2	437.00	--	--
RISER TOP EL. Z3	436.30	--	--
ORIFICE ROW 4 INVERT	434.60	2"	4
ORIFICE ROW 3 INVERT	434.25	1"	2
ORIFICE ROW 2 INVERT	432.70	1"	3
ORIFICE ROW 1 INVERT	432.20	1"	1
INLET/OUTLET PIPES INVERT Z4	432.20	--	--
PARKING LOT/DRIVE UNDERGROUND PIPE STORAGE OUTLET CONTROL STRUCTURE			
STRUCTURE LOCATION	ELEVATION	DIAMETER OF ORIFICE	NUMBER ORIFICES
RIM EL. Z1	439.35	--	--
FLAT TOP INNER ELEV. Z2	435.00	--	--
RISER TOP EL. Z3	434.00	--	--
ORIFICE ROW 4 INVERT	--	--	--
ORIFICE ROW 3 INVERT	433.5	1.5"	1
ORIFICE ROW 2 INVERT	432.80	1.5"	1
ORIFICE ROW 1 INVERT	431.80	3"	1
INLET/OUTLET PIPES INVERT Z4	431.80	--	--



3	02/18/20	CONSTRUCTION DOCUMENTS	PAB	RJF	RJF
2	12/10/19	ALTERATION OF TERRAIN SUBMISSION	DPM	RJF	
1	07/29/19	REVISED PARKING LOT/DRIVE UNDERGROUND STORAGE PIPE DETAIL	DPM	RJF	
REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

DRAINAGE DETAILS FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V
LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC
240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
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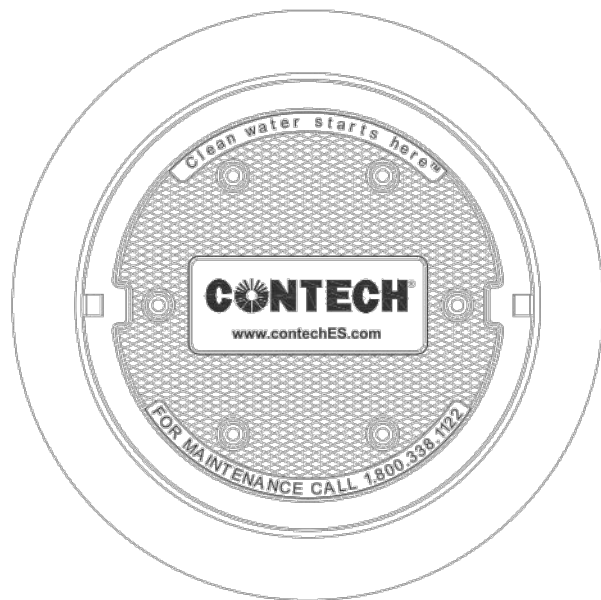
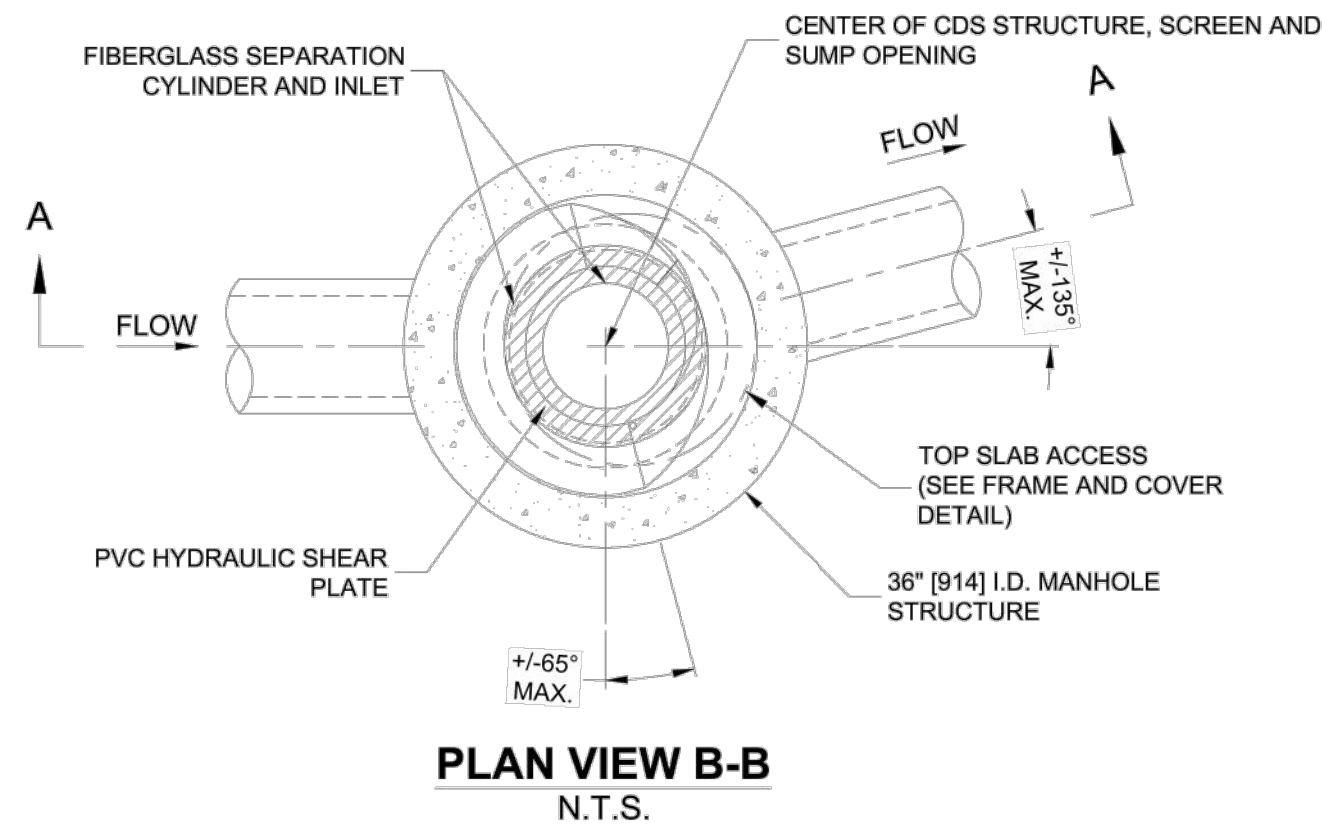
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DRAWN BY: DPM
CHECKED BY: RJF
DATE: 06/10/19
PROJ. NO. 10112

13

SHEET 13 OF

CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 1.0 CFS, OR PER LOCAL REGULATIONS.
THE STANDARD CDS1515-3-C CONFIGURATION IS SHOWN.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC
DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	0.70 CFS
PEAK FLOW RATE (CFS OR L/s)	4.13 CFS
RETURN PERIOD OF PEAK FLOW (YRS)	50 YEAR
SCREEN APERTURE (2400 OR 4700)	2400
PIPE DATA:	I.E. MATERIAL DIAMETER
INLET PIPE 1	436.8 HDPE 12"
INLET PIPE 2	NA NA
OUTLET PIPE	436.8 HDPE 15"

RIM ELEVATION	442.0±
ANTI-FLOTATION BALLAST	WIDTH HEIGHT
	* *

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES

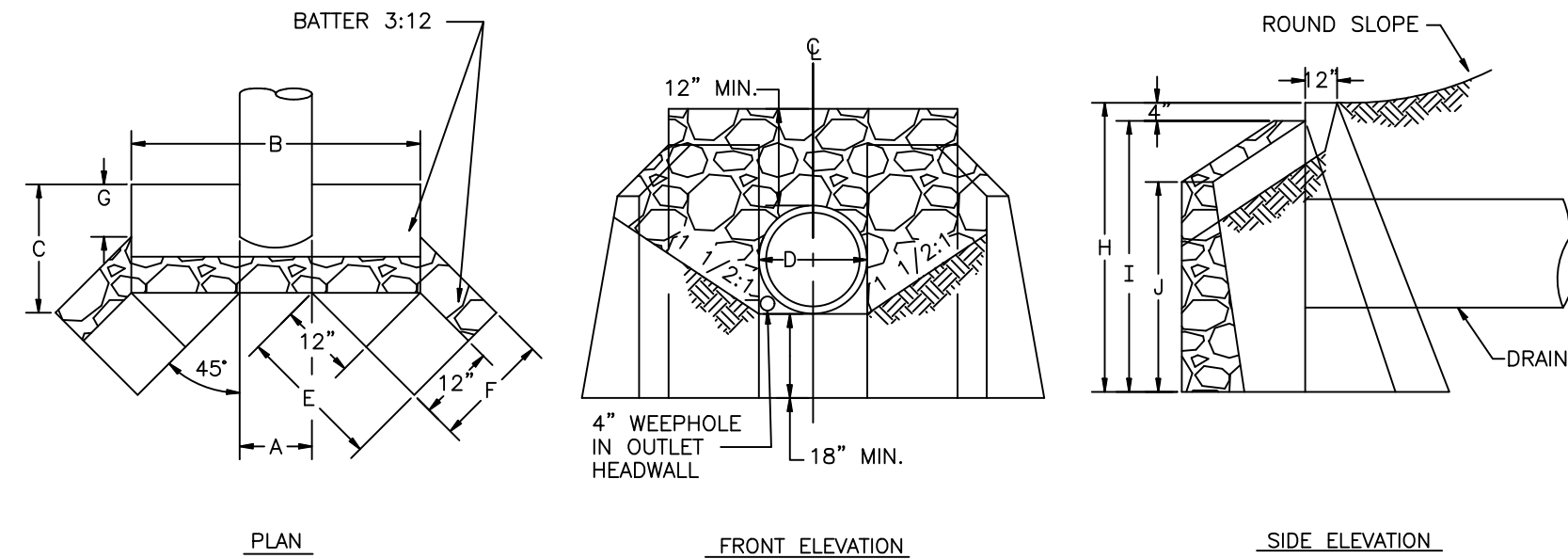
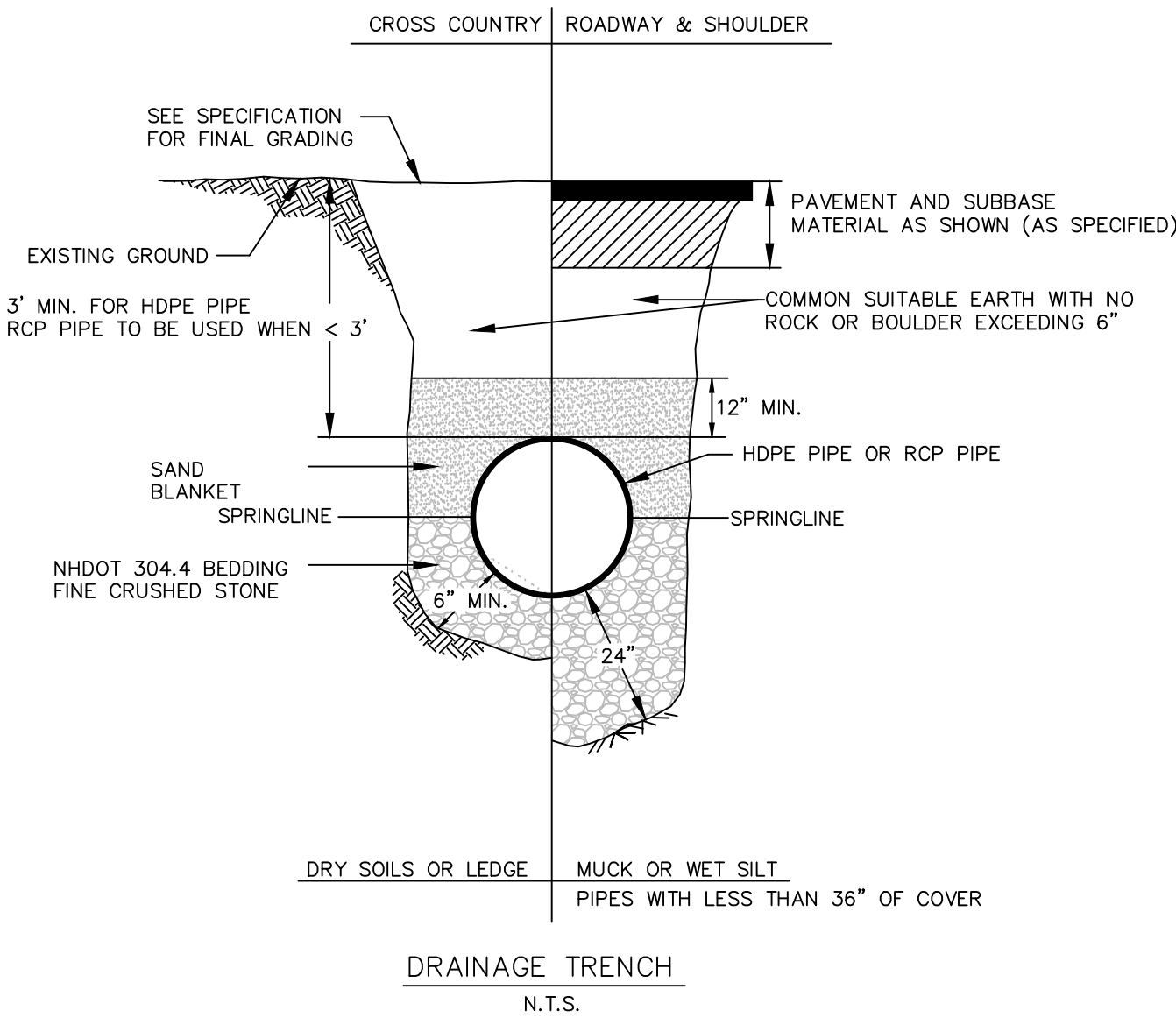
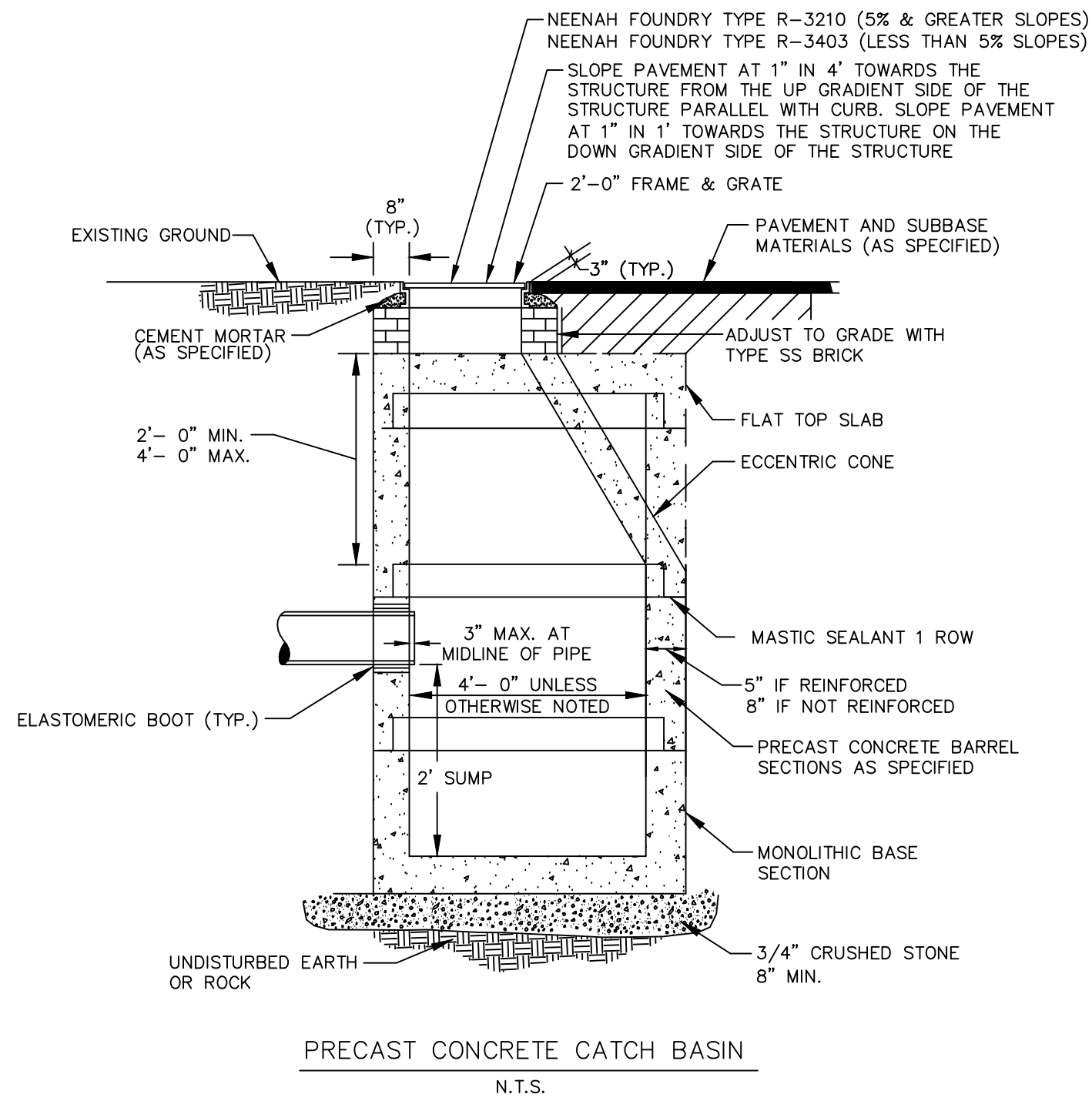
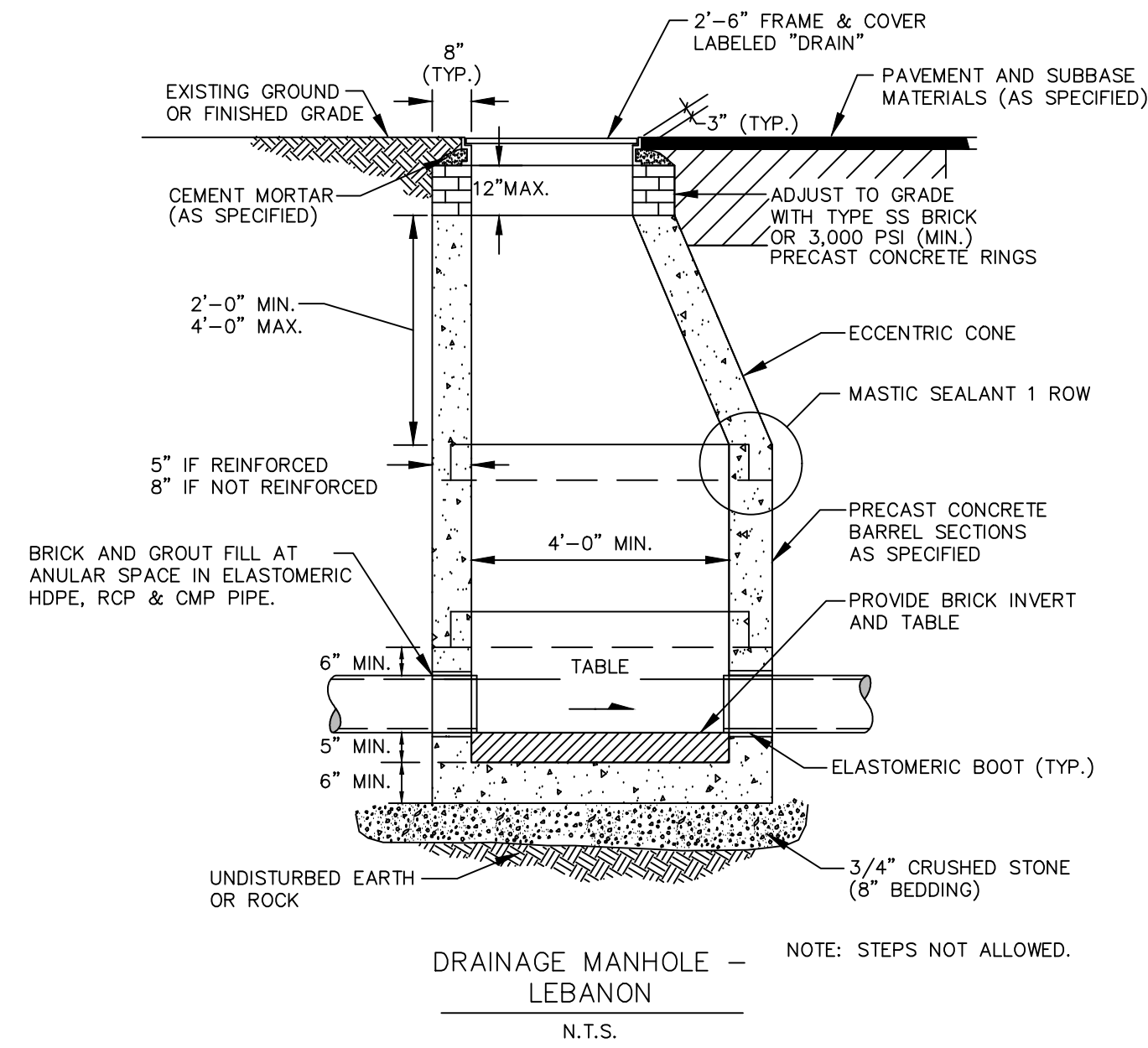
- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
- CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
- STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
- CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

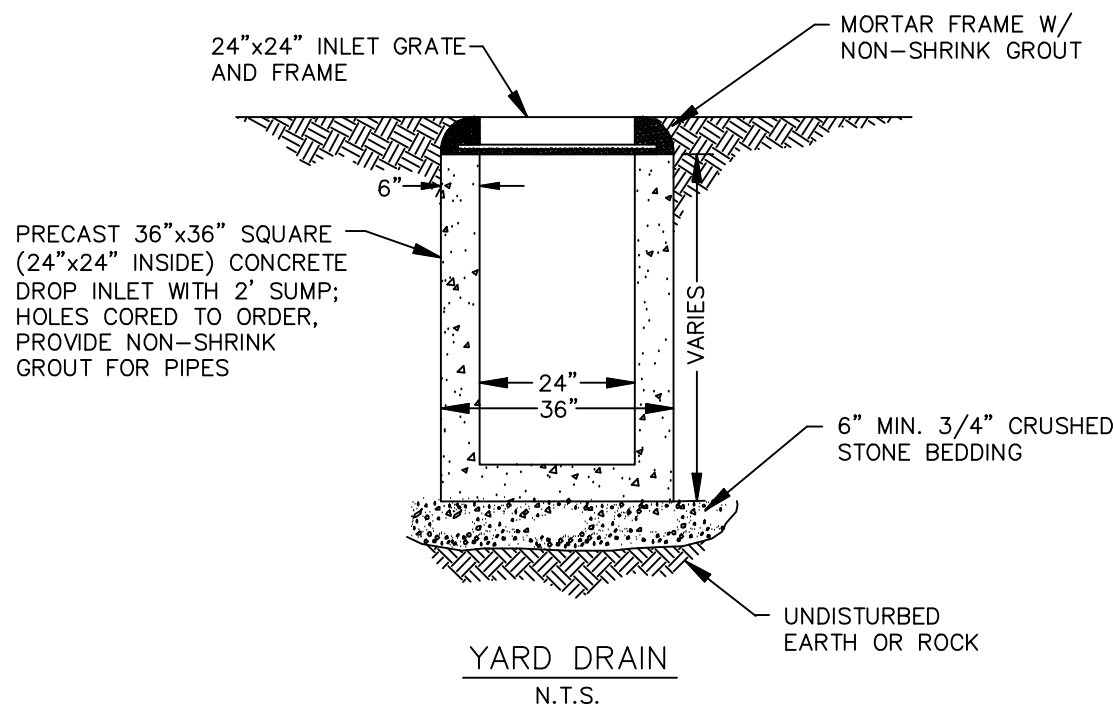


CDS1515-3-C
ONLINE CDS
STANDARD DETAIL



DIA. D INCHES	DIMENSIONS									
	A	B	C	E	F	G	H	I	J	
15"	1'-6"	4'-3"	2'-2"	2'-4"	1'-10"	0'-7"	4'-0"	3'-8"	3'-0"	

STONE MASONRY HEADWALL DETAILS
N.T.S.



DRAINAGE DETAIL PLAN FOR

QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V

LILY LANE - CITY OF LEBANON - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC

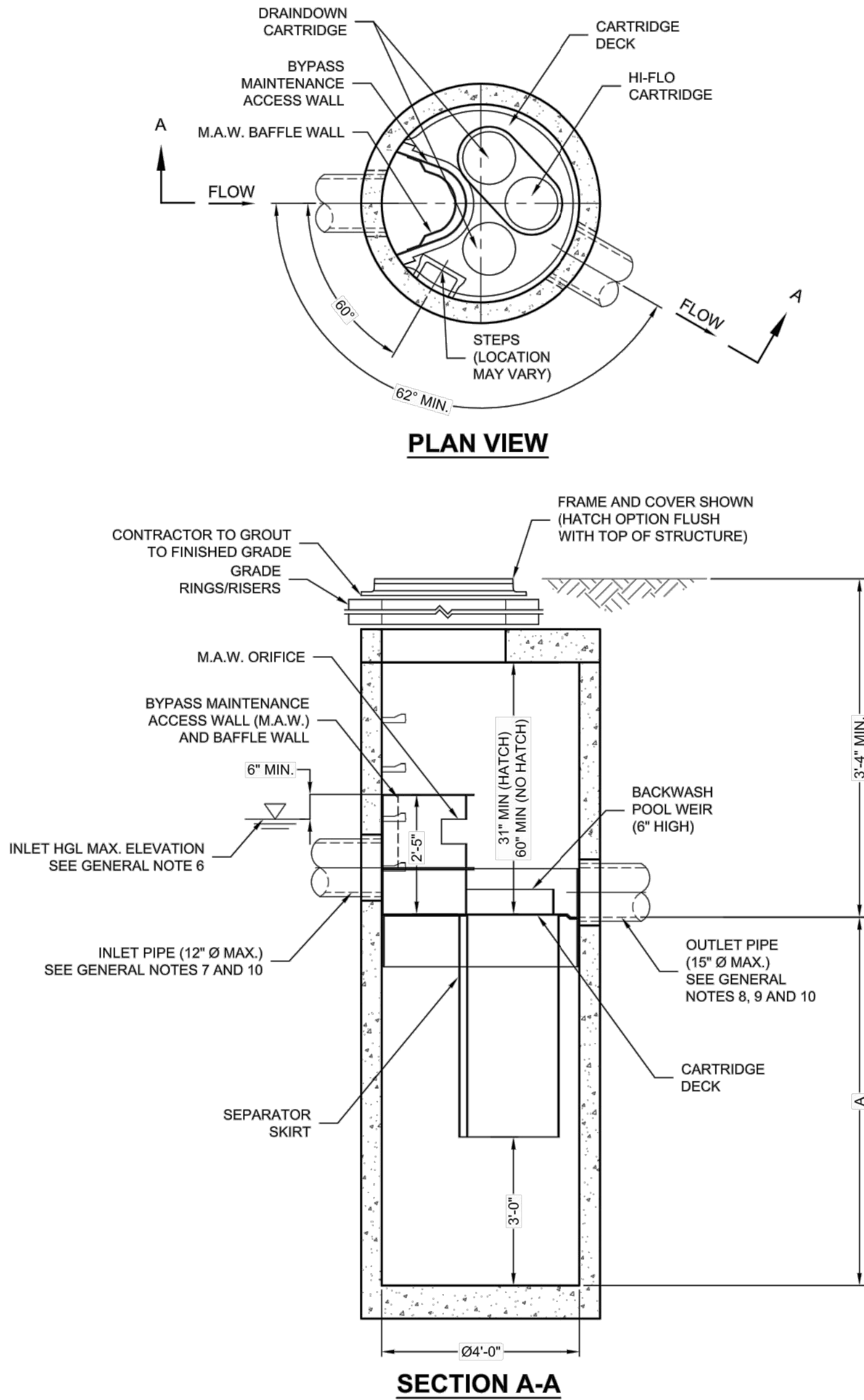
240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN
DESIGNED BY: DPM
DRAWN BY: DPM
CHECKED BY: RJF
DATE: 06/10/19
PROJ. NO. 10112

14

SHEET 14 OF 22

I:\COMMON\CAD\TREATMENT\13 JELLYFISH FILTER\40 STANDARD DRAWINGS\ONLINEDWG\JF4-DTL.DWG 6/26/2015 4:13 PM

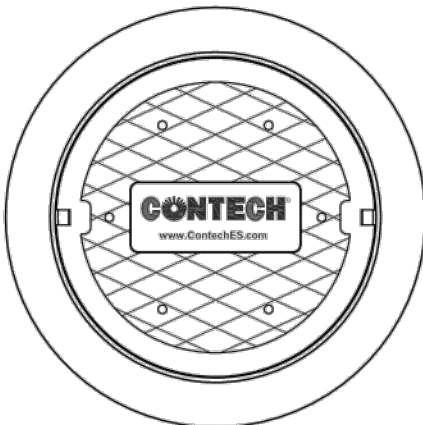


Jellyfish® Filter
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENT NO. 8,287,726; 8,221,618 & US & 123,935; OTHER INTERNATIONAL PATENTS PENDING

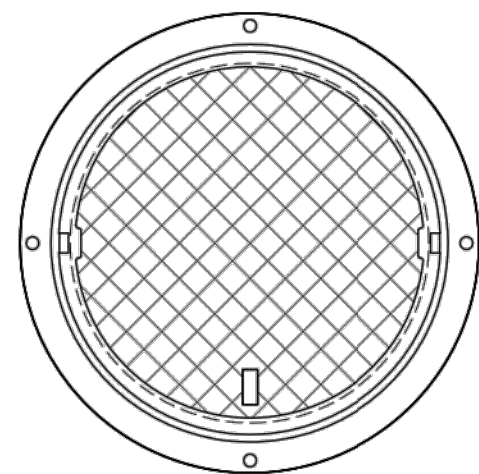
JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN. Ø48" MANHOLE JELLYFISH PEAK TREATMENT CAPACITY IS 0.45 CFS, AND MAXIMUM BYPASS CAPACITY IS 2.50 CFS. IF THE SITE CONDITIONS EXCEED TOTAL CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION				
CARTRIDGE DEPTH	54"	40"	27"	15"
OUTLET INVERT TO STRUCTURE INVERT (A)	7'-5"	6'-3"	5'-2"	4'-2"
FLOW RATE HIGH-FLO / DRAINDOWN (cfs) (per cart)	0.18 / 0.09	0.13 / 0.065	0.09 / 0.045	0.05 / 0.025
MAX. CARTS HIGH-FLO/DRAINDOWN	2 / 1			
MAX. BYPASS (cfs)	2.5			
MAX. TREATMENT (cfs)	0.45	0.33	0.22	0.12
MAX. TREATMENT AND BYPASS (cfs) (TOTAL CAPACITY)	2.95	2.83	2.72	2.62



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.



HATCH
(Ø36" CAST INTO SLAB)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	SEE PLAN
WATER QUALITY FLOW RATE (cfs)	0.41 CFS
BYPASS FLOW RATE (cfs)	2.95 CFS
PEAK FLOW RATE (cfs)	2.54 CFS
RETURN PERIOD OF PEAK FLOW (yrs)	50 YEAR
# OF CARTRIDGES REQUIRED (HF / DD)	2 / 1
CARTRIDGE SIZE	54"

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	433.3	HDPE	12"	1.0%	*
INLET #2	NA	NA	NA	NA	NA
OUTLET	432.8	HDPE	15"	0.5%	*

SEE GENERAL NOTES 6-10 FOR INLET AND OUTLET HYDRAULIC AND SIZING REQUIREMENTS.

RIM ELEVATION	439.5±
---------------	--------

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES:

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE. www.ContechES.com
- JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
- STRUCTURE SHALL MEET AASHTO HS-20 OR PER APPROVING JURISDICTION REQUIREMENTS, WHICHEVER IS MORE STRINGENT, ASSUMING EARTH COVER OF 0' - 3', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 LOAD RATING AND BE CAST WITH THE CONTECH LOGO.
- STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.
- INLET HGL NOT TO EXCEED 6" BELOW THE TOP OF THE M.A.W. DURING THE PEAK DESIGN STORM, OR 10-YEAR STORM (WHICHEVER IS GREATER).
- INLET PIPE INVERT ELEVATION VARIES FROM 0' TO 6" MAXIMUM ABOVE THE OUTLET PIPE INVERT.
- OUTLET PIPE INVERT IS EQUAL TO THE CARTRIDGE DECK ELEVATION.
- THE OUTLET PIPE DIAMETER FOR NEW INSTALLATIONS IS TO BE ONE PIPE SIZE LARGER THAN THE INLET PIPE AT EQUAL OR GREATER SLOPE.
- THE DIFFERENCE IN THE INLET AND OUTLET PIPE ELEVATIONS FOR RETROFIT INSTALLATIONS TO EXISTING STORM DRAIN PIPES SHALL BE EQUAL TO THE SLOPE OVER THE DIAMETER OF THE MANHOLE; NOT THE EXCEED 6" IN VERTICAL DIFFERENTIAL BETWEEN INLET AND OUTLET PIPES.
- NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

- A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
- C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
- D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
- E. CARTRIDGE INSTALLATION, BY CONTECH, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT CONTECH TO COORDINATE CARTRIDGE INSTALLATION WITH SITE STABILIZATION AT (866) 740-3318.

CONTECH
ENGINEERED SOLUTIONS LLC
www.ContechES.com

9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

JELLYFISH JF4
STANDARD DETAIL
ONLINE CONFIGURATION

DRAINAGE DETAILS FOR

QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V

LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC

240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN

DESIGNED BY: DPM

DRAWN BY: DPM

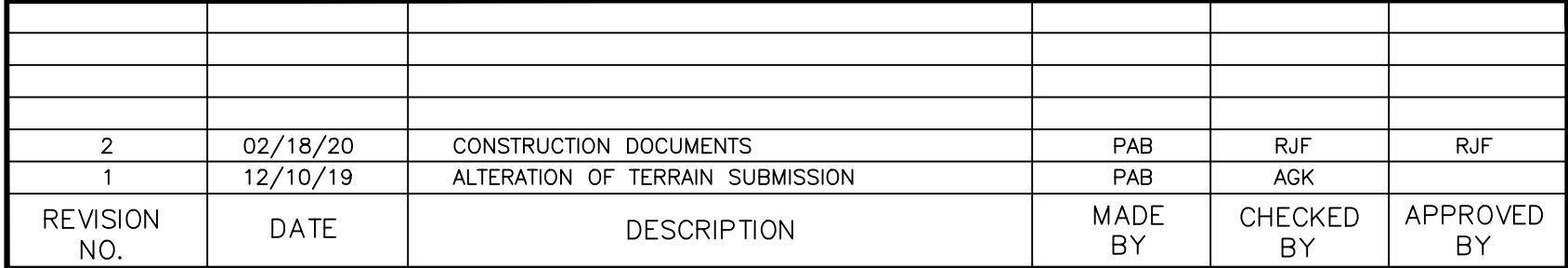
CHECKED BY: RJF

DATE: 06/10/19

PROJ. NO. 10112

15

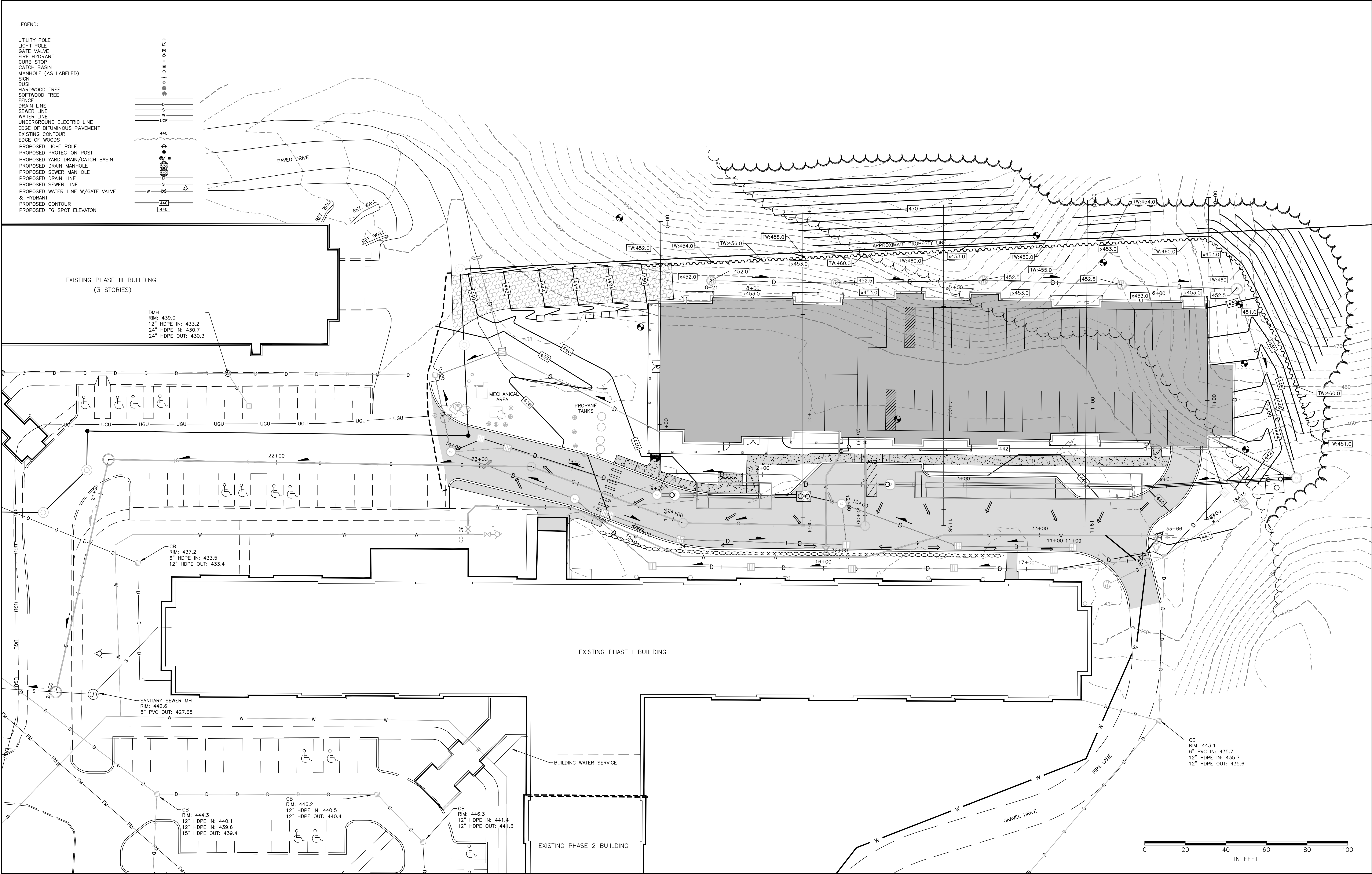
SHEET 15 OF 22



LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

16



REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY
2	02/18/20	CONSTRUCTION DOCUMENTS	PAB	RJF	RJF
1	06/24/19	STAFF REVIEW COMMENTS	PAB	RJF	

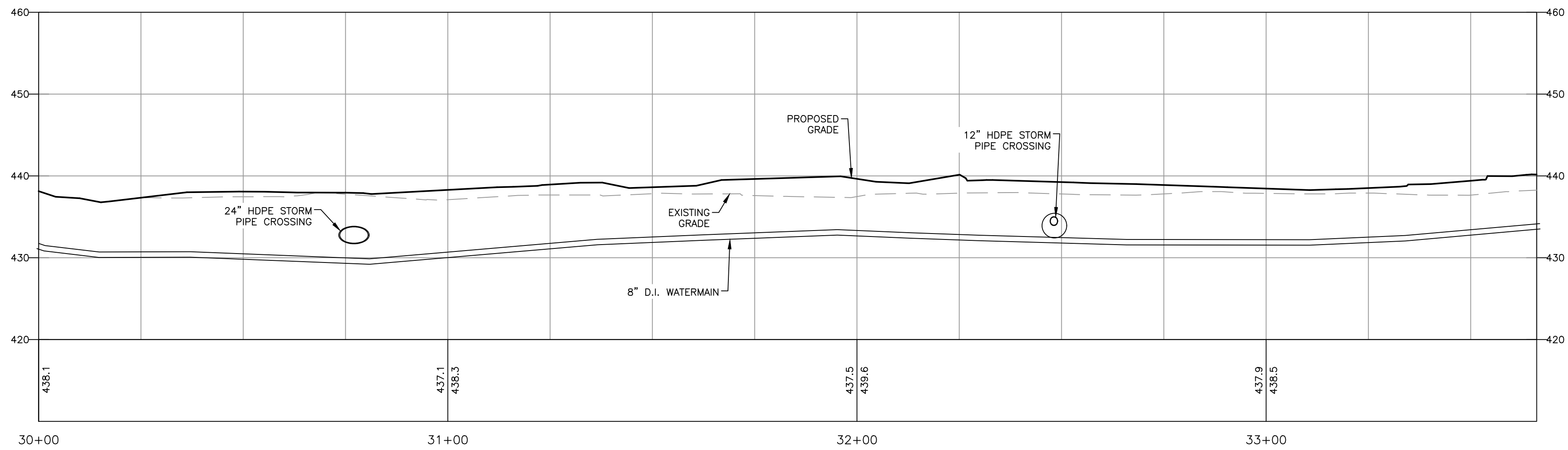
UTILITY PROFILE ALIGNMENTS FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V
LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC

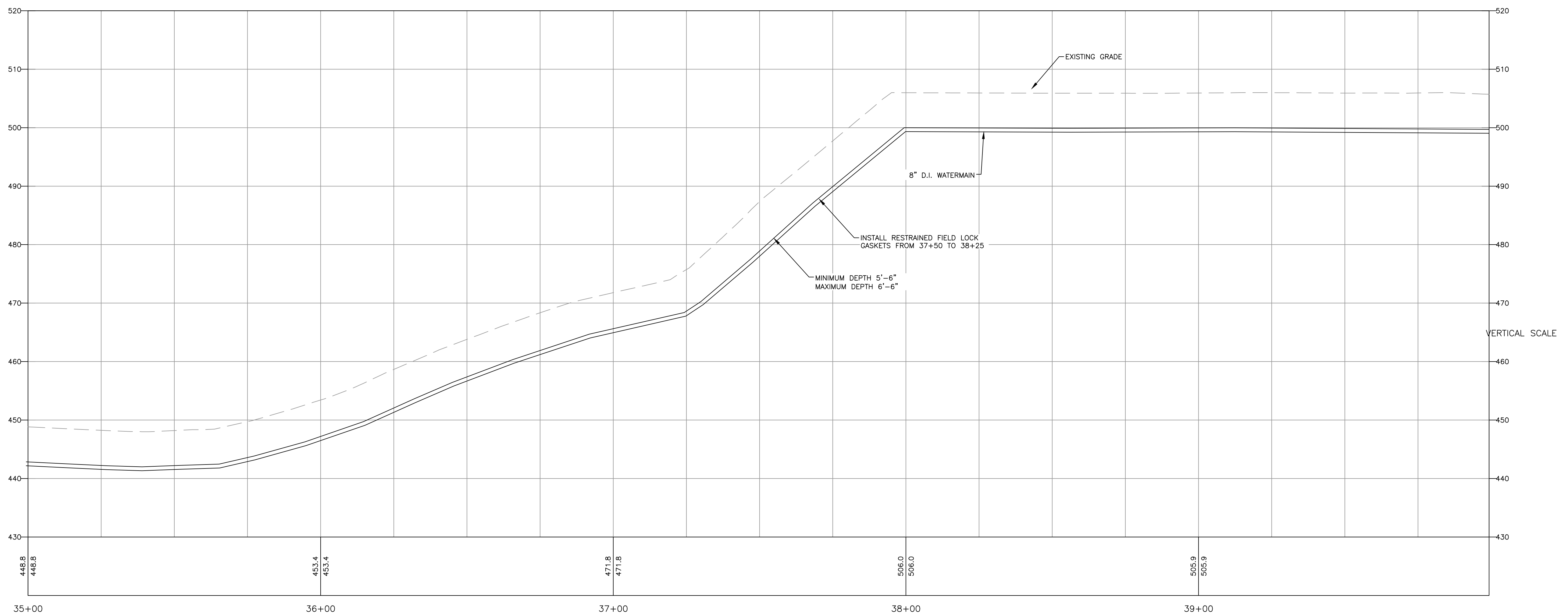
240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN
DESIGNED BY: PAB
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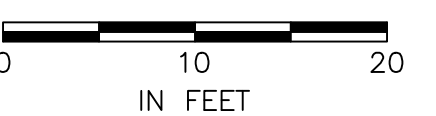
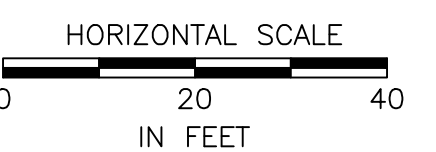
17



WATER PROFILE - STA. 30+00 TO STA. 33+66
SCALE: 1"=20' - HORIZONTAL
1"=10' - VERTICAL



WATER PROFILE - STA. 35+00 TO STA. 39+99

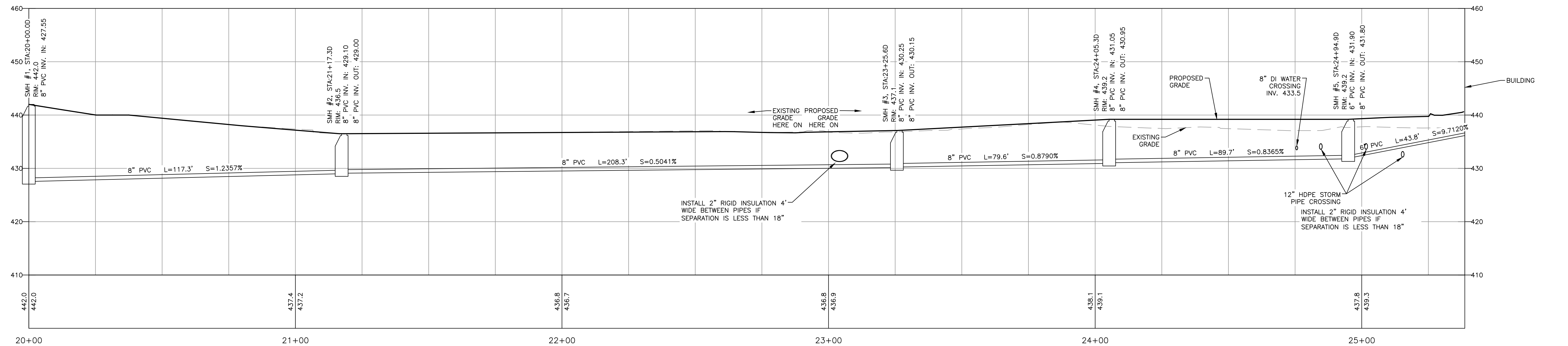


2	02/18/20	CONSTRUCTION DOCUMENTS	PAB	RJF	RJF
1	07/29/19	DPW REVIEW COMMENTS, RETAINING WALL, & GRADING	DPM	RJF	
REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

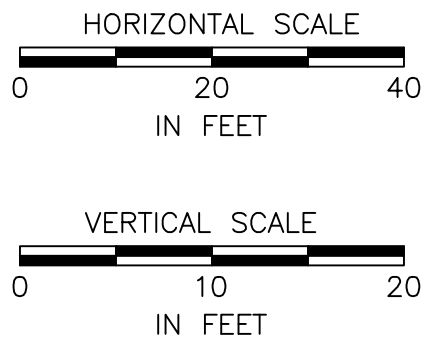
WATER PROFILES FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V
LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC
240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN
DESIGNED BY: PAB
DRAWN BY: DPM
CHECKED BY:
DATE: 06/24/19
PROJ. NO. 10112



SEWER PROFILE - STA. 20+00 TO STA. 25+39

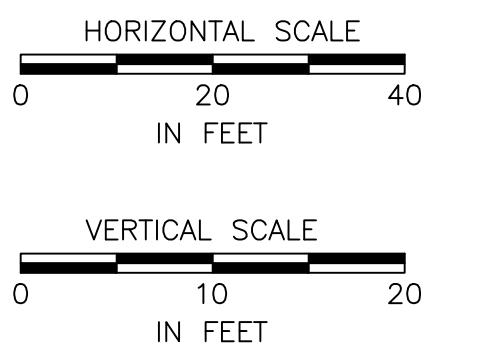
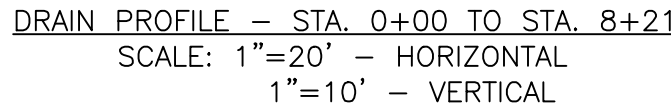
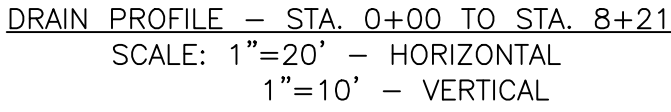


2	02/18/20	CONSTRUCTION DOCUMENTS	PAB	RJF	RJF
1	07/29/19	DPW REVIEW COMMENTS, RETAINING WALL, & GRADING	DPM	RJF	
REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

SEWER PROFILE FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V
LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC
240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN
DESIGNED BY: PAB
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CHECKED BY:
DATE: 06/24/19
PROJ. NO. 10112



2	02/18/20	CONSTRUCTION DOCUMENTS	PAB	RJF	
1	07/29/19	DPW REVIEW COMMENTS, RETAINING WALL, & GRADING	DPM	RJF	
REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

DRAINAGE PROFILES FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V

LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

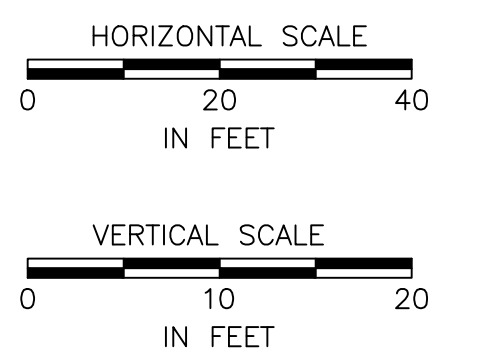
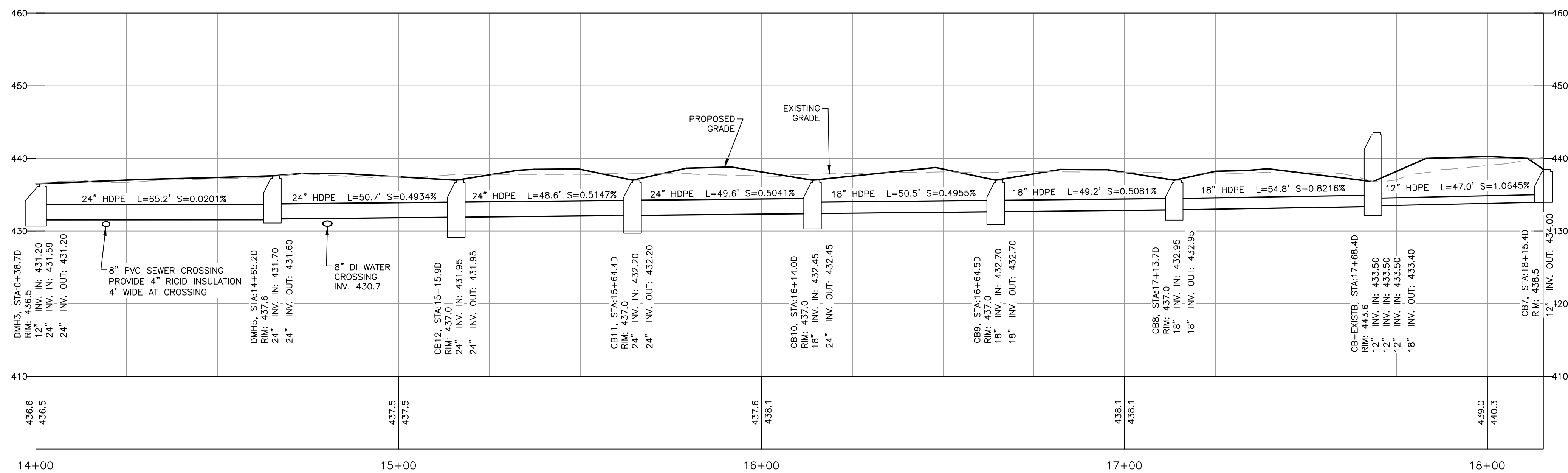
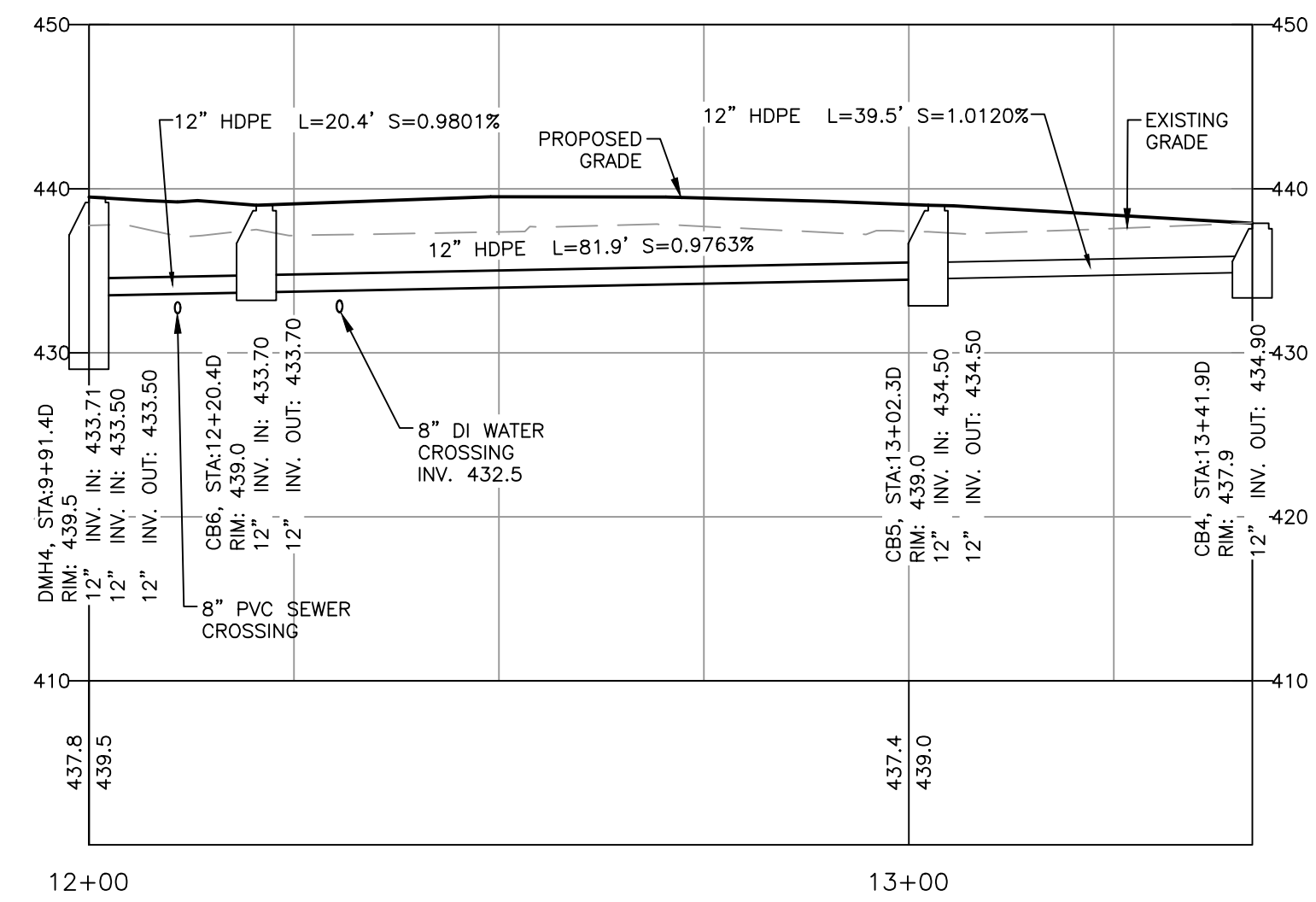
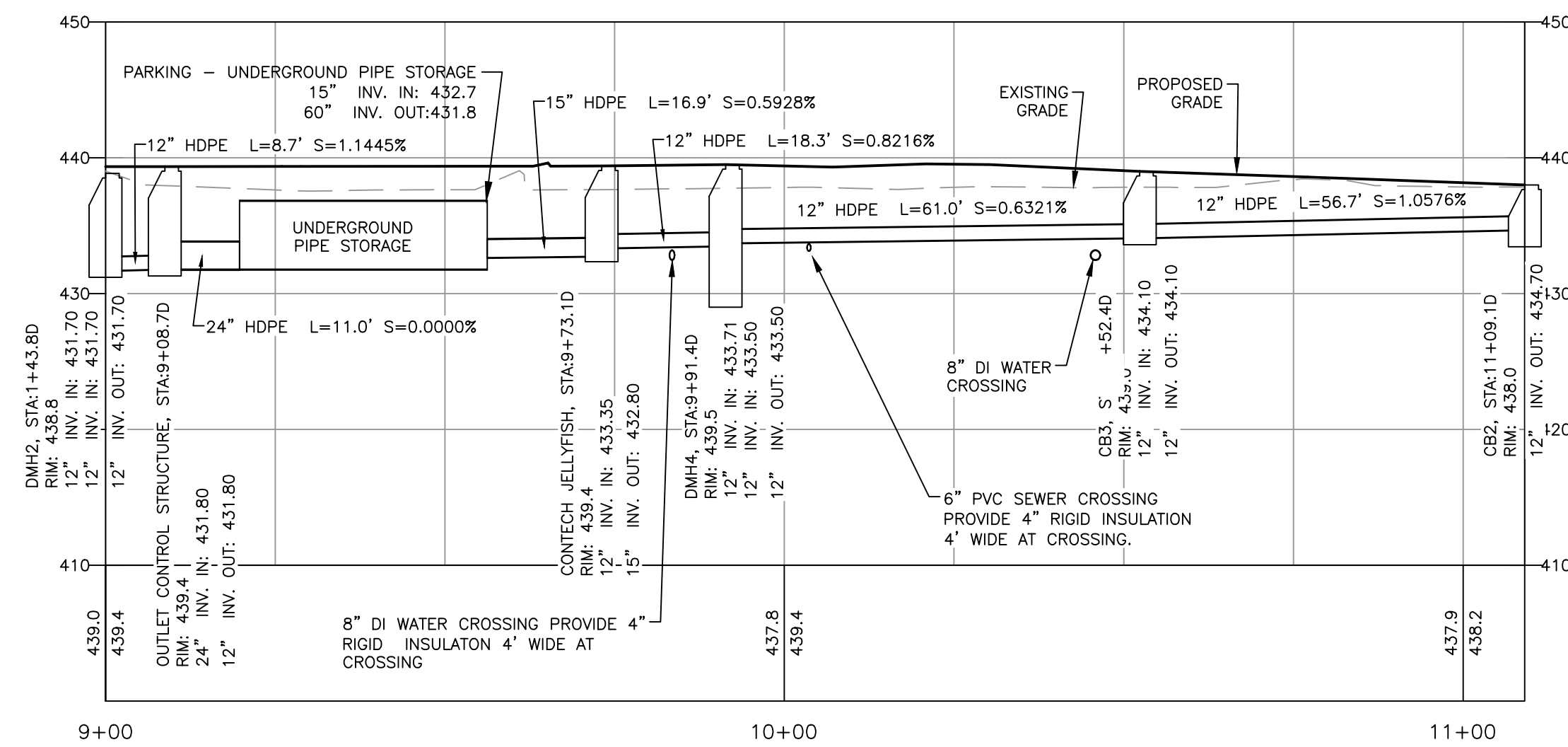
PATHWAYS CONSULTING, LLC

240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN
DESIGNED BY: PAB
DRAWN BY: DPM
CHECKED BY:
DATE: 06/24/19
PROJ. NO. 10112

20

SHEET 20 OF 22



2	02/18/20	CONSTRUCTION DOCUMENTS	PAB	RJF	RJF
1	07/29/19	DPW REVIEW COMMENTS, RETAINING WALL, & GRADING	DPM	RJF	
REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

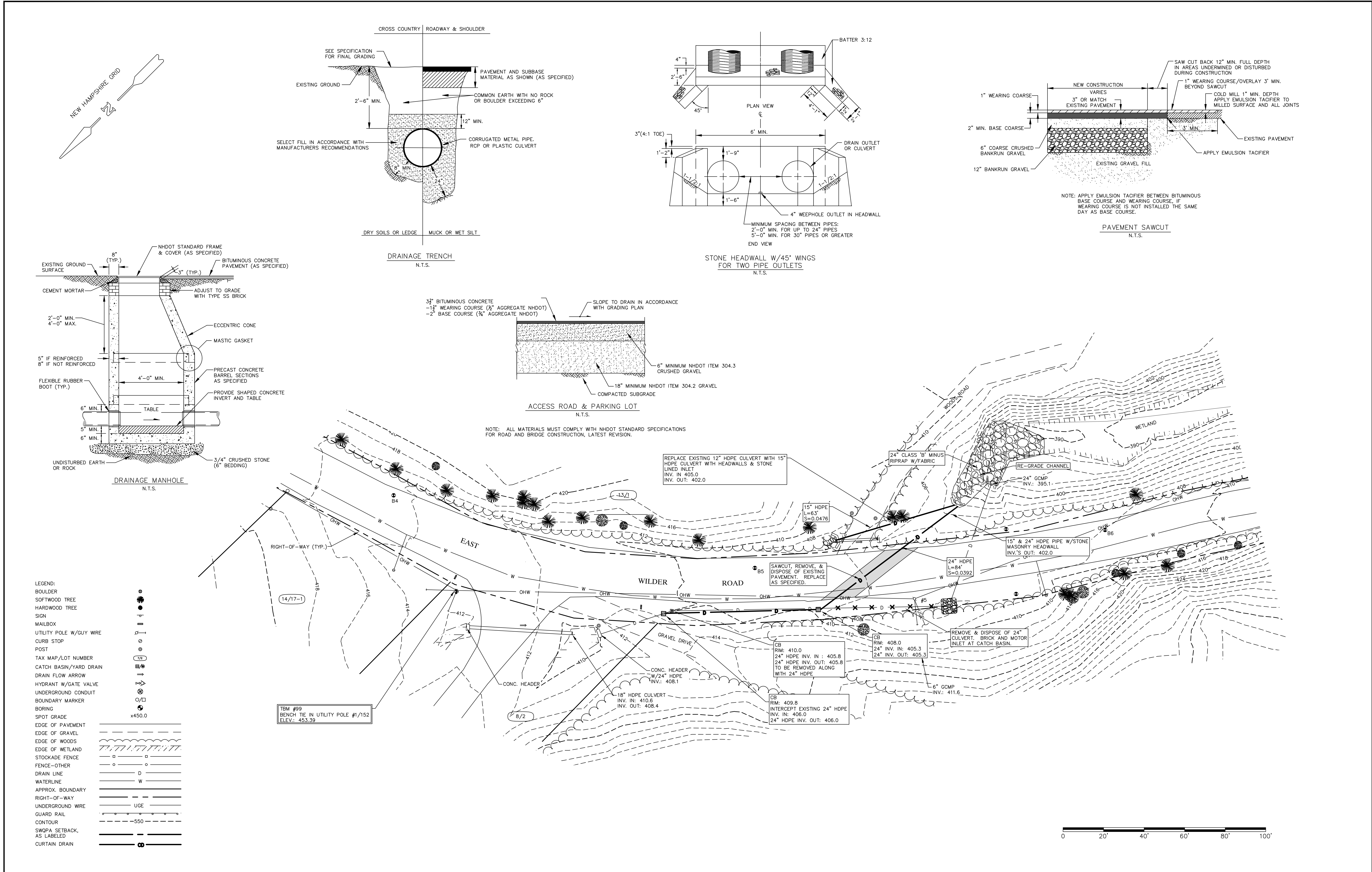
DRAINAGE PROFILES FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY - PHASE V

LILY LANE - CITY OF LEBANON - GRAFTON COUNTY - NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC

240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN
DESIGNED BY: PAB
DRAWN BY: DPM
CHECKED BY:
DATE: 06/24/19
PROJ. NO. 10112



REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

DRAINAGE IMPROVEMENTS FOR
EAST WILDER ROAD
LEBANON, NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC
240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: 1"= 20'
DESIGNED BY: PAB
DRAWN BY: PAB
CHECKED BY: RJF
DATE: 06/24/19
PROJ. NO. 11805

22
SHEET 22 OF 22





**J. GRAHAM GOLDSMITH
ARCHITECTS**
ARCHITECTURE . PLANNING . INTERIORS

7 Kilburn Street . Burlington VT 05401
86 Pocumt Road . Nantucket MA 02554
201 Grenville Road . Hobe Sound FL 33455
T: 800 862 4053 F: 802 864 8267

www.jgggarchitects.com

[illegible]

ALS & SIGNATURES

BUILDING KEY

5
QUAIL RIDGE

project for
development

DRAWING TITLE

Colored Elevations

SCALE	3/32" = 1'-0"
DATE	07/08/19
DRAWN	TRF
JOB NUMBER	1703
SHEET	

A2.0-P



Lake House at Quail Hollow



365 North Main St.
West Lebanon, NH
03784
(603) 653-3000
www.summitpmg.com

PATHWAYS CONSULTING, LLC

Planning • Civil & Environmental Engineering • Surveying • Construction Assistance
240 Mechanic Street • Suite 100
Lebanon, New Hampshire 03766
(603) 448-2200 • Fax: (603) 448-1221

MEMORANDUM

TO: CHRISTINA HALL, P.E., CITY ENGINEER, CITY OF LEBANON

FROM: DANIEL P. MOSS, P.E., PROJECT ENGINEER *DPM*

RE: QUAIL HOLLOW SENIOR LIVING COMMUNITY PHASE V EXPANSION
PRE-CONSTRUCTION/POST-CONSTRUCTION WATERSHED MODELING
(Project No. 10112)

DATE: JUNE 10, 2019

Per our communications with you, Christina Hall, P.E., City Engineer (see attached emails), LID BMP techniques have been implemented onsite to the maximum extent possible to:

1. Provide treatment for the Quail Ridge Phase V Expansion.
2. Provide 50 year detention for the new building's storm roof water.
3. Provide 2-year detention for the majority of any new paved parking/drives/sidewalks.

Off-site drainage will by-pass the proposed detention and treatment systems.

The roof for the proposed new Phase V building (20,422 sq. ft.) has been designed to direct roof runoff to an Underground Pipe Detention System (UPDS1). The UPDS is designed to detain and release up to the 50-year storm at a controlled flow rate that will be less or equal to the modeled Pre-Existing Conditions flow rate for the area the new building is being constructed on. The water released from the UPDS will be treated by a CONTECH CDS Unit.

The stormwater runoff collected from the maximum area possible of the new parking/drives/sidewalks being constructed shall be directed to a CONTECH Jellyfish Filter for treatment and an Underground Pipe Detention System (UPDS2) for detention. The detention has been designed to detain and release up to the 2-year storm at a controlled flow rate that will be less or equal to the modeled Pre-Existing Conditions 2-year flow rate for the area the new parking/drive/sidewalks are being constructed on.

We evaluated the Pre-Construction and Post-Construction peak flow rates for the proposed Underground Pipe Detention Systems (UPDS1 and UPDS2) utilizing the HydroCAD computer program for the 1-inch, 2-year, 10-year and 25-year, 50-year, and 100-year storm event data, which we obtained from the Extreme Precipitation Estimates by the Northeast Regional Climate Center, as well as soils data from the Natural Resources Conservation Service (NRCS).

The model established links or points of interest at (2) major discharge points for the re-developed area (SN001 and SN002) and one minor discharge point for the redeveloped area as shown on the attached Watershed Modeling Exhibits to compare the Pre-Construction and Post-Construction peak flow rates and volumes for the proposed project. SN001 being the general discharge point for the area the new Phase V building is proposed for, SN002 being the general discharge point for the area the new parking/drive/and sidewalk are located on, and SN003 being the general discharge point for a very small area located due north of the proposed building that

will be reconfigured from a part woods/grass area to a grassed area. The following table summarizes the peak flows:

Summary Table: Pre-Construction Vs Post-Construction Peak Flows, 1-Inch, 2-yr, 10-yr and 25-yr Storm Events

Discharge Point No.	1-Inch Storm		2-Year Storm		10-Year Storm		25-Year Storm	
	Pre-Const. Q (cfs)	Post-Const. Q (cfs)	Pre-Const. Q (cfs)	Post-Const. Q (cfs)	Pre-Const. Q (cfs)	Post-Const. Q (cfs)	Pre-Const. Q (cfs)	Post-Const. Q (cfs)
SN001	0.00	0.05	0.16	0.14	0.64	0.49	1.09	0.69
SN002	0.01	0.11	0.48	0.43	0.98	1.58	1.40	2.07
SN003	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Summary Table: Pre-Construction Vs Post-Construction Volumes, 1-inch, 2-yr, 10-yr and 25-yr Storm Events

Discharge Point No.	1-Inch Storm		2-Year Storm		10-Year Storm		25-Year Storm	
	Pre-Const. Vol. (cf)	Post-Const. Vol. (cf)	Pre-Const. Vol. (cf)	Post-Const. Vol. (cf)	Pre-Const. Vol. (cf)	Post-Const. Vol. (cf)	Pre-Const. Vol. (cf)	Post-Const. Vol. (cf)
SN001	0	795	526	3,325	1,463	5,338	2,368	6,901
SN002	62	291	956	1,696	1,930	2,923	2,762	3,901
SN003	0	0	0	0	0	3	1	26

Summary Table: Pre-Construction Vs Post-Construction Peak Flows, 50-yr and 100-yr Storm Events

Discharge Point No.	50-Year Storm		100-Year Storm	
	Pre-Const. Q (cfs)	Post-Const. Q (cfs)	Pre-Const. Q (cfs)	Post-Const. Q (cfs)
SN001	1.55	1.52	2.12	4.04
SN002	1.79	2.52	2.25	3.04
SN003	0.00	0.01	0.00	0.04

Summary Table: Pre-Construction Vs Post-Construction Volumes, 50-yr and 100-yr Storm Events

Discharge Point No.	50-Year Storm		100-Year Storm	
	Pre-Const. Vol. (cf)	Post-Const. Vol. (cf)	Pre-Const. Vol. (cf)	Post-Const. Vol. (cf)
SN001	3,289	8,325	4,455	9,990
SN002	3,556	4,803	4,517	5,867
SN003	15	64	47	124

Additionally, we discussed and came to an agreement with you (see attached emails) that pervious pavement or other forms of infiltration will not work for the site due to the high groundwater found at the site, not allowing for the NHDES required separation to the ESHWT for these type of BMPs. Groundwater Recharge is therefore not possible.

TO: CHRISTINA HALL, P.E., CITY ENGINEER, CITY OF LEBANON
FROM: DANIEL P. MOSS, P.E., PROJECT ENGINEER
RE: QUAIL HOLLOW SENIOR LIVING COMMUNITY PHASE V EXPANSION PRE-
CONSTRUCTION/POST-CONSTRUCTION WATERSHED MODELING
(Project No. 10112)
June10, 2019
Page 3

The following supporting documents are attached:

- Quail Hollow Phase V Drainage System Communications with City
- Stormwater Modeling
- Stormwater Treatment Sizing
- Operation & Maintenance Manual

QUAIL HOLLOW PHASE V DRAINAGE SYSTEM COMMUNICATIONS WITH CITY

- Rod Finley, P.E. Email to Christina Hall, P.E. and Erica Brittner, EIT (City of Lebanon) dated May 31, 2018
- Christina Hall, P.E. Email to Rod Finley, P.E. (Pathways Consulting, LLC) dated July 30, 2018

Dan Moss

From: Rod Finley
Sent: Thursday, May 31, 2018 9:11 AM
To: Hall, Christina; 'Brittner, Erica'
Cc: Dan Moss; Pat Buccellato; 'Tom Getz'
Subject: Quail V Drainage System Meeting Minutes (Project No. 10112)
Attachments: 10112 QUAIL REFERENCE MATERIALS.pdf

Hi Christina and Erica:

Thank you for meeting with Dan Moss and me to discuss the conceptual drainage system for Quail Hollow Phase V. The following items and issues were discussed:

Rod reviewed the results of the test pits and noted that there was an ESHWT at 24 – 36 inches.

Rod reviewed the infiltration test results of 0.875"/hour in the Phase V building footprint and 18.25"/hour in the Phase I parking area.

Rod noted that pervious pavement could not be installed because the NHDES required separation to the ESHWT could not be achieved.

Christina and Erica seemed to agree that pervious pavement or other forms of infiltration will not work at this site.

Dan noted that space constraints, surrounding topography, and existing and proposed utilities will also limit what can be done for stormwater treatment/detention.

Christina noted that NHDES requires a 10' separation between stormwater and water

Rod reviewed the conceptual drainage system for the Phase V building and associated pavement.

- Two rows of 36" pipe to detain the 50 year storm roof water.
- Sand filter to treat pavement/sidewalks that also detains the two year storm.
- Off-site drainage will by-pass the detention pipes and sand filter.

Christina noted that we should incorporate a couple of access points in pipe storage for cleaning

Rod asked Christina and Erica if they had any initial feedback on the conceptual design.

Christina said that she needed time to think about it.

Christina noted that we would need a lot of waivers.

Christina asked if the building could be smaller.

Dan mentioned that the Phase V building has a 20,500 sq. ft. footprint.

Rod mentioned that the building needs to be proximate to the Phase I main building to share common core facilities.

Christina asked if other stormwater facilities could be constructed on the southern side of Quail Hollow.

Rod noted that there is no available space for additional facilities.

Rod noted that the original AOT permit did not require detention due to the project's proximity to the Connecticut River.

Christina said that the pipes and discharge at East Wilder Road needs repair.

Rod noted that Green Mountain Development Group (GMDG) is aware of the situation and will look into addressing it.

Rod noted that the Phase I building has gutters and downspouts that discharge directly to lawn areas.

Dan showed some photos of the Phase I building and gutters/downspouts.

Rod said that there are no plans to detain Phase I building roof water.

Rod suggested that we install a First Defender stormwater separator in a catch basin to pre-treat the stormwater or possibly a Vortech unit to treat the existing parking lot for Phase I/II.

Christina asked about Quail's maintenance protocols.

Rod said that he would need to ask the maintenance manager about system maintenance protocols.

Christina requested:

- An overall Quail Hollow plan with the complete drainage system identified
- An Aerial of the overall facility
- Picture of existing parking to Phase I/II
- A pdf of the Phase V drainage concept with Building dimensions.
- Provide areas of existing impervious (pavement) and proposed for the Phase V Building
- Copy of the Test Pit Logs

Christina said that she will review and respond with comments in the next week or two.

Rod noted all NHDES AoT is requiring is to take care of the new Phase V project area.

Let me know if you have any comments or changes to the minutes.

Thank you,

Rod

Rodrick J. Finley, P.E.
Vice President/Director of Engineering Services
Pathways Consulting, LLC
240 Mechanic Street, Suite 100
Lebanon, New Hampshire 03766
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Dan Moss

From: Hall, Christina <Christina.Hall@lebanonnh.gov>
Sent: Monday, July 30, 2018 11:22 AM
To: Rod Finley; Brittner, Erica
Cc: Dan Moss; Pat Buccellato; 'Tom Getz'; 'John Giebink'
Subject: RE: Quail V Drainage System Meeting Minutes (Project No. 10112)

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Rod,

We met again in house on this last week in anticipation of getting back to you this week. This is a difficult one, as what is being proposed doesn't meet our current standards and there are drainage issues along our road from the previous/Existing Quail project(s) that have compromised both East Wilder Road and the drainage system. These issues will need to be rectified. In order for Engineering to recommend to the planning board a waiver from our storm water regulations, we would need to have those improvements incorporated into the proposed Quail project. This would include East Wilder roadway and drainage ditches and structures replaced and stabilized where Quail's drainage runoff has impacted the City's infrastructure. The offsite, eroded areas at outlet of the cross-culvert, which would need to be replaced, would also need to be addressed in addition to providing the proposed detention and some treatment onsite. The conceptual on site appears reasonable as an attempt to try and both detain and treat with the limited amount of area in which to do so, if the building cannot be rotated or adjusted to limit its footprint, but again, this would only work if the offsite work was incorporated.

Thank you,

*Christina B. Hall, P.E.
City Engineer*

*City of Lebanon
Department of Public Works
193 Dartmouth College Highway
Lebanon, NH 03766
Phone: 603-448-3112
Fax: 603-448-2671
Internal Ext. 1502
Christina.Hall@lebanonnh.gov*

From: Rod Finley <Rod.Finley@pathwaysconsult.com>
Sent: Monday, July 30, 2018 10:16 AM
To: Hall, Christina <Christina.Hall@lebanonnh.gov>; Brittner, Erica <Erica.Brittner@lebanonnh.gov>
Cc: Dan Moss <Dan.Moss@pathwaysconsult.com>; Pat Buccellato <Pat.Buccellato@pathwaysconsult.com>; 'Tom Getz' <tgetz@summitpmg.com>; 'John Giebink' <jgiebink@summitpmg.com>
Subject: RE: Quail V Drainage System Meeting Minutes (Project No. 10112)

Hi Christina/Erica:

Checking in on the status of your review. We need your comments and feedback to allow the project to move forward.

Rod

Rodrick J. Finley, P.E.
Vice President/Director of Engineering Services

STORMWATER MODELING

- Extreme Precipitation Table
- NRCS Soils Data
- Pre-Construction HydroCAD Report for 1-inch, 2-Year, 10-Year, 25-Year, 50-year, and 100-year Storm Events
- Figure W1: Pre-Construction Watershed Modeling Exhibit
- Post- Construction HydroCAD Report for 1-inch, 2-Year, 10-Year, 25-Year, 50-year, and 100-year Storm Events
- Figure W2: Post-Construction Watershed Modeling Exhibit

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Vermont
Location	
Longitude	72.298 degrees West
Latitude	43.683 degrees North
Elevation	0 feet
Date/Time	Tue, 12 Feb 2019 09:46:53 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.40	0.50	0.66	0.82	1.02	1yr	0.71	0.93	1.17	1.44	1.76	2.14	2.41	1yr	1.90	2.32	2.69	3.29	3.78	1yr
2yr	0.31	0.48	0.59	0.78	0.98	1.22	2yr	0.85	1.11	1.40	1.70	2.06	2.49	2.80	2yr	2.21	2.69	3.14	3.76	4.30	2yr
5yr	0.37	0.57	0.72	0.96	1.23	1.54	5yr	1.06	1.40	1.76	2.14	2.56	3.06	3.46	5yr	2.71	3.33	3.85	4.53	5.16	5yr
10yr	0.41	0.65	0.82	1.12	1.46	1.83	10yr	1.26	1.67	2.10	2.54	3.03	3.57	4.06	10yr	3.16	3.90	4.50	5.22	5.93	10yr
25yr	0.49	0.78	1.00	1.38	1.83	2.31	25yr	1.58	2.11	2.64	3.18	3.77	4.39	5.02	25yr	3.88	4.83	5.53	6.31	7.12	25yr
50yr	0.56	0.91	1.16	1.62	2.18	2.76	50yr	1.88	2.52	3.16	3.78	4.44	5.13	5.90	50yr	4.54	5.67	6.46	7.27	8.19	50yr
100yr	0.64	1.04	1.34	1.90	2.59	3.29	100yr	2.23	3.01	3.77	4.49	5.23	5.99	6.93	100yr	5.31	6.66	7.55	8.40	9.41	100yr
200yr	0.74	1.21	1.56	2.24	3.08	3.93	200yr	2.66	3.60	4.49	5.33	6.17	7.01	8.15	200yr	6.21	7.83	8.83	9.70	10.82	200yr
500yr	0.89	1.47	1.91	2.77	3.88	4.96	500yr	3.35	4.56	5.66	6.68	7.67	8.63	10.09	500yr	7.64	9.71	10.87	11.73	13.03	500yr

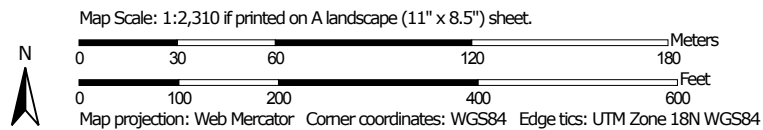
Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.38	0.46	0.62	0.76	0.83	1yr	0.66	0.82	0.99	1.20	1.56	1.92	2.19	1yr	1.70	2.11	2.48	3.04	3.58	1yr
2yr	0.30	0.46	0.57	0.77	0.95	1.11	2yr	0.82	1.08	1.24	1.61	2.05	2.44	2.73	2yr	2.16	2.63	3.06	3.68	4.20	2yr
5yr	0.34	0.53	0.65	0.89	1.14	1.32	5yr	0.98	1.30	1.49	1.90	2.41	2.89	3.25	5yr	2.56	3.12	3.61	4.25	4.87	5yr
10yr	0.38	0.58	0.72	1.01	1.30	1.51	10yr	1.12	1.48	1.69	2.15	2.69	3.27	3.70	10yr	2.89	3.56	4.08	4.74	5.45	10yr
25yr	0.44	0.67	0.83	1.18	1.56	1.79	25yr	1.34	1.75	2.00	2.50	3.12	3.84	4.40	25yr	3.40	4.23	4.80	5.46	6.31	25yr
50yr	0.48	0.73	0.92	1.32	1.77	2.05	50yr	1.53	2.00	2.25	2.83	3.50	4.34	5.01	50yr	3.84	4.82	5.43	6.08	7.07	50yr
100yr	0.54	0.82	1.03	1.49	2.04	2.32	100yr	1.76	2.27	2.54	3.16	3.92	4.91	5.71	100yr	4.34	5.49	6.13	6.78	7.91	100yr
200yr	0.61	0.91	1.16	1.68	2.34	2.65	200yr	2.02	2.59	2.87	3.57	4.44	5.54	6.48	200yr	4.90	6.24	6.94	7.55	8.85	200yr
500yr	0.71	1.06	1.36	1.97	2.81	3.12	500yr	2.42	3.05	3.35	4.16	5.20	6.55	7.72	500yr	5.80	7.43	8.18	8.70	10.29	500yr

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.44	0.54	0.72	0.89	1.02	1yr	0.77	1.00	1.18	1.51	1.88	2.32	2.61	1yr	2.05	2.51	2.87	3.49	3.96	1yr
2yr	0.32	0.49	0.60	0.82	1.01	1.19	2yr	0.87	1.16	1.35	1.72	2.17	2.56	2.88	2yr	2.26	2.77	3.23	3.88	4.41	2yr
5yr	0.40	0.62	0.76	1.05	1.33	1.56	5yr	1.15	1.53	1.73	2.16	2.70	3.24	3.68	5yr	2.87	3.53	4.10	4.79	5.47	5yr
10yr	0.48	0.74	0.91	1.28	1.65	1.94	10yr	1.43	1.90	2.13	2.60	3.19	3.88	4.42	10yr	3.43	4.25	4.92	5.65	6.43	10yr
25yr	0.61	0.93	1.16	1.66	2.18	2.60	25yr	1.88	2.54	2.84	3.32	3.99	4.93	5.68	25yr	4.36	5.47	6.27	7.02	7.98	25yr
50yr	0.74	1.12	1.39	2.00	2.70	3.24	50yr	2.33	3.17	3.53	4.00	4.75	5.90	6.86	50yr	5.22	6.59	7.53	8.30	9.42	50yr
100yr	0.89	1.34	1.68	2.43	3.34	4.04	100yr	2.88	3.95	4.40	4.81	5.65	7.08	8.30	100yr	6.27	7.98	9.06	9.82	11.10	100yr
200yr	1.07	1.61	2.05	2.96	4.13	5.05	200yr	3.56	4.94	5.48	5.81	6.70	8.48	10.04	200yr	7.51	9.66	10.91	11.62	13.09	200yr
500yr	1.39	2.06	2.65	3.86	5.48	6.80	500yr	4.73	6.65	7.36	7.43	8.39	10.78	12.93	500yr	9.54	12.43	13.94	14.54	16.29	500yr

Hydrologic Soil Group—Grafton County, New Hampshire



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

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 1:24,000.

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: Grafton County, New Hampshire
 Survey Area Data: Version 21, Sep 5, 2018

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

Date(s) aerial images were photographed: Jun 28, 2014—Apr 24, 2016

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
26C	Windsor loamy sand, 8 to 15 percent slopes	A	3.5	21.1%
26E	Windsor loamy sand, 15 to 60 percent slopes	A	8.3	49.8%
130E	Hitchcock silt loam, 15 to 60 percent slopes	C	4.4	26.5%
132A	Dartmouth silt loam, 0 to 3 percent slopes	C	0.4	2.5%
Totals for Area of Interest			16.6	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

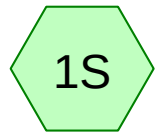
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

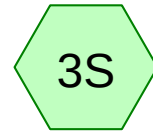
Tie-break Rule: Higher



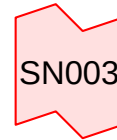
Existing-BUILDING
AREA



SN001



Existing



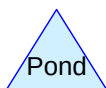
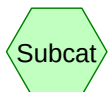
SN003



Existing-Paved
Road/Sidewalk



SN002



Routing Diagram for 19-06-03_ 10112 Quail Phase V Pre-Construction

Prepared by Pathways Consulting, LLC

HydroCAD® 10.00-24 s/n 03822 © 2018 HydroCAD Software Solutions LLC

19-06-03_ 10112 Quail Phase V Pre-Construction

Prepared by Pathways Consulting, LLC

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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
10,434	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S)
15,247	74	>75% Grass cover, Good, HSG C (1S, 2S)
3,142	96	Gravel surface, HSG A (1S, 2S)
4,856	96	Gravel surface, HSG C (1S, 2S)
1,405	98	Paved parking, HSG A (2S)
2,252	98	Paved parking, HSG C (2S)
5,348	30	Woods, Good, HSG A (1S, 3S)
42,684	66	TOTAL AREA

19-06-03_ 10112 Quail Phase V Pre-Construction*Type II 24-hr 1-inch Rainfall=1.00"*

Prepared by Pathways Consulting, LLC

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Page 3

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Existing-BUILDINGAREA Runoff Area=23,693 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=143' Tc=6.9 min CN=64 Runoff=0.00 cfs 0 cf

Subcatchment2S: Existing-Paved Runoff Area=15,620 sf 23.41% Impervious Runoff Depth=0.05"
Flow Length=130' Tc=5.3 min CN=77 Runoff=0.01 cfs 62 cf

Subcatchment3S: Existing Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=143' Tc=8.0 min CN=33 Runoff=0.00 cfs 0 cf

Link SN001: SN001 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SN002: SN002 Inflow=0.01 cfs 62 cf
Primary=0.01 cfs 62 cf

Link SN003: SN003 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 42,684 sf Runoff Volume = 62 cf Average Runoff Depth = 0.02"
91.43% Pervious = 39,027 sf 8.57% Impervious = 3,657 sf

Summary for Subcatchment 1S: Existing-BUILDING AREA

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-inch Rainfall=1.00"

Area (sf)	CN	Description
3,173	30	Woods, Good, HSG A
5,587	39	>75% Grass cover, Good, HSG A
10,792	74	>75% Grass cover, Good, HSG C
1,011	96	Gravel surface, HSG A
3,130	96	Gravel surface, HSG C
23,693	64	Weighted Average
23,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	53	0.3400	0.19		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.9	37	0.2300	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.1	11	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
0.2	42	0.0350	3.01		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
6.9	143	Total			

Summary for Subcatchment 2S: Existing-Paved Road/Sidewalk

Runoff = 0.01 cfs @ 12.04 hrs, Volume= 62 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-inch Rainfall=1.00"

Area (sf)	CN	Description
2,131	96	Gravel surface, HSG A
1,726	96	Gravel surface, HSG C
1,405	98	Paved parking, HSG A
2,252	98	Paved parking, HSG C
3,651	39	>75% Grass cover, Good, HSG A
4,455	74	>75% Grass cover, Good, HSG C
15,620	77	Weighted Average
11,963		76.59% Pervious Area
3,657		23.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	22	0.4400	0.38		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
3.9	51	0.0700	0.22		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.3	45	0.0200	2.87		Shallow Concentrated Flow, CD Paved Kv= 20.3 fps
0.1	12	0.0200	2.28		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
5.3	130	Total			

Summary for Subcatchment 3S: Existing

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-inch Rainfall=1.00"

Area (sf)	CN	Description
2,175	30	Woods, Good, HSG A
1,196	39	>75% Grass cover, Good, HSG A
3,371	33	Weighted Average
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	77	0.3400	0.20		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.2	23	0.3000	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.4	43	0.0700	1.85		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
8.0	143	Total			

Summary for Link SN001: SN001

Inflow Area = 23,693 sf, 0.00% Impervious, Inflow Depth = 0.00" for 1-inch event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

Inflow Area = 15,620 sf, 23.41% Impervious, Inflow Depth = 0.05" for 1-inch event
Inflow = 0.01 cfs @ 12.04 hrs, Volume= 62 cf
Primary = 0.01 cfs @ 12.04 hrs, Volume= 62 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area = 3,371 sf, 0.00% Impervious, Inflow Depth = 0.00" for 1-inch event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

19-06-03_ 10112 Quail Phase V Pre-Construction*Type II 24-hr 2-yr Rainfall=2.49"*

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Existing-BUILDINGAREA Runoff Area=23,693 sf 0.00% Impervious Runoff Depth=0.27"
Flow Length=143' Tc=6.9 min CN=64 Runoff=0.16 cfs 526 cf

Subcatchment2S: Existing-Paved Runoff Area=15,620 sf 23.41% Impervious Runoff Depth=0.73"
Flow Length=130' Tc=5.3 min CN=77 Runoff=0.48 cfs 956 cf

Subcatchment3S: Existing Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=143' Tc=8.0 min CN=33 Runoff=0.00 cfs 0 cf

Link SN001: SN001 Inflow=0.16 cfs 526 cf
Primary=0.16 cfs 526 cf

Link SN002: SN002 Inflow=0.48 cfs 956 cf
Primary=0.48 cfs 956 cf

Link SN003: SN003 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 42,684 sf Runoff Volume = 1,482 cf Average Runoff Depth = 0.42"
91.43% Pervious = 39,027 sf 8.57% Impervious = 3,657 sf

Summary for Subcatchment 1S: Existing-BUILDING AREA

Runoff = 0.16 cfs @ 12.02 hrs, Volume= 526 cf, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.49"

Area (sf)	CN	Description
3,173	30	Woods, Good, HSG A
5,587	39	>75% Grass cover, Good, HSG A
10,792	74	>75% Grass cover, Good, HSG C
1,011	96	Gravel surface, HSG A
3,130	96	Gravel surface, HSG C
23,693	64	Weighted Average
23,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	53	0.3400	0.19		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.9	37	0.2300	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.1	11	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
0.2	42	0.0350	3.01		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
6.9	143	Total			

Summary for Subcatchment 2S: Existing-Paved Road/Sidewalk

Runoff = 0.48 cfs @ 11.97 hrs, Volume= 956 cf, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.49"

Area (sf)	CN	Description
2,131	96	Gravel surface, HSG A
1,726	96	Gravel surface, HSG C
1,405	98	Paved parking, HSG A
2,252	98	Paved parking, HSG C
3,651	39	>75% Grass cover, Good, HSG A
4,455	74	>75% Grass cover, Good, HSG C
15,620	77	Weighted Average
11,963		76.59% Pervious Area
3,657		23.41% Impervious Area

19-06-03_ 10112 Quail Phase V Pre-Construction

Type II 24-hr 2-yr Rainfall=2.49"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	22	0.4400	0.38		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
3.9	51	0.0700	0.22		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.3	45	0.0200	2.87		Shallow Concentrated Flow, CD Paved Kv= 20.3 fps
0.1	12	0.0200	2.28		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
5.3	130	Total			

Summary for Subcatchment 3S: Existing

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.49"

Area (sf)	CN	Description
2,175	30	Woods, Good, HSG A
1,196	39	>75% Grass cover, Good, HSG A
3,371	33	Weighted Average
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	77	0.3400	0.20		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.2	23	0.3000	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.4	43	0.0700	1.85		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
8.0	143	Total			

Summary for Link SN001: SN001

Inflow Area = 23,693 sf, 0.00% Impervious, Inflow Depth = 0.27" for 2-yr event

Inflow = 0.16 cfs @ 12.02 hrs, Volume= 526 cf

Primary = 0.16 cfs @ 12.02 hrs, Volume= 526 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

Inflow Area = 15,620 sf, 23.41% Impervious, Inflow Depth = 0.73" for 2-yr event
Inflow = 0.48 cfs @ 11.97 hrs, Volume= 956 cf
Primary = 0.48 cfs @ 11.97 hrs, Volume= 956 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area = 3,371 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

19-06-03_ 10112 Quail Phase V Pre-Construction*Type II 24-hr 10-yr Rainfall=3.57"*

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Existing-BUILDINGAREA Runoff Area=23,693 sf 0.00% Impervious Runoff Depth=0.74"
Flow Length=143' Tc=6.9 min CN=64 Runoff=0.64 cfs 1,463 cf

Subcatchment2S: Existing-Paved Runoff Area=15,620 sf 23.41% Impervious Runoff Depth=1.48"
Flow Length=130' Tc=5.3 min CN=77 Runoff=0.98 cfs 1,930 cf

Subcatchment3S: Existing Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=143' Tc=8.0 min CN=33 Runoff=0.00 cfs 0 cf

Link SN001: SN001 Inflow=0.64 cfs 1,463 cf
Primary=0.64 cfs 1,463 cf

Link SN002: SN002 Inflow=0.98 cfs 1,930 cf
Primary=0.98 cfs 1,930 cf

Link SN003: SN003 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 42,684 sf Runoff Volume = 3,393 cf Average Runoff Depth = 0.95"
91.43% Pervious = 39,027 sf 8.57% Impervious = 3,657 sf

Summary for Subcatchment 1S: Existing-BUILDING AREA

Runoff = 0.64 cfs @ 12.00 hrs, Volume= 1,463 cf, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.57"

Area (sf)	CN	Description
3,173	30	Woods, Good, HSG A
5,587	39	>75% Grass cover, Good, HSG A
10,792	74	>75% Grass cover, Good, HSG C
1,011	96	Gravel surface, HSG A
3,130	96	Gravel surface, HSG C
23,693	64	Weighted Average
23,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	53	0.3400	0.19		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.9	37	0.2300	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.1	11	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
0.2	42	0.0350	3.01		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
6.9	143	Total			

Summary for Subcatchment 2S: Existing-Paved Road/Sidewalk

Runoff = 0.98 cfs @ 11.97 hrs, Volume= 1,930 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.57"

Area (sf)	CN	Description
2,131	96	Gravel surface, HSG A
1,726	96	Gravel surface, HSG C
1,405	98	Paved parking, HSG A
2,252	98	Paved parking, HSG C
3,651	39	>75% Grass cover, Good, HSG A
4,455	74	>75% Grass cover, Good, HSG C
15,620	77	Weighted Average
11,963		76.59% Pervious Area
3,657		23.41% Impervious Area

19-06-03_ 10112 Quail Phase V Pre-Construction

Type II 24-hr 10-yr Rainfall=3.57"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	22	0.4400	0.38		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
3.9	51	0.0700	0.22		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.3	45	0.0200	2.87		Shallow Concentrated Flow, CD Paved Kv= 20.3 fps
0.1	12	0.0200	2.28		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
5.3	130	Total			

Summary for Subcatchment 3S: Existing

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.57"

Area (sf)	CN	Description
2,175	30	Woods, Good, HSG A
1,196	39	>75% Grass cover, Good, HSG A
3,371	33	Weighted Average
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	77	0.3400	0.20		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.2	23	0.3000	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.4	43	0.0700	1.85		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
8.0	143	Total			

Summary for Link SN001: SN001

Inflow Area = 23,693 sf, 0.00% Impervious, Inflow Depth = 0.74" for 10-yr event

Inflow = 0.64 cfs @ 12.00 hrs, Volume= 1,463 cf

Primary = 0.64 cfs @ 12.00 hrs, Volume= 1,463 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

Inflow Area = 15,620 sf, 23.41% Impervious, Inflow Depth = 1.48" for 10-yr event
Inflow = 0.98 cfs @ 11.97 hrs, Volume= 1,930 cf
Primary = 0.98 cfs @ 11.97 hrs, Volume= 1,930 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area = 3,371 sf, 0.00% Impervious, Inflow Depth = 0.00" for 10-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

19-06-03_ 10112 Quail Phase V Pre-Construction*Type II 24-hr 25-yr Rainfall=4.39"*

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Existing-BUILDINGAREA Runoff Area=23,693 sf 0.00% Impervious Runoff Depth=1.20"
Flow Length=143' Tc=6.9 min CN=64 Runoff=1.09 cfs 2,368 cf

Subcatchment2S: Existing-Paved Runoff Area=15,620 sf 23.41% Impervious Runoff Depth=2.12"
Flow Length=130' Tc=5.3 min CN=77 Runoff=1.40 cfs 2,762 cf

Subcatchment3S: Existing Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=143' Tc=8.0 min CN=33 Runoff=0.00 cfs 1 cf

Link SN001: SN001 Inflow=1.09 cfs 2,368 cf
Primary=1.09 cfs 2,368 cf

Link SN002: SN002 Inflow=1.40 cfs 2,762 cf
Primary=1.40 cfs 2,762 cf

Link SN003: SN003 Inflow=0.00 cfs 1 cf
Primary=0.00 cfs 1 cf

Total Runoff Area = 42,684 sf Runoff Volume = 5,131 cf Average Runoff Depth = 1.44"
91.43% Pervious = 39,027 sf 8.57% Impervious = 3,657 sf

Summary for Subcatchment 1S: Existing-BUILDING AREA

Runoff = 1.09 cfs @ 11.99 hrs, Volume= 2,368 cf, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.39"

Area (sf)	CN	Description
3,173	30	Woods, Good, HSG A
5,587	39	>75% Grass cover, Good, HSG A
10,792	74	>75% Grass cover, Good, HSG C
1,011	96	Gravel surface, HSG A
3,130	96	Gravel surface, HSG C
23,693	64	Weighted Average
23,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	53	0.3400	0.19		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.9	37	0.2300	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.1	11	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
0.2	42	0.0350	3.01		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
6.9	143	Total			

Summary for Subcatchment 2S: Existing-Paved Road/Sidewalk

Runoff = 1.40 cfs @ 11.97 hrs, Volume= 2,762 cf, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.39"

Area (sf)	CN	Description
2,131	96	Gravel surface, HSG A
1,726	96	Gravel surface, HSG C
1,405	98	Paved parking, HSG A
2,252	98	Paved parking, HSG C
3,651	39	>75% Grass cover, Good, HSG A
4,455	74	>75% Grass cover, Good, HSG C
15,620	77	Weighted Average
11,963		76.59% Pervious Area
3,657		23.41% Impervious Area

19-06-03_10112 Quail Phase V Pre-Construction

Type II 24-hr 25-yr Rainfall=4.39"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	22	0.4400	0.38		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
3.9	51	0.0700	0.22		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.3	45	0.0200	2.87		Shallow Concentrated Flow, CD Paved Kv= 20.3 fps
0.1	12	0.0200	2.28		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
5.3	130	Total			

Summary for Subcatchment 3S: Existing

Runoff = 0.00 cfs @ 24.01 hrs, Volume= 1 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.39"

Area (sf)	CN	Description
2,175	30	Woods, Good, HSG A
1,196	39	>75% Grass cover, Good, HSG A
3,371	33	Weighted Average
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	77	0.3400	0.20		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.2	23	0.3000	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.4	43	0.0700	1.85		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
8.0	143	Total			

Summary for Link SN001: SN001

Inflow Area = 23,693 sf, 0.00% Impervious, Inflow Depth = 1.20" for 25-yr event
Inflow = 1.09 cfs @ 11.99 hrs, Volume= 2,368 cf
Primary = 1.09 cfs @ 11.99 hrs, Volume= 2,368 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

Inflow Area = 15,620 sf, 23.41% Impervious, Inflow Depth = 2.12" for 25-yr event
Inflow = 1.40 cfs @ 11.97 hrs, Volume= 2,762 cf
Primary = 1.40 cfs @ 11.97 hrs, Volume= 2,762 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area = 3,371 sf, 0.00% Impervious, Inflow Depth = 0.01" for 25-yr event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 1 cf
Primary = 0.00 cfs @ 24.01 hrs, Volume= 1 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

19-06-03_ 10112 Quail Phase V Pre-Construction*Type II 24-hr 50-yr Rainfall=5.13"*

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Existing-BUILDINGAREA Runoff Area=23,693 sf 0.00% Impervious Runoff Depth=1.67"
Flow Length=143' Tc=6.9 min CN=64 Runoff=1.55 cfs 3,289 cf

Subcatchment2S: Existing-Paved Runoff Area=15,620 sf 23.41% Impervious Runoff Depth=2.73"
Flow Length=130' Tc=5.3 min CN=77 Runoff=1.79 cfs 3,556 cf

Subcatchment3S: Existing Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.05"
Flow Length=143' Tc=8.0 min CN=33 Runoff=0.00 cfs 15 cf

Link SN001: SN001 Inflow=1.55 cfs 3,289 cf
Primary=1.55 cfs 3,289 cf

Link SN002: SN002 Inflow=1.79 cfs 3,556 cf
Primary=1.79 cfs 3,556 cf

Link SN003: SN003 Inflow=0.00 cfs 15 cf
Primary=0.00 cfs 15 cf

Total Runoff Area = 42,684 sf Runoff Volume = 6,860 cf Average Runoff Depth = 1.93"
91.43% Pervious = 39,027 sf 8.57% Impervious = 3,657 sf

Summary for Subcatchment 1S: Existing-BUILDING AREA

Runoff = 1.55 cfs @ 11.99 hrs, Volume= 3,289 cf, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=5.13"

Area (sf)	CN	Description
3,173	30	Woods, Good, HSG A
5,587	39	>75% Grass cover, Good, HSG A
10,792	74	>75% Grass cover, Good, HSG C
1,011	96	Gravel surface, HSG A
3,130	96	Gravel surface, HSG C
23,693	64	Weighted Average
23,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	53	0.3400	0.19		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.9	37	0.2300	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.1	11	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
0.2	42	0.0350	3.01		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
6.9	143	Total			

Summary for Subcatchment 2S: Existing-Paved Road/Sidewalk

Runoff = 1.79 cfs @ 11.97 hrs, Volume= 3,556 cf, Depth= 2.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=5.13"

Area (sf)	CN	Description
2,131	96	Gravel surface, HSG A
1,726	96	Gravel surface, HSG C
1,405	98	Paved parking, HSG A
2,252	98	Paved parking, HSG C
3,651	39	>75% Grass cover, Good, HSG A
4,455	74	>75% Grass cover, Good, HSG C
15,620	77	Weighted Average
11,963		76.59% Pervious Area
3,657		23.41% Impervious Area

19-06-03_10112 Quail Phase V Pre-Construction

Type II 24-hr 50-yr Rainfall=5.13"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	22	0.4400	0.38		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
3.9	51	0.0700	0.22		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.3	45	0.0200	2.87		Shallow Concentrated Flow, CD Paved Kv= 20.3 fps
0.1	12	0.0200	2.28		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
5.3	130	Total			

Summary for Subcatchment 3S: Existing

Runoff = 0.00 cfs @ 18.00 hrs, Volume= 15 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=5.13"

Area (sf)	CN	Description
2,175	30	Woods, Good, HSG A
1,196	39	>75% Grass cover, Good, HSG A
3,371	33	Weighted Average
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	77	0.3400	0.20		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.2	23	0.3000	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.4	43	0.0700	1.85		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
8.0	143	Total			

Summary for Link SN001: SN001

Inflow Area = 23,693 sf, 0.00% Impervious, Inflow Depth = 1.67" for 50-yr event
 Inflow = 1.55 cfs @ 11.99 hrs, Volume= 3,289 cf
 Primary = 1.55 cfs @ 11.99 hrs, Volume= 3,289 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

Inflow Area = 15,620 sf, 23.41% Impervious, Inflow Depth = 2.73" for 50-yr event
 Inflow = 1.79 cfs @ 11.97 hrs, Volume= 3,556 cf
 Primary = 1.79 cfs @ 11.97 hrs, Volume= 3,556 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area = 3,371 sf, 0.00% Impervious, Inflow Depth = 0.05" for 50-yr event
Inflow = 0.00 cfs @ 18.00 hrs, Volume= 15 cf
Primary = 0.00 cfs @ 18.00 hrs, Volume= 15 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

19-06-03_ 10112 Quail Phase V Pre-Construction*Type II 24-hr 100-yr Rainfall=5.99"*

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Existing-BUILDINGAREA Runoff Area=23,693 sf 0.00% Impervious Runoff Depth=2.26"
Flow Length=143' Tc=6.9 min CN=64 Runoff=2.12 cfs 4,455 cf

Subcatchment2S: Existing-Paved Runoff Area=15,620 sf 23.41% Impervious Runoff Depth=3.47"
Flow Length=130' Tc=5.3 min CN=77 Runoff=2.25 cfs 4,517 cf

Subcatchment3S: Existing Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.17"
Flow Length=143' Tc=8.0 min CN=33 Runoff=0.00 cfs 47 cf

Link SN001: SN001 Inflow=2.12 cfs 4,455 cf
Primary=2.12 cfs 4,455 cf

Link SN002: SN002 Inflow=2.25 cfs 4,517 cf
Primary=2.25 cfs 4,517 cf

Link SN003: SN003 Inflow=0.00 cfs 47 cf
Primary=0.00 cfs 47 cf

Total Runoff Area = 42,684 sf Runoff Volume = 9,019 cf Average Runoff Depth = 2.54"
91.43% Pervious = 39,027 sf 8.57% Impervious = 3,657 sf

Summary for Subcatchment 1S: Existing-BUILDING AREA

Runoff = 2.12 cfs @ 11.99 hrs, Volume= 4,455 cf, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.99"

Area (sf)	CN	Description
3,173	30	Woods, Good, HSG A
5,587	39	>75% Grass cover, Good, HSG A
10,792	74	>75% Grass cover, Good, HSG C
1,011	96	Gravel surface, HSG A
3,130	96	Gravel surface, HSG C
23,693	64	Weighted Average
23,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	53	0.3400	0.19		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.9	37	0.2300	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.1	11	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
0.2	42	0.0350	3.01		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
6.9	143	Total			

Summary for Subcatchment 2S: Existing-Paved Road/Sidewalk

Runoff = 2.25 cfs @ 11.96 hrs, Volume= 4,517 cf, Depth= 3.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.99"

Area (sf)	CN	Description
2,131	96	Gravel surface, HSG A
1,726	96	Gravel surface, HSG C
1,405	98	Paved parking, HSG A
2,252	98	Paved parking, HSG C
3,651	39	>75% Grass cover, Good, HSG A
4,455	74	>75% Grass cover, Good, HSG C
15,620	77	Weighted Average
11,963		76.59% Pervious Area
3,657		23.41% Impervious Area

19-06-03_10112 Quail Phase V Pre-Construction

Type II 24-hr 100-yr Rainfall=5.99"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	22	0.4400	0.38		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
3.9	51	0.0700	0.22		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.3	45	0.0200	2.87		Shallow Concentrated Flow, CD Paved Kv= 20.3 fps
0.1	12	0.0200	2.28		Shallow Concentrated Flow, DE Unpaved Kv= 16.1 fps
5.3	130	Total			

Summary for Subcatchment 3S: Existing

Runoff = 0.00 cfs @ 13.29 hrs, Volume= 47 cf, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.99"

Area (sf)	CN	Description
2,175	30	Woods, Good, HSG A
1,196	39	>75% Grass cover, Good, HSG A
3,371	33	Weighted Average
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	77	0.3400	0.20		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 2.49"
1.2	23	0.3000	0.33		Sheet Flow, BC Grass: Short n= 0.150 P2= 2.49"
0.4	43	0.0700	1.85		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
8.0	143	Total			

Summary for Link SN001: SN001

Inflow Area = 23,693 sf, 0.00% Impervious, Inflow Depth = 2.26" for 100-yr event
 Inflow = 2.12 cfs @ 11.99 hrs, Volume= 4,455 cf
 Primary = 2.12 cfs @ 11.99 hrs, Volume= 4,455 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

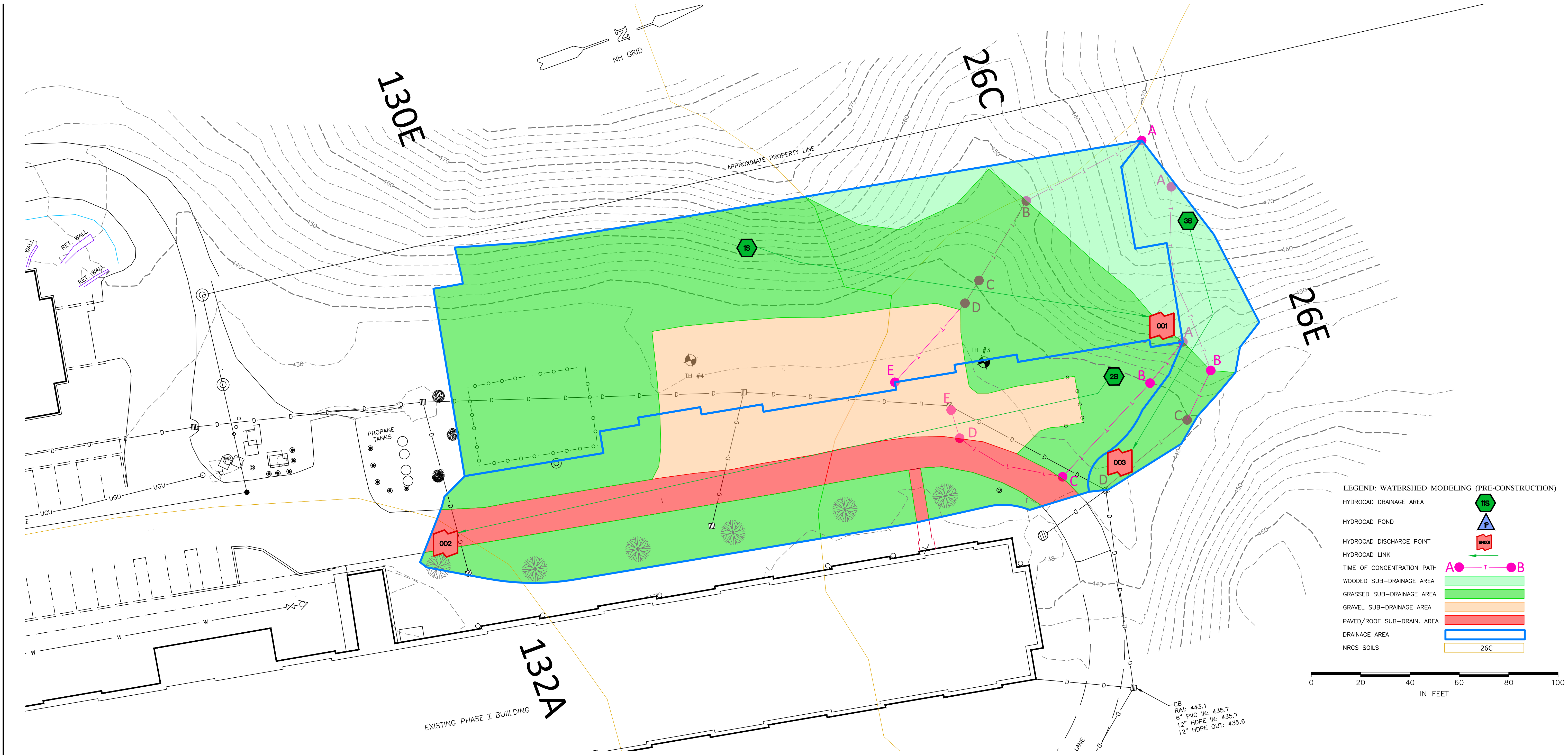
Inflow Area = 15,620 sf, 23.41% Impervious, Inflow Depth = 3.47" for 100-yr event
 Inflow = 2.25 cfs @ 11.96 hrs, Volume= 4,517 cf
 Primary = 2.25 cfs @ 11.96 hrs, Volume= 4,517 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area = 3,371 sf, 0.00% Impervious, Inflow Depth = 0.17" for 100-yr event
Inflow = 0.00 cfs @ 13.29 hrs, Volume= 47 cf
Primary = 0.00 cfs @ 13.29 hrs, Volume= 47 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



PRE-CONSTRUCTION VERSUS POST-CONSTRUCTION PEAK FLOWS/VOLUMES																								
DISCHARGE POINT NO.	1-INCH STORM				2-YEAR STORM				10-YEAR STORM				25-YEAR STORM				50-YEAR STORM				100-YEAR STORM			
	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)
SN001	0.00	0.05	0	795	0.16	0.14	526	3,325	0.64	0.49	1,463	5,338	1.09	0.69	2,368	6,901	1.55	1.52	3,289	8,325	2.12	4.04	4,455	9,990
SN002	0.01	0.11	62	291	0.48	0.43	956	1,696	0.98	1.58	1,930	2,923	1.40	2.07	2,762	3,901	1.79	2.52	3,556	4,803	2.25	3.04	4,517	5,867
SN003	0.00	0.00	0	0	0.00	0.00	0	0	0.00	0.00	0	3	0.00	0.00	1	26	0.00	0.01	15	64	0.00	0.04	47	124

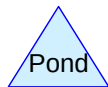
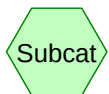
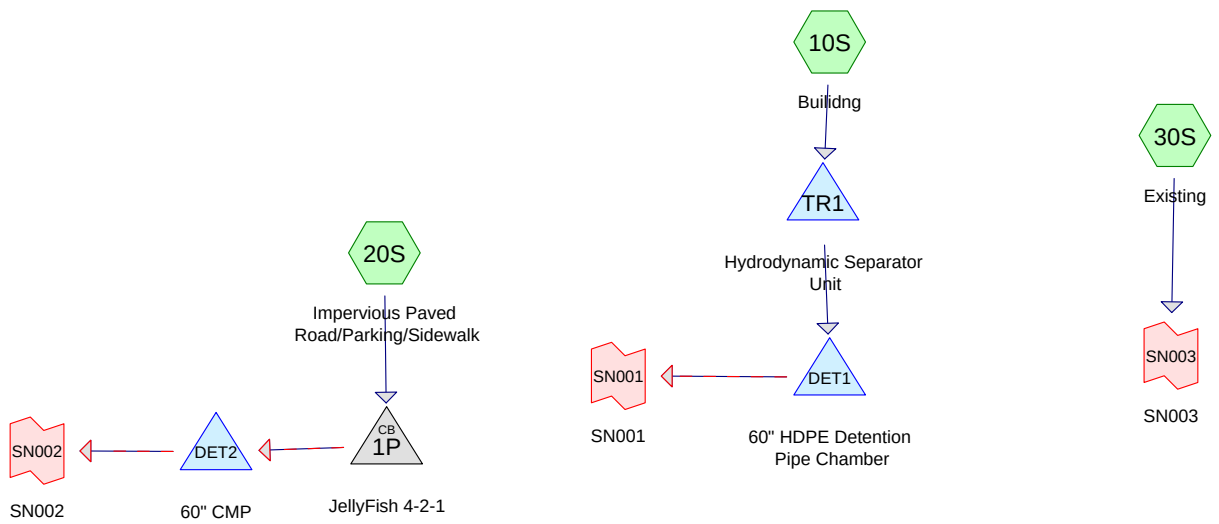
REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

PRE-CONSTRUCTION WATERSHED MODELING FOR
QUAIL HOLLOW - PHASE V
LEBANON, NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC
240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN
DESIGNED BY:
DRAWN BY: DPM
CHECKED BY: RJF
DATE: 06-03-19
PROJ. NO. 10112

W1
SHEET 1 OF 2



Routing Diagram for 19-06-03 _ Underground Storage Design and Filter- BLDG and Parking- Drive
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19-06-03 _ Underground Storage Design and Filter- BLDG and Parking- Drive

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
6,987	39	>75% Grass cover, Good, HSG A (10S, 20S, 30S)
3,789	74	>75% Grass cover, Good, HSG C (10S, 20S)
5,113	98	Paved parking, HSG A (20S)
6,373	98	Paved parking, HSG C (20S)
8,231	98	Roofs, HSG A (10S)
12,191	98	Roofs, HSG C (10S)
42,684	86	TOTAL AREA

19-06-03 _ Underground Storage Design and Filter- BL Type II 24-hr 1-inch Rainfall=1.00"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Building

Runoff Area=23,693 sf 86.19% Impervious Runoff Depth=0.40"

Flow Length=450' Tc=2.9 min CN=92 Runoff=0.44 cfs 795 cf

Subcatchment20S: Impervious Paved

Runoff Area=15,620 sf 73.53% Impervious Runoff Depth=0.22"

Flow Length=58' Slope=0.0200 '/' Tc=2.5 min CN=87 Runoff=0.16 cfs 291 cf

Subcatchment30S: Existing

Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.00"

Flow Length=115' Tc=1.9 min CN=39 Runoff=0.00 cfs 0 cf

Pond 1P: JellyFish 4-2-1

Peak Elev=433.61' Inflow=0.16 cfs 291 cf

Primary=0.16 cfs 291 cf Secondary=0.00 cfs 0 cf Outflow=0.16 cfs 291 cf

Pond DET1: 60" HDPE Detention Pipe Chamber

Peak Elev=432.86' Storage=320 cf Inflow=0.44 cfs 795 cf

Primary=0.05 cfs 795 cf Secondary=0.00 cfs 0 cf Outflow=0.05 cfs 795 cf

Pond DET2: 60" CMP

Peak Elev=432.15' Storage=28 cf Inflow=0.16 cfs 291 cf

Primary=0.11 cfs 291 cf Secondary=0.00 cfs 0 cf Outflow=0.11 cfs 291 cf

Pond TR1: Hydrodynamic Separator Unit

Inflow=0.44 cfs 795 cf

Primary=0.44 cfs 795 cf

Link SN001: SN001

Inflow=0.05 cfs 795 cf

Primary=0.05 cfs 795 cf

Link SN002: SN002

Inflow=0.11 cfs 291 cf

Primary=0.11 cfs 291 cf

Link SN003: SN003

Inflow=0.00 cfs 0 cf

Primary=0.00 cfs 0 cf

Total Runoff Area = 42,684 sf Runoff Volume = 1,086 cf Average Runoff Depth = 0.31"

25.25% Pervious = 10,776 sf 74.75% Impervious = 31,908 sf

19-06-03 _ Underground Storage Design and Filter- BL Type II 24-hr 1-inch Rainfall=1.00"

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Summary for Subcatchment 10S: Building

Runoff = 0.44 cfs @ 11.94 hrs, Volume= 795 cf, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-inch Rainfall=1.00"

	Area (sf)	CN	Description
*	8,231	98	Roofs, HSG A
	12,191	98	Roofs, HSG C
	1,541	39	>75% Grass cover, Good, HSG A
	1,730	74	>75% Grass cover, Good, HSG C
	23,693	92	Weighted Average
	3,271		13.81% Pervious Area
	20,422		86.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	20	0.0500	0.16		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.8	430	0.0250	8.48	6.66	Pipe Channel, BC 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
2.9	450	Total			

Summary for Subcatchment 20S: Impervious Paved Road/Parking/Sidewalk

Runoff = 0.16 cfs @ 11.94 hrs, Volume= 291 cf, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-inch Rainfall=1.00"

	Area (sf)	CN	Description
	5,113	98	Paved parking, HSG A
	6,373	98	Paved parking, HSG C
*	2,075	39	>75% Grass cover, Good, HSG A
	2,059	74	>75% Grass cover, Good, HSG C
	15,620	87	Weighted Average
	4,134		26.47% Pervious Area
	11,486		73.53% Impervious Area

19-06-03 _ Underground Storage Design and Filter- BL Type II 24-hr 1-inch Rainfall=1.00"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	10	0.0200	0.09		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.2	7	0.0200	0.71		Sheet Flow, BC Smooth surfaces n= 0.011 P2= 2.49"
0.3	15	0.0200	0.83		Sheet Flow, CD Smooth surfaces n= 0.011 P2= 2.49"
0.2	26	0.0200	2.87		Shallow Concentrated Flow, DE Paved Kv= 20.3 fps
2.5	58	Total			

Summary for Subcatchment 30S: Existing

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-inch Rainfall=1.00"

Area (sf)	CN	Description
3,371	39	>75% Grass cover, Good, HSG A
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	20	0.2000	0.27		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.7	95	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
1.9	115	Total			

Summary for Pond 1P: JellyFish 4-2-1

[57] Hint: Peaked at 433.61' (Flood elevation advised)

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 0.22" for 1-inch event
 Inflow = 0.16 cfs @ 11.94 hrs, Volume= 291 cf
 Outflow = 0.16 cfs @ 11.94 hrs, Volume= 291 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.16 cfs @ 11.94 hrs, Volume= 291 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 433.61' @ 11.94 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.80'	High-Flo Cartridges X 2.00 Head (feet) 0.00 0.50 0.58 0.67 0.75 0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00 Disch. (cfs) 0.000 0.000 0.015 0.030 0.044 0.059 0.074 0.089

19-06-03 _ Underground Storage Design and Filter- BL Type II 24-hr 1-inch Rainfall=1.00"

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#2	Primary	432.80'	0.104 0.119 0.134 0.148 0.163 0.178 0.178 Lo-Flow Cartridges Head (feet) 0.00 0.08 0.17 0.25 0.33 0.42 0.50 0.58 0.67 0.75 0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00 Disch. (cfs) 0.000 0.005 0.010 0.015 0.020 0.025 0.030 0.035 0.040 0.045 0.050 0.054 0.059 0.064 0.069 0.074 0.079 0.084 0.089 0.089
#3	Secondary	435.22'	2.8' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.16 cfs @ 11.94 hrs HW=433.61' TW=432.10' (Dynamic Tailwater)

1=High-Flo Cartridges (Custom Controls 0.11 cfs)

2=Lo-Flow Cartridges (Custom Controls 0.05 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=432.80' TW=431.80' (Dynamic Tailwater)

3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DET1: 60" HDPE Detention Pipe Chamber

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 0.40" for 1-inch event
 Inflow = 0.44 cfs @ 11.94 hrs, Volume= 795 cf
 Outflow = 0.05 cfs @ 12.31 hrs, Volume= 795 cf, Atten= 89%, Lag= 22.0 min
 Primary = 0.05 cfs @ 12.31 hrs, Volume= 795 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 432.86' @ 12.31 hrs Surf.Area= 697 sf Storage= 320 cf

Flood Elev= 439.65' Surf.Area= 20 sf Storage= 4,073 cf

Plug-Flow detention time= 131.9 min calculated for 794 cf (100% of inflow)

Center-of-Mass det. time= 132.0 min (974.3 - 842.2)

Volume	Invert	Avail.Storage	Storage Description
#1	432.20'	3,927 cf	60.0" Round HDPE_Round 60" x 2 L= 100.0'
#2	432.20'	146 cf	5.00'D x 7.45'H MH
		4,073 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	432.20'	12.0" Round Outelt Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.20' / 431.70' S= 0.0050 ' / ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	432.20'	1.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.70'	1.0" Vert. ROW 2 Orifice X 3.00 C= 0.600
#4	Device 1	434.25'	1.0" Vert. ROW 3 Orifice X 2.00 C= 0.600
#5	Device 1	434.60'	2.0" Vert. ROW 4 Orifice X 4.00 C= 0.600
#6	Secondary	436.30'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

19-06-03 _ Underground Storage Design and Filter- BL Type II 24-hr 1-inch Rainfall=1.00"

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Primary OutFlow Max=0.05 cfs @ 12.31 hrs HW=432.86' TW=0.00' (Dynamic Tailwater)

- ↑ **1=Outlet Pipe** (Passes 0.05 cfs of 1.24 cfs potential flow)
 - ↑ **2=ROW 1 Orifice** (Orifice Controls 0.02 cfs @ 3.79 fps)
 - ↑ **3=ROW 2 Orifice** (Orifice Controls 0.03 cfs @ 1.66 fps)
 - ↑ **4=ROW 3 Orifice** (Controls 0.00 cfs)
 - ↑ **5=ROW 4 Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=432.20' TW=0.00' (Dynamic Tailwater)

- ↑ **6=Riser Overflow** (Controls 0.00 cfs)

Summary for Pond DET2: 60" CMP

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 0.22" for 1-inch event
 Inflow = 0.16 cfs @ 11.94 hrs, Volume= 291 cf
 Outflow = 0.11 cfs @ 11.99 hrs, Volume= 291 cf, Atten= 28%, Lag= 2.9 min
 Primary = 0.11 cfs @ 11.99 hrs, Volume= 291 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 432.15' @ 11.99 hrs Surf.Area= 115 sf Storage= 28 cf

Flood Elev= 439.35' Surf.Area= 0 sf Storage= 884 cf

Plug-Flow detention time= 4.3 min calculated for 291 cf (100% of inflow)

Center-of-Mass det. time= 4.3 min (882.7 - 878.4)

Volume	Invert	Avail.Storage	Storage Description
#1	431.80'	884 cf	60.0" Round HDPE_Round 60" L= 45.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	431.80'	12.0" Round Outlet Pipe L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 431.80' / 431.70' S= 0.0050 ' / ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	431.80'	3.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.80'	1.5" Vert. ROW 2 Orifice C= 0.600
#4	Device 1	433.50'	1.5" Vert. ROW 3 Orifice C= 0.600
#5	Secondary	434.00'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.11 cfs @ 11.99 hrs HW=432.15' TW=0.00' (Dynamic Tailwater)

- ↑ **1=Outlet Pipe** (Passes 0.11 cfs of 0.37 cfs potential flow)
 - ↑ **2=ROW 1 Orifice** (Orifice Controls 0.11 cfs @ 2.30 fps)
 - ↑ **3=ROW 2 Orifice** (Controls 0.00 cfs)
 - ↑ **4=ROW 3 Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=431.80' TW=0.00' (Dynamic Tailwater)

- ↑ **5=Riser Overflow** (Controls 0.00 cfs)

Summary for Pond TR1: Hydrodynamic Separator Unit

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 0.40" for 1-inch event
Inflow = 0.44 cfs @ 11.94 hrs, Volume= 795 cf
Primary = 0.44 cfs @ 11.94 hrs, Volume= 795 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Link SN001: SN001

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 0.40" for 1-inch event
Inflow = 0.05 cfs @ 12.31 hrs, Volume= 795 cf
Primary = 0.05 cfs @ 12.31 hrs, Volume= 795 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 0.22" for 1-inch event
Inflow = 0.11 cfs @ 11.99 hrs, Volume= 291 cf
Primary = 0.11 cfs @ 11.99 hrs, Volume= 291 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area = 3,371 sf, 0.00% Impervious, Inflow Depth = 0.00" for 1-inch event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Buildng Runoff Area=23,693 sf 86.19% Impervious Runoff Depth=1.68"
Flow Length=450' Tc=2.9 min CN=92 Runoff=1.76 cfs 3,325 cf

Subcatchment20S: Impervious Paved Runoff Area=15,620 sf 73.53% Impervious Runoff Depth=1.30"
Flow Length=58' Slope=0.0200 '/' Tc=2.5 min CN=87 Runoff=0.94 cfs 1,696 cf

Subcatchment30S: Existing Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=115' Tc=1.9 min CN=39 Runoff=0.00 cfs 0 cf

Pond 1P: JellyFish 4-2-1 Peak Elev=435.36' Inflow=0.94 cfs 1,696 cf
Primary=0.44 cfs 1,510 cf Secondary=0.50 cfs 185 cf Outflow=0.94 cfs 1,696 cf

Pond DET1: 60" HDPE Detention Pipe Peak Elev=434.30' Storage=1,609 cf Inflow=1.76 cfs 3,325 cf
Primary=0.14 cfs 3,325 cf Secondary=0.00 cfs 0 cf Outflow=0.14 cfs 3,325 cf

Pond DET2: 60" CMP Peak Elev=433.94' Storage=361 cf Inflow=0.94 cfs 1,696 cf
Primary=0.43 cfs 1,696 cf Secondary=0.00 cfs 0 cf Outflow=0.43 cfs 1,696 cf

Pond TR1: Hydrodynamic Separator Unit Inflow=1.76 cfs 3,325 cf
Primary=1.76 cfs 3,325 cf

Link SN001: SN001 Inflow=0.14 cfs 3,325 cf
Primary=0.14 cfs 3,325 cf

Link SN002: SN002 Inflow=0.43 cfs 1,696 cf
Primary=0.43 cfs 1,696 cf

Link SN003: SN003 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 42,684 sf Runoff Volume = 5,020 cf Average Runoff Depth = 1.41"
25.25% Pervious = 10,776 sf 74.75% Impervious = 31,908 sf

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Summary for Subcatchment 10S: Building

Runoff = 1.76 cfs @ 11.93 hrs, Volume= 3,325 cf, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.49"

	Area (sf)	CN	Description
*	8,231	98	Roofs, HSG A
	12,191	98	Roofs, HSG C
	1,541	39	>75% Grass cover, Good, HSG A
	1,730	74	>75% Grass cover, Good, HSG C
	23,693	92	Weighted Average
	3,271		13.81% Pervious Area
	20,422		86.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	20	0.0500	0.16		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.8	430	0.0250	8.48	6.66	Pipe Channel, BC 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
2.9	450	Total			

Summary for Subcatchment 20S: Impervious Paved Road/Parking/Sidewalk

Runoff = 0.94 cfs @ 11.93 hrs, Volume= 1,696 cf, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.49"

	Area (sf)	CN	Description
*	5,113	98	Paved parking, HSG A
	6,373	98	Paved parking, HSG C
	2,075	39	>75% Grass cover, Good, HSG A
	2,059	74	>75% Grass cover, Good, HSG C
	15,620	87	Weighted Average
	4,134		26.47% Pervious Area
	11,486		73.53% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	10	0.0200	0.09		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.2	7	0.0200	0.71		Sheet Flow, BC Smooth surfaces n= 0.011 P2= 2.49"
0.3	15	0.0200	0.83		Sheet Flow, CD Smooth surfaces n= 0.011 P2= 2.49"
0.2	26	0.0200	2.87		Shallow Concentrated Flow, DE Paved Kv= 20.3 fps
2.5	58	Total			

Summary for Subcatchment 30S: Existing

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-yr Rainfall=2.49"

Area (sf)	CN	Description
3,371	39	>75% Grass cover, Good, HSG A
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	20	0.2000	0.27		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.7	95	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
1.9	115	Total			

Summary for Pond 1P: JellyFish 4-2-1

[57] Hint: Peaked at 435.36' (Flood elevation advised)

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 1.30" for 2-yr event
 Inflow = 0.94 cfs @ 11.93 hrs, Volume= 1,696 cf
 Outflow = 0.94 cfs @ 11.93 hrs, Volume= 1,696 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.44 cfs @ 11.82 hrs, Volume= 1,510 cf
 Secondary = 0.50 cfs @ 11.93 hrs, Volume= 185 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 435.36' @ 11.93 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.80'	High-Flo Cartridges X 2.00 Head (feet) 0.00 0.50 0.58 0.67 0.75 0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00 Disch. (cfs) 0.000 0.000 0.015 0.030 0.044 0.059 0.074 0.089

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#2	Primary	432.80'	0.104 0.119 0.134 0.148 0.163 0.178 0.178
			Lo-Flow Cartridges
#3	Secondary	435.22'	Head (feet) 0.00 0.08 0.17 0.25 0.33 0.42 0.50 0.58 0.67 0.75
			0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00
			Disch. (cfs) 0.000 0.005 0.010 0.015 0.020 0.025 0.030 0.035
			0.040 0.045 0.050 0.054 0.059 0.064 0.069 0.074 0.079 0.084
			0.089 0.089
			2.8' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.44 cfs @ 11.82 hrs HW=435.23' TW=432.62' (Dynamic Tailwater)

1=High-Flo Cartridges (Custom Controls 0.36 cfs)

2=Lo-Flow Cartridges (Custom Controls 0.09 cfs)

Secondary OutFlow Max=0.50 cfs @ 11.93 hrs HW=435.36' TW=433.53' (Dynamic Tailwater)

3=Sharp-Crested Rectangular Weir (Weir Controls 0.50 cfs @ 1.24 fps)

Summary for Pond DET1: 60" HDPE Detention Pipe Chamber

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 1.68" for 2-yr event
 Inflow = 1.76 cfs @ 11.93 hrs, Volume= 3,325 cf
 Outflow = 0.14 cfs @ 12.41 hrs, Volume= 3,325 cf, Atten= 92%, Lag= 28.4 min
 Primary = 0.14 cfs @ 12.41 hrs, Volume= 3,325 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 434.30' @ 12.41 hrs Surf.Area= 1,007 sf Storage= 1,609 cf

Flood Elev= 439.65' Surf.Area= 20 sf Storage= 4,073 cf

Plug-Flow detention time= 154.8 min calculated for 3,325 cf (100% of inflow)

Center-of-Mass det. time= 154.7 min (955.8 - 801.2)

Volume	Invert	Avail.Storage	Storage Description
#1	432.20'	3,927 cf	60.0" Round HDPE_Round 60" x 2 L= 100.0'
#2	432.20'	146 cf	5.00'D x 7.45'H MH
		4,073 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	432.20'	12.0" Round Outelt Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.20' / 431.70' S= 0.0050 ' /' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	432.20'	1.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.70'	1.0" Vert. ROW 2 Orifice X 3.00 C= 0.600
#4	Device 1	434.25'	1.0" Vert. ROW 3 Orifice X 2.00 C= 0.600
#5	Device 1	434.60'	2.0" Vert. ROW 4 Orifice X 4.00 C= 0.600
#6	Secondary	436.30'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

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Primary OutFlow Max=0.14 cfs @ 12.41 hrs HW=434.30' TW=0.00' (Dynamic Tailwater)

- ↑ **1=Outlet Pipe** (Passes 0.14 cfs of 3.90 cfs potential flow)
- ↑ **2=ROW 1 Orifice** (Orifice Controls 0.04 cfs @ 6.91 fps)
- ↑ **3=ROW 2 Orifice** (Orifice Controls 0.10 cfs @ 6.02 fps)
- ↑ **4=ROW 3 Orifice** (Orifice Controls 0.01 cfs @ 0.78 fps)
- ↑ **5=ROW 4 Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=432.20' TW=0.00' (Dynamic Tailwater)

- ↑ **6=Riser Overflow** (Controls 0.00 cfs)

Summary for Pond DET2: 60" CMP

[78] Warning: Submerged Pond 1P Primary device # 1 by 1.14'

[78] Warning: Submerged Pond 1P Primary device # 2 by 1.14'

[80] Warning: Exceeded Pond 1P by 0.21' @ 12.05 hrs (0.25 cfs 74 cf)

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 1.30" for 2-yr event
 Inflow = 0.94 cfs @ 11.93 hrs, Volume= 1,696 cf
 Outflow = 0.43 cfs @ 12.01 hrs, Volume= 1,696 cf, Atten= 54%, Lag= 4.5 min
 Primary = 0.43 cfs @ 12.01 hrs, Volume= 1,696 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 433.94' @ 12.01 hrs Surf.Area= 223 sf Storage= 361 cf

Flood Elev= 439.35' Surf.Area= 0 sf Storage= 884 cf

Plug-Flow detention time= 7.1 min calculated for 1,696 cf (100% of inflow)

Center-of-Mass det. time= 7.1 min (830.7 - 823.5)

Volume	Invert	Avail.Storage	Storage Description
#1	431.80'	884 cf	60.0" Round HDPE_Round 60" L= 45.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	431.80'	12.0" Round Outlet Pipe L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 431.80' / 431.70' S= 0.0050 1' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	431.80'	3.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.80'	1.5" Vert. ROW 2 Orifice C= 0.600
#4	Device 1	433.50'	1.5" Vert. ROW 3 Orifice C= 0.600
#5	Secondary	434.00'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.43 cfs @ 12.01 hrs HW=433.94' TW=0.00' (Dynamic Tailwater)

↑ **1=Outlet Pipe** (Passes 0.43 cfs of 4.84 cfs potential flow)

↑ **2=ROW 1 Orifice** (Orifice Controls 0.34 cfs @ 6.83 fps)

↑ **3=ROW 2 Orifice** (Orifice Controls 0.06 cfs @ 4.99 fps)

↑ **4=ROW 3 Orifice** (Orifice Controls 0.04 cfs @ 2.95 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=431.80' TW=0.00' (Dynamic Tailwater)

↑ **5=Riser Overflow** (Controls 0.00 cfs)

Summary for Pond TR1: Hydrodynamic Separator Unit

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 1.68" for 2-yr event
Inflow = 1.76 cfs @ 11.93 hrs, Volume= 3,325 cf
Primary = 1.76 cfs @ 11.93 hrs, Volume= 3,325 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Link SN001: SN001

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 1.68" for 2-yr event
Inflow = 0.14 cfs @ 12.41 hrs, Volume= 3,325 cf
Primary = 0.14 cfs @ 12.41 hrs, Volume= 3,325 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 1.30" for 2-yr event
Inflow = 0.43 cfs @ 12.01 hrs, Volume= 1,696 cf
Primary = 0.43 cfs @ 12.01 hrs, Volume= 1,696 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area = 3,371 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: BuildngRunoff Area=23,693 sf 86.19% Impervious Runoff Depth=2.70"
Flow Length=450' Tc=2.9 min CN=92 Runoff=2.73 cfs 5,338 cf**Subcatchment20S: Impervious Paved**Runoff Area=15,620 sf 73.53% Impervious Runoff Depth=2.25"
Flow Length=58' Slope=0.0200 '/' Tc=2.5 min CN=87 Runoff=1.59 cfs 2,923 cf**Subcatchment30S: Existing**Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=115' Tc=1.9 min CN=39 Runoff=0.00 cfs 3 cf**Pond 1P: JellyFish 4-2-1**Peak Elev=435.47' Inflow=1.59 cfs 2,923 cf
Primary=0.44 cfs 2,338 cf Secondary=1.14 cfs 585 cf Outflow=1.59 cfs 2,923 cf**Pond DET1: 60" HDPE Detention Pipe**Peak Elev=435.11' Storage=2,433 cf Inflow=2.73 cfs 5,338 cf
Primary=0.49 cfs 5,338 cf Secondary=0.00 cfs 0 cf Outflow=0.49 cfs 5,338 cf**Pond DET2: 60" CMP**Peak Elev=434.14' Storage=407 cf Inflow=1.59 cfs 2,923 cf
Primary=0.46 cfs 2,542 cf Secondary=1.12 cfs 381 cf Outflow=1.58 cfs 2,923 cf**Pond TR1: Hydrodynamic Separator Unit**Inflow=2.73 cfs 5,338 cf
Primary=2.73 cfs 5,338 cf**Link SN001: SN001**Inflow=0.49 cfs 5,338 cf
Primary=0.49 cfs 5,338 cf**Link SN002: SN002**Inflow=1.58 cfs 2,923 cf
Primary=1.58 cfs 2,923 cf**Link SN003: SN003**Inflow=0.00 cfs 3 cf
Primary=0.00 cfs 3 cf**Total Runoff Area = 42,684 sf Runoff Volume = 8,265 cf Average Runoff Depth = 2.32"**
25.25% Pervious = 10,776 sf 74.75% Impervious = 31,908 sf

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Summary for Subcatchment 10S: Building

Runoff = 2.73 cfs @ 11.93 hrs, Volume= 5,338 cf, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.57"

	Area (sf)	CN	Description
*	8,231	98	Roofs, HSG A
	12,191	98	Roofs, HSG C
	1,541	39	>75% Grass cover, Good, HSG A
	1,730	74	>75% Grass cover, Good, HSG C
	23,693	92	Weighted Average
	3,271		13.81% Pervious Area
	20,422		86.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	20	0.0500	0.16		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.8	430	0.0250	8.48	6.66	Pipe Channel, BC 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
2.9	450	Total			

Summary for Subcatchment 20S: Impervious Paved Road/Parking/Sidewalk

Runoff = 1.59 cfs @ 11.93 hrs, Volume= 2,923 cf, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.57"

	Area (sf)	CN	Description
	5,113	98	Paved parking, HSG A
	6,373	98	Paved parking, HSG C
*	2,075	39	>75% Grass cover, Good, HSG A
	2,059	74	>75% Grass cover, Good, HSG C
	15,620	87	Weighted Average
	4,134		26.47% Pervious Area
	11,486		73.53% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	10	0.0200	0.09		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.2	7	0.0200	0.71		Sheet Flow, BC Smooth surfaces n= 0.011 P2= 2.49"
0.3	15	0.0200	0.83		Sheet Flow, CD Smooth surfaces n= 0.011 P2= 2.49"
0.2	26	0.0200	2.87		Shallow Concentrated Flow, DE Paved Kv= 20.3 fps
2.5	58	Total			

Summary for Subcatchment 30S: Existing

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 3 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.57"

Area (sf)	CN	Description
3,371	39	>75% Grass cover, Good, HSG A
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	20	0.2000	0.27		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.7	95	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
1.9	115	Total			

Summary for Pond 1P: JellyFish 4-2-1

[57] Hint: Peaked at 435.47' (Flood elevation advised)

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 2.25" for 10-yr event
 Inflow = 1.59 cfs @ 11.93 hrs, Volume= 2,923 cf
 Outflow = 1.59 cfs @ 11.93 hrs, Volume= 2,923 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.44 cfs @ 11.73 hrs, Volume= 2,338 cf
 Secondary = 1.14 cfs @ 11.93 hrs, Volume= 585 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 435.47' @ 11.93 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.80'	High-Flo Cartridges X 2.00 Head (feet) 0.00 0.50 0.58 0.67 0.75 0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00 Disch. (cfs) 0.000 0.000 0.015 0.030 0.044 0.059 0.074 0.089 0.104 0.119 0.134 0.148 0.163 0.178 0.178
#2	Primary	432.80'	Lo-Flow Cartridges

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Head (feet) 0.00 0.08 0.17 0.25 0.33 0.42 0.50 0.58 0.67 0.75
 0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00
 Disch. (cfs) 0.000 0.005 0.010 0.015 0.020 0.025 0.030 0.035
 0.040 0.045 0.050 0.054 0.059 0.064 0.069 0.074 0.079 0.084
 0.089 0.089

#3 Secondary 435.22' **2.8' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)**Primary OutFlow** Max=0.44 cfs @ 11.73 hrs HW=435.24' TW=432.67' (Dynamic Tailwater)

└─1=High-Flo Cartridges (Custom Controls 0.36 cfs)

└─2=Lo-Flow Cartridges (Custom Controls 0.09 cfs)

Secondary OutFlow Max=1.14 cfs @ 11.93 hrs HW=435.47' TW=434.14' (Dynamic Tailwater)

└─3=Sharp-Crested Rectangular Weir (Weir Controls 1.14 cfs @ 1.64 fps)

Summary for Pond DET1: 60" HDPE Detention Pipe Chamber

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 2.70" for 10-yr event
 Inflow = 2.73 cfs @ 11.93 hrs, Volume= 5,338 cf
 Outflow = 0.49 cfs @ 12.06 hrs, Volume= 5,338 cf, Atten= 82%, Lag= 7.3 min
 Primary = 0.49 cfs @ 12.06 hrs, Volume= 5,338 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 435.11' @ 12.06 hrs Surf.Area= 1,006 sf Storage= 2,433 cf

Flood Elev= 439.65' Surf.Area= 20 sf Storage= 4,073 cf

Plug-Flow detention time= 139.5 min calculated for 5,338 cf (100% of inflow)

Center-of-Mass det. time= 139.6 min (927.4 - 787.8)

Volume	Invert	Avail.Storage	Storage Description
#1	432.20'	3,927 cf	60.0" Round HDPE_Round 60" x 2 L= 100.0'
#2	432.20'	146 cf	5.00'D x 7.45'H MH
		4,073 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	432.20'	12.0" Round Outelt Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.20' / 431.70' S= 0.0050 ' / ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	432.20'	1.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.70'	1.0" Vert. ROW 2 Orifice X 3.00 C= 0.600
#4	Device 1	434.25'	1.0" Vert. ROW 3 Orifice X 2.00 C= 0.600
#5	Device 1	434.60'	2.0" Vert. ROW 4 Orifice X 4.00 C= 0.600
#6	Secondary	436.30'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

19-06-03 _ Underground Storage Design and Filter- BLDType II 24-hr 10-yr Rainfall=3.57"

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Primary OutFlow Max=0.49 cfs @ 12.06 hrs HW=435.11' TW=0.00' (Dynamic Tailwater)

- ↑ **1=Outlet Pipe** (Passes 0.49 cfs of 4.79 cfs potential flow)
- ↑ **2=ROW 1 Orifice** (Orifice Controls 0.04 cfs @ 8.16 fps)
- ↑ **3=ROW 2 Orifice** (Orifice Controls 0.12 cfs @ 7.42 fps)
- ↑ **4=ROW 3 Orifice** (Orifice Controls 0.05 cfs @ 4.37 fps)
- ↑ **5=ROW 4 Orifice** (Orifice Controls 0.28 cfs @ 3.16 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=432.20' TW=0.00' (Dynamic Tailwater)

- ↑ **6=Riser Overflow** (Controls 0.00 cfs)

Summary for Pond DET2: 60" CMP

[78] Warning: Submerged Pond 1P Primary device # 1 by 1.34'

[78] Warning: Submerged Pond 1P Primary device # 2 by 1.34'

[80] Warning: Exceeded Pond 1P by 0.15' @ 12.07 hrs (0.29 cfs 95 cf)

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 2.25" for 10-yr event
 Inflow = 1.59 cfs @ 11.93 hrs, Volume= 2,923 cf
 Outflow = 1.58 cfs @ 11.94 hrs, Volume= 2,923 cf, Atten= 1%, Lag= 0.3 min
 Primary = 0.46 cfs @ 11.94 hrs, Volume= 2,542 cf
 Secondary = 1.12 cfs @ 11.94 hrs, Volume= 381 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 434.14' @ 11.94 hrs Surf.Area= 225 sf Storage= 407 cf

Flood Elev= 439.35' Surf.Area= 0 sf Storage= 884 cf

Plug-Flow detention time= 6.3 min calculated for 2,922 cf (100% of inflow)

Center-of-Mass det. time= 6.3 min (814.3 - 808.0)

Volume	Invert	Avail.Storage	Storage Description
#1	431.80'	884 cf	60.0" Round HDPE_Round 60" L= 45.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	431.80'	12.0" Round Outlet Pipe L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 431.80' / 431.70' S= 0.0050 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	431.80'	3.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.80'	1.5" Vert. ROW 2 Orifice C= 0.600
#4	Device 1	433.50'	1.5" Vert. ROW 3 Orifice C= 0.600
#5	Secondary	434.00'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.46 cfs @ 11.94 hrs HW=434.14' TW=0.00' (Dynamic Tailwater)

↑ **1=Outlet Pipe** (Passes 0.46 cfs of 5.13 cfs potential flow)
↑ **2=ROW 1 Orifice** (Orifice Controls 0.35 cfs @ 7.17 fps)
↑ **3=ROW 2 Orifice** (Orifice Controls 0.07 cfs @ 5.45 fps)
↑ **4=ROW 3 Orifice** (Orifice Controls 0.05 cfs @ 3.67 fps)

Secondary OutFlow Max=1.11 cfs @ 11.94 hrs HW=434.14' TW=0.00' (Dynamic Tailwater)

↑ **5=Riser Overflow** (Weir Controls 1.11 cfs @ 1.24 fps)

Summary for Pond TR1: Hydrodynamic Separator Unit

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 2.70" for 10-yr event
Inflow = 2.73 cfs @ 11.93 hrs, Volume= 5,338 cf
Primary = 2.73 cfs @ 11.93 hrs, Volume= 5,338 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Link SN001: SN001

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 2.70" for 10-yr event
Inflow = 0.49 cfs @ 12.06 hrs, Volume= 5,338 cf
Primary = 0.49 cfs @ 12.06 hrs, Volume= 5,338 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 2.25" for 10-yr event
Inflow = 1.58 cfs @ 11.94 hrs, Volume= 2,923 cf
Primary = 1.58 cfs @ 11.94 hrs, Volume= 2,923 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area = 3,371 sf, 0.00% Impervious, Inflow Depth = 0.01" for 10-yr event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 3 cf
Primary = 0.00 cfs @ 24.00 hrs, Volume= 3 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Buildng Runoff Area=23,693 sf 86.19% Impervious Runoff Depth=3.50"
Flow Length=450' Tc=2.9 min CN=92 Runoff=3.47 cfs 6,901 cf

Subcatchment20S: Impervious Paved Runoff Area=15,620 sf 73.53% Impervious Runoff Depth=3.00"
Flow Length=58' Slope=0.0200 '/' Tc=2.5 min CN=87 Runoff=2.08 cfs 3,901 cf

Subcatchment30S: Existing Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.09"
Flow Length=115' Tc=1.9 min CN=39 Runoff=0.00 cfs 26 cf

Pond 1P: JellyFish 4-2-1 Peak Elev=435.54' Inflow=2.08 cfs 3,901 cf
Primary=0.44 cfs 2,948 cf Secondary=1.64 cfs 953 cf Outflow=2.08 cfs 3,901 cf

Pond DET1: 60" HDPE Detention Pipe Peak Elev=435.78' Storage=3,082 cf Inflow=3.47 cfs 6,901 cf
Primary=0.69 cfs 6,901 cf Secondary=0.00 cfs 0 cf Outflow=0.69 cfs 6,901 cf

Pond DET2: 60" CMP Peak Elev=434.18' Storage=415 cf Inflow=2.08 cfs 3,901 cf
Primary=0.47 cfs 3,159 cf Secondary=1.60 cfs 741 cf Outflow=2.07 cfs 3,901 cf

Pond TR1: Hydrodynamic Separator Unit Inflow=3.47 cfs 6,901 cf
Primary=3.47 cfs 6,901 cf

Link SN001: SN001 Inflow=0.69 cfs 6,901 cf
Primary=0.69 cfs 6,901 cf

Link SN002: SN002 Inflow=2.07 cfs 3,901 cf
Primary=2.07 cfs 3,901 cf

Link SN003: SN003 Inflow=0.00 cfs 26 cf
Primary=0.00 cfs 26 cf

Total Runoff Area = 42,684 sf Runoff Volume = 10,828 cf Average Runoff Depth = 3.04"
25.25% Pervious = 10,776 sf 74.75% Impervious = 31,908 sf

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Summary for Subcatchment 10S: Building

Runoff = 3.47 cfs @ 11.93 hrs, Volume= 6,901 cf, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.39"

	Area (sf)	CN	Description
*	8,231	98	Roofs, HSG A
	12,191	98	Roofs, HSG C
	1,541	39	>75% Grass cover, Good, HSG A
	1,730	74	>75% Grass cover, Good, HSG C
	23,693	92	Weighted Average
	3,271		13.81% Pervious Area
	20,422		86.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	20	0.0500	0.16		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.8	430	0.0250	8.48	6.66	Pipe Channel, BC 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
2.9	450	Total			

Summary for Subcatchment 20S: Impervious Paved Road/Parking/Sidewalk

Runoff = 2.08 cfs @ 11.93 hrs, Volume= 3,901 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.39"

	Area (sf)	CN	Description
	5,113	98	Paved parking, HSG A
	6,373	98	Paved parking, HSG C
*	2,075	39	>75% Grass cover, Good, HSG A
	2,059	74	>75% Grass cover, Good, HSG C
	15,620	87	Weighted Average
	4,134		26.47% Pervious Area
	11,486		73.53% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	10	0.0200	0.09		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.2	7	0.0200	0.71		Sheet Flow, BC Smooth surfaces n= 0.011 P2= 2.49"
0.3	15	0.0200	0.83		Sheet Flow, CD Smooth surfaces n= 0.011 P2= 2.49"
0.2	26	0.0200	2.87		Shallow Concentrated Flow, DE Paved Kv= 20.3 fps
2.5	58	Total			

Summary for Subcatchment 30S: Existing

Runoff = 0.00 cfs @ 14.81 hrs, Volume= 26 cf, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-yr Rainfall=4.39"

Area (sf)	CN	Description
3,371	39	>75% Grass cover, Good, HSG A
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	20	0.2000	0.27		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.7	95	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
1.9	115	Total			

Summary for Pond 1P: JellyFish 4-2-1

[57] Hint: Peaked at 435.54' (Flood elevation advised)

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 3.00" for 25-yr event
 Inflow = 2.08 cfs @ 11.93 hrs, Volume= 3,901 cf
 Outflow = 2.08 cfs @ 11.93 hrs, Volume= 3,901 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.44 cfs @ 11.67 hrs, Volume= 2,948 cf
 Secondary = 1.64 cfs @ 11.93 hrs, Volume= 953 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 435.54' @ 11.93 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.80'	High-Flo Cartridges X 2.00 Head (feet) 0.00 0.50 0.58 0.67 0.75 0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00 Disch. (cfs) 0.000 0.000 0.015 0.030 0.044 0.059 0.074 0.089 0.104 0.119 0.134 0.148 0.163 0.178 0.178
#2	Primary	432.80'	Lo-Flow Cartridges

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Head (feet) 0.00 0.08 0.17 0.25 0.33 0.42 0.50 0.58 0.67 0.75
 0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00
 Disch. (cfs) 0.000 0.005 0.010 0.015 0.020 0.025 0.030 0.035
 0.040 0.045 0.050 0.054 0.059 0.064 0.069 0.074 0.079 0.084
 0.089 0.089

#3 Secondary 435.22' **2.8' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)**Primary OutFlow** Max=0.44 cfs @ 11.67 hrs HW=435.23' TW=432.60' (Dynamic Tailwater)

└─1=High-Flo Cartridges (Custom Controls 0.36 cfs)

└─2=Lo-Flow Cartridges (Custom Controls 0.09 cfs)

Secondary OutFlow Max=1.64 cfs @ 11.93 hrs HW=435.54' TW=434.18' (Dynamic Tailwater)

└─3=Sharp-Crested Rectangular Weir (Weir Controls 1.64 cfs @ 1.86 fps)

Summary for Pond DET1: 60" HDPE Detention Pipe Chamber

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 3.50" for 25-yr event
 Inflow = 3.47 cfs @ 11.93 hrs, Volume= 6,901 cf
 Outflow = 0.69 cfs @ 12.05 hrs, Volume= 6,901 cf, Atten= 80%, Lag= 6.9 min
 Primary = 0.69 cfs @ 12.05 hrs, Volume= 6,901 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 435.78' @ 12.05 hrs Surf.Area= 921 sf Storage= 3,082 cf

Flood Elev= 439.65' Surf.Area= 20 sf Storage= 4,073 cf

Plug-Flow detention time= 127.4 min calculated for 6,900 cf (100% of inflow)

Center-of-Mass det. time= 127.5 min (908.2 - 780.7)

Volume	Invert	Avail.Storage	Storage Description
#1	432.20'	3,927 cf	60.0" Round HDPE_Round 60" x 2 L= 100.0'
#2	432.20'	146 cf	5.00'D x 7.45'H MH
		4,073 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	432.20'	12.0" Round Outelt Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.20' / 431.70' S= 0.0050 ' / ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	432.20'	1.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.70'	1.0" Vert. ROW 2 Orifice X 3.00 C= 0.600
#4	Device 1	434.25'	1.0" Vert. ROW 3 Orifice X 2.00 C= 0.600
#5	Device 1	434.60'	2.0" Vert. ROW 4 Orifice X 4.00 C= 0.600
#6	Secondary	436.30'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

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Primary OutFlow Max=0.69 cfs @ 12.05 hrs HW=435.78' TW=0.00' (Dynamic Tailwater)

- ↑ **1=Outlet Pipe** (Passes 0.69 cfs of 5.42 cfs potential flow)
- ↑ **2=ROW 1 Orifice** (Orifice Controls 0.05 cfs @ 9.06 fps)
- ↑ **3=ROW 2 Orifice** (Orifice Controls 0.14 cfs @ 8.40 fps)
- ↑ **4=ROW 3 Orifice** (Orifice Controls 0.06 cfs @ 5.88 fps)
- ↑ **5=ROW 4 Orifice** (Orifice Controls 0.44 cfs @ 5.05 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=432.20' TW=0.00' (Dynamic Tailwater)

- ↑ **6=Riser Overflow** (Controls 0.00 cfs)

Summary for Pond DET2: 60" CMP

[78] Warning: Submerged Pond 1P Primary device # 1 by 1.38'

[78] Warning: Submerged Pond 1P Primary device # 2 by 1.38'

[80] Warning: Exceeded Pond 1P by 0.05' @ 12.08 hrs (0.30 cfs 63 cf)

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 3.00" for 25-yr event
 Inflow = 2.08 cfs @ 11.93 hrs, Volume= 3,901 cf
 Outflow = 2.07 cfs @ 11.93 hrs, Volume= 3,901 cf, Atten= 0%, Lag= 0.3 min
 Primary = 0.47 cfs @ 11.93 hrs, Volume= 3,159 cf
 Secondary = 1.60 cfs @ 11.93 hrs, Volume= 741 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 434.18' @ 11.93 hrs Surf.Area= 225 sf Storage= 415 cf

Flood Elev= 439.35' Surf.Area= 0 sf Storage= 884 cf

Plug-Flow detention time= 5.8 min calculated for 3,900 cf (100% of inflow)

Center-of-Mass det. time= 5.8 min (805.6 - 799.8)

Volume	Invert	Avail.Storage	Storage Description
#1	431.80'	884 cf	60.0" Round HDPE_Round 60" L= 45.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	431.80'	12.0" Round Outlet Pipe L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 431.80' / 431.70' S= 0.0050 '/ Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	431.80'	3.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.80'	1.5" Vert. ROW 2 Orifice C= 0.600
#4	Device 1	433.50'	1.5" Vert. ROW 3 Orifice C= 0.600
#5	Secondary	434.00'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.47 cfs @ 11.93 hrs HW=434.18' TW=0.00' (Dynamic Tailwater)

↑ **1=Outlet Pipe** (Passes 0.47 cfs of 5.19 cfs potential flow)

↑ **2=ROW 1 Orifice** (Orifice Controls 0.36 cfs @ 7.23 fps)

↑ **3=ROW 2 Orifice** (Orifice Controls 0.07 cfs @ 5.53 fps)

↑ **4=ROW 3 Orifice** (Orifice Controls 0.05 cfs @ 3.79 fps)

Secondary OutFlow Max=1.60 cfs @ 11.93 hrs HW=434.18' TW=0.00' (Dynamic Tailwater)

↑ **5=Riser Overflow** (Weir Controls 1.60 cfs @ 1.40 fps)

Summary for Pond TR1: Hydrodynamic Separator Unit

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	23,693 sf, 86.19% Impervious, Inflow Depth = 3.50"	for 25-yr event
Inflow =	3.47 cfs @ 11.93 hrs, Volume=	6,901 cf
Primary =	3.47 cfs @ 11.93 hrs, Volume=	6,901 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Link SN001: SN001

Inflow Area =	23,693 sf, 86.19% Impervious, Inflow Depth = 3.50"	for 25-yr event
Inflow =	0.69 cfs @ 12.05 hrs, Volume=	6,901 cf
Primary =	0.69 cfs @ 12.05 hrs, Volume=	6,901 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

Inflow Area =	15,620 sf, 73.53% Impervious, Inflow Depth = 3.00"	for 25-yr event
Inflow =	2.07 cfs @ 11.93 hrs, Volume=	3,901 cf
Primary =	2.07 cfs @ 11.93 hrs, Volume=	3,901 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area =	3,371 sf, 0.00% Impervious, Inflow Depth = 0.09"	for 25-yr event
Inflow =	0.00 cfs @ 14.81 hrs, Volume=	26 cf
Primary =	0.00 cfs @ 14.81 hrs, Volume=	26 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Buildng Runoff Area=23,693 sf 86.19% Impervious Runoff Depth=4.22"
Flow Length=450' Tc=2.9 min CN=92 Runoff=4.13 cfs 8,325 cf

Subcatchment20S: Impervious Paved Runoff Area=15,620 sf 73.53% Impervious Runoff Depth=3.69"
Flow Length=58' Slope=0.0200 '/' Tc=2.5 min CN=87 Runoff=2.53 cfs 4,803 cf

Subcatchment30S: Existing Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=115' Tc=1.9 min CN=39 Runoff=0.01 cfs 64 cf

Pond 1P: JellyFish 4-2-1 Peak Elev=435.60' Inflow=2.53 cfs 4,803 cf
Primary=0.44 cfs 3,494 cf Secondary=2.08 cfs 1,309 cf Outflow=2.53 cfs 4,803 cf

Pond DET1: 60" HDPE Detention Pipe Peak Elev=436.40' Storage=3,607 cf Inflow=4.13 cfs 8,325 cf
Primary=0.83 cfs 8,205 cf Secondary=0.69 cfs 120 cf Outflow=1.52 cfs 8,325 cf

Pond DET2: 60" CMP Peak Elev=434.21' Storage=423 cf Inflow=2.53 cfs 4,803 cf
Primary=0.47 cfs 3,713 cf Secondary=2.05 cfs 1,090 cf Outflow=2.52 cfs 4,803 cf

Pond TR1: Hydrodynamic Separator Unit Inflow=4.13 cfs 8,325 cf
Primary=4.13 cfs 8,325 cf

Link SN001: SN001 Inflow=1.52 cfs 8,325 cf
Primary=1.52 cfs 8,325 cf

Link SN002: SN002 Inflow=2.52 cfs 4,803 cf
Primary=2.52 cfs 4,803 cf

Link SN003: SN003 Inflow=0.01 cfs 64 cf
Primary=0.01 cfs 64 cf

Total Runoff Area = 42,684 sf Runoff Volume = 13,192 cf Average Runoff Depth = 3.71"
25.25% Pervious = 10,776 sf 74.75% Impervious = 31,908 sf

19-06-03 _ Underground Storage Design and Filter- BLDType II 24-hr 50-yr Rainfall=5.13"

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Summary for Subcatchment 10S: Building

Runoff = 4.13 cfs @ 11.93 hrs, Volume= 8,325 cf, Depth= 4.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=5.13"

	Area (sf)	CN	Description
*	8,231	98	Roofs, HSG A
	12,191	98	Roofs, HSG C
	1,541	39	>75% Grass cover, Good, HSG A
	1,730	74	>75% Grass cover, Good, HSG C
	23,693	92	Weighted Average
	3,271		13.81% Pervious Area
	20,422		86.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	20	0.0500	0.16		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.8	430	0.0250	8.48	6.66	Pipe Channel, BC 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
2.9	450	Total			

Summary for Subcatchment 20S: Impervious Paved Road/Parking/Sidewalk

Runoff = 2.53 cfs @ 11.93 hrs, Volume= 4,803 cf, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=5.13"

	Area (sf)	CN	Description
	5,113	98	Paved parking, HSG A
	6,373	98	Paved parking, HSG C
*	2,075	39	>75% Grass cover, Good, HSG A
	2,059	74	>75% Grass cover, Good, HSG C
	15,620	87	Weighted Average
	4,134		26.47% Pervious Area
	11,486		73.53% Impervious Area

19-06-03 _ Underground Storage Design and Filter- BLD Type II 24-hr 50-yr Rainfall=5.13"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	10	0.0200	0.09		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.2	7	0.0200	0.71		Sheet Flow, BC Smooth surfaces n= 0.011 P2= 2.49"
0.3	15	0.0200	0.83		Sheet Flow, CD Smooth surfaces n= 0.011 P2= 2.49"
0.2	26	0.0200	2.87		Shallow Concentrated Flow, DE Paved Kv= 20.3 fps
2.5	58	Total			

Summary for Subcatchment 30S: Existing

Runoff = 0.01 cfs @ 11.99 hrs, Volume= 64 cf, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-yr Rainfall=5.13"

Area (sf)	CN	Description
3,371	39	>75% Grass cover, Good, HSG A
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	20	0.2000	0.27		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.7	95	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
1.9	115	Total			

Summary for Pond 1P: JellyFish 4-2-1

[57] Hint: Peaked at 435.60' (Flood elevation advised)

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 3.69" for 50-yr event
 Inflow = 2.53 cfs @ 11.93 hrs, Volume= 4,803 cf
 Outflow = 2.53 cfs @ 11.93 hrs, Volume= 4,803 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.44 cfs @ 11.64 hrs, Volume= 3,494 cf
 Secondary = 2.08 cfs @ 11.93 hrs, Volume= 1,309 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 435.60' @ 11.93 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.80'	High-Flo Cartridges X 2.00 Head (feet) 0.00 0.50 0.58 0.67 0.75 0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00 Disch. (cfs) 0.000 0.000 0.015 0.030 0.044 0.059 0.074 0.089 0.104 0.119 0.134 0.148 0.163 0.178 0.178
#2	Primary	432.80'	Lo-Flow Cartridges

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Head (feet) 0.00 0.08 0.17 0.25 0.33 0.42 0.50 0.58 0.67 0.75
 0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00
 Disch. (cfs) 0.000 0.005 0.010 0.015 0.020 0.025 0.030 0.035
 0.040 0.045 0.050 0.054 0.059 0.064 0.069 0.074 0.079 0.084
 0.089 0.089

#3 Secondary 435.22' **2.8' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)**Primary OutFlow** Max=0.44 cfs @ 11.64 hrs HW=435.24' TW=432.62' (Dynamic Tailwater)

└─1=High-Flo Cartridges (Custom Controls 0.36 cfs)

└─2=Lo-Flow Cartridges (Custom Controls 0.09 cfs)

Secondary OutFlow Max=2.08 cfs @ 11.93 hrs HW=435.60' TW=434.21' (Dynamic Tailwater)

└─3=Sharp-Crested Rectangular Weir (Weir Controls 2.08 cfs @ 2.01 fps)

Summary for Pond DET1: 60" HDPE Detention Pipe Chamber

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 4.22" for 50-yr event
 Inflow = 4.13 cfs @ 11.93 hrs, Volume= 8,325 cf
 Outflow = 1.52 cfs @ 12.02 hrs, Volume= 8,325 cf, Atten= 63%, Lag= 5.3 min
 Primary = 0.83 cfs @ 12.02 hrs, Volume= 8,205 cf
 Secondary = 0.69 cfs @ 12.02 hrs, Volume= 120 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 436.40' @ 12.02 hrs Surf.Area= 751 sf Storage= 3,607 cf

Flood Elev= 439.65' Surf.Area= 20 sf Storage= 4,073 cf

Plug-Flow detention time= 120.2 min calculated for 8,325 cf (100% of inflow)

Center-of-Mass det. time= 120.1 min (895.8 - 775.7)

Volume	Invert	Avail.Storage	Storage Description
#1	432.20'	3,927 cf	60.0" Round HDPE_Round 60" x 2 L= 100.0'
#2	432.20'	146 cf	5.00'D x 7.45'H MH
		4,073 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	432.20'	12.0" Round Outelt Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.20' / 431.70' S= 0.0050 ' / ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	432.20'	1.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.70'	1.0" Vert. ROW 2 Orifice X 3.00 C= 0.600
#4	Device 1	434.25'	1.0" Vert. ROW 3 Orifice X 2.00 C= 0.600
#5	Device 1	434.60'	2.0" Vert. ROW 4 Orifice X 4.00 C= 0.600
#6	Secondary	436.30'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

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Primary OutFlow Max=0.83 cfs @ 12.02 hrs HW=436.40' TW=0.00' (Dynamic Tailwater)

- ↑ **1=Outlet Pipe** (Passes 0.83 cfs of 5.94 cfs potential flow)
 - ↑ **2=ROW 1 Orifice** (Orifice Controls 0.05 cfs @ 9.82 fps)
 - ↑ **3=ROW 2 Orifice** (Orifice Controls 0.15 cfs @ 9.21 fps)
 - ↑ **4=ROW 3 Orifice** (Orifice Controls 0.08 cfs @ 7.00 fps)
 - ↑ **5=ROW 4 Orifice** (Orifice Controls 0.55 cfs @ 6.31 fps)

Secondary OutFlow Max=0.68 cfs @ 12.02 hrs HW=436.40' TW=0.00' (Dynamic Tailwater)

- ↑ **6=Riser Overflow** (Weir Controls 0.68 cfs @ 1.05 fps)

Summary for Pond DET2: 60" CMP

[78] Warning: Submerged Pond 1P Primary device # 1 by 1.41'

[78] Warning: Submerged Pond 1P Primary device # 2 by 1.41'

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 3.69" for 50-yr event
 Inflow = 2.53 cfs @ 11.93 hrs, Volume= 4,803 cf
 Outflow = 2.52 cfs @ 11.93 hrs, Volume= 4,803 cf, Atten= 0%, Lag= 0.3 min
 Primary = 0.47 cfs @ 11.93 hrs, Volume= 3,713 cf
 Secondary = 2.05 cfs @ 11.93 hrs, Volume= 1,090 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 434.21' @ 11.93 hrs Surf.Area= 225 sf Storage= 423 cf

Flood Elev= 439.35' Surf.Area= 0 sf Storage= 884 cf

Plug-Flow detention time= 5.5 min calculated for 4,802 cf (100% of inflow)

Center-of-Mass det. time= 5.5 min (799.4 - 793.9)

Volume	Invert	Avail.Storage	Storage Description
#1	431.80'	884 cf	60.0" Round HDPE_Round 60" L= 45.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	431.80'	12.0" Round Outlet Pipe L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 431.80' / 431.70' S= 0.0050 ' / ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	431.80'	3.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.80'	1.5" Vert. ROW 2 Orifice C= 0.600
#4	Device 1	433.50'	1.5" Vert. ROW 3 Orifice C= 0.600
#5	Secondary	434.00'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.47 cfs @ 11.93 hrs HW=434.21' TW=0.00' (Dynamic Tailwater)

- ↑ **1=Outlet Pipe** (Passes 0.47 cfs of 5.23 cfs potential flow)
 - ↑ **2=ROW 1 Orifice** (Orifice Controls 0.36 cfs @ 7.29 fps)
 - ↑ **3=ROW 2 Orifice** (Orifice Controls 0.07 cfs @ 5.60 fps)
 - ↑ **4=ROW 3 Orifice** (Orifice Controls 0.05 cfs @ 3.89 fps)

Secondary OutFlow Max=2.04 cfs @ 11.93 hrs HW=434.21' TW=0.00' (Dynamic Tailwater)

- ↑ **5=Riser Overflow** (Weir Controls 2.04 cfs @ 1.51 fps)

Summary for Pond TR1: Hydrodynamic Separator Unit

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 4.22" for 50-yr event
Inflow = 4.13 cfs @ 11.93 hrs, Volume= 8,325 cf
Primary = 4.13 cfs @ 11.93 hrs, Volume= 8,325 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Link SN001: SN001

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 4.22" for 50-yr event
Inflow = 1.52 cfs @ 12.02 hrs, Volume= 8,325 cf
Primary = 1.52 cfs @ 12.02 hrs, Volume= 8,325 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 3.69" for 50-yr event
Inflow = 2.52 cfs @ 11.93 hrs, Volume= 4,803 cf
Primary = 2.52 cfs @ 11.93 hrs, Volume= 4,803 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area = 3,371 sf, 0.00% Impervious, Inflow Depth = 0.23" for 50-yr event
Inflow = 0.01 cfs @ 11.99 hrs, Volume= 64 cf
Primary = 0.01 cfs @ 11.99 hrs, Volume= 64 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Building

Runoff Area=23,693 sf 86.19% Impervious Runoff Depth=5.06"
Flow Length=450' Tc=2.9 min CN=92 Runoff=4.89 cfs 9,990 cf

Subcatchment20S: Impervious Paved

Runoff Area=15,620 sf 73.53% Impervious Runoff Depth=4.51"
Flow Length=58' Slope=0.0200 '/' Tc=2.5 min CN=87 Runoff=3.05 cfs 5,867 cf

Subcatchment30S: Existing

Runoff Area=3,371 sf 0.00% Impervious Runoff Depth=0.44"
Flow Length=115' Tc=1.9 min CN=39 Runoff=0.04 cfs 124 cf

Pond 1P: JellyFish 4-2-1

Peak Elev=435.66' Inflow=3.05 cfs 5,867 cf
Primary=0.44 cfs 4,128 cf Secondary=2.60 cfs 1,739 cf Outflow=3.05 cfs 5,867 cf

Pond DET1: 60" HDPE Detention Pipe

Peak Elev=436.59' Storage=3,738 cf Inflow=4.89 cfs 9,990 cf
Primary=0.87 cfs 9,133 cf Secondary=3.17 cfs 857 cf Outflow=4.04 cfs 9,990 cf

Pond DET2: 60" CMP

Peak Elev=434.25' Storage=430 cf Inflow=3.05 cfs 5,867 cf
Primary=0.48 cfs 4,353 cf Secondary=2.56 cfs 1,514 cf Outflow=3.04 cfs 5,867 cf

Pond TR1: Hydrodynamic Separator Unit

Inflow=4.89 cfs 9,990 cf
Primary=4.89 cfs 9,990 cf

Link SN001: SN001

Inflow=4.04 cfs 9,990 cf
Primary=4.04 cfs 9,990 cf

Link SN002: SN002

Inflow=3.04 cfs 5,867 cf
Primary=3.04 cfs 5,867 cf

Link SN003: SN003

Inflow=0.04 cfs 124 cf
Primary=0.04 cfs 124 cf

Total Runoff Area = 42,684 sf Runoff Volume = 15,982 cf Average Runoff Depth = 4.49"
25.25% Pervious = 10,776 sf 74.75% Impervious = 31,908 sf

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Summary for Subcatchment 10S: Building

Runoff = 4.89 cfs @ 11.93 hrs, Volume= 9,990 cf, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.99"

	Area (sf)	CN	Description
*	8,231	98	Roofs, HSG A
	12,191	98	Roofs, HSG C
	1,541	39	>75% Grass cover, Good, HSG A
	1,730	74	>75% Grass cover, Good, HSG C
	23,693	92	Weighted Average
	3,271		13.81% Pervious Area
	20,422		86.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	20	0.0500	0.16		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.8	430	0.0250	8.48	6.66	Pipe Channel, BC 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011
2.9	450	Total			

Summary for Subcatchment 20S: Impervious Paved Road/Parking/Sidewalk

Runoff = 3.05 cfs @ 11.93 hrs, Volume= 5,867 cf, Depth= 4.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.99"

	Area (sf)	CN	Description
*	5,113	98	Paved parking, HSG A
	6,373	98	Paved parking, HSG C
	2,075	39	>75% Grass cover, Good, HSG A
	2,059	74	>75% Grass cover, Good, HSG C
	15,620	87	Weighted Average
	4,134		26.47% Pervious Area
	11,486		73.53% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	10	0.0200	0.09		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.2	7	0.0200	0.71		Sheet Flow, BC Smooth surfaces n= 0.011 P2= 2.49"
0.3	15	0.0200	0.83		Sheet Flow, CD Smooth surfaces n= 0.011 P2= 2.49"
0.2	26	0.0200	2.87		Shallow Concentrated Flow, DE Paved Kv= 20.3 fps
2.5	58	Total			

Summary for Subcatchment 30S: Existing

Runoff = 0.04 cfs @ 11.96 hrs, Volume= 124 cf, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.99"

Area (sf)	CN	Description
3,371	39	>75% Grass cover, Good, HSG A
3,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	20	0.2000	0.27		Sheet Flow, AB Grass: Short n= 0.150 P2= 2.49"
0.7	95	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
1.9	115	Total			

Summary for Pond 1P: JellyFish 4-2-1

[57] Hint: Peaked at 435.66' (Flood elevation advised)

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 4.51" for 100-yr event
 Inflow = 3.05 cfs @ 11.93 hrs, Volume= 5,867 cf
 Outflow = 3.05 cfs @ 11.93 hrs, Volume= 5,867 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.44 cfs @ 11.61 hrs, Volume= 4,128 cf
 Secondary = 2.60 cfs @ 11.93 hrs, Volume= 1,739 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 435.66' @ 11.93 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.80'	High-Flo Cartridges X 2.00 Head (feet) 0.00 0.50 0.58 0.67 0.75 0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00 Disch. (cfs) 0.000 0.000 0.015 0.030 0.044 0.059 0.074 0.089 0.104 0.119 0.134 0.148 0.163 0.178 0.178
#2	Primary	432.80'	Lo-Flow Cartridges

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Head (feet) 0.00 0.08 0.17 0.25 0.33 0.42 0.50 0.58 0.67 0.75
 0.83 0.92 1.00 1.08 1.17 1.25 1.33 1.42 1.50 4.00
 Disch. (cfs) 0.000 0.005 0.010 0.015 0.020 0.025 0.030 0.035
 0.040 0.045 0.050 0.054 0.059 0.064 0.069 0.074 0.079 0.084
 0.089 0.089

#3 Secondary 435.22' **2.8' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)**Primary OutFlow** Max=0.44 cfs @ 11.61 hrs HW=435.24' TW=432.64' (Dynamic Tailwater)

└─1=High-Flo Cartridges (Custom Controls 0.36 cfs)

└─2=Lo-Flow Cartridges (Custom Controls 0.09 cfs)

Secondary OutFlow Max=2.60 cfs @ 11.93 hrs HW=435.66' TW=434.25' (Dynamic Tailwater)

└─3=Sharp-Crested Rectangular Weir (Weir Controls 2.60 cfs @ 2.17 fps)

Summary for Pond DET1: 60" HDPE Detention Pipe Chamber

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 5.06" for 100-yr event
 Inflow = 4.89 cfs @ 11.93 hrs, Volume= 9,990 cf
 Outflow = 4.04 cfs @ 11.97 hrs, Volume= 9,990 cf, Atten= 17%, Lag= 2.3 min
 Primary = 0.87 cfs @ 11.97 hrs, Volume= 9,133 cf
 Secondary = 3.17 cfs @ 11.97 hrs, Volume= 857 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 436.59' @ 11.97 hrs Surf.Area= 675 sf Storage= 3,738 cf

Flood Elev= 439.65' Surf.Area= 20 sf Storage= 4,073 cf

Plug-Flow detention time= 111.3 min calculated for 9,990 cf (100% of inflow)

Center-of-Mass det. time= 111.2 min (882.0 - 770.9)

Volume	Invert	Avail.Storage	Storage Description
#1	432.20'	3,927 cf	60.0" Round HDPE_Round 60" x 2 L= 100.0'
#2	432.20'	146 cf	5.00'D x 7.45'H MH
		4,073 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	432.20'	12.0" Round Outelt Pipe L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.20' / 431.70' S= 0.0050 ' / ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	432.20'	1.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.70'	1.0" Vert. ROW 2 Orifice X 3.00 C= 0.600
#4	Device 1	434.25'	1.0" Vert. ROW 3 Orifice X 2.00 C= 0.600
#5	Device 1	434.60'	2.0" Vert. ROW 4 Orifice X 4.00 C= 0.600
#6	Secondary	436.30'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

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Primary OutFlow Max=0.87 cfs @ 11.97 hrs HW=436.59' TW=0.00' (Dynamic Tailwater)

- ↑ **1=Outlet Pipe** (Passes 0.87 cfs of 6.08 cfs potential flow)
 - ↑ **2=ROW 1 Orifice** (Orifice Controls 0.05 cfs @ 10.04 fps)
 - ↑ **3=ROW 2 Orifice** (Orifice Controls 0.15 cfs @ 9.44 fps)
 - ↑ **4=ROW 3 Orifice** (Orifice Controls 0.08 cfs @ 7.29 fps)
 - ↑ **5=ROW 4 Orifice** (Orifice Controls 0.58 cfs @ 6.64 fps)

Secondary OutFlow Max=3.15 cfs @ 11.97 hrs HW=436.59' TW=0.00' (Dynamic Tailwater)

- ↑ **6=Riser Overflow** (Weir Controls 3.15 cfs @ 1.75 fps)

Summary for Pond DET2: 60" CMP

[78] Warning: Submerged Pond 1P Primary device # 1 by 1.45'

[78] Warning: Submerged Pond 1P Primary device # 2 by 1.45'

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 4.51" for 100-yr event
 Inflow = 3.05 cfs @ 11.93 hrs, Volume= 5,867 cf
 Outflow = 3.04 cfs @ 11.93 hrs, Volume= 5,867 cf, Atten= 0%, Lag= 0.2 min
 Primary = 0.48 cfs @ 11.93 hrs, Volume= 4,353 cf
 Secondary = 2.56 cfs @ 11.93 hrs, Volume= 1,514 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 434.25' @ 11.93 hrs Surf.Area= 225 sf Storage= 430 cf

Flood Elev= 439.35' Surf.Area= 0 sf Storage= 884 cf

Plug-Flow detention time= 5.3 min calculated for 5,867 cf (100% of inflow)

Center-of-Mass det. time= 5.3 min (793.6 - 788.3)

Volume	Invert	Avail.Storage	Storage Description
#1	431.80'	884 cf	60.0" Round HDPE_Round 60" L= 45.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	431.80'	12.0" Round Outlet Pipe L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 431.80' / 431.70' S= 0.0050 ' / ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	431.80'	3.0" Vert. ROW 1 Orifice C= 0.600
#3	Device 1	432.80'	1.5" Vert. ROW 2 Orifice C= 0.600
#4	Device 1	433.50'	1.5" Vert. ROW 3 Orifice C= 0.600
#5	Secondary	434.00'	24.0" Horiz. Riser Overflow C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.48 cfs @ 11.93 hrs HW=434.25' TW=0.00' (Dynamic Tailwater)

- ↑ **1=Outlet Pipe** (Passes 0.48 cfs of 5.28 cfs potential flow)
 - ↑ **2=ROW 1 Orifice** (Orifice Controls 0.36 cfs @ 7.34 fps)
 - ↑ **3=ROW 2 Orifice** (Orifice Controls 0.07 cfs @ 5.67 fps)
 - ↑ **4=ROW 3 Orifice** (Orifice Controls 0.05 cfs @ 3.99 fps)

Secondary OutFlow Max=2.55 cfs @ 11.93 hrs HW=434.25' TW=0.00' (Dynamic Tailwater)

- ↑ **5=Riser Overflow** (Weir Controls 2.55 cfs @ 1.63 fps)

Summary for Pond TR1: Hydrodynamic Separator Unit

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 5.06" for 100-yr event
Inflow = 4.89 cfs @ 11.93 hrs, Volume= 9,990 cf
Primary = 4.89 cfs @ 11.93 hrs, Volume= 9,990 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Summary for Link SN001: SN001

Inflow Area = 23,693 sf, 86.19% Impervious, Inflow Depth = 5.06" for 100-yr event
Inflow = 4.04 cfs @ 11.97 hrs, Volume= 9,990 cf
Primary = 4.04 cfs @ 11.97 hrs, Volume= 9,990 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN002: SN002

Inflow Area = 15,620 sf, 73.53% Impervious, Inflow Depth = 4.51" for 100-yr event
Inflow = 3.04 cfs @ 11.93 hrs, Volume= 5,867 cf
Primary = 3.04 cfs @ 11.93 hrs, Volume= 5,867 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link SN003: SN003

Inflow Area = 3,371 sf, 0.00% Impervious, Inflow Depth = 0.44" for 100-yr event
Inflow = 0.04 cfs @ 11.96 hrs, Volume= 124 cf
Primary = 0.04 cfs @ 11.96 hrs, Volume= 124 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



PRE-CONSTRUCTION VERSUS POST-CONSTRUCTION PEAK FLOWS/VOLUMES

DISCHARGE POINT NO.	1-INCH STORM				2-YEAR STORM				10-YEAR STORM				25-YEAR STORM				50-YEAR STORM				100-YEAR STORM			
	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)	PRE-CONST. Q (cfs)	POST-CONST. Q (cfs)	PRE-CONST. VOLUME (cf)	POST-CONST. VOLUME (cf)
SN001	0.00	0.05	0	795	0.16	0.14	526	3,325	0.64	0.49	1,463	5,338	1.09	0.69	2,368	6,901	1.55	1.52	3,289	8,325	2.12	4.04	4,455	9,990
SN002	0.01	0.11	62	291	0.48	0.43	956	1,696	0.98	1.58	1,930	2,923	1.40	2.07	2,762	3,901	1.79	2.52	3,556	4,803	2.25	3.04	4,517	5,867
SN003	0.00	0.00	0	0	0.00	0.00	0	0	0.00	0.00	0	3	0.00	0.00	1	26	0.00	0.01	15	64	0.00	0.04	47	124

REVISION NO.	DATE	DESCRIPTION	MADE BY	CHECKED BY	APPROVED BY

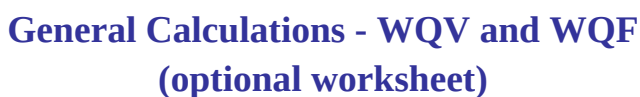
POST-CONSTRUCTION WATERSHED MODELING FOR
QUAIL HOLLOW - PHASE V
LEBANON, NEW HAMPSHIRE

PATHWAYS CONSULTING, LLC
240 MECHANIC STREET, SUITE 100
LEBANON, NEW HAMPSHIRE 03766
(603) 448-2200

SCALE: AS SHOWN
DESIGNED BY:
DRAWN BY: DPM
CHECKED BY: RJF
DATE: 06-03-19
PROJ. NO. 10112

STORMWATER TREATMENT SIZING

- NHDES WQF Worksheets for Contech CDS and Jellyfish Treatment Units
- Contech Sizing Worksheets for CDS and Jellyfish Treatment Units



This worksheet may be useful when designing a BMP that does not fit into one of the specific worksheets already provided (i.e. for a technology which is not a stormwater wetland, infiltration practice, etc.)

Water Quality Volume (WQV)

0.54	ac	A = Area draining to the practice
0.47	ac	A _I = Impervious area draining to the practice
0.87	decimal	I = percent impervious area draining to the practice, in decimal form
0.83	unitless	R _v = Runoff coefficient = 0.05 + (0.9 x I)
0.45	ac-in	WQV = 1" x R _v x A
1,634	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")

Water Quality Flow (WQF)

1 inches	P = amount of rainfall. For WQF in NH, P = 1".
0.83 inches	Q = water quality depth. $Q = WQV/A$
98 unitless	CN = unit peak discharge curve number. $CN = 1000 / (10 + 5P + 10Q - 10 * [Q^2 + 1.25 * Q * P]^{0.5})$
0.2 inches	S = potential maximum retention. $S = (1000 / CN) - 10$
0.031 inches	Ia = initial abstraction. $Ia = 0.2S$
1.0 minutes	T_c = Time of Concentration
1,000.0 cfs/mi ² /in	qu is the unit peak discharge. Obtain this value from TR-55 exhibits 4-II and 4-III
0.703 cfs	WQF = $q_u \times WQV$. Conversion: to convert "cfs/mi ² /in * ac-in" to "cfs" multiply by 1mi ² /640ac

Designer's Notes: WQF for building roof run-off (10S)

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

QUAIL HOLLOW - PHASE V LEBANON, NH

Area **0.54 ac**
Weighted C **0.9**
 t_c **5 min**
CDS Model **1515-3**

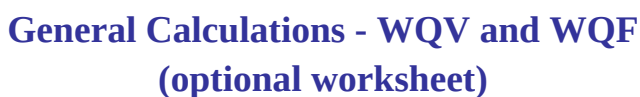
Unit Site Designation **CDS**
Rainfall Station # **104**

CDS Treatment Capacity **1.0 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	13.0%	13.0%	0.01	0.01	12.5
0.04	12.2%	25.2%	0.02	0.02	11.7
0.06	11.2%	36.4%	0.03	0.03	10.7
0.08	10.0%	46.4%	0.04	0.04	9.4
0.10	8.2%	54.6%	0.05	0.05	7.7
0.12	5.8%	60.4%	0.06	0.06	5.4
0.14	6.5%	66.9%	0.07	0.07	6.0
0.16	4.6%	71.5%	0.08	0.08	4.3
0.18	3.7%	75.2%	0.09	0.09	3.3
0.20	3.3%	78.5%	0.10	0.10	3.0
0.25	6.7%	85.2%	0.12	0.12	5.9
0.30	3.7%	88.9%	0.15	0.15	3.2
0.35	2.4%	91.3%	0.17	0.17	2.1
0.40	1.8%	93.1%	0.20	0.20	1.5
0.45	1.9%	95.0%	0.22	0.22	1.6
0.50	1.1%	96.1%	0.24	0.24	0.9
0.75	2.6%	98.7%	0.37	0.37	1.9
1.00	0.9%	99.6%	0.49	0.49	0.6
1.50	0.4%	100.0%	0.73	0.73	0.2
2.00	0.0%	100.0%	0.98	0.98	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					91.9
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.5%
Predicted Net Annual Load Removal Efficiency =					85.5%

1 - Based on 10 years of hourly precipitation data from NCDC 1683, Concord WSO Airport, Merrimack County, NH

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



Water Quality Volume (WQV)

Water Quality Flow (WQF)

Designer's Notes: WQF for parking area/drive/sidewalk (20S)

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.



Project Name:	Quail Hollow	Date:	3/22/19
Site Designation:		Designer:	PWV
County or Independent City:	Lebanon		
State:	NH		

Mass Loading Calculations:

Peak Design Flow (cfs)	2.54
Water Quality Flow (cfs)	0.410
Annual Rainfall (inches)	40
Total Drainage Area, A (ac)	0.35
Post Development Impervious Area, A _i (ac)	0.27
Pervious Area, A _p (ac)	0.08
Impervious Runoff Coefficient, R _v	0.95
Pervious Runoff Coefficient, R _v	0.25
TSS Removal By Pretreatment	0%
Agency Required TSS % Removal	85%
Required TSS Removal Efficiency of Filter	85%
Percent Runoff Capture	90%
Mean Annual Runoff, V _t (ft ³)	36,133
Event Mean Concentration of Pollutant, EMC (mg/L)	70
Annual Mass Load, M _{total} (lbs)	157.81

Flow Based Filter Sizing:

Mass to be Captured by System (lbs)	134.14
Filter Type	Jellyfish
Structure Type	Manhole
Cartridge Length	54"
Allowable Load Per Hi-Flo Cartridge (lbs)	125
Allowable Load Per Draindown Cartridge (lbs)	63
# Hi-Flo Cartridges Required	2
# Draindown Cartridges Required	1
Recommended Model	JF4-2-1
TSS Treatment Capacity (lbs)	313.00
Maximum Water Quality Flow	0.45 cfs

OPERATION & MAINTENANCE MANUAL

STORMWATER MANAGEMENT FACILITIES OPERATION AND MAINTENANCE MANUAL

FOR
QUAIL HOLLOW SENIOR LIVING COMMUNITY –
PHASE V
69 LILY LANE
WEST LEBANON, NEW HAMPSHIRE

Pathways Consulting, LLC
Project No. 10112

Date Written: June 3, 2019

Last Update: _____

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Appendices

Appendix A: Site Location Map, Drainage Plan

Appendix B: Semi-Annual Inspection Checklist and Log

Appendix C: Deicing Application Rate Guidelines, and Log of Use of Deicing Agents

Appendix D: CONTECH CDS® Inspection and Maintenance Guide

Appendix E: CONTECH JellyFish® Filter Maintenance Guide

1.0 Introduction

This Operation and Maintenance Manual (O&M Manual) covers the stormwater management and facility wide practices at Quail Hollow Senior Living Community – Phase V, Lebanon, New Hampshire (refer to the Site Location Map, Figure 1, in Appendix A). The O&M Manual has been developed as required by the City of Lebanon under its Site Plan Review Regulations. This O&M Manual provides a description of the project site and its stormwater management facilities, and outlines the periodic inspection and maintenance requirements of these practices to insure continued operational effectiveness.

2.0 Purpose

Regular inspections and maintenance are essential for long-term effectiveness of stormwater Best Management Practices (BMPs). BMPs are also very expensive to repair and replace. Sediment, trash, and other debris can accumulate in BMPs and need to be removed periodically. If not properly maintained, the BMP will not operate as designed and will not provide effective treatment of stormwater runoff. This neglect jeopardizes water quality and may violate permit conditions. All stormwater BMPs require maintenance; however, the frequency and complexity of maintenance activities and the equipment needed to carry them out varies. Inspectors and those overseeing or performing maintenance should be well-trained and thoroughly familiar with the plans for each BMP, and they should utilize the O&M Manual provided herein to document their inspection and maintenance procedures.

3.0 Responsible Party

The Responsible Party will provide the required corporate oversight of the implementation of the O&M Manual and the documentation that it is in compliance with Town and State regulations and approved permits.

Responsible Party: Quail I, L.P., c/o John Giebink
 Address: 7 Aspen Drive, Suite 1
 So. Burlington VT 05403
 Phone: 802-864-9899
 Title: Owner
 E-mail: jgiebink@summitpmg.com

Responsibilities: The Responsible Party shall:

- Initiate the O&M activities once all site construction disturbance and restoration activities are complete for a particular phase associated with a stormwater management practice;
- Assign Quail Hollow Senior Living Community facilities personnel, or contract with one or more third party contractors to conduct the required O&M activities (hiring third party contractors shall not relieve Quail Hollow Senior Living Community of the primary responsibility for the activities required by the O&M Manual);
- Implement the required reporting, inspection, and maintenance activities identified in the O&M Manual in accordance with the established frequency and schedule;

- Maintain required activity documentation in the site project files, including inspection reports, maintenance descriptions or logs, additions to the stormwater practices, and other facility practices or policies related to stormwater management;
- Serve as the liaison between Quail Hollow Senior Living Community and the City of Lebanon as it relates to matters of stormwater management for Phase V of the site; and
- Revise the plan if substantive changes are made to the stormwater management practices, to the frequency or type of maintenance or inspection, or to accommodate changes to local or state regulations.

4.0 Site Description

4.1 Facility Information

911 Street Address:	69 Lily Lane West Lebanon, New Hampshire 03766
Town Map/Lot:	Tax Map 8, Lot 2-200
Facility Operator/Owner:	Quail I, LP.
Phone:	802-864-9899

4.2 Site Description

The site is an existing Senior Housing Development with paved parking, drives, and a primary and secondary access roads connecting to North Main Street (NH Route 10) in West Lebanon, New Hampshire.

The Phase V site, along with the Phase I site, consists of approximately 11.9 acres of land, all of which is located in the Residential 3 (R-3) Zoning District of Lebanon, New Hampshire. The Phase V building is approximately 20,400 square feet in footprint and is served by access roads and internal and external parking areas.

The Phase V site is bounded to the west by a hillside, to the east by Phase I Building and to the south by the Phase III Building. The stormwater drainage from the Phase V site ultimately enters a closed drainage/open channel system that flows south towards East Wilder Road and ultimately discharges into the Connecticut River.

4.3 Site Maps and Plans

The Site Location Map and Plan are included in Appendix A. Figure 1 is a Site Location Map showing the location of the site relative to the surface water and roadway features along Etna Road. Figure 2 is a Drainage Plan that depicts the location of stormwater management features or structural BMPs at the site. The plan features the following stormwater practices:

- **Yard Drains:** There are yard drains located at the rear of the Phase V Building that collect the back-half of the roof runoff from the Phase V Building.

- **Roof Drains:** There are roof drains that collect the front-half and back-half of the roof runoff from the Phase V Building. The back-half discharges to yard drains. The front half discharges to the Contech CDS Unit.
- **Underground Storage Pipe System 1:** There are two rows of connected 60-inch diameter HDPE pipe located underground in front of the Phase V Building. This group of pipes collects the Phase V roof runoff and is meant to detain the it.
- **Underground Storage Pipe Outlet Control Structure:** There is a manhole located immediately downstream of Underground Storage Pipe System 1 that controls the rate of flow out of the pipe system.
- **Contech CDS unit:** The water entering the Underground Storage Pipe System 1 first flows through a Contech CDS unit for treatment.
- **Catch Basins:** There are catch basins along the drive/parking/sidewalks in front of the Phase V Building that collect stormwater and divert it to an Underground Contech Jellyfish Filter.
- **Catch Basins:** There are catch basins along the front of the Phase I Building that divert the Phase I drainage around the Phase V stormwater collection system.
- **Underground Contech Jellyfish Filter Device:** Treats the Phase V drive/parking/sidewalks runoff collected by the catch basins.
- **Underground Storage Pipe System 2:** There is one row of 60-inch diameter HDPE pipe located underground downstream of the Contech Jellyfish Filter. This pipe accepts the flow from the Contech Jellyfish Filter and is meant to detain the runoff from the Phase V paved areas.
- **Underground Storage Pipe Outlet Control Structure:** There is a manhole located immediately downstream of Underground Storage Pipe System 2 that controls the rate of flow out of the pipe system.

The above items require periodic inspection and maintenance as outlined herein. The locations, sizes, lengths, and materials of these items are noted on the Drainage Plan.

5.0 Structural BMP Identification

Structure:	Catch Basins/Yard Drains
Date of Implementation:	2019 or later
Discharge Point:	Contech Jellyfish Filter/Contech CDS Unit/DMH
Maintenance Requirement(s):	Frequency:
Removal of debris and accumulated sediment from basin	Inspect every 6 months during non-winter seasons

Structure:	Roof Drains
Date of Implementation:	2019 or later
Discharge Point:	Yard Drains/Contech CDS Unit
Maintenance Requirement(s):	Frequency:
Removal any debris or blockage from outlet	Inspect every 6 months during non-winter seasons

Inspect for erosion or damage	Inspect every 6 months during non-winter seasons
-------------------------------	--

Structure:	Underground Storage Pipe Systems 1 and 2 and associated Outlet Control Manholes	
Date of Implementation:	2019 or later	
Discharge Point:	Drainage Manhole- Existing Phase I/III Stormwater System	
Maintenance Requirement(s):		Frequency:
Inspect the system for sediment/debris via the Discharge Manhole at the downstream end of the system and Cleanouts located at the upstream end of the system.		Inspect twice annually during non-winter seasons
Inspect the system. Conduct maintenance or rehabilitation, as conditions warrant.		After rainfall events exceeding 2.5 inches in a 24 hour period
Remove debris from inlet and outlet structures		As warranted by inspection
Remove accumulated sediment from system.		As warranted by inspection
Inspect and repair system components.		As warranted by inspection
Obtain a qualified professional to assess the condition of the facility to determine measures required to restore the draining of the system. Measures may include removal of accumulated sediment/debris or reconstruction of the system		If the system does not drain fully within 72 hours following a rainfall event
Inspect surrounding area around pipes for erosion/damage or surface depressions/sink holes.		Inspect twice annually during non-winter seasons

Structure:	Contech CDS Unit	
Date of Implementation:	2019 or later	
Discharge Point:	Underground Storage Pipe Systems 1	
Maintenance Requirement(s):		Frequency/Timing:
Refer to attached CDS® Inspection and Maintenance Guide (See Appendix D)		Minimum Semi-Annual

Structure:	Contech Jellyfish Filter	
Date of Implementation:	2019 or later	
Discharge Point:	Underground Storage Pipe Systems 2	
Maintenance Requirement(s):		Frequency:
Refer to attached JellyFish® Filter Maintenance Guide (See Appendix E)		Minimum Semi-Annual

6.0 Routine Inspections and Maintenance Requirements

6.1 Sensitive BMPs

BMPs are susceptible to damage during inspections and maintenance activities, and due to environmental factors. Sediment removal activities can damage BMPs, especially when vehicles such as backhoes are used. Loss of filtration capacity is an important concern if the Underground Sand Filter System is compacted. Hand removal of sediment or use of vacuum truck may be the best option in sensitive BMPs.

6.2 Semi-Annual Visual Inspections and Maintenance

Facility inspections will be conducted every six months in non-winter conditions by the Responsible Party for evidence of sediment, other visible contamination, or damage, preferably during a runoff event to allow the operation under flowing conditions to be evaluated. The inspection will take place within the first 30 minutes of a precipitation or snowmelt event if possible, but no more than 60 minutes after onset. Precipitation events must be greater than 0.1 inch in magnitude and occur at least 72 hours after the last runoff-producing event. If stormwater BMPs are found to be functioning incorrectly, maintenance will be performed before the next anticipated storm event, or as necessary to maintain effectiveness of the stormwater controls. A sample inspection checklist and an inspection recording log are provided in Appendix B of the O&M Manual. Completed checklists and logs shall be kept in Appendix B.

6.3 Updates to O&M Manual

Ultimately, the goal of this O&M Manual is to maintain the integrity of the stormwater management system to protect the quality of water resources. Inspection results should be used to regularly reassess the effectiveness of the BMPs on reducing the transport of sediment and providing adequate conveyance of stormwater flows. The O&M Manual may be updated and improved throughout the term of the permit.

7.0 De-icing Plan

Snow will be removed from the driveway and parking and loading areas by plow. Snow will be removed from the sidewalks by shovel or snowblower. The use of salt or other de-icing agents will be used in accordance with the owner's maintenance protocols. A log for the application of salt or anti-icing agents is included in Appendix C.

8.0 General Requirements

8.1 Record Keeping and Reporting

The original of this O&M Manual will be maintained on-site. Records pertaining to inspections and maintenance will be kept on-site with the O&M Manual. This manual will be made available upon request to the City of Lebanon or the NHDES during scheduled site visits and to the public for review if a formal written request is made.

9.0 Summary of Updates

Date Plan Amended	Summary of Updates

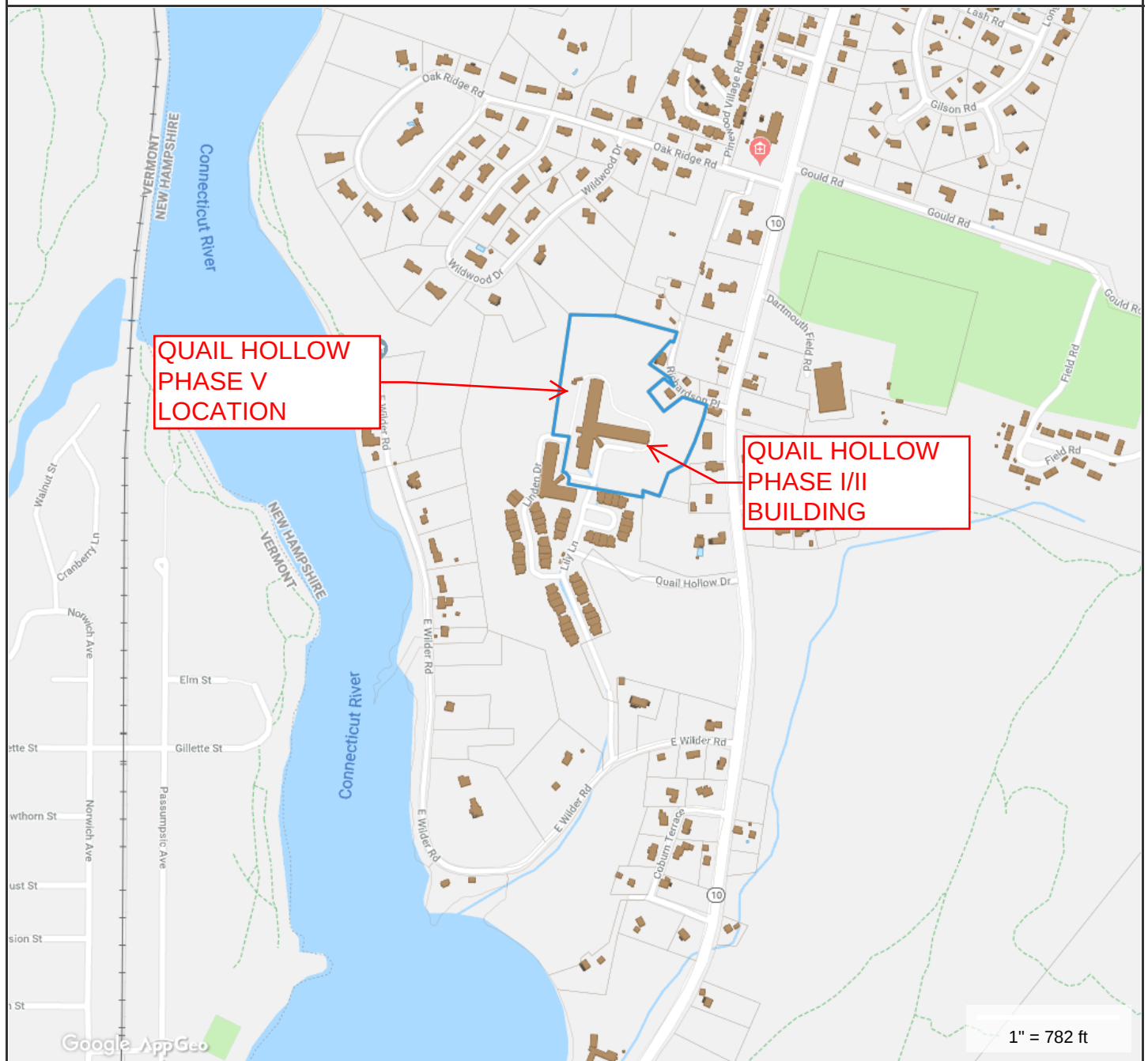
OPERATION AND MAINTENANCE MANUAL

APPENDIX A

FIGURE 1: SITE LOCATION MAP

FIGURE 2: DRAINAGE PLAN

Quail Hollow Phase V Site Location Map



Property Information

Property ID 8-2-200
Location 69 LILY LN
Owner QUAIL I, LP

MAP FOR REFERENCE ONLY
NOT A LEGAL DOCUMENT

City of Lebanon, NH makes no claims and no warranties, expressed or implied, concerning the validity or accuracy of the GIS data presented on this map.

Geometry updated 10/23/2018
Data updated 11/18/2018

FIGURE 1

OPERATION AND MAINTENANCE MANUAL

APPENDIX B

Semi-Annual Inspection Checklist and Log

Keep the completed inspection forms here.

Semi-Annual Inspection Log

*If practical, inspections at each stormwater practice should be made within the first 30 minutes of a significant rainfall event.
Observations should note color, odor, turbidity, solids, foam, oil sheen, or any other obvious form of contamination.*

Date: _____

Weather Conditions: _____

QUAIL HOLLOW SENIOR LIVING COMMUNITY PHASE V **69 LILY LANE, WEST LEBANON, NH** **SEMI-ANNUAL INSPECTION CHECKLIST**

Please refer to the Inspection and Maintenance Manual for specific information regarding the frequency of maintenance, inspection, and reporting requirements.

Project Name: Quail Hollow Senior Living Community Phase V at 69 Lily Lane, West Lebanon, NH

Permittee Name: Quail I, L.P., c/o John Giebink
Address: 7 Aspen Drive, Suite 1
So. Burlington VT 05403
Phone: 802-864-9899

Inspector Name (if applicable):

***Inspector does not need to be an Engineer, Authorized Representative is acceptable**

Address:

Phone #:

Has ownership or project name changed since previous authorization? ☐N ☐Y - *If yes, attach explanation.*

Has amount of impervious area changed since previous authorization? ☐N ☐Y - *If yes, attach explanation.*

Maintenance Requirements

The City of Lebanon Site Plan Review Regulations require that a permittee shall at all times properly operate, inspect and maintain all stormwater treatment and control systems which are installed or used to maintain compliance with this permit. The permittee shall continue to comply with the inspection and maintenance requirements set forth in these regulations, unless specifically modified by the City of Lebanon in a subsequent regulation amendment.

Maintenance Inspection Checklist

Utilize the Inspection Checklists for the Contech CDS Unit and Contech Jellyfish Filter Unit found in Appendices D and E.

Semi-Annual Inspection Log

If practical, inspections at each stormwater practice should be made within the first 30 minutes of a significant rainfall event.

Observations should note color, odor, turbidity, solids, foam, oil sheen, or any other obvious form of contamination.

Date: _____

Weather Conditions: _____

Stormwater Practice	Is maintenance needed? (Y/N)	Does it function as expected? (Y/N)	Describe the problem (sediment, contamination, invasive species growth?)	Corrective actions to be taken	Schedule for completion
Yard Drains					
Catch Basins					
Roof Drains					
Underground Pipe Detection System1/Outlet Control Structure					

Semi-Annual Inspection Log

If practical, inspections at each stormwater practice should be made within the first 30 minutes of a significant rainfall event.

Observations should note color, odor, turbidity, solids, foam, oil sheen, or any other obvious form of contamination.

Date: _____

Weather Conditions: _____

Contech CDS Unit					
---------------------	--	--	--	--	--

Stormwater Practice	Is maintenance needed? (Y/N)	Does it function as expected? (Y/N)	Describe the problem (sediment, contamination, invasive species growth?)	Corrective actions to be taken	Schedule for completion
Underground Pipe Detection System1/Outlet Control Structure					
Contech Jellyfish Filter Unit					

Date Completed: _____

Completed by: _____

OPERATION AND MAINTENANCE MANUAL

APPENDIX C
DEICING APPLICATION RATE GUIDELINES, AND
LOG OF USE OF DEICING AGENTS

Deicing Application Rate Guidelines

24' of pavement (typical two-lane road)

These rates are not fixed values, but rather the middle of a range to be selected and adjusted by an agency according to its local conditions and experience.

Pavement Temp. (°F) and Trend (↑↓)	Weather Condition	Maintenance Actions	Pounds per two-lane mile			
			Salt Prewetted / Pretreated with Salt Brine	Salt Prewetted / Pretreated with Other Blends	Dry Salt*	Winter Sand (abrasives)
> 30° ↑	Snow	Plow, treat intersections only	80	70	100*	Not recommended
	Freezing Rain	Apply Chemical	80 - 160	70 - 140	100 - 200*	Not recommended
30° ↓	Snow	Plow and apply chemical	80 - 160	70 - 140	100 - 200*	Not recommended
	Freezing Rain	Apply Chemical	150 - 200	130 - 180	180 - 240*	Not recommended
25° - 30° ↑	Snow	Plow and apply chemical	120 - 160	100 - 140	150 - 200*	Not recommended
	Freezing Rain	Apply Chemical	150 - 200	130 - 180	180 - 240*	Not recommended
25° - 30° ↓	Snow	Plow and apply chemical	120 - 160	100 - 140	150 - 200*	Not recommended
	Freezing Rain	Apply Chemical	160 - 240	140 - 210	200 - 300*	400
20° - 25° ↑	Snow or Freezing Rain	Plow and apply chemical	160 - 240	140 - 210	200 - 300*	400
20° - 25° ↓	Snow	Plow and apply chemical	200 - 280	175 - 250	250 - 350*	Not recommended
	Freezing Rain	Apply Chemical	240 - 320	210 - 280	300 - 400*	400
15° - 20° ↑	Snow	Plow and apply chemical	200 - 280	175 - 250	250 - 350*	Not recommended
	Freezing Rain	Apply Chemical	240 - 320	210 - 280	300 - 400*	400
15° - 20° ↓	Snow or Freezing Rain	Plow and apply chemical	240 - 320	210 - 280	300 - 400*	500 for freezing rain
0° - 15° ↑↓	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	300 - 400	Not recommended	500 - 750 spot treatment as needed
< 0°	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	400 - 600**	Not recommended	500 - 750 spot treatment as needed

* Dry salt is not recommended. It is likely to blow off the road before it melts ice.

** A blend of 6 - 8 gal/ton $MgCl_2$ or $CaCl_2$ added to $NaCl$ can melt ice as low as -10°.

Anti-icing Route Data Form				
Truck Station:				
Date:				
Air Temperature	Pavement Temperature	Relative Humidity	Dew Point	Sky
Reason for applying:				
Route:				
Chemical:				
Application Time:				
Application Amount:				
Observation (first day):				
Observation (after event):				
Observation (before next application):				
Name:				

OPERATION AND MAINTENANCE MANUAL

APPENDIX D

CONTECH CDS® Inspection and Maintenance Guide

CDS® Inspection and Maintenance Guide



Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allow both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine whether the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS system should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.



CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y ³	m ³
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities



Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

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The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; 7,517,450 related foreign patents or other patents pending.

CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

[illegible]

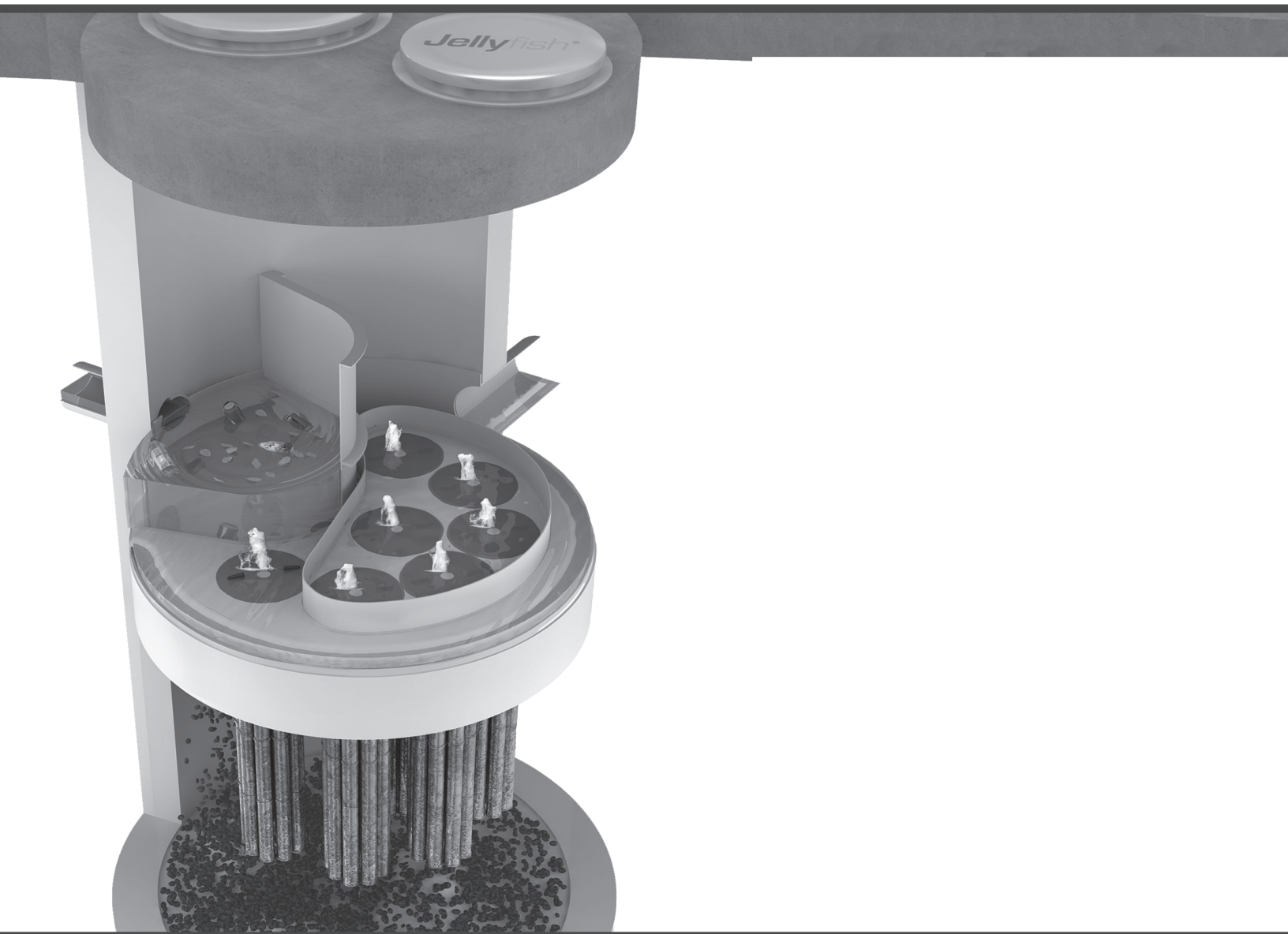
1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**
2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

OPERATION AND MAINTENANCE MANUAL

APPENDIX E

CONTECH JellyFish® Filter Maintenance Guide

JellyFish[®] Filter Maintenance Guide





JELLYFISH® FILTER MANHOLE CONFIGURATIONS INSPECTION & MAINTENANCE GUIDE

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Maintenance Procedure.....	4
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Jellyfish Filter & Components	6
Inspection Process	7

1.0 Inspection and Maintenance Overview

The primary purpose of the Jellyfish® Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, these pollutants must be removed to maintain the filter's maximum treatment performance. Regular inspection and maintenance are required to insure proper functioning of the system.

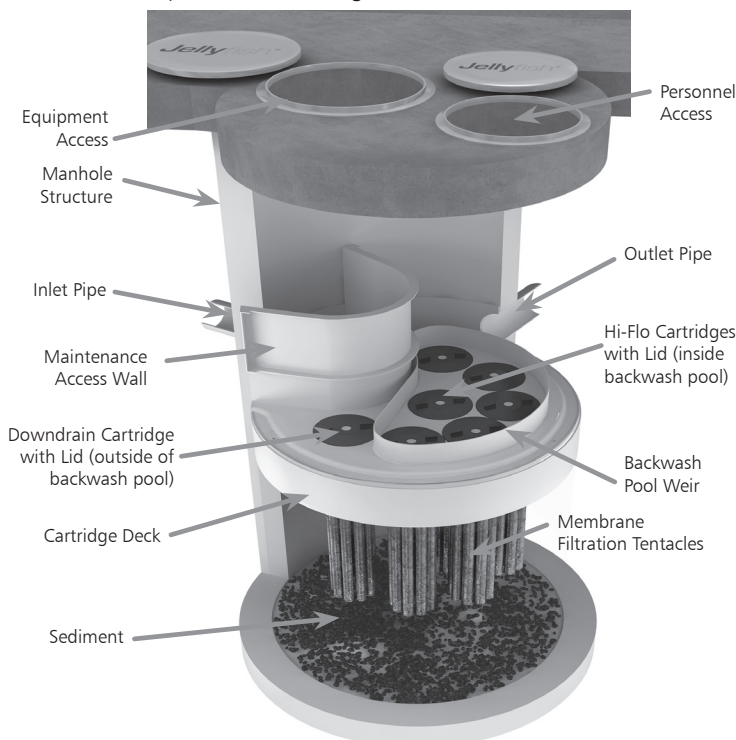
Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Additional maintenance activities may be required in the event of non-storm event runoff, such as base-flow or seasonal flow, an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted from surface observations and include:

- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW)

Maintenance activities typically include:

- Removal of oil, floatable trash and debris
- Removal of collected sediments
- Rinsing and re-installing the filter cartridges
- Replace filter cartridge tentacles, as needed



Note: Separator Skirt not shown

2.0 Inspection Timing

Inspection of the Jellyfish Filter is key in determining the maintenance requirements for, and to develop a history of the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below; *or per the approved project stormwater quality documents (if applicable), whichever is more frequent.*

1. Post-construction inspection is required prior to putting the Jellyfish Filter into service. All construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired, before installing the filter cartridges.
2. A minimum of two inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.
3. Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation. Minimum frequency should be once per year.
4. Inspection is recommended after each major storm event.
5. Inspection is required immediately after an upstream oil, fuel or other chemical spill.

3.0 Inspection Procedure

The following procedure is recommended when performing inspections:

1. Provide traffic control measures as necessary.
2. Inspect the MAW for floatable pollutants such as trash, debris, and oil sheen.
3. Measure oil and sediment depth in several locations, by lowering a sediment probe through the MAW opening until contact is made with the floor of the structure. Record sediment depth, and presences of any oil layers.
4. Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
5. Inspect the MAW, cartridge deck, and backwash pool weir, for cracks or broken components. If damaged, repair is required.

3.1 Dry weather inspections

- Inspect the cartridge deck for standing water, and/or sediment on the deck.
- No standing water under normal operating conditions.
- Standing water inside the backwash pool, but not outside the backwash pool indicates that the filter cartridges need to be rinsed.



Inspection Utilizing Sediment Probe

- Standing water outside the backwash pool may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- Any appreciable sediment ($\geq 1/16"$) accumulated on the deck surface should be removed.

3.2 Wet weather inspections

- Observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW.
- Less than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
- Greater than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
- 18 inches or greater and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges are occluded with sediment and need to be rinsed

4.0 Maintenance Requirements

Required maintenance for the Jellyfish Filter is based upon results of the most recent inspection, historical maintenance records, or the site specific water quality management plan; whichever is more frequent. In general, maintenance requires some combination of the following:

1. Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.
2. Floatable trash, debris, and oil removal.
3. Deck cleaned and free from sediment.
4. Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs sooner.
5. Replace tentacles if rinsing does not restore adequate hydraulic capacity, remove accumulated sediment, or if damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
6. Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
7. The unit must be cleaned out and filter cartridges inspected immediately after an upstream oil, fuel, or chemical spill. Filter cartridge tentacles should be replaced if damaged or compromised by the spill.

5.0 Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish Filter:

1. Provide traffic control measures as necessary.
2. Open all covers and hatches. Use ventilation equipment as required, according to confined space entry procedures.
3. Caution: Dropping objects onto the cartridge deck may cause damage.

4. Perform Inspection Procedure prior to maintenance activity.
5. To access the cartridge deck for filter cartridge service, descend the ladder and step directly onto the deck. Caution: Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.
6. Maximum weight of maintenance crew and equipment on the cartridge deck not to exceed 450 lbs.

5.1 Filter Cartridge Removal

1. Remove a cartridge lid.
2. Remove cartridges from the deck using the lifting loops in the cartridge head plate. Rope or a lifting device (available from Contech) should be used. Caution: Should a snag occur, do not force the cartridge upward as damage to the tentacles may result. Wet cartridges typically weigh between 100 and 125 lbs.
3. Replace and secure the cartridge lid on the exposed empty receptacle as a safety precaution. Contech does not recommend exposing more than one empty cartridge receptacle at a time.

5.2 Filter Cartridge Rinsing

1. Remove all 11 tentacles from the cartridge head plate. Take care not to damage or break the plastic threaded nut or connector.
2. Position tentacles in a container (or over the MAW), with the



Cartridge Removal & Lifting Device



threaded connector (open end) facing down, so rinse water is flushed through the membrane and captured in the container.

3. Using the Jellyfish rinse tool (available from Contech) or a low-pressure garden hose sprayer, direct water spray onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane. Caution: Do not use a high pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane.

4. Collected rinse water is typically removed by vacuum hose.
5. Reattach tentacles to cartridge head plate. Reuse O-rings and nuts, ensuring proper placement on each tentacle.

5.3 Cleaning Procedure

1. Perform vacuum cleaning of the Jellyfish Filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning only through the maintenance access wall (MAW) opening, being careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck. The separator skirt surrounds the filter cartridge zone, and could be torn if contacted by the wand. Do not lower the vacuum wand through a cartridge receptacle, as damage to the receptacle will result.
2. Vacuum floatable trash, debris, and oil, from the MAW opening. Alternatively, floatable solids may be removed by a net or skimmer.



Tentacle Rinse Using Jellyfish Rinse Tool

3. Pressure wash cartridge deck and receptacles to remove all sediment and debris. Sediment should be rinsed into the sump area. Take care not to flush rinse water into the outlet pipe.
4. Remove water from the sump area. Vacuum or pump equipment should only be introduced through the MAW.
5. Remove the sediment from the bottom of the unit through the MAW opening.



Vacuuming Sump Through MAW

6. For larger diameter Jellyfish Filter manholes (≥ 8 -ft) and vaults without an MAW opening, complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle.

7. After the unit is clean, re-fill the lower chamber with water if required by the local jurisdiction, and re-install filter cartridges.
8. Dispose of sediment, floatable trash and debris, oil, spent tentacles, and water according to local regulatory requirements.

5.4 Filter Cartridge Replacement

1. Cartridges should be installed after the deck has been cleaned. It is important that the receptacle surfaces be free from grit and debris.
2. If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Contech to order replacement tentacles.
3. Lower filter cartridge to the cartridge deck. Remove cartridge lid from deck and carefully lower the filter cartridge into the receptacle until head plate gasket is seated squarely in receptacle. Caution: Should a snag occur when lowering the cartridge into the receptacle, do not force the cartridge downward; damage may occur.
4. Replace the cartridge lid and check fit before completing rotation to a firm hand-tight attachment.

5.5 Chemical Spills

Caution: If a chemical spill has been captured, do not attempt maintenance. Immediately contact the local hazard response agency and contact Contech.

6.0 Related Maintenance Activities

Jellyfish units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

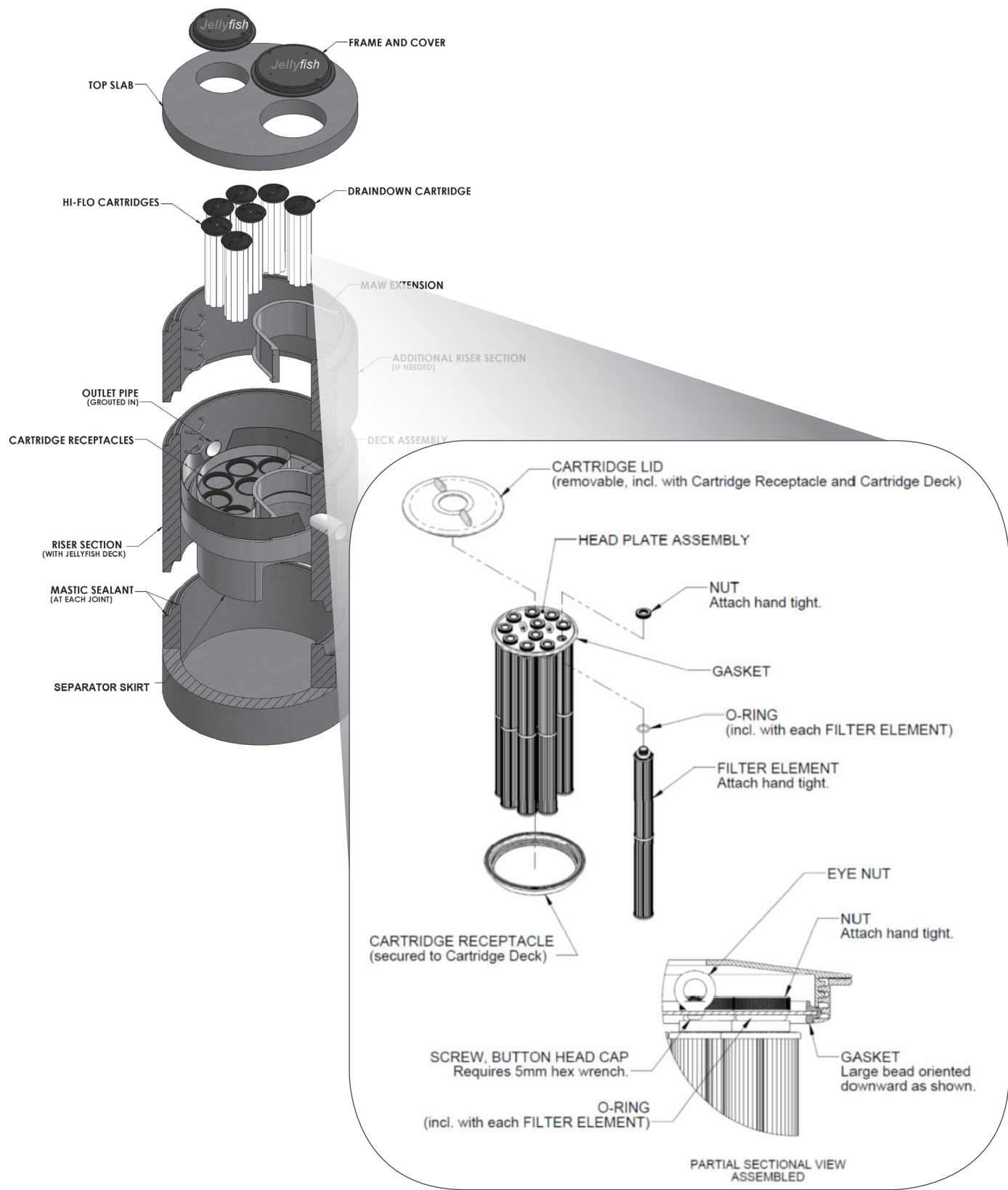
In order for maintenance of the Jellyfish filter to be successful, it is imperative that all other components be properly maintained. The maintenance and repair of upstream facilities should be carried out prior to Jellyfish maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

7.0 Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads. Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Jellyfish Filter Components & Filter Cartridge



Jellyfish Filter Inspection and Maintenance Log

Owner:		Jellyfish Model No:	
Location:		GPS Coordinates:	
Land Use:	Commercial:	Industrial:	Service Station:
	Roadway/Highway:	Airport:	Residential:

Date/Time:						
Inspector:						
Maintenance Contractor:						
Visible Oil Present: (Y/N)						
Oil Quantity Removed:						
Floatable Debris Present: (Y/N)						
Floatable Debris Removed: (Y/N)						
Water Depth in Backwash Pool						
Draindown Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Cartridges: (Y/N)						
Hi-Flo Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Hi-Flo Cartridges: (Y/N)						
Sediment Depth Measured: (Y/N)						
Sediment Depth (inches or mm):						
Sediment Removed: (Y/N)						
Cartridge Lids intact: (Y/N)						
Observed Damage:						
Comments:						



Jellyfish®

CONTECH®
ENGINEERED SOLUTIONS

Support

- Drawings and specifications are available at ContechES.com/jellyfish.
- Site-specific design support is available from Contech Engineered Solutions.

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Jellyfish Maintenance DRAFT 2/17



CITY OF LEBANON ~ PLANNING & DEVELOPMENT

PLANNING BOARD

September 25, 2023 Meeting

Staff Memorandum – PB2023-33-SPR

APPLICATION INFORMATION

Agenda Item: 3.B

Application ID#:
PB2023-33-SPR

Application Type:
Site Plan Review (advisory)

Property Location:
160 Mechanic Street (Tax Map
105, Lot 27)

Property Owner/Applicant:
City of Lebanon

Existing Improvements & Use:
+/-1,800 sq. ft. single-story
commercial building constructed
in 1940 (per City assessing
records), most recently occupied
by a building contractor

**Proposed Use &
Improvements:**
Conversion of building to an
emergency winter shelter and
minor associated site
improvements

Zoning District:
Residential Two (R-2)

Overlay Districts:
none

LEGAL NOTICE

City of Lebanon, 160 Mechanic Street (Tax Map 105, Lot 27), zoned R-2: Request for Site Plan Review to convert the use of the property to an emergency winter shelter. PB2023-33-SPR (NOTE: This application will be reviewed as a Governmental Land Use pursuant to RSA 674:54)

NOTE: This application will be reviewed as a Governmental Land Use pursuant to NH RSA 674:54).

APPLICATION MATERIALS

- ▶ Application form
- ▶ Memo from Shaun Mulholland, Lebanon City Manager, dated September 19, 2023 (1 page; project description)
- ▶ Plot plan titled, "Proposed Emergency Winter Shelter", dated September 19, 2023 (existing conditions plan)
- ▶ Site plan titled, "Lebanon Homeless Shelter," prepared by Randall T Mudge & Associates, dated September 20, 2023

COMPLETENESS REVIEW

This application is being reviewed in accordance with New Hampshire RSA 674:54, Governmental Land Uses. As such, there is no completeness review for this project. In addition, any comments on the proposal by the Planning Board and City staff are considered non-binding on the applicant.

APPLICATION OVERVIEW

160 Mechanic Street is a +/-0.23 acre parcel of land recently purchased by the City of Lebanon, located at the northeast corner of the Mechanic Street and Slayton Hill Rd intersection, and zoned Residential Two (R-2). The property is improved with a vacant +/-1,800 sq. ft. single-story commercial building constructed in 1940 (per City assessing records), most recently occupied by a building contractor pursuant to a Special Exception approved in 2017, and occupied by a retail use prior to 2017.

As described in further detail in the attached memo from the Lebanon City Manager, the City of Lebanon proposes to utilize the building as an emergency winter shelter for the unhoused. The site will remain substantially as is except for a few minor site improvements including

regrading and repaving an existing section of sidewalk to meet ADA requirements, striping and signage for ADA-compliant parking, and placement of a trash receptacle and storage container to the east of the building.

The City Council took action to exempt the property from the Zoning Ordinance pursuant to the following motion approved by the Council on September 6, 2023: “[I]n accordance with Section 214 of the Lebanon Zoning Ordinance, the City Council exempts the property located at 160 Mechanic St., Tax Map 105, Lot 27 from all zoning requirements; however in accordance with RSA 674:54 the City Manager is directed to prepare all necessary documentation to notify the Planning Board of the planned emergency shelter so it can hold the required public hearing.”

The change of use to an emergency shelter constitutes a “minor change” that would ordinarily require minor site plan review. However, when the applicant is the City of Lebanon, it is staff’s practice to send the application to the full Planning Board for review to avoid a conflict of interest (given that the Minor Site Plan Committee consists of City staff members).

Moreover, because the property is owned by the City and the building will be funded and maintained by the City, the project qualifies as a Governmental Land Use pursuant RSA 674:54 and, therefore, is not subject to the Site Plan Review Regulations. Nevertheless, the Planning Board is permitted to conduct a public hearing on the project, as set forth in NH RSA 674:54, II:

The [...] city [...] shall give written notification to the [...] planning board [...] of a municipality of any proposed governmental use of property within its jurisdiction, which constitutes a substantial change in use or a substantial new use. Written notification shall contain plans, specifications, explanations of proposed changes available at the time, a statement of the governmental nature of the use as set forth in paragraph I, and a proposed construction schedule. Such notification shall be provided at least 60 days prior to the beginning of construction. Either the governing body or planning board of the municipality may conduct a public hearing relative to the proposed governmental use. A representative of the governmental entity which provided notice shall be available to present the plans, specifications, and construction schedule, and to provide explanations. The governing body or planning board may issue nonbinding written comments relative to conformity or nonconformity of the proposal with normally applicable land use regulations to the sponsor of the governmental use within 30 days after the hearing.

Although site plan review is advisory only, note that the building will still need to obtain a building permit and construction must comply with all applicable rules and regulations (other than zoning) including but not limited to the Building Code.

cc: Shaun Mulholland, City Manager
Paula Maville, Deputy City Manager
Lynne Goodwin, Human Services Director

(property images on following page)

Figure 1. Street view of subject property (looking northeast near the intersection of Mechanic St and Slayton Hill Rd).



©2021 Google (image taken August, 2023)

Figure 2. Bird's eye view of subject property (looking north).



©2021 Eagleview (image taken 4/4/2021)

APPLICATION FOR

SPECIAL EXCEPTION	☐	☐	SITE PLAN REVIEW
VARIANCE	☐	☐	SUBDIVISION
MOTION FOR REHEARING	☐	☐	LOT LINE ADJUSTMENT
APPEAL OF AN ADMIN. DECISION	☐	☐	CONDITIONAL USE PERMIT

☒ OTHER Governmental Land Use

PROPERTY OWNER (APPLICANT):

NAME: City of Lebanon TEL.#: 603.448.4220
 MAILING ADDRESS: 51 N. Park Street, Lebanon, NH 03766
 E-MAIL ADDRESS: manager@lebanonnh.gov

CO-APPLICANT, AGENT, OR LESSEE:

NAME: _____ TEL.#: _____
 MAILING ADDRESS: _____
 E-MAIL ADDRESS: _____

PROJECT LOCATION:

TAX MAP #: 105 LOT#: 27 PLOT #: - ZONE: R2
 STREET ADDRESS OF PROJECT: 160 Mechanic Street, Lebanon
 IS THIS PROPERTY LOCATED IN THE: **WETLANDS** ☐ YES ☒ NO **HISTORIC DISTRICT** ☐ YES ☒ NO
FLOOD PLAIN ☐ YES ☒ NO

SCOPE OF PROJECT:

Review of property as a Governmental Land Use
(Emergency winter shelter) per RSA 674:54

TYPE OF OCCUPANCY:

EXISTING ☐ VACANT ☐ ONE FAMILY ☐ TWO FAMILY ☐ MULTI-FAMILY ☒ COMMERCIAL ☐ INDUSTRIAL
 PROPOSED ☐ VACANT ☐ ONE FAMILY ☐ TWO FAMILY ☐ MULTI-FAMILY ☐ COMMERCIAL ☐ INDUSTRIAL
 IF USE IS **COMMERCIAL** OR **INDUSTRIAL**, PLEASE NOTE **SPECIFIC**
 USE: Governmental Land Use

SIGNATURE BLOCK:

FOR PLANNING BOARD APPLICATIONS ONLY: I, the undersigned, hereby submit this application on the date noted below with the knowledge and understanding that the Planning Board shall determine if the submitted application is complete according to its regulations at its next regularly scheduled meeting on _____, 20____, unless I personally request, in writing, that the Board delay its determination of completeness to a later date.

PROPERTY OWNER: [Signature] DATE: 9/7/23

NOTE: IF, AS OWNER, YOU WISH TO DESIGNATE AN AGENT TO ACT ON YOUR BEHALF, PLEASE READ THE FOLLOWING AND SIGN BELOW: I hereby designate the person listed above as my agent for the purpose of procuring the necessary local permits for the proposed work as described herein. Representations made by my agent may be accepted as though made by me personally, and I understand that I am bound by any official decision made on the basis of such representation.

PROPERTY OWNER: _____ DATE: _____

DATE RECEIVED	FILE # (MAP/LOT)	APPLICATION #			
9/7/2023	105-27	PB2023-33	SPR		



CITY MANAGER'S OFFICE
City of Lebanon, NH
51 North Park Street
Lebanon, NH 03766
(603) 448-4220 fax (603) 966-3122

TO: Members of the Lebanon Planning Board
FROM: City Manager Shaun Mulholland
DATE: September 19, 2023
RE: Operation of Emergency Winter Shelter, 160 Mechanic Street, Lebanon

The City has purchased property at 160 Mechanic Street, Lebanon (Tax Map 105, Lot 27) in anticipation of a transportation project which requires this parcel as part of the required right-of-way acquisition to construct a future roundabout at the intersection. The project is included in the New Hampshire Department of Transportation's Ten-Year Highway Plan and is slated to begin in 2029.

In the years leading up to the construction project, the building will remain on the site and will not be demolished until the State is ready to proceed.

As has been documented in recent years, the homelessness issue in the Upper Valley is ever increasing and is in need of immediate attention. The amount of shelter space in the region is inadequate to meet the needs of the unhoused in the Lebanon area. The Haven and the Claremont shelter are the only two options currently available and both are typically at maximum capacity. In order to help address the situation, the City has been in discussions with The Haven of the Upper Valley to assess the feasibility of operating an emergency winter shelter at this location. The intent is to open the shelter during winter months only and only for overnight stays (no daytime operations are planned). Total number of beds to be provided is still being assessed, but the maximum number for the available space is 10-15.

The City will own and maintain the site which constitutes a Governmental Land Use under the provisions of RSA 674:54. In accordance with those provisions, we are asking for input from the Planning Board in relation to site conditions so we may address to the best of our ability any expressed concerns.

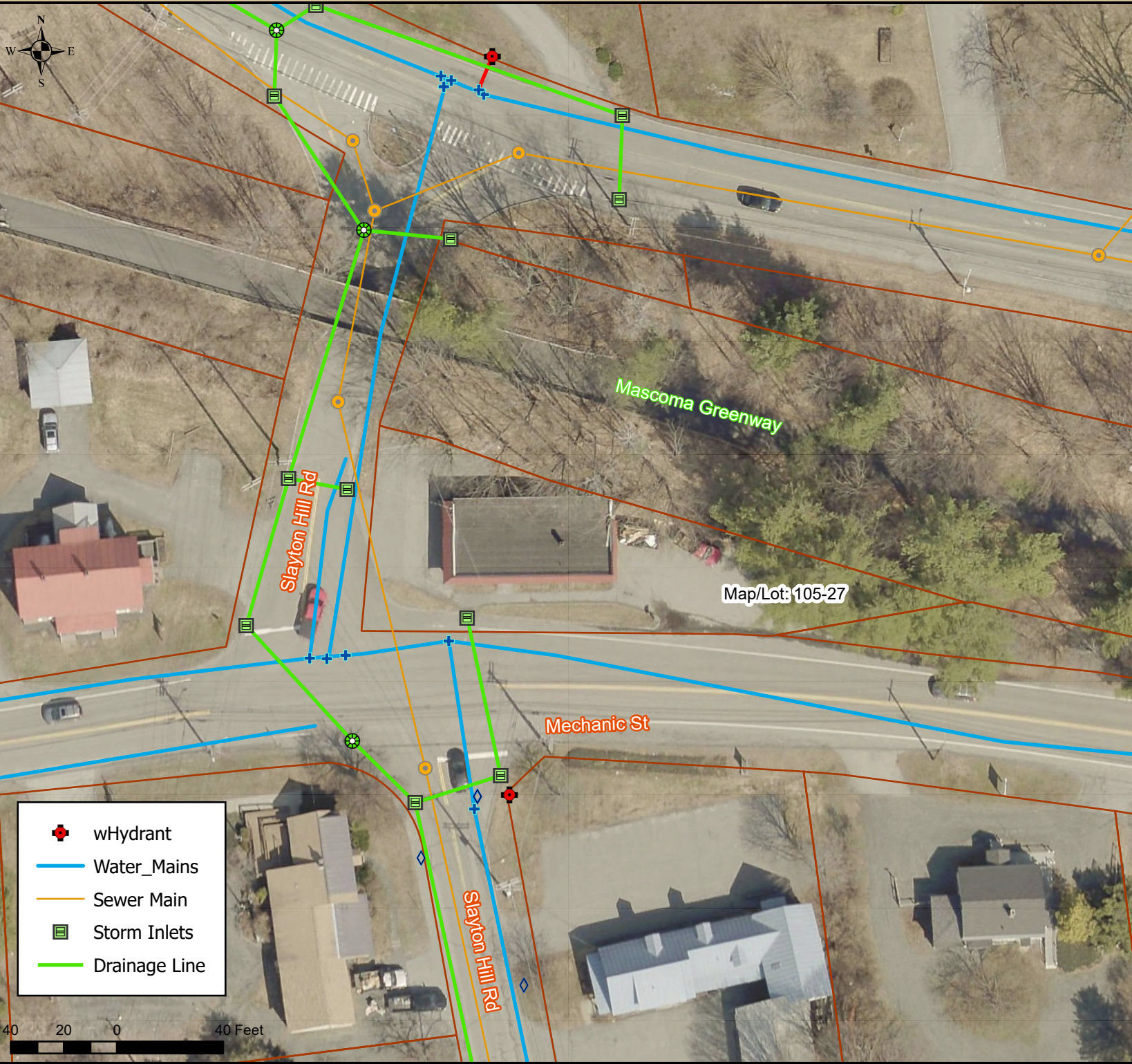
The site plan provided as part of our submittal shows a total of seven on-site parking spaces with one of the spaces being reserved for handicapped individuals. A storage container is planned to be on-site for those people that have personal items that will not fit within their designated sleeping area. Other than that, some simple re-grading of a 15' – 20' section of the walkway to permit better handicapped access to the building from the existing bus stop is planned. We welcome your feedback as we look to finalize our plan for construction.



Proposed Emergency Winter Shelter

163 Mechanic St
Map/Lot: 105-27

LEBANON,
NEW HAMPSHIRE



DRAFT SITE PLAN REVIEW REGULATION AMENDMENTS –

Electric Vehicle Infrastructure

ARTICLE VI – DESIGN AND CONSTRUCTION REQUIREMENTS

The Planning Board shall approve the proposed site plan only upon determination that the following requirements have been met:

[...]

NEW SECTION 6.11 - ELECTRIC VEHICLE (EV) INFRASTRUCTURE

A. Parking Space Design.

1. Battery charging station outlets and connector devices for ***Electric vehicle supply equipment*** (EVSE) shall be no less than 36 inches and no higher than 48 inches from the ground or pavement surface where mounted.
2. EVSE and associated parking space elements (including components mounted on pedestals, lighting posts, bollards, or other devices) shall be designed and located as to not impede pedestrian travel or create trip hazards and should include a barrier-free accessible route of travel to a primary building entrance. Provide a retraction device or place to mount cords and EVSE pedestals or protections designed to minimize vandalism, pedestrian conflict, and potential damage by accidents, snow storage/plowing and inclement weather.
3. ***Electric vehicle*** (EV) parking spaces shall meet standard dimensional and related requirements of the Site Plan Regulations, Section 6.5E and ADA parameters from the [U.S. Access Board](#).
4. EVSE shall be protected such as by wheel stops or concrete filled bollards or shall be placed a minimum of 24 inches clear from the face of the curb.
5. Adequate lighting (may be on timers or motion sensors) must be provided unless charging will always be for daytime purposes only.

B. EVSE signage.

1. Identify individual ***EV-installed spaces*** as EV-parking only, according to the Federal Highways Administration/Manual on Uniform Traffic Control Devices (MUTCD) Interim Approval (IA-13) for Electric Vehicle Charging, current edition, except when located in conjunction with single- or two-family dwellings.
2. Required information. At each ***EV-installed space*** or cluster of EV charging stations, except when located in conjunction with single- or two-family dwellings, signage must

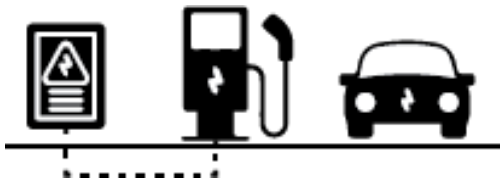
be posted and include pertinent user information, such as time limits or similar restrictions (e.g., “Electric Vehicle Parking Only While Charging”), pricing, safety information (e.g., voltage and amperage levels), contact information for service problems (including phone number), hours of operation (e.g. MUTCD R7-5), and penalty warnings (e.g., idling/maximum duration of charging sessions, non-EV parking), if applicable.

3. Format. As an alternative to posting all of the above information, details subject to change (e.g. rates) may be provided via a digital screen, website or similar. Signage must be included in the specifications package for Site Plan approval.
4. Labels. Submittal plans and associated installed equipment must be clearly labeled as follows: 1) service panels must identify dedicated circuits available for EV charging as “**EV Ready**”, 2) service panels designated for future additional EV charging must be identified as “**EV Capable**”, and 3) Conduit endpoints must be marked as “**EV Ready**” for full circuits, and “**EV Capable**” for inaccessible conduit installed.

C. Other

1. Multifamily dwellings and non-residential EVSE installations must include a plan for Operations & Maintenance of the chargers and related equipment, such as software.
2. Applicants are encouraged to design EVSE and related parking facilities in adherence to the Electric Vehicle Charging Design Guide (see Appendix B).

ARTICLE II – DEFINITIONS



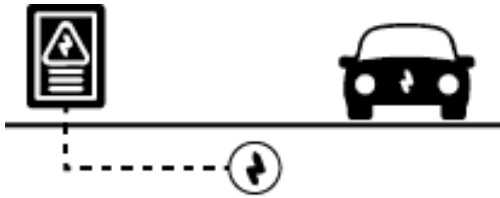
Electric vehicle supply equipment (EVSE)/ EV charging station: The apparatus installed specifically for the purpose of transferring energy between the site or building wiring and the Electric Vehicle. EVSE does not include any equipment affixed to the electric vehicle.

Electric vehicle infrastructure: Structures, machinery, and equipment necessary and integral to support an *electric vehicle*, including **EV charging stations** and electrical outlets.

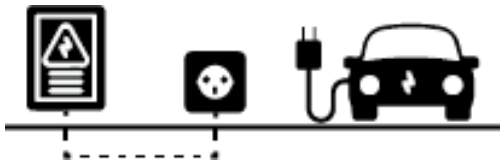
Electric vehicle (EV): An automotive-type vehicle for on-road use primarily powered by an electric motor, including any battery electric vehicle, fuel cell electric vehicle, or plug-in hybrid electric vehicle, that draws current from an onboard battery charged through a building or site electrical service, **EVSE**, or other source of electric current.

EV-capable space: An *off-street parking space* with electrical panel capacity and space for a branch circuit dedicated to the parking space that is not less than 40ampere and 208/240-volt

and equipped with raceways, both underground and surface mounted, to enable the future installation of **EVSE**. For two adjacent EV-capable spaces, a single branch circuit is permitted.



EV-ready space: An *off-street parking space* provided with a full dedicated branch circuit that includes not less than 40-ampere and 208/240-volt panel capacity, conduit, wiring, receptacle, and overcurrent protection devices terminating in a receptacle or junction box that will support an installed EVSE and which is located in close proximity to the location of the parking space. For two adjacent EV-ready spaces, a single branch circuit is permitted. These spaces are “ready to go” with the addition of an EV charging station (EVSE).



EVSE-installed space: An *off-street parking space* with a dedicated branch circuit and **EVSE** for **Level 2 EV** or **Low Power Level 2 charging stations**, at minimum.

Level 1: “Trickle” charging level for **EVs** that operates on a 15- to 20-amp breaker on a 120-volt AC circuit (wall outlet) while drawing 1.4 to 2.4 kW to add 2-6 miles of range per hour of charging.

Low Power Level 2: Charging level for **EVs** that operates on a 208- or 240-volt, 20-amp circuit while drawing around 3.8 kW to add approximately 13 miles of range gained per hour of charging.

Level 2: Charging level for **EVs** that operates on a dedicated 40- to 100-amp breaker (same kind used by a clothes dryer or stove) on a 208- or 240-volt AC circuit while drawing around 6.2+ kW to supply approximately 19+ miles of range gained per hour of charging.

Level 3: Fast or rapid charging level for **EVs** that operates on a 60-amp or higher breaker on a 480-volt AC electric circuit or higher three phase circuit with special grounding equipment and mounting on an equipment pad.

Electric Vehicle Load Management System: An automatic load management system designed to distribute load across one, or to locate charging capacity among multiple, EV charging stations. The system should distribute a minimum of 8 amps per charger (though allocations may vary) and is intended to increase cost-effectiveness by allowing the system to “share” the load across multiple EVs in the parking facility depending on aggregate and individual charging needs.

CITY OF LEBANON SITE PLAN REGULATIONS APPENDIX B

ELECTRIC VEHICLE CHARGING DESIGN GUIDE

This guide provides detailed requirements for electric vehicle charging and is part of the City's Site Plan Review development regulations. Companion requirements for EV Charging Infrastructure thresholds are part of the Zoning Ordinance. A key objective of this guide is to foster the greatest uptime of EVSE, a smooth user experience, and maximum value of related investments.

A. Site selection

1. Utility coordination. Prior to initiating permitting in conjunction with the requirements of Zoning Ordinance Section 607.8, proposed EVSE sites should have a site survey in coordination with utilities to assess physical and financial options of existing electrical power capacity or needs for bringing power to the site, if required. The purpose is to avoid conflicts that might increase project complexity or impact parking configurations. Submission of load requests to utilities for power reviews should use GPS coordinates rather than address locations. Such a strategy will lead to a more accurate assessment of the feasibility of supplying power to the site.
2. Power level. Where **Level 3** and **Level 2** EV charging station capacity is demonstrated to be unsuitable due to user needs or the site's power capacity, and upgrades are not practical, **Low Power Level 2** or **Level 1** EV charging stations should be considered for alternative provisions.
3. Visibility. The site design and location of EVSE is important to encourage its maximal use. EV parking spaces should be sited in visible and convenient locations. EV charging station wayfinding signage should be implemented.
4. Risk management. Consider the risks of locating chargers in areas subject to 100-year floods. For example, protections can include waterproof connectors that guard the grid from moisture. Some stations can use batteries, but they need to be elevated and have the ability to ventilate.
5. Accessibility. EV parking spaces should be located adjacent to the principal use. Accessible electric vehicle charging stations should be located in close proximity to the building or facility entrance and connected to a barrier-free accessible route of

travel. The owner of the property may designate the accessible electric vehicle charging station exclusively for use by people with disabilities.

6. Shelter. EV batteries are degraded in hot conditions and not charged fully in cold weather; the applicant may wish to provide shade, canopy or other shelter (i.e., enclosed structured parking), noting that 60-70 degrees (F) is the ideal charging temperature.
7. Energy optimization. When selecting a charging station location, site hosts and developers should consider existing and future needs for incorporating on-site distributed energy resources, and prioritize areas that can easily accommodate these assets, which in turn could reduce the cost of future upgrades. It is best practice to identify existing locations with excess load capacity that can support the deployment of curbside EV charging; for example, consider repurposing light poles.

B. Electrical system

1. Code compliance. All installations of EVSE shall meet National Electric Code (Article 625) and UL certification is recommended. The applicant should consult with the local code officials to ensure electrical code compliance as well. Level 2, including all auxiliary loads, should be metered in accordance with electric utility requirements.
2. Service. The electric service panels for EVSE ready circuits should be positioned near EV parking and shall provide sufficient capacity and space to accommodate the circuit and over-current protective device.
3. Load balancing. Property owners should consider equipment that is capable of supporting demand response, time-of-use (TOU), and/or smart charging. For example, evaluation and installation of an **electric vehicle load management system** in conjunction with other EVSE is recommended for larger projects, with the system designed to allocate charging capacity among multiple EV charging stations at a minimum of 8 amps per charger (minimum allocation may vary).
4. Enhanced charging infrastructure. Innovative charging strategies are encouraged, such as battery pack storage integration with EVSE for TOU demand management, solar canopy parking, co-location with electric bike storage and charging, and bidirectional EV chargers for vehicle-to-grid, -home, or -building load balancing.
5. Future-proofing. The make-ready portion of electrical infrastructure installed at publicly-funded, publicly-accessible locations, in particular, should be capable of supporting chargers with a minimum 150kW capacity.

C. Other best practices

1. Price signals. Usage fees must be transparent. Related considerations for programming include time of use rates and demand charges. Charging stations should display on their face the rate of charge, unit price (in whole cents or tenths of one cent), kWh at which the EVSE dispenses electricity during a transaction, and total kWh delivered per charging session, and demand charge signals prior to payment (where applicable).
2. Payment type. Multiple payment operations should be enabled. Each newly installed publicly-funded, publicly-accessible charging station must accept payments, with appropriate consumer data protection safeguards, via credit card reader and at least one other accessible form of payment. Publicly accessible EVSE should not require use of cell phone-based payment approaches.
3. Materials. EV infrastructure should be made of low-maintenance durable materials that are vandal-proof to the extent possible and operational in extreme weather conditions (including low and high temperatures).
4. Publicly accessible EVSE. The owner or operator should disclose the location and characteristics of each publicly accessible EV charging station to the U.S. Department of Energy's Alternative Fuels Data Center. Information that must be disclosed includes, but is not limited to, address, voltage, and timing restrictions.