ATTACHMENTS
FOR STORMWATER MANAGEMENT PLAN

For Proposed Improvements at
23 Central Street, Newbury, Massachusetts

21 April 2020

Stormwater Checklist
Illicit Discharge Statement
Construction Period Operation and Maintenance Plan
Long Term Operation and Maintenance Plan
Area Maps, GIS, Oliver, Subcatchment Area Plans & Tables
Soil and Test Pit Investigation Logs
Invisible Systems Rainstore 3 Product Information

Prepared by
Anthony Guba, P.E.
A.L. Prime Energy Consultant, Inc.
18 Lark Avenue, Saugus, MA 01906
Mobile 512-745-6400
Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands Program  
Checklist for Stormwater Report

A. Introduction

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

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

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

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

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

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

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

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

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

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

Registered Professional Engineer’s Certification

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

Registered Professional Engineer Block and Signature

[Signature and Date: 4/29/20]

Checklist

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

☒ New development
☐ Redevelopment
☐ Mix of New Development and Redevelopment
Checklist (continued)

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

- [ ] No disturbance to any Wetland Resource Areas
- [ ] Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- [ ] Reduced Impervious Area (Redevelopment Only)
- [ ] Minimizing disturbance to existing trees and shrubs
- [ ] LID Site Design Credit Requested:
  - [ ] Credit 1
  - [ ] Credit 2
  - [ ] Credit 3
- [ ] Use of “country drainage” versus curb and gutter conveyance and pipe
- [ ] Bioretention Cells (includes Rain Gardens)
- [ ] Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- [ ] Treebox Filter
- [ ] Water Quality Swale
- [ ] Grass Channel
- [ ] Green Roof
- [ ] Other (describe):

**Standard 1: No New Untreated Discharges**

- [ ] No new untreated discharges
- [ ] Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- [ ] Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.
Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static  ☒ Simple Dynamic  ☐ Dynamic Field

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

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

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

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

☐ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

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

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

1 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.
Checklist (continued)

**Standard 3: Recharge (continued)**

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

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

**Standard 4: Water Quality**

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

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

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

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

☐ is within the Zone II or Interim Wellhead Protection Area

☐ is near or to other critical areas

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

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

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

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

**Standard 4: Water Quality** (continued)

- The BMP is sized (and calculations provided) based on:
  - The ½” or 1” Water Quality Volume or
  - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

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

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

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

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted prior to the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does not cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

- All exposure has been eliminated.

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

- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

**Standard 6: Critical Areas**

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

- Critical areas and BMPs are identified in the Stormwater Report.
Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
  ☐ Limited Project
  ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
  ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
  ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
  ☐ Bike Path and/or Foot Path
  ☐ Redevelopment Project
  ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.
Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control
(continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has not been included in the Stormwater Report but will be submitted before land disturbance begins.

☒ The project is not covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted before land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

☒ Name of the stormwater management system owners;

☒ Party responsible for operation and maintenance;

☒ Schedule for implementation of routine and non-routine maintenance tasks;

☒ Plan showing the location of all stormwater BMPs maintenance access areas;

☐ Description and delineation of public safety features;

☐ Estimated operation and maintenance budget; and

☒ Operation and Maintenance Log Form.

☐ The responsible party is not the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

☐ A copy of the legal instrument (deed, homeowner’s association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;

☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted prior to the discharge of any stormwater to post-construction BMPs.
Illicit Discharge Statement
A.L. Prime, 23 Central Street, Byfield MA

Per the requirements of Standard 10 of the Massachusetts Stormwater Management Standards it shall be stated that NO ILLICIT DISCHARGES TO THE STORMWATER SYSTEM EXIST ON THIS SITE. This includes the discharge of hazardous material as well as the wastewater systems on site.

No discharges of any kind are allowed into stormwater systems other than stormwater and irrigation runoff. There will be no connections between any wastewater piping and stormwater piping or system.

Signature of Owner making this Certification

[Signature] 4/20/20
Stormwater System Construction Phase Operation and Maintenance Plan
A.L. Prime, 23 Central Street, Byfield MA

Primary contact – Brian Hughes, Director of Construction, mobile 781-929-2831

The Construction Contractor under the direction of the property owner is responsible to implement this plan throughout the duration of the site construction schedule. The responsible persons may employ others to complete actual work as necessary.

This plan is to be used in conjunction with the approved site plan package and any Town of Newbury Board or municipal approvals, decisions, permits, and conditions or any applicable regulations or bylaws regarding the proposed improvements.

A.L. Prime is proposing to construct a gas station including a convenience store and drive-thru coffee shop at 23 Central Street, Byfield. The location is slightly under one acre and situated just east of the Central Street interchange with Interstate 95. It is zoned Highway Commercial, presently used as residential, and abutted by other residential and commercial uses. The proposed work includes razing the existing improvements and constructing a new store, fueling islands and canopy, underground tanks, utilities, pavement, and landscaping.

The site is relatively flat and slopes primarily to the north. The development will adjust grades throughout the site and most of the site will be disturbed at some point during the project.

Erosion Control is most demanding during the construction phase when the site is disturbed and has the most potential to produce silt laden runoff. All contractor and sub-contractor employees are to be trained and aware of this plan. Daily inspection of the system and adherence to this plan are required to insure that the system meets the design expectations. Please refer to the project drawings, and in particular the Erosion Control, Grading, Utilities, and Site Detail drawings for more information regarding the design and procedures for maintaining erosion control.

Construction Sequence (see ER-1 Drawing)

1. Estimated time of construction for this project is five months.
2. Temp control measures and any required ma dep signage to be installed prior to any site work or demo of existing improvements.
3. Install perimeter fencing, silt controls, construction entrances and establish stockpile areas prior to site work excavation
4. Throughout project, inspect the erosion and sedimentation control structures daily and after any storm events and maintain as necessary. Repair damaged or deteriorated erosion control measures immediately upon identification
5. Drainage shall be prevented from entering the subsurface infiltration system components before the system is completed and backfilled
6. Catch basin inlet protection must remain until base pavement is installed and all stockpiles are removed and no longer necessary
7. Temporary hay bales, straw wattles, or silt fences may be removed after final soil stabilization and base pavement has been installed and issuance of any required approval from municipal authority
8. Upon conclusion of construction and after all final stabilization is achieved, clean all drainage structures of all dirt, debris, or any loose materials.

**Construction Period Activities**

The Construction Contractor shall implement the following measures:
- There will be no vehicle or equipment maintenance conducted on the site other than daily equipment checks and maintenance
- Disturbed areas will be kept moist or covered and stabilized to control dust
- All stockpiles materials will be managed to prevent migration by either rain or wind. When not in use for any extended period of time, stockpiles should be covered. When possible, reduce the amount of stockpile material necessary by having such material delivered as needed. All stockpiles to be maintained in a neat and orderly manner
- Manage concrete washout. Such washout is prohibited from catch basins and drainage systems
- Employ all available mosquito control measures eliminating standing water where possible and draining or filling temporary pools of water. There will be no application of pesticides or herbicides during the course of this construction
Stormwater System Long Term Operation and Maintenance Plan
A.L. Prime, 23 Central Street, Byfield MA

The property owner, A.L. Prime Energy Consultant, Inc., is the party responsible for the post-development long term operation and maintenance of the stormwater system at this location. This responsibility transfers to any successor owner and this plan should be updated with new ownership any time the property transfers. Owner responsibility for the maintenance of the stormwater system is intended to remain in perpetuity, or until the system is removed or modified and a new plan is approved.

Primary contact – Nasser Abu-Eid, Vice President, mobile 617-212-3551
Alternate contacts – Bassil Zaza, Dir of Operations, mobile 617-212-3553
Brian Hughes, Dir of Const, mobile 781-929-2831
Anthony Guba, Dir of Engineering, mobile 512-745-6400

The responsible persons may employ others to complete actual work as necessary. Any and all work done will be at the expense of the site owner and no expense will accrue to the Town of Newbury.

The subject site consists of a gas station including a convenience store and drive-thru coffee shop. The parcel is slightly less than one acre and situated just east of the Central Street interchange with Interstate 95. It is zoned Highway Commercial. Site improvements include a 4,850 square foot store, fueling islands and canopy, underground tanks, utilities, pavement, and landscaping.

The site is relatively flat and slopes primarily to the north and south as divided near the centerline of the store. Attached is a site plan that shows the site layout and main components of the stormwater management system. The system is comprised of to surface retention basins and four underground infiltration systems. Runoff from roof and pavement areas is routed to these systems to reduce any flow off the site and to promote groundwater recharge.

In order to keep these systems operating properly, the owner will implement this plan to maintain all the system components. All new employees are to be trained and aware of this plan. Scheduled inspection of the system and adherence to this plan are required to insure that the system meets the design expectations. This plan is to be used in conjunction with the approved site plan package and any Town of Newbury Board or municipal approvals, decisions, permits, and conditions or any applicable regulations or bylaws regarding the proposed improvements.

Long Term Operation and Maintenance Procedures
1. See attached plan and inspection/maintenance log form. Follow the routine inspection and/or maintenance schedule as indicated.
   a. The site is to have pavement swept at least annually in the spring to remove accumulated sand from winter season
b. Catch Basins and Oil/Grit separators are to be inspected at least annually and cleaned as necessary to remove accumulated sediment.

2. See the station Emergency Response Plan that is posted at the station
3. All spills must be attended to and cleaned up immediately
4. No vehicle washing or maintenance on site. All vehicle fueling to be conducted at the vehicle fueling area under the canopy and within the dry chemical fire protection system
5. This site has an on-site septic system. Any connection between that system and the stormwater drainage system is prohibited. No discharges of any kind are allowed into stormwater systems other than stormwater and irrigation runoff
6. Only designated areas at the screened trash enclosure is to be used for storage of used absorbents and liquid removed from any petroleum tank or dispenser sump or fill or vapor bucket
7. Snow plowing to use area to rear and sides to stockpile any snow. If snow exceeds available storage areas, remove from site and transport to properly permitted facility. Do not store snow in retention basin areas.
8. Inspect and properly maintain the perimeter grooves (PLB) around the fueling area
9. Deicing materials will only be used to the extent needed to make the drive aisles and walkways safe
10. Fertilizers, herbicides, and pesticides will only be used to the extent needed to maintain healthy plant materials and landscaped areas
11. Employ all available mosquito control measures eliminating standing water where possible and draining or filling temporary pools of water

The owner agrees to the above plan, including the attached inspection log and frequency. Any and all work done will be at the expense of the site owner and no expense will accrue to the Town of Newbury.

Signature of Owner accepting this Plan
### Stormwater Management System Inspection Log

#### A.L. Prime Energy Consultant, Inc.
23 Central Street, Byfield MA

<table>
<thead>
<tr>
<th>Pavement Areas</th>
<th>Date</th>
<th>Comments</th>
<th>Date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect every spring and after major snowstorms for accumulation of sand</td>
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<tr>
<td>Sweep areas in April.</td>
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<tr>
<td>Sweep pavement if needed due to sand accumulation</td>
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<table>
<thead>
<tr>
<th>Retention Basins</th>
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<th>Comments</th>
<th>Date</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Inspect in April and November, measure depth of sediment. Remove sediment whenever found in the spreader at inlet to north retention area. Remove sediment in basin any time the total depth accumulates to more than 6&quot; in either of those areas.</td>
<td></td>
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<tr>
<td>Inspect if necessary between other scheduled inspections, due to major storms, site fuel spill, or other concern</td>
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<table>
<thead>
<tr>
<th>Catch Basins</th>
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<tbody>
<tr>
<td>Inspect in April and November, measure depth of sediment</td>
<td></td>
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<td></td>
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<tr>
<td>Inspect if necessary between other scheduled inspections, due to major storms, site fuel spill, or other concern</td>
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<tr>
<td>Remove any floating contaminant or sheen as soon as possible. Remove all sediment if total accumulated is less than 12&quot; from bottom of outlet tee</td>
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<table>
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<tr>
<th>Oil/Grit Separator</th>
<th>Date</th>
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<tr>
<td>Inspect in April. Remove cover to measure accumulated sediment and floating contaminant</td>
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<td>Inspect if necessary between other scheduled inspections, due to major storms, site fuel spill, or other concern</td>
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<tr>
<td>Remove any floating contaminant immediately. Remove all sediment if that accumulated is less than 12&quot; from bottom of outlet tee.</td>
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**Additional notes regarding any inspections:**

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### Pre-Development Sub-Catchment Areas

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<th>Total Study Area Total:</th>
<th>46775</th>
<th>1.074 (acre)</th>
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<tbody>
<tr>
<td>PreDev On-site Area Total:</td>
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<td>0.985 (acre)</td>
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<tr>
<td><strong>CN</strong></td>
<td><strong>Slope</strong></td>
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<tr>
<td><strong>EX1 Rear</strong></td>
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<td></td>
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<td>10854</td>
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<td><strong>EX2 Middle</strong></td>
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<td>Building</td>
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<td><strong>EX4 ROW</strong></td>
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<td>c</td>
<td>Pervious East</td>
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### Post-Development Sub-Catchment Areas

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<th>Total Study Area Total:</th>
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<td>PostDev On-site Area Total:</td>
<td>42891</td>
<td>0.985 (acre)</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>on site</th>
<th>off site</th>
<th>CN</th>
<th>Slope</th>
<th>d (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S1A Roof (P1A)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>store roof</td>
<td>4845</td>
<td>98</td>
<td>0.010</td>
<td>110</td>
</tr>
<tr>
<td><strong>S1B Roof (P1B)</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>canopy roof</td>
<td>3568</td>
<td>98</td>
<td>0.020</td>
<td>165</td>
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<tr>
<td><strong>S2 Rear total (P2)</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>basin</td>
<td>2370</td>
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<tr>
<td></td>
<td>pervious</td>
<td>239</td>
<td>79</td>
<td>0.033</td>
<td>120</td>
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<tr>
<td></td>
<td>pavement</td>
<td>8851</td>
<td>98</td>
<td>0.014</td>
<td>125</td>
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<tr>
<td><strong>S3 CB1 E Side total (P3)</strong></td>
<td></td>
<td></td>
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</tr>
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<td></td>
<td>pavement</td>
<td>9091</td>
<td>98</td>
<td>0.016</td>
<td>198</td>
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<tr>
<td></td>
<td>grass slope</td>
<td>1020</td>
<td>79</td>
<td>0.016</td>
<td>205</td>
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<tr>
<td></td>
<td>off site driveway</td>
<td>47</td>
<td>98</td>
<td>0.042</td>
<td>10.5</td>
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<td><strong>S4 CB2 W Side total (P4)</strong></td>
<td></td>
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<td></td>
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<td></td>
<td>pavement</td>
<td>9786</td>
<td>98</td>
<td>0.012</td>
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<td>pervious</td>
<td>128</td>
<td>79</td>
<td>0.330</td>
<td>22</td>
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<td><strong>S5 Retention area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>front bioretention</td>
<td>440</td>
<td>98</td>
<td>0.000</td>
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<tr>
<td><strong>S6 Runs offsite (1R)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>to North A</td>
<td>773</td>
<td>79</td>
<td>0.250</td>
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<tr>
<td><strong>S7 Runs offsite (2R)</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>to West B</td>
<td>931</td>
<td>79</td>
<td>0.330</td>
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<td><strong>S8 Pavement to off (2R)</strong></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>to CB3</td>
<td>849</td>
<td>98</td>
<td>0.020</td>
<td>65</td>
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<td></td>
<td>driveway</td>
<td>608</td>
<td>98</td>
<td>0.016</td>
<td>35</td>
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<tr>
<td><strong>S9 Driveway Retention area</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>(S9) off site driveway</td>
<td>617</td>
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<td>0.018</td>
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<td>(S9) off site pervious</td>
<td>951</td>
<td>79</td>
<td>0.037</td>
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<tr>
<td></td>
<td>(S9) off site bioretention area</td>
<td>867</td>
<td>98</td>
<td>0.000</td>
<td>5</td>
</tr>
<tr>
<td><strong>S10 to ROW (4R)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>paved</td>
<td>707</td>
<td>98</td>
<td>0.085</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>pervious</td>
<td>87</td>
<td>79</td>
<td>0.330</td>
<td>5</td>
</tr>
</tbody>
</table>
## Runoff Comparison of Rates and Volumes from Pre to Post Conditions

<table>
<thead>
<tr>
<th></th>
<th>Total Runoff to St (4R) or (S10)</th>
<th>Total Runoff to Offsite (5R)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Rate</td>
<td>Volume</td>
</tr>
<tr>
<td>2yr Pre Dev</td>
<td>0.16</td>
<td>0.012</td>
</tr>
<tr>
<td>2yr Post Dev</td>
<td>0.08</td>
<td>0.004</td>
</tr>
<tr>
<td>Change</td>
<td>-0.08</td>
<td>-0.008</td>
</tr>
<tr>
<td>% change Pre to Post</td>
<td>-50%</td>
<td>-67%</td>
</tr>
<tr>
<td>10yr Pre Dev</td>
<td>0.41</td>
<td>0.027</td>
</tr>
<tr>
<td>10yr Post Dev</td>
<td>0.11</td>
<td>0.006</td>
</tr>
<tr>
<td>Change</td>
<td>-0.3</td>
<td>-0.021</td>
</tr>
<tr>
<td>% change Pre to Post</td>
<td>-73%</td>
<td>-78%</td>
</tr>
<tr>
<td>100yr Pre Dev</td>
<td>0.83</td>
<td>0.054</td>
</tr>
<tr>
<td>100yr Post Dev</td>
<td>0.17</td>
<td>0.009</td>
</tr>
<tr>
<td>Change</td>
<td>-0.66</td>
<td>-0.045</td>
</tr>
<tr>
<td>% change Pre to Post</td>
<td>-80%</td>
<td>-83%</td>
</tr>
<tr>
<td>Pond</td>
<td>P1A</td>
<td>P1B</td>
</tr>
<tr>
<td>-------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Type</td>
<td>RS-3</td>
<td>RS-3</td>
</tr>
<tr>
<td>design unit</td>
<td>38ea(12)</td>
<td>45ea(6)</td>
</tr>
<tr>
<td>total RS-3 units</td>
<td>456</td>
<td>270</td>
</tr>
<tr>
<td>SF</td>
<td>334</td>
<td>487</td>
</tr>
<tr>
<td>ESHGW*</td>
<td>54.5</td>
<td>56.2</td>
</tr>
<tr>
<td>bottom of sys</td>
<td>56.80</td>
<td>58.20</td>
</tr>
<tr>
<td>stone base</td>
<td>0.50</td>
<td>0.25</td>
</tr>
<tr>
<td>invert of chamber</td>
<td>57.30</td>
<td>58.45</td>
</tr>
<tr>
<td>top of sys</td>
<td>61.30</td>
<td>60.45</td>
</tr>
<tr>
<td>100 yr peak elev</td>
<td>60.53</td>
<td>60.08</td>
</tr>
<tr>
<td>100yr peak cushion</td>
<td>0.77</td>
<td>0.37</td>
</tr>
<tr>
<td>Proposed final grade</td>
<td>62.78</td>
<td>61.60</td>
</tr>
<tr>
<td>Min cover over chamber</td>
<td>1.48</td>
<td>1.15</td>
</tr>
<tr>
<td>Catchment Area Inlet RIM**</td>
<td>63.25</td>
<td>60.5</td>
</tr>
<tr>
<td>RIM - 100yr cushion</td>
<td>2.72</td>
<td>0.42</td>
</tr>
</tbody>
</table>

* for P1B and P5, using highest nearby ESHGW found

** for downspout, use grade elev, assuming loose connection at grade
### Map Unit Legend

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>256A</td>
<td>Deerfield loamy fine sand, 0 to 3 percent slopes</td>
<td>1.1</td>
<td>22.9%</td>
</tr>
<tr>
<td>422C</td>
<td>Canton fine sandy loam, 8 to 15 percent slopes, extremely stony</td>
<td>0.9</td>
<td>19.8%</td>
</tr>
<tr>
<td>651</td>
<td>Udorthents, smoothed</td>
<td>2.7</td>
<td>57.4%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>4.6</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
### Soil Log

<table>
<thead>
<tr>
<th>Test Pit #</th>
<th>Elevation</th>
<th>Fill</th>
<th>Depth</th>
<th>Soil Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>62.7</td>
<td></td>
<td>10&quot;</td>
<td>Ab - F.S.L 10YR 2/2</td>
</tr>
<tr>
<td>02</td>
<td>60.3'</td>
<td>9&quot;</td>
<td>20&quot;</td>
<td>Ab - F.S.L 10YR 2/2</td>
</tr>
<tr>
<td>03</td>
<td>60.2'</td>
<td>30&quot;</td>
<td>32&quot;</td>
<td>BW - F.S.L 10YR 4/6</td>
</tr>
<tr>
<td>04</td>
<td>59.8'</td>
<td>29&quot;</td>
<td>32&quot;</td>
<td>C - SLOAM 25Y 5/4</td>
</tr>
<tr>
<td>05</td>
<td>56.8'</td>
<td></td>
<td>52&quot;</td>
<td>C - V.F.S.L 10YR 4/6</td>
</tr>
<tr>
<td>06</td>
<td>58.0'</td>
<td></td>
<td>52&quot;</td>
<td>C - L.SAND 25Y 5/4</td>
</tr>
</tbody>
</table>

**Water Table**
- none observed: 40" estimated 59.4'
- none observed: 52" estimated 55.8'
- none observed: 52" estimated 55.5'
- 98" observed: 57" estimated 52.1'
- none observed: 52" estimated 56.0'

### Percolation Tests

<table>
<thead>
<tr>
<th>Date</th>
<th>Depth</th>
<th>Rate</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-02-2019</td>
<td>6 MIN</td>
<td>12&quot; - 9&quot;</td>
<td></td>
</tr>
<tr>
<td>12-02-2019</td>
<td>7 MIN</td>
<td>9&quot; - 6&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**Diagram**

- Tax map information:
  - N.Y. Burke Jil.
  - BK 19, LOT 37
  - Central St.
  - PG 53
  - SMH RIM = 59.65'
  - Sign
  - #26
  - CO UP #65
**USDA - S.C.S. SOIL TYPES**  
**THE ENTIRE SITE IS MAPPED AS:**  
**Ur - URBAN LAND**

**SOIL LOG**

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>TEST PIT # SW-1</strong></td>
<td><strong>TEST PIT # SW-2</strong></td>
<td><strong>TEST PIT # SW-3</strong></td>
</tr>
<tr>
<td>ELEV = 59.4'</td>
<td>ELEV = 59.6'</td>
<td>ELEV = 59.5'</td>
</tr>
<tr>
<td>A - F.S.L 10YR 3/2</td>
<td><strong>FILL</strong></td>
<td><strong>FILL</strong></td>
</tr>
<tr>
<td>14&quot;</td>
<td>42&quot;</td>
<td>23&quot;</td>
</tr>
<tr>
<td>BW - F.S.L 10YR 4/6</td>
<td></td>
<td>29&quot;</td>
</tr>
<tr>
<td>28&quot;</td>
<td></td>
<td>42&quot;</td>
</tr>
<tr>
<td>C1 - S.LOAM 2.5Y 5/4</td>
<td></td>
<td>BW - F.S.L 10YR 4/6</td>
</tr>
<tr>
<td>72&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2 - V.F.S.L 2.5Y 4/4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>101&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WATER TABLE</td>
<td>WATER TABLE</td>
<td>WATER TABLE</td>
</tr>
<tr>
<td>NONE OBSERVED</td>
<td>NONE OBSERVED</td>
<td>NONE OBSERVED</td>
</tr>
<tr>
<td>38&quot; ESTIMATED 56.2'</td>
<td>58&quot; ESTIMATED 54.8'</td>
<td>45&quot; ESTIMATED 55.8'</td>
</tr>
</tbody>
</table>
Commonwealth of Massachusetts
City/Town of NEWBURY
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

MassDEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

<table>
<thead>
<tr>
<th>Owner Name</th>
<th>23 CENTRAL STREET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street Address</td>
<td>R &amp; E REALTY TRUST</td>
</tr>
<tr>
<td>Map/Lot #</td>
<td>R-20 / 28</td>
</tr>
<tr>
<td>City</td>
<td>NEWBURY</td>
</tr>
<tr>
<td>State</td>
<td>MA</td>
</tr>
<tr>
<td>Zip Code</td>
<td>01922</td>
</tr>
</tbody>
</table>

B. Site Information

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

2. Published Soil Survey Available? ☑ Yes ☐ No
   - URBAN LAND
     - Soil Name
       - VARIABLE
         - Ur
           - Year Published: 1981
           - Publication Scale: 1"=1320'
           - Soil Map Unit

3. Surficial Geological Report Available? ☐ Yes ☑ No
   - TILL
     - Geologic Material
       - DRUMLIN
         - Landform

4. Flood Rate Insurance Map
   - Above the 500-year flood boundary? ☑ Yes ☐ No
   - Within the 100-year flood boundary? ☐ Yes ☑ No
   - Within the 500-year flood boundary? ☐ Yes ☑ No
   - Within a velocity zone? ☐ Yes ☑ No

5. Wetland Area:
   - National Wetland Inventory Map
   - Wetlands Conservancy Program Map

Form 11 – Soil Suitability Assessment for On-Site Sewage Disposal • Page 1 of 8
### B. Site Information (Continued)

6. Current Water Resource Conditions (USGS): 11/19 Month/Year  
   Range: ☐ Above Normal ☑ Normal ☐ Below Normal

7. Other references reviewed: U.S.G.S. QUAD, FEMA, SCS SOILS

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

<table>
<thead>
<tr>
<th>Deep Observation Hole Number: SW-1</th>
<th>Date: 12-02-2019</th>
<th>Time: 1 PM</th>
<th>Weather: SNOW</th>
</tr>
</thead>
</table>

1. **Location**
   - Ground Elevation at Surface of Hole: 59.4’
   - Location (identify on plan): 

2. **Land Use**
   - RES - SINGLE FAMILY - Prop Commercial Stormwater
   - NONE
   - Surface Stones
   - 1-3 Slope (%)
   - LAWN Vegetation
   - DRUMLIN Landform
   - Position on Landscape (attach sheet)

3. **Distances from:**
   - Open Water Body >400’ feet
   - Drainage Way >100’ feet
   - Property Line >10’ feet
   - Drinking Water Well >100’ feet
   - Possible Wet Area >100’ feet
   - Other

4. **Parent Material:** TILL
   - Unsuitable Materials Present: ☐ Yes ☑ No
   - If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. **Groundwater Observed:** ☐ Yes ☑ No
   - If yes:
     - Depth Weeping from Pit
     - Depth Standing Water in Hole
   - Estimated Depth to High Groundwater: 38” inches
   - 56.2’ elevation
C. On-Site Review (Continued)

Deep Observation Hole Number: SW-1

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon/ Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>14&quot;</td>
<td>A</td>
<td>10YR 3/2</td>
<td></td>
<td></td>
<td>F.S.L.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28&quot;</td>
<td>BW</td>
<td>10YR 4/6</td>
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<td></td>
<td>F.S.L.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50&quot;</td>
<td>C1</td>
<td>2.5Y 5/4</td>
<td>38&quot;</td>
<td>7.5YR 5/8</td>
<td>20%</td>
<td>S.LOAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>101&quot;</td>
<td>C2</td>
<td>2.5Y 4/4</td>
<td></td>
<td></td>
<td>V.F.S.L.</td>
<td></td>
<td></td>
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Additional Notes:

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________
C. On-Site Review (Continued)

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<th>SW-2</th>
<th>12-02-2019</th>
<th>1 PM</th>
<th>SNOW</th>
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<td></td>
<td>Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weather</td>
<td></td>
<td></td>
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</tbody>
</table>

1. Location

<table>
<thead>
<tr>
<th>Ground Elevation at Surface of Hole:</th>
<th>59.6'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location (identify on plan):</td>
<td></td>
</tr>
</tbody>
</table>

2. Land Use

| RES - SINGLE FAMILY - Prop Commercial Stormwater | NONE | 1-3 |
| (e.g., woodland, agricultural field, vacant lot, etc.) | Surface Stones | Slope (%) |
| LAWN | DRUMLIN |
| Vegetation | Landform |
| Position on Landscape (attach sheet) | |

3. Distances from:

<table>
<thead>
<tr>
<th>Open Water Body</th>
<th>Drainage Way</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;400' feet</td>
<td>&gt;100' feet</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Property Line</th>
<th>Drinking Water Well</th>
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</thead>
<tbody>
<tr>
<td>&gt;10' feet</td>
<td>&gt;100' feet</td>
</tr>
</tbody>
</table>

4. Parent Material:

| TILL |

Unsuitable Materials Present: ☒ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No

<table>
<thead>
<tr>
<th>If yes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth Weeping from Pit</td>
</tr>
<tr>
<td>Depth Standing Water in Hole</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Estimated Depth to High Groundwater:</th>
</tr>
</thead>
<tbody>
<tr>
<td>58&quot; inches</td>
</tr>
</tbody>
</table>
### C. On-Site Review (Continued)

Deep Observation Hole Number: **SW-2**

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon/Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>42&quot;</td>
<td>FILL</td>
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</tr>
</tbody>
</table>

Additional Notes:

__________________________________________________________________________

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__________________________________________________________________________
D. Determination of High Groundwater Elevation

1. Method Used:

- Depth observed standing water in observation hole
- Depth weeping from side of observation hole
- Depth to soil redoximorphic features (mottles)
- Groundwater adjustment (USGS methodology)

2. Index Well Number | Reading Date | Adjustment Factor | Adjusted Groundwater Level

<table>
<thead>
<tr>
<th>A. inches</th>
<th>B. inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. inches</td>
<td>B. inches</td>
</tr>
<tr>
<td>A. SW1 - 38&quot;</td>
<td>B. SW2 - 58&quot;</td>
</tr>
</tbody>
</table>

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

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

   - Yes    - No

   b. If yes, at what depth was it observed?

   Upper boundary: 42" inches
   Lower boundary: 101" inches
F. Certification

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

______________________________
Signature of Soil Evaluator
ROBERT M. GRASSO, SE#933
Typed or Printed Name of Soil Evaluator / License #

______________________________
Date
12-02-2019

______________________________
Date of Soil Evaluator Exam
10/97

______________________________
Name of Board of Health Witness

______________________________
Board of Health

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

Use this sheet for field diagrams:
Commonwealth of Massachusetts
City/Town of NEWBURY
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

MassDEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

R & E REALTY TRUST
Owner Name
23 CENTRAL STREET
Street Address
NEWBURY
City
R-20 / 28
Map/Lot #
MA
State
01922
Zip Code

B. Site Information

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

2. Published Soil Survey Available? ☐ Yes ☐ No If yes: 1981
   URBAN LAND
   Soil Name
   Year Published
   1"=1320'
   Publication Scale
   Ur
   Soil Map Unit

3. Surficial Geological Report Available? ☐ Yes ☒ No If yes: 
   TILL
   Geologic Material
   Year Published
   Publication Scale
   Map Unit
   DRUMLIN
   Landform

4. Flood Rate Insurance Map

   Above the 500-year flood boundary? ☐ Yes ☒ No
   Within the 500-year flood boundary? ☐ Yes ☒ No
   Within the 100-year flood boundary? ☐ Yes ☒ No
   Within a velocity zone? ☐ Yes ☒ No

5. Wetland Area:
   National Wetland Inventory Map
   Wetlands Conservancy Program Map
B. Site Information (Continued)

   11/19
   Month/Year
   Range: □ Above Normal □ Normal □ Below Normal

7. Other references reviewed: U.S.G.S. QUAD, FEMA, SCS SOILS

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

Deep Observation Hole Number: SW-3 12-06-2019 1 PM SNOW

1. Location

   Ground Elevation at Surface of Hole: 59.5'
   Location (identify on plan):

2. Land Use

   RES - SINGLE FAMILY - Prop Commercial Stormwater
   (e.g., woodland, agricultural field, vacant lot, etc.)

   LAWN
   Vegetation

   DRUMLIN
   Landform

3. Distances from:

   Open Water Body >400' feet
   Drainage Way >100' feet
   Property Line >10' feet
   Drinking Water Well >100' feet

4. Parent Material: TILL

   Unsuitable Materials Present: □ Yes □ No
   If Yes: □ Disturbed Soil □ Fill Material □ Impervious Layer(s) □ Weathered/Fractured Rock □ Bedrock

5. Groundwater Observed: □ Yes □ No

   Estimated Depth to High Groundwater: 45'' inches
   If yes: Depth Weeping from Pit
   Depth Standing Water in Hole 55.8' elevation
### C. On-Site Review (Continued)

Deep Observation Hole Number: **SW-3**

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
<th>Other</th>
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<td>F.S.L.</td>
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<td>F.S.L.</td>
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<td>20% S.LOAM</td>
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Additional Notes:

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__________________________
Commonwealth of Massachusetts
City/Town of NEWBURY
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:
   - [ ] Depth observed standing water in observation hole
   - [ ] Depth weeping from side of observation hole
   - [x] Depth to soil redoximorphic features (mottles)
   - [ ] Groundwater adjustment (USGS methodology)

2. Index Well Number
   Reading Date
   Adjustment Factor
   Adjusted Groundwater Level

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
      - [x] Yes  [ ] No
   b. If yes, at what depth was it observed?
      Upper boundary: 42" inches  
      Lower boundary: 100" inches
F. Certification

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

Signature of Soil Evaluator
ROBERT M. GRASSO, SE#933
Typed or Printed Name of Soil Evaluator / License #

Name of Board of Health Witness

12-06-2019
Date
10/97
Date of Soil Evaluator Exam

Board of Health

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.
Commonwealth of Massachusetts
City/Town of NEWBURY
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

MassDEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

R & E REALTY TRUST
Owner Name
23 CENTRAL STREET
Street Address
NEWBURY
City
R-20 / 28
Map/Lot #
MA
State
01922
Zip Code

B. Site Information

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

2. Published Soil Survey Available?  ☒ Yes  ☐ No

URBAN LAND
Soil Name

3. Surficial Geological Report Available?  ☐ Yes  ☒ No

TILL
Geologic Material

4. Flood Rate Insurance Map

Able the 500-year flood boundary?  ☒ Yes  ☐ No
Within the 500-year flood boundary?  ☐ Yes  ☒ No

5. Wetland Area:
National Wetland Inventory Map
Wetlands Conservancy Program Map

If yes:  1981
Year Published
1"=1320'
Publication Scale

If yes:  Year Published
Publication Scale

If yes:  Year Published
Publication Scale

VARIABLE
Soil Limitations

DRUMLIN
Landform

Within the 100-year flood boundary?  ☐ Yes  ☒ No
Within a velocity zone?  ☐ Yes  ☒ No

Map Unit
Name

Map Unit
Name

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Form 11 – Soil Suitability Assessment for On-Site Sewage Disposal • Page 1 of 8
Commonwealth of Massachusetts
City/Town of NEWBURY
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

B. Site Information (Continued)

   Month/Year  Range: □ Above Normal  □ Normal  □ Below Normal

7. Other references reviewed: U.S.G.S. QUAD, FEMA, SCS SOILS

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

Deep Observation Hole Number: SW-4  03-02-2020  1 PM  CLEAR/SUNNY

1. Location

   Ground Elevation at Surface of Hole: 57.8'

   Location (identify on plan):

2. Land Use

   Land Use: RES - SINGLE FAMILY - Prop Commercial Stormwater
   (e.g., woodland, agricultural field, vacant lot, etc.)
   Vegetation: LAWN
   Landform: DRUMLIN
   Surface Stones: NONE
   Slope (%): 1-3
   Position on Landscape (attach sheet): 

3. Distances from:

   Open Water Body: >400' feet
   Drainage Way: >100' feet
   Property Line: >10' feet
   Drinking Water Well: >100' feet
   Possible Wet Area: >100' feet
   Other:

4. Parent Material:

   Parent Material: TILL

   Unsuitable Materials Present: □ Yes □ No

   If Yes: □ Disturbed Soil □ Fill Material □ Impervious Layer(s) □ Weathered/Fractured Rock □ Bedrock

5. Groundwater Observed: □ Yes □ No

   Estimated Depth to High Groundwater: 48''

   If yes: 58'' Depth Weeping from Pit 58'' Depth Standing Water in Hole

   53.8' elevation
### C. On-Site Review (Continued)

Deep Observation Hole Number: SW-4

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistency (Moist)</th>
<th>Other</th>
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<tbody>
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<td>112&quot;</td>
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</table>

Additional Notes:

[Blank lines for notes]
C. On-Site Review (Continued)

Deep Observation Hole Number: SW-5
Date: 03-02-2020
Time: 1 PM
Weather: CLEAR/SUNNY

1. Location
Ground Elevation at Surface of Hole: 58.5'
Location (identify on plan):  

2. Land Use
   
   RES - SINGLE FAMILY - Prop Commercial Stormwater (e.g., woodland, agricultural field, vacant lot, etc.)
   Location: NONE
   Vegetation: LAWN
   Landform: DRUMLIN
   Surface Stones: 1-3
   Slope (%): 
   Position on Landscape (attach sheet): 

3. Distances from:
   Open Water Body: >400' feet
   Drainage Way: >100' feet
   Property Line: >100' feet
   Drinking Water Well: >100' feet
   Other: 

4. Parent Material:
   TILL
   Unsuitable Materials Present: ☒ Yes ☐ No
   If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed:
   ☒ Yes ☐ No
   If yes: 65” Depth Weeping from Pit
   Estimated Depth to High Groundwater: 49” inches
   Depth Standing Water in Hole: 54.4” elevation
**C. On-Site Review** (Continued)

Deep Observation Hole Number: SW-5

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
<th>Other</th>
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<tbody>
<tr>
<td>65&quot;</td>
<td>FILL</td>
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<td>15%</td>
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<td>106&quot;</td>
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</tbody>
</table>

Additional Notes:

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Commonwealth of Massachusetts
City/Town of NEWBURY
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

B. Site Information (Continued)

   Range: □ Above Normal □ Normal □ Below Normal
   Month/Year

7. Other references reviewed: U.S.G.S. QUAD, FEMA, SCS SOILS

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

Deep Observation Hole Number: SWI-6 03-02-2020 1 PM CLEAR/SUNNY
Date Time Weather

1. Location

   Ground Elevation at Surface of Hole: 59.0'

   Location (identify on plan):

2. Land Use

   RES - SINGLE FAMILY - Prop Commercial Stormwater
   (e.g., woodland, agricultural field, vacant lot, etc.)
   LAWN
   Vegetation
   DRUMLIN
   Landform
   Surface Stones
   1-3
   Slope (%)

3. Distances from:

   Open Water Body >400' feet
   Drainage Way >100' feet
   Property Line >10' feet
   Drinking Water Well >100' feet
   Other

4. Parent Material:

   TILL

   Unsuitable Materials Present: □ Yes □ No

   □ Disturbed Soil □ Fill Material □ Impervious Layer(s) □ Weathered/Fractured Rock □ Bedrock

5. Groundwater Observed: □ Yes □ No

   Estimated Depth to High Groundwater: 51'' inches
   If yes: 67'' Depth Weeping from Pit
   54.8' elevation
   67'' Depth Standing Water in Hole

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Form 11 – Soil Suitability Assessment for On-Site Sewage Disposal • Page 2 of 8
### C. On-Site Review (Continued)

Deep Observation Hole Number: **SW-6**

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon Layer</th>
<th>Soil Matrix: Color Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
<th>Other</th>
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<td>15%</td>
<td>F.S.L.</td>
<td></td>
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</tr>
</tbody>
</table>

Additional Notes:

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C. On-Site Review (Continued)

Deep Observation Hole Number: SW-7 Date: 03-02-2020 1 PM Time: CLEAR/SUNNY

1. Location

Ground Elevation at Surface of Hole: 60.4' Location (identify on plan):

2. Land Use

RES - SINGLE FAMILY - Prop Commercial Stormwater
(e.g., woodland, agricultural field, vacant lot, etc.)

LAWN
Vegetation

DRUMLIN
Landform

Surface Stones

1-3 Slope (%)

3. Distances from:

Open Water Body >400' feet

Drainage Way >100' feet

Property Line >10' feet

Drinking Water Well >100' feet

Possible Wet Area >100' feet

Other feet

4. Parent Material:

TILL

Unsuitable Materials Present:

☐ Yes ☒ No

If Yes:

☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock

☐ Bedrock

5. Groundwater Observed:

☐ Yes ☒ No

If yes:

Depth Weeping from Pit

Depth Standing Water in Hole

Estimated Depth to High Groundwater:

55' inches

55.8' elevation
## C. On-Site Review (Continued)

Deep Observation Hole Number: **SW-7**

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon/Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
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</table>

Additional Notes:

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B. Site Information (Continued)

   Month/Year  Range: □ Above Normal  □ Normal  □ Below Normal

7. Other references reviewed: U.S.G.S. QUAD, FEMA, SCS SOILS

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

Deep Observation Hole Number: SW-8  03-02-2020  1 PM  CLEAR/SUNNY

Date  Time  Weather

1. Location
   Ground Elevation at Surface of Hole: 58.6'
   Location (identify on plan):

2. Land Use
   RES - SINGLE FAMILY - Prop Commercial Stormwater
   (e.g., woodland, agricultural field, vacant lot, etc.)
   LAWN
   Vegetation
   DRUMLIN
   Landform
   Surface Stones
   1-3
   Slope (%)
   Position on Landscape (attach sheet)

3. Distances from:
   Open Water Body >400' feet
   Drainage Way >100' feet
   Property Line >100' feet
   Drinking Water Well >100' feet
   Other

4. Parent Material:
   TILL
   Unsuitable Materials Present: □ Yes  □ No
   If Yes:  □ Disturbed Soil  □ Fill Material  □ Impervious Layer(s)  □ Weathered/Fractured Rock  □ Bedrock

5. Groundwater Observed: □ Yes  □ No
   Estimated Depth to High Groundwater:
   49'' inches
   54.5' elevation
   If yes:  81''
   Depth Draining from Pit
   81''
   Depth Standing Water in Hole
C. On-Site Review (Continued)

Deep Observation Hole Number: SW-8

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon/Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
<th>Other</th>
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</tbody>
</table>

Additional Notes:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
D. Determination of High Groundwater Elevation

1. Method Used:
   - Depth observed standing water in observation hole
   - Depth weeping from side of observation hole
   - Depth to soil redoximorphic features (mottles)
   - Groundwater adjustment (USGS methodology)

2. Index Well Number: 
   Reading Date: 
   Index Well Level: 

   Adjustment Factor: 
   Adjusted Groundwater Level: 

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
      - Yes  
      - No

   b. If yes, at what depth was it observed? 
      Upper boundary: 62” inches
      Lower boundary: 112” inches
D. Determination of High Groundwater Elevation

1. Method Used:
   - Depth observed standing water in observation hole
   - Depth weeping from side of observation hole
   - Depth to soil redoximorphic features (mottles)
   - Groundwater adjustment (USGS methodology)

2. Index Well Number
   Reading Date
   Adjustment Factor
   Adjusted Groundwater Level

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
      - Yes
      - No
   b. If yes, at what depth was it observed?
      Upper boundary: 30" inches
      Lower boundary: 103" inches
D. Determination of High Groundwater Elevation

1. Method Used:
   - Depth observed standing water in observation hole
   - Depth weeping from side of observation hole
   - Depth to soil redoximorphic features (mottles)
   - Groundwater adjustment (USGS methodology)

2. Index Well Number: ____________________  Reading Date: ____________  Index Well Level: ____________
   Adjustment Factor: ____________________  Adjusted Groundwater Level: ____________

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
      - Yes  ☐  No  ☑
   b. If yes, at what depth was it observed?  Upper boundary: 84" inches  Lower boundary: 126" inches
F. Certification

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

Signature of Soil Evaluator
ROBERT M. GRASSO, SE#933
Typed or Printed Name of Soil Evaluator / License #

Name of Board of Health Witness

Date
03-02-2020

Date
10/97

Board of Health

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

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

### A. Site Information

<table>
<thead>
<tr>
<th>Owner Name</th>
<th>R &amp; E REALTY TRUST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street Address or Lot #</td>
<td>23 CENTRAL STREET</td>
</tr>
<tr>
<td>City/Town</td>
<td>NEWBURY</td>
</tr>
<tr>
<td>State</td>
<td>MA</td>
</tr>
<tr>
<td>Zip Code</td>
<td>01922</td>
</tr>
<tr>
<td>Contact Person (if different from Owner)</td>
<td>508-962-2675</td>
</tr>
</tbody>
</table>

### B. Test Results

<table>
<thead>
<tr>
<th>Observation Hole #</th>
<th>Date</th>
<th>Time</th>
<th>Date</th>
<th>Time</th>
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<tbody>
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<td>1A</td>
<td>12-02-2019</td>
<td>1 PM</td>
<td>12-02-2019</td>
<td>1 PM</td>
</tr>
<tr>
<td>3A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth of Perc</td>
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<td>54&quot; + 18&quot; = 72&quot;</td>
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<td></td>
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<tr>
<td>Start Pre-Soak</td>
<td>2:20</td>
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<td>End Pre-Soak</td>
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<td>Time at 12&quot;</td>
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<td>Time at 9&quot;</td>
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<td>Time at 6&quot;</td>
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<td>Time (9&quot;-6&quot;)</td>
<td>7 MIN</td>
<td></td>
<td>7 MIN</td>
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<tr>
<td>Rate (Min./Inch)</td>
<td>3 MIN/INCH</td>
<td></td>
<td>3 MIN/INCH</td>
<td></td>
</tr>
</tbody>
</table>

Test Passed: ☒  Test Failed: ☐

ROBERT M. GRASSO, SE#933
Test Performed By:
DEBORAH ROGERS - B.O.H. AGENT
Witnessed By:

Comments:
MassDEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

R & E REALTY TRUST
Owner Name
23 CENTRAL STREET
Street Address
NEWBURY
City
MA
State
01922
Zip Code

B. Site Information

1. (Check one) ☑ New Construction ☐ Upgrade ☐ Repair
2. Published Soil Survey Available? ☑ Yes ☐ No
If yes:
URBAN LAND
Soil Name
VARIABLE
Soil Limitations
Year Published: 1981
Publication Scale: 1"=1320'
Map/Lot #: R-20 / 28
3. Surficial Geological Report Available? ☐ Yes ☑ No
If yes:
TILL
Geologic Material
DRUMLIN
Landform
4. Flood Rate Insurance Map
Above the 500-year flood boundary? ☑ Yes ☐ No
Within the 100-year flood boundary? ☐ Yes ☑ No
Within the 500-year flood boundary? ☐ Yes ☑ No
Within a velocity zone? ☐ Yes ☑ No
5. Wetland Area:
National Wetland Inventory Map
Wetlands Conservancy Program Map

B. Site Information (Continued)

   11/19 Month/Year  
   Range: ☐ Above Normal ☑ Normal ☐ Below Normal

7. Other references reviewed:  
   U.S.G.S. QUAD, FEMA, SCS SOILS

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

Deep Observation Hole Number: 01  
12-02-2019 Date  
1 PM Time  
SNOW Weather

1. Location
   Ground Elevation at Surface of Hole: 62.7'  
   Location (identify on plan):

2. Land Use
   RES - SINGLE FAMILY - PROP COMMERCIAL  
   (e.g., woodland, agricultural field, vacant lot, etc.)  
   NONE  
   1-3 Slope (%)
   Lawson Vegetation  
   DRUMLIN Landform
   Position on Landscape (attach sheet)

3. Distances from:
   Open Water Body >400' feet  
   Drainage Way >100' feet  
   Property Line >10' feet  
   Drinking Water Well >100' feet  
   Possible Wet Area >100' feet  
   Other feet

4. Parent Material:
   TILL  
   Unsuitable Materials Present: ☑ Yes ☐ No
   If Yes: ☐ Disturbed Soil ☑ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock
   Disturbed Soil Fill Material Impervious Layer(s) Weathered/Fractured Rock Bedrock

5. Groundwater Observed:
   ☐ Yes ☑ No
   If yes:
   Depth Weeping from Pit  
   Depth Standing Water in Hole
   Estimated Depth to High Groundwater: 40' inches  
   59.4' elevation
### C. On-Site Review (Continued)

Deep Observation Hole Number: 01

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon/Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
<th>Other</th>
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<td>7.5YR 5/8</td>
<td>20%</td>
<td>S.LOAM</td>
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Additional Notes:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
C. On-Site Review  (Continued)

<table>
<thead>
<tr>
<th>Deep Observation Hole Number:</th>
<th>Date</th>
<th>Time</th>
<th>Weather</th>
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<tr>
<td>02</td>
<td>12-02-2019</td>
<td>1 PM</td>
<td>SNOW</td>
</tr>
</tbody>
</table>

1. Location

Ground Elevation at Surface of Hole: 60.3'
Location (identify on plan): ____________________________

2. Land Use

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Surface Stones</th>
<th>Slope (%)</th>
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<tbody>
<tr>
<td>RES - SINGLE FAMILY - PROP COMMERCIAL</td>
<td>NONE</td>
<td>1-3</td>
</tr>
<tr>
<td>LAWN</td>
<td>DRUMLIN</td>
<td>Surface Rocks</td>
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3. Distances from:

<table>
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<tr>
<th>Distance from</th>
<th>Type</th>
<th>Minimum Distance</th>
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<tbody>
<tr>
<td>Open Water Body</td>
<td>&gt;400'</td>
<td>feet</td>
</tr>
<tr>
<td>Drainage Way</td>
<td>&gt;100'</td>
<td>feet</td>
</tr>
<tr>
<td>Property Line</td>
<td>&gt;10'</td>
<td>feet</td>
</tr>
<tr>
<td>Drinking Water Well</td>
<td>&gt;100'</td>
<td>feet</td>
</tr>
<tr>
<td>Possible Wet Area</td>
<td>&gt;100'</td>
<td>feet</td>
</tr>
<tr>
<td>Other</td>
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<td>feet</td>
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4. Parent Material:

<table>
<thead>
<tr>
<th>Parent Material</th>
<th>Unsuitable Materials Present</th>
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</thead>
<tbody>
<tr>
<td>TILL</td>
<td>✓ Yes</td>
</tr>
</tbody>
</table>

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed:

<table>
<thead>
<tr>
<th>Groundwater Observed</th>
<th>Depth Weeping from Pit</th>
<th>Depth Standing Water in Hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Yes</td>
<td>✓ No</td>
<td>If yes:</td>
</tr>
</tbody>
</table>

Estimated Depth to High Groundwater: 40" inches 57.0' elevation
### C. On-Site Review (Continued)

**Deep Observation Hole Number:** 02

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon/Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
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</tr>
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<td>34&quot;</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>124&quot;</td>
<td>C</td>
<td>2.5Y 5/4</td>
<td>40%</td>
<td>7.5YR 5/8</td>
<td>20%</td>
<td>S.LOAM</td>
<td></td>
<td></td>
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</tbody>
</table>

**Additional Notes:**

- 
- 
-
D. Determination of High Groundwater Elevation

1. Method Used:
   - □ Depth observed standing water in observation hole
   - □ Depth weeping from side of observation hole
   - ☑ Depth to soil redoximorphic features (mottles)
   - □ Groundwater adjustment (USGS methodology)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>B.</td>
</tr>
<tr>
<td>inches</td>
<td>inches</td>
</tr>
<tr>
<td>A.</td>
<td>B.</td>
</tr>
<tr>
<td>inches</td>
<td>inches</td>
</tr>
</tbody>
</table>

2. Index Well Number ____________________________________________
   Reading Date ________________________________________________
   Adjustment Factor ____________________________________________
   Index Well Level _____________________________________________
   Adjusted Groundwater Level __________________________________

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
      - ☑ Yes       □ No
   b. If yes, at what depth was it observed? Upper boundary: 34" inches   Lower boundary: 121" inches
F. Certification

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

Signature of Soil Evaluator

ROBERT M. GRASSO, SE#933

Typed or Printed Name of Soil Evaluator / License #

DEBORAH ROGERS

Name of Board of Health Witness

12-02-2019

Date

10/97

Date of Soil Evaluator Exam

NEWBURY

Board of Health

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

Use this sheet for field diagrams:
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

MassDEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

### A. Facility Information

<table>
<thead>
<tr>
<th>R &amp; E REALTY TRUST</th>
<th>23 CENTRAL STREET</th>
<th>R-20 / 28</th>
<th>NEWBURY</th>
<th>MA</th>
<th>01922</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner Name</td>
<td></td>
<td>Map/Lot #</td>
<td>City</td>
<td>State</td>
<td>Zip Code</td>
</tr>
</tbody>
</table>

### B. Site Information

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

2. Published Soil Survey Available?  
   - ☒ Yes
   - ☐ No
   
   Year Published: 1981
   Publication Scale: 1"=1320' 
   Soil Map Unit: Ur

   Soil Name: URBAN LAND
   
   VARIABLE

   - ☑ Yes
   - ☐ No

   Geologic Material: TILL
   
   Landform: DRUMLIN

4. Flood Rate Insurance Map
   
   Above the 500-year flood boundary?  
   - ☒ Yes
   - ☐ No
   
   Within the 100-year flood boundary?  
   - ☑ Yes
   - ☐ No
   
   Within the 500-year flood boundary?  
   - ☑ Yes
   - ☐ No
   
   Within a velocity zone?  
   - ☑ Yes
   - ☐ No

5. Wetland Area:
   
   National Wetland Inventory Map
   
   Wetlands Conservancy Program Map

   Map Unit
   Name
   
   Map Unit
   Name
Commonwealth of Massachusetts
City/Town of NEWBURY
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

B. Site Information (Continued)

   Month/Year  Range: ☐ Above Normal ☑ Normal ☐ Below Normal

7. Other references reviewed: U.S.G.S. QUAD, FEMA, SCS SOILS

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

<table>
<thead>
<tr>
<th>Deep Observation Hole Number:</th>
<th>03</th>
<th>12-02-2019</th>
<th>1 PM</th>
<th>SNOW</th>
</tr>
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<tr>
<td>Date</td>
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<td>Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weather</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Location

   Ground Elevation at Surface of Hole: 60.2’

   Location (identify on plan): ________________

2. Land Use

   RES - SINGLE FAMILY - PROP COMMERCIAL
   (e.g., woodland, agricultural field, vacant lot, etc.)
   Surface Stones: NONE
   Slope (%): 1-3
   Vegetation: LAWN
   Landform: DRUMLIN
   Position on Landscape (attach sheet): ________________

3. Distances from:

   Open Water Body: >400’
   Drainage Way: >100’
   Property Line: >10’
   Drinking Water Well: >100’
   Possible Wet Area: >100’
   Other: __________________

4. Parent Material:

   TILL

   Unsuitable Materials Present: ☑ Yes ☐ No

   If Yes: ☐ Disturbed Soil ☑ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed:

   ☐ Yes ☑ No

   Estimated Depth to High Groundwater: 52”
   Depth Weeping from Pit: 55.9’
   Depth Standing Water in Hole: ________________
### C. On-Site Review (Continued)

Deep Observation Hole Number: 03

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon/Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
<th>Other</th>
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<tbody>
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<td>20%</td>
<td>S. LOAM</td>
<td></td>
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</tbody>
</table>

Additional Notes:

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C. On-Site Review (Continued)

Deep Observation Hole Number: 04  12-02-2019  1 PM  SNOW

1. Location

   Ground Elevation at Surface of Hole: 59.8'

   Location (identify on plan):

2. Land Use

   RES - SINGLE FAMILY - PROP COMMERCIAL  NONE  1-3

   (e.g., woodland, agricultural field, vacant lot, etc.)

   Surface Stones  Slope (%)

   LAWN  DRUMLIN

   Vegetation  Landform

3. Distances from:

   Open Water Body  Drainage Way  Possible Wet Area

   >400' feet  >100' feet

   Property Line  Drinking Water Well  >100'

   >10' feet  feet

4. Parent Material:

   TILL

   Unsuitable Materials Present: ☒ Yes  ☐ No

   If Yes:  ☐ Disturbed Soil  ☐ Fill Material  ☐ Impervious Layer(s)

5. Groundwater Observed:  ☐ Yes  ☒ No

   Estimated Depth to High Groundwater: 52''  55.5'

   If yes: Depth Weeping from Pit  Depth Standing Water in Hole
### C. On-Site Review (Continued)

Deep Observation Hole Number: 04

<table>
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<tr>
<th>Depth (in.)</th>
<th>Soil Horizon/Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
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<th>Soil Consistence (Moist)</th>
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<tr>
<td>124&quot;</td>
<td>C</td>
<td>2.5Y 5/4</td>
<td>52&quot;</td>
<td>7.5YR 5/8</td>
<td>20% S.LOAM</td>
<td></td>
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</tbody>
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Additional Notes:

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________
D. Determination of High Groundwater Elevation

1. Method Used:
   - Depth observed standing water in observation hole
     - A. \[\text{inches}\]  
     - B. \[\text{inches}\]
   - Depth weeping from side of observation hole
     - A. \[\text{inches}\]  
     - B. \[\text{inches}\]
   - Depth to soil redoximorphic features (mottles)
     - A. \[3 - 52"\]  
     - B. \[4 - 52"\]  
   - Groundwater adjustment (USGS methodology)
     - A. \[\text{inches}\]  
     - B. \[\text{inches}\]

2. Index Well Number | Reading Date | Index Well Level
------------------|--------------|-----------------|
                   |              | Adjusted Groundwater Level

Adj. Factor

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
      - \[\checkmark\] Yes  
      - \[\square\] No

   b. If yes, at what depth was it observed?
      - Upper boundary: \[51"\]  
      - Lower boundary: \[122"\]
F. Certification

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

Signature of Soil Evaluator
ROBERT M. GRASSO, SE#933
Typed or Printed Name of Soil Evaluator / License #
DEBORAH ROGERS
Name of Board of Health Witness

12-02-2019
Date

10/97
Date of Soil Evaluator Exam

NEWBURY
Board of Health

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

Use this sheet for field diagrams:
Commonwealth of Massachusetts  
City/Town of NEWBURY  
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

MassDEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

### A. Facility Information

<table>
<thead>
<tr>
<th>R &amp; E REALTY TRUST</th>
<th>Owner Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 CENTRAL STREET</td>
<td>Street Address</td>
</tr>
<tr>
<td>NEWBURY</td>
<td>City</td>
</tr>
<tr>
<td>MA</td>
<td>State</td>
</tr>
<tr>
<td>01922</td>
<td>Zip Code</td>
</tr>
</tbody>
</table>

### B. Site Information

1. (Check one) 
   - New Construction 
   - Upgrade 
   - Repair

2. Published Soil Survey Available? 
   - Yes 
   - No

   - Yes 
   - No

4. Flood Rate Insurance Map
   - Above the 500-year flood boundary? 
     - Yes 
     - No
   - Within the 500-year flood boundary? 
     - Yes 
     - No

5. Wetland Area: 
   - National Wetland Inventory Map
   - Wetlands Conservancy Program Map

---

23 CENTRAL STREET, NEWBURY - SOILS 586 • rev. 10/07  
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal • Page 1 of 8
### B. Site Information (Continued)

   - Range: □ Above Normal  □ Normal  □ Below Normal
   - 11/19

7. Other references reviewed:
   - U.S.G.S. QUAD, FEMA, SCS SOILS

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

<table>
<thead>
<tr>
<th>Deep Observation Hole Number</th>
<th>05</th>
<th>16-06-2019</th>
<th>1 PM</th>
<th>SUNNY</th>
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<tr>
<td>Date</td>
<td></td>
<td>Time</td>
<td></td>
<td>Weather</td>
</tr>
</tbody>
</table>

1. Location
   - Ground Elevation at Surface of Hole: 56.8' Location (identify on plan):

2. Land Use
   - RES - SINGLE FAMILY - PROP COMMERCIAL
   - (e.g., woodland, agricultural field, vacant lot, etc.)
   - LAWN
   - Vegetation
   - DRUMLIN
   - Lentic

3. Distances from:
   - Open Water Body: >400' feet
   - Drainage Way: >100' feet
   - Property Line: >10' feet
   - Drinking Water Well: >100' feet
   - Possible Wet Area: >100' feet
   - Other: <100' feet

4. Parent Material:
   - TILL
   - Unsuitable Materials Present: □ Yes  □ No
   - If Yes: □ Disturbed Soil  □ Fill Material  □ Impervious Layer(s)  □ Weathered/Fractured Rock  □ Bedrock

5. Groundwater Observed:
   - Yes  □ No

   Estimated Depth to High Groundwater:
   - 57" inches
   - 52.1' elevation

   If yes: 96" Depth Weeping from Pit  95" Depth Standing Water in Hole

---

Form 11 – Soil Suitability Assessment for On-Site Sewage Disposal • Page 2 of 8
### C. On-Site Review (Continued)

Deep Observation Hole Number: 05

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon/Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
<th>Other</th>
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Additional Notes:

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Commonwealth of Massachusetts
City/Town of NEWBURY
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

23 CENTRAL STREET, NEWBURY - SOILS 5&6 • rev. 10/07

Form 11 – Soil Suitability Assessment for On-Site Sewage Disposal • Page 3 of 8
C. On-Site Review (Continued)

<table>
<thead>
<tr>
<th>Deep Observation Hole Number:</th>
<th>06</th>
<th>Date</th>
<th>12-06-2019</th>
<th>Time</th>
<th>1 PM</th>
<th>Weather</th>
<th>SUNNY</th>
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</table>

1. Location

- Ground Elevation at Surface of Hole: 58.0'
- Location (identify on plan):

2. Land Use

- RES - SINGLE FAMILY - PROP COMMERCIAL (e.g., woodland, agricultural field, vacant lot, etc.)
- LAWN
- DRUMLIN

- Vegetation:
- Landform:
- Position on Landscape (attach sheet):

3. Distances from:

<table>
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<th>Distance Measure</th>
<th>Value</th>
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<tr>
<td>Open Water Body</td>
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<td>Drainage Way</td>
<td>&gt;100' feet</td>
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<tr>
<td>Property Line</td>
<td>&gt;10' feet</td>
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<tr>
<td>Drinking Water Well</td>
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<tr>
<td>Possible Wet Area</td>
<td>&gt;100' feet</td>
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<tr>
<td>Other</td>
<td></td>
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</tbody>
</table>

4. Parent Material: TILL

5. Parent Material: TILL

- Unsuitable Materials Present: ☑ Yes ☐ No

If Yes: ☐ Disturbed Soil ☑ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☑ No

- Depth Weeping from Pit
- Depth Standing Water in Hole

- Estimated Depth to High Groundwater: 24''
- 56.0' elevation
### C. On-Site Review (Continued)

**Deep Observation Hole Number:** 06

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Soil Horizon/Layer</th>
<th>Soil Matrix: Color-Moist (Munsell)</th>
<th>Redoximorphic Features (mottles)</th>
<th>Soil Texture (USDA)</th>
<th>Coarse Fragments % by Volume</th>
<th>Soil Structure</th>
<th>Soil Consistence (Moist)</th>
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</table>

**Additional Notes:**

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---
D. Determination of High Groundwater Elevation

1. Method Used:

☐ Depth observed standing water in observation hole

☐ Depth weeping from side of observation hole

☒ Depth to soil redoximorphic features (mottles)

☐ Groundwater adjustment (USGS methodology)

2. Index Well Number

Reading Date

Adjustment Factor

Adjusted Groundwater Level

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

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

☒ Yes    ☐ No

b. If yes, at what depth was it observed? Upper boundary: 57" inches

Lower boundary: 132" inches
Commonwealth of Massachusetts  
City/Town of NEWBURY  
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

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

Signature of Soil Evaluator  
ROBERT M. GRASSO, SE#933  
Typed or Printed Name of Soil Evaluator / License #

Name of Board of Health Witness

12-06-2019  
Date  
10/97  
Date of Soil Evaluator Exam  
NEWBURY  
Board of Health

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.
RAINSTORE3 Unit Details and Dimensions

Single Rainstore3 injection molded unit geometry and dimensions

1 meter (40”)

0.1 meter (4”)

0.06 meter (2.6”)

0.17 meter (6.6”)

0.1 meter (4”)

NOT TO SCALE
Rainstore³ Installation Instructions
For Stormwater Drainage Detention & Retention with Geotextile Fabric
(A separate install guide for storm water harvesting for reuse, is available - call 303-233-8383 or visit invisiblestructures.com)

1) Introduction
A. This document describes how to properly install the Rainstore³ water storage system with geotextile fabric for stormwater drainage detention and retention.

B. **Detention** allows for short-term storage and release of storm water through outlet pipes. Nearby water treatment plants may have a limited capacity for handling storm water and thus, stormwater needs to be temporarily detained on site.

C. **Retention** allows water to recharge the ground water through exfiltration. There are no standard outlet pipes from the system except in some cases when overflow pipes are called for.

D. **Contractors**: Only licensed contractors should install the Rainstore³ system. The contractor should have a good performance record with similar construction projects. Homeowners should not install the Rainstore³ units themselves.

E. **Landscaping**: Plant only grass, flowers, or shrubs with shallow root systems over the installed product. Trees should be carefully planned and CANNOT be planted directly above a complete Rainstore³ system. The deep tree roots can damage the water storage capacity of the system by tearing the geotextile fabric and clogging Rainstore³ cells with root growth. Trees can be planted around the system, or planted in an island of a parking lot devoid of Rainstore³ cells. Recommended distance from Rainstore³ system is 10 meters with a root barrier on the edge next to tree.

F. **Warning**: Do NOT drive motorized equipment on any portion of the Rainstore³ area until installation is 100% complete. Driving over any part of the partial installation could damage the geogrid, fabric, or Rainstore³ cells, thus compromising the integrity of the entire installation. Walking on the Rainstore³ units is acceptable.

G. **Warranty**: Invisible Structures, Inc. is not responsible for careless installations that do not follow the technical specifications. The ISI warranty only covers Rainstore³ material defects. Please see the separate warranty sheet in the Rainstore³ brochure, or call ISI at 800-233-1510.

2) Material Requirements
A. **Rainstore³**: The cells arrive preassembled to the desired height. They will arrive in a box truck on pallets. When multiples cells are stacked on one pallet, white paper will divide each stack. Do not assemble, re-stack, or disassemble units onsite as this will void the product warranty. **DO NOT** cut Rainstore³ units. Units must be installed whole. Cutting is only permitted for maintenance port installation (see
our Rainstore³ maintenance port design detail). DO NOT disassemble, reassemble, or reconfigure the height (stacks) of Rainstore³. Stacks must be assembled at Invisible Structures manufacturing facility.

B. **Geogrid**: Acceptable examples are Tensar TriX 160, Tenax MS 330, or Huesker Fornit 30 or equivalent. Geogrid is available in 2 rolls sizes: 9.84 ft x 164 ft roll that weighs 102 lbs, or 13.1 ft x 264 ft that weighs 138 lbs. **This product is not supplied by Invisible Structures**.

C. **Geotextile**: Non-woven PP or PET of at least 8-ounce per square yard. The geotextile fabric is available in rolls measuring 12.5 ft x 360 feet or 15 ft x 300 feet. Both roll sizes weigh 240 lbs. **This product is not supplied by Invisible Structures**.

D. **Silver or metallic tape**: the corners of the completed installation should be marked with metallic tape for future utility detection.

E. **Pipe Boot**: to properly secure inlet, outlet, and maintenance ports to the Rainstore³ system use a pipe boot. Please view section 5.10 B for installation instructions.

3) **Equipment Requirements**

   A. A powered lift to move stacked Rainstore³ cells into the excavated area. A backhoe can have a fork or hanging chain attachment for lowering Rainstore³ units into the excavated area.

   B. A walk behind roller for backfill compaction. For installations with an area of 1,000 square feet or more, a light drivable roller such as the Bomag 125 D-4 that weighs 3,125 kgs (6890 lbs) or a compacter of similar weight may be used for compaction after the first six inches of fill material have been installed.

4) **Shipping, Handling & Storage**

   4.1 **Unloading**:

   A. Rainstore³ cells arrive stacked to the desire height in a box truck on wooden pallets. Two or more workers per stacked unit can unload the cells. The Rainstore³ can also be removed from the truck with a powered lift.

   o **Powered lift**: Rainstore³ can be unloaded by a bobcat machine with a fork attachment or a larger bobcat with a scoop attachment. To unload the units with a powered lift, slide a pallet of Rainstore³ to the rear of the truck using workers or a pallet jack. Position the cells onto the fork or scoop attachment.

   B. Depending upon the height of the cells, a powered lift may be required for removal from the truck. This could be a bobcat, forklift, or backhoe.
C. If a cell stack has a few cylinders that have become partially dislodged in transit or offloading, simply apply even pressure onto the top of the cell to re-connect the units – each cylinder top rib should touch adjacent cylinder’s bottom rib. If there are more than twelve (12) cylinders disconnected in a cell stack, replacement cells are needed.

4.2 Sun exposure:
A. If the product is not to be installed for five or more days after delivery, the Rainstore³ cells MUST be stored out of the sun. Rainstore³ should be stored in a shed or covered with a UV resistant tarp. Too much exposure to UV rays from the sun will weaken the plastic of the Rainstore³ cells. Failure to comply with appropriate storage requirements could result in breach of the product warranty.

4.3 Inclement weather:
A. Install Rainstore³ only if the outside air temperature is 55 degrees Fahrenheit or above. The plastic becomes brittle below 40 degrees F.
B. Rainstore³ should not be installed on muddy soil or in standing water. The excavated area should be dry before installation.

5) Installation

5.1 Excavation Preparation
A. Excavate the area to the desired depth for the Rainstore³ system, as shown on site plans. Allow proper depth for the height of the Rainstore³ cells and the cover material.
B. The excavated area must be dry, smooth, level, and devoid of rocks, lumps or debris. Before installing the Rainstore³, test the area with a 3 meter (10 feet) straight edge or laser level. The surface of the excavated area should not differ in
elevation more than 6mm (0.25 inches). All irregularities must be corrected and re-leveled.

C. Excavation must extend at least three feet beyond all sides of the Rainstore³ placement area to allow ample room for product installation and sidefill compaction.

D. All inlet pipes and filtering systems should be installed to the edge of the excavated area per manufacturer’s recommendation. Please see section 5.10, for installation of connection pipes from these devices.

E. Typically, inlet pipes are located near or at the top of the Rainstore³ chambers and outlet pipes (if necessary) are located along the bottom of the system. An overflow pipe should be located at the top of the system.

5.2 Geogrid – First Layer:

A. Three separate layers of geogrid are required for the Rainstore³ system. Geogrid arrives in rolls and can be shipped on a flatbed truck. Rolls are available in two sizes: 9.84 ft x 164 ft roll that weighs 102 lbs, or 13.1 ft x 264 ft that weighs 138 lbs. This product is not supplied by Invisible Structures. Two or more workers should carry the geogrid roll into the excavated area.

B. Spread the first layer of geogrid at the base of the excavated area. The geogrid will quickly unroll across the excavation area. Seams of the geogrid should overlap at least 12 inches. The first layer provides a stable and even surface for Rainstore³ cell installation.

C. The geogrid layers may be temporarily anchored with rocks or adequate debris, to prevent it from rolling up before other system components can be installed.
Maintenance of a Rainstore3 Stormwater Storage Chamber

“How do I clean or maintain a Rainstore3 system?”

Invisible Structures, Inc. recommends that stormwater be pretreated prior to discharging into the chambers to avoid foreign matter accumulation inside the chamber. This can be accomplished by a variety of techniques or products. Some examples are:

**Short Term Storage (Detention Basin)**

**“Zero” maintenance – the Preferred Method:**

Use a natural, or “Bio-Filter”, inlet device – essentially a porous pavement or swale, to pre-filter trash and sediment laden runoff before capture and conveyance into a Rainstore3 chamber. Use of a simple 10-12” deep sand, or sand/gravel, filter pavement or swale will provide adequate vertical flow capacity (20 to 35+ inches per hour) and residence time to capture coarse debris and trash at the surface, with sediment and hydrocarbons (and even most traffic generated metals) kept in voids of the section for treatment action by bacteria and oxidation.

Water passing through the filter section can pass directly into the top of a Rainstore3 chamber, or be collected and transported over larger distances via Draincore2. Only super fine sediments will pass through this section and be conveyed into the chamber. With relatively short storage times (24 to 48 hours) most of these sediments shall remain suspended, or be easily re-suspended by the next rain event for removal. Long term accumulations to a depth affecting exfiltration rates can be measured in decades, not years.

Trash pickup from the surface requires that Zero be in quotes. Also be aware that grass surface porous pavements (Grasspave2) offer greater biological activity, but at a higher surface maintenance cost – mowing, fertilization and irrigation. Gravel surface porous pavements (Gravelpave2) still provide biological activity at a level lower than with grass, but with lower maintenance required.

**Short Term Storage (Detention Basin)**

**Low, but periodic maintenance:**

Use a structural form of catch basin with a deep sump prior to use of a hooded elbow inlet into the chamber. Whether standard catch basins or sophisticated cyclonic flow devices are used, the objective is to remove any coarse debris and sediment (sand and larger) from entering the Rainstore3 chamber. Periodic maintenance will be required to remove trash and sediment that accumulates in the device. Frequency shall depend upon the physical nature of sediments carried and allowed into the “screening” device.

Fine sediments may still be transported into the chamber via the inlet pipe and will likely be dispersed rather evenly over the entire chamber bottom surface area, where they will then settle to the bottom – depending upon the duration of time water is left in the chamber and the size of the particle. Particles smaller than the AOS of the porous fabric liner will pass through the liner and continue migration until stopped by underlying soils. Particles larger than the AOS shall remain inside the chamber, and can be periodically re-suspended by injecting high-pressure water into a Maintenance Port, with removal of the sediment laden water via sump pump from the same, or other, port.
Eventually, especially if maintenance is too infrequent, the bottom of the chamber may develop a thick sediment layer sufficient to obstruct exfiltration through the bottom of the chamber. The sides of the chamber shall continue to function, but time for total water evacuation will increase.

This approach is most closely related to more traditional design responses, but is not the best solution long term for the client. Standard catch basins are lowest initial cost, but much higher in maintenance cost. Commercial cyclonic devices may have lower maintenance cost, but offer higher levels of cleaning efficiency at much higher initial investment cost.

Long Term Storage (Water Harvest Basin)
“Zero” maintenance – the Preferred Method:

Use a natural, or “Bio-Filter”, inlet device – essentially a porous pavement or swale, to pre-filter trash and sediment laden runoff before capture and conveyance into a Rainstore3 chamber. Use of a simple 10-12” deep sand, or sand/gravel, filter pavement or swale will provide adequate vertical flow capacity (20 to 35+ inches per hour) and residence time to capture coarse debris and trash at the surface, with sediment and hydrocarbons (and even most traffic generated metals) kept in voids of the section for treatment action by bacteria and oxidation.

Water passing through the filter section can pass directly into the top of a Rainstore3 chamber, or be collected and transported over larger distances via Draincore2. Only super fine sediments will pass through this section and be conveyed into the chamber. With relatively short storage times (24 to 48 hours) most of these sediments shall be easily re-suspended by the next rain event for removal. This level of sediment can be safely captured and transported via pumps for water reuse in irrigation or gray water applications, or further filtered by an automatic sand filter device with “back-flush” capabilities.

A Note About Sump Pumps

Many of our clients have designed elaborate pump stations to remove water from Rainstore3 chambers (usually for water harvest applications). We would like to make you aware that several pump manufacturers now make standard small diameter profile sump pumps that could be useful and cost effective alternatives to subsurface pump stations that are usually placed adjacent to the chamber. With top surface evacuation pumps, all liner penetrations are kept to the top edges of the chamber and minimize potential leak points on harvest applications.

Some of the pumps are less than 3.5” diameter, which could fit inside any of the ring columns of the Rainstore3 structure itself. Most of the others are less than 7.5” diameter, and will fit inside an 8” pipe placed in a Maintenance Port configuration – removal of one “corner” column of rings. Provided that electricity and outlet pipes can be easily accommodated within the 12” minimum cover over the chamber, these sump pumps may provide a ready, easy and economical alternative to more expensive pump stations.

Ω ©2002, Invisible Structures, Inc.
5.3 Geotextile Fabric:

A. A layer of geotextile fabric is installed on top of the first layer of geogrid. The geotextile encompasses all of the Rainstore$^3$ cells. The fabric is permeable, allowing for slow exfiltration of water but preventing sediments from entering the cells from the surrounding area. *Detention systems may require an outlet pipe, please refer to your site plans.*

B. The geotextile arrives in two rolls that measure 12.5 ft x 360 feet or 15 ft x 300 feet. Both roll sizes weigh 240 lbs. Two or more workers can lift and quickly install the geotextile by unrolling it over the geogrid material. Seams should overlap 12 inches. Seams can be joined with duct tape or a similar material to prevent shifting of the geotextile fabric.

C. Be sure to leave excess fabric on all sides of the excavated area. The excess fabric will later be brought up and around to encompass the sides and top of the Rainstore$^3$ cells. The geotextile can be temporarily anchored at the sides of the excavated area with rocks, bricks, or boards during installation.

5.4 Marking Rainstore$^3$ Placement:

A. The Rainstore$^3$ installation area can be outlined on the geotextile using spray paint, chalk line, or even rope. If using rope, make sure to remove all rope after the Rainstore$^3$ cells are in place.

5.5 Position the Cells:

A. Depending upon the height of the Rainstore$^3$ cells, two to four workers can carry the cells and place them on the geotextile fabric.

B. Workers can also use a dolly to roll the stacked Rainstore$^3$ cells into place. Take care not to allow the stacked unit to tip over to prevent stacked cells from damage. **Damaged units CANNOT**
be installed and must be discarded. Call ISI for replacement pieces at 800-233-1510. Rainstore\textsuperscript{3} units CANNOT BE CUT to fit the hole. Each unit must be installed whole. No Partial unit is allowed unless making room for a maintenance port (see 5.6).

C. A powered lift can be used as a small crane to lower Rainstore\textsuperscript{3} cells into place. The powered lift should use wide strapping around the Rainstore\textsuperscript{3} cells. The strapping should be placed under the pallet the Rainstore\textsuperscript{3} cells are on to avoid damage to the bottom of the cells. To avoid product damage or replacement, make sure the strapping isn’t too tight around the top, bottom, or sides of the stacked cells.

D. There are two sets of banding surrounding the Rainstore\textsuperscript{3} cells and pallet. Only cut the metal banding that attaches the cells to the pallet, BUT NOT the banding that holds the cell stacks together. Remove and discard the pallet from under the Rainstore\textsuperscript{3} units. If white paper divides the stacked cells, remove and discard that as well.

E. Final positioning of cells should be done by hand by at least two workers. The cells are placed side by side, with the grid side down on the geotextile fabric layer. Align bumpers on each side of all stacked cells to ensure square placement.

5.6 Maintenance Ports:

A. Depending on the size of the maintenance port, one or four Rainstore\textsuperscript{3} columns can be removed to install a maintenance port. The Rainstore\textsuperscript{3} units can ONLY be cut for maintenance port installation – no other cutting is permitted. The Rainstore\textsuperscript{3} cells can be cut using a powered cutter, such as a chain saw or a reciprocating saw. NOTE: Cut ONLY the GRID between the cylinders, NOT the cylinders themselves. The location of the maintenance port should be clearly marked with tape or paint before Rainstore\textsuperscript{3} cells are cut.

5.7 Geogrid – Second Layer:

A. The second geogrid layer is applied directly over the installed Rainstore\textsuperscript{3} cells and provides a walking surface for workers. This layer temporarily interlocks the cell stacks and prevents the geotextile fabric from being penetrated.

B. The geogrid easily unrolls with two workers. The seams should overlap at least 12 inches.
5.8 Wrap Geotextile:

A. After the second layer of geogrid is installed, the anchored geotextile fabric surrounding the Rainstore\textsuperscript{3} installation can be wrapped around all sides and the top of the Rainstore\textsuperscript{3} chamber.

B. Remove anchor material from the geotextile fabric. Enclose the Rainstore\textsuperscript{3} cells by bringing the fabric around the sides to the top of the cells. Seams should be sealed according to manufacturer recommendations.

5.9 Add Maintenance Ports/ Connect Inlet & Outlet Pipes:

A. Prefabricated boots are available to provide a water tight connection between the Rainstore\textsuperscript{3} units and any maintenance ports, inlet or outlet pipes. This replaces securing the geotextile fabric around a pipe using a hose clamp. The prefabricated boots are available from any geotextile manufacturer.

B. Boot Pipe Installation (from Environment Protection, Inc. www.geomembrane.com)
   a. Prepare the sub grade around the area of the pipe. The sub grade must be smooth, uniform, and free of any protrusions.
   b. Clean the surface of the liner around the penetration where the boot will be welded in place. Wipe away any dirt or dust particles. The surfaces of the liner, boot, and the pipe must be completely clean and dry.
   c. Slide the boot sleeve on the pipe, making sure the boot is aligned and all surfaces are smooth. It may be necessary to trim the excess tapered portion of the boot sleeve.
   d. Weld the boot apron to the liner using adhesive. Apply the adhesive to the liner and the boot apron. Let the adhesive setup for several seconds before pressing the boot apron and the liner together using a roller. Make sure to smooth out any bubbles or wrinkles.
   e. Seal the boot sleeve to the pipe using the stainless steel hose clamp. The clamp around the pipe will form a watertight seal to the pipe.

C. Maintenance ports/boots and pipes should be completely sealed to the impermeable PVC liner per manufacturer’s requirements.

5.10 Side Backfill & Compaction:

A. The area around the installed Rainstore\textsuperscript{3} structure must be backfilled with self containing structural aggregate. The fill material should be applied gradually. The fill should be compacted in a maximum of 12-inch high lifts to 95% proctor density. Backfill to the top of the geotextile wrapped Rainstore\textsuperscript{3} structure.

B. To ensure the backfill is properly compacted, have a Geotechnical Engineer test the fill density on site.

5.11 Geogrid - Third Layer:
A. When the side backfill compaction is complete, the third layer of geogrid is ready for installation. The final layer of geogrid must extend beyond all sides of the Rainstore³ installation at least three feet. The third layer helps dissipate the load of traffic. Have two workers unroll the geogrid. Make sure the seams overlap at least 12 inches.

5.12 Top Backfill:
A. Add the top layer of backfill material over the geogrid material. The backfill must be compacted in six inch high lifts to 95% proctor density. Use a walk behind roller for small installations.

B. For installations with an area of 1,000 square feet or more, a light drivable roller such as the Bomag 125 D-4 that weighs 3,125 kgs (6890 lbs) or a compacter of similar weight may be used for compaction after the first six inches of fill material have been installed.

C. Fill material should measure 12 inches minimum and 36 inches maximum. To ensure the backfill is properly compacted, have a Geotechnical Engineer test the fill density on site.

5.13 Surface Material:
A. Once compaction is complete, cover material may be placed. Landscaping materials such as grass, or shallow root shrubs may be planted. For parking lot applications: Grasspave2, Gravelpave2, asphalt, concrete or other pavement may be installed.

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