October 27, 2016

Old Laperle Farm Property Committee
Attn: Seth Gardner, Chair
East Montpelier Town Office
40 Kelton Road
East Montpelier, Vermont 054651

Stone Project No. 16-100
Subject: Additional Potential for Wastewater Capacity on the Old Laperle Farm Property

Dear Seth,

We are pleased to provide the results of field and desktop analysis of the potential for additional onsite wastewater treatment capacity of three areas on the Old Laperle Farm property:

1. Potential expansion of the area evaluated by Dufresne Group Consulting Engineers in 2010 (west-southwest of previously excavated test pits, but still on the top of the flat terrace area);
2. The entire portion of the property west of Sodom Pond Brook; and
3. The open, relatively flat area immediately south of Fontaine Millwork and Forestry.

This work was completed to support the Old Laperle Farm Property Committee's continued exploration of the potential future uses of this property, which was acquired by the Town in November, 2015. An area of soils suitable for construction of an in-ground leachfield with potential capacity of approximately 1,440 gallons/day was located west of the area evaluated by Dufresne Group in 2010. If confirmed, this capacity would be sufficient to allow for up to 13 additional units of senior housing (using the same basis of design outlined in the 2010 predevelopment work completed for the East Montpelier Senior Living Initiative). A small area of soils suitable for construction of a mound system was also located northwest of the existing structure west of Sodom Pond Brook, with capacity on the order of 420 gallons per day—sufficient to serve a three-bedroom home or an office with up to 28 employees.

Sources of information consulted to complete the analyses included:

- *Predevelopment Services for the Winston Parcel*, prepared by Dufresne Group Consulting Engineers and Hoffer Consulting, Inc., and dated September 10, 2010. High-resolution versions of the accompanying Site Plans C1 (Existing Conditions) and C2 (Preliminary Wastewater Disposal Site, 30 Scale Site Plan) were provided by Dufresne Group on October 19, 2016.
- ANR Natural Resources Atlas and Well Locator mapping database, http://anrmaps.vermont.gov/websites/anra5/, as accessed on October 20, 2016.

- Pre-marked soil testing locations, chosen during a site meeting attended by Amy Macrellis of Stone Environmental, Inc. and Seth Gardner of the Town of East Montpelier on September 13, 2016.
- Backhoe test pits excavated by Seth Gardner and characterized by Amy Macrellis of Stone Environmental, Inc. on October 11, 2016.
- GPS locations of backhoe test pits and other relevant features, completed by Amy Macrellis of Stone Environmental, Inc. on October 11, 2016 (Map #1).

Area #1, Potential Expansion of Area Identified by Dufresne Group

As part of pre-development services for a potential senior housing project, an area of soils was identified and characterized near the northeast corner of this property in 2010. Based on the hydrological study, test pit observations, and site conditions, the 0.7-acre area was estimated to have a wastewater treatment capacity of approximately 1,600 gallons per day without the use of an approved pretreatment device (increasing to 2,500 to 2,800 gallons per day if an approved pretreatment device was used) (Dufresne Group, 2010). The southern portion of this upland area, west-southwest of previously excavated test pits but still on the top of the flat terrace area was revisited to determine whether additional capacity might exist.

Two locations on this site were pre-marked during the September 13, 2016 site meeting. Two soil test pits, TP-12 and TP-13, were advanced across this portion of the property. The pits tests were 76-96 inches (6.3-8.0 feet) deep. The soil test logs are attached, and test locations are shown on the site plan (Map #2).

Both test pits revealed loamy fine sands to fine sands that are suitable for onsite wastewater treatment (attached soil logs and Map #2). Test pit TP-12 contained indicators of seasonal high groundwater at 72" below ground surface, while test pit TP-13 did not contain any limiting features to a depth of 96 inches. These soils are suitable for in-ground absorption trenches or beds receiving either septic tank or filtrate effluent.

Nearby steep slopes substantially constrain this area, especially to the northeast and southeast. Slopes to the west of this area were measured by Dufresne Group to be 21-22%. These areas are too steep for construction of absorption trenches without the submittal of a site-specific analysis under the performance-based approach, but a 25-foot horizontal setback is only required if the slope is 30% or greater. The slope breaks to the northeast and southeast are outside the limits of the Dufresne Group's 2010 topographic survey, but were estimated to be consistent with the treelines identified on that survey (Map #2). After accounting for the 25-foot separation from the estimated slope breaks, a roughly triangular area (4,560 ft^2) is potentially available for wastewater disposal (Map #2). If a more refined estimate of this area and its constraints is desired, extension of the existing topographic survey to the northeast and southeast to better capture the slope breaks is recommended.

Area #1 Capacity Analysis

In order to estimate the hydraulic capacity of this potential wastewater dispersal site, we used a conservative method called Darcy's Law. This formula is represented as Q = KiA where

Q = design flow (gallons/day) (gpd)
K = hydraulic conductivity (ft./day)
i = hydraulic gradient (slope of water table)
A = transmitting soil cross-sectional area (square feet) = D x L where
D = transmitting soil thickness (depth to impeding layer or water table, minus the required separation depth, minus the system depth) (feet), and
L = length of the disposal system in the estimated direction of groundwater flow (feet)

We used this formula to develop a hydraulic capacity estimate, given the assumptions described below. The full calculations are included in Table 1.

1. Hydraulic conductivity (K) = 40 feet per day. Vermont DEC guidance regarding K values for the loamy fine sand to fine sand soil textures encountered gives a range of 40-50 feet/day.

2. Hydraulic gradient (i) = 6.0%, estimated as similar to ground surface slope from Dufresne Group's 2010 topographic survey only in the gently sloping area at the top of the terrace. This is a conservative estimate, as the nearby downgradient slopes are much steeper. Groundwater mounding beneath the disposal field will also slightly increase the hydraulic gradient, but we did not include an allowance for this increased slope in the capacity analysis.

3. The average limiting depth to an impeding layer or seasonal high water table (6.0 feet at TP-12, and the bottom of the test pit at 8.0 feet for TP-13) was assumed to be continuous across the potential disposal area.

4. Given the nearby steep slopes but very well-drained soils, the most feasible design that maximizes capacity will be for a filtrate absorption trench with the bottom of the trench 18 inches (1.5 feet) below the ground surface.

5. For a filtrate system, the required separation distance to seasonal high groundwater = 2.0 feet, with 1.5 feet between the induced groundwater mound and the bottom of the filtrate trench.

6. System length (L) across slope (perpendicular to contours) = 20 feet. This is a conservative estimate, measured at the narrower, northern end of the proposed leachfield area.

Based on our calculations, the available capacity for wastewater disposal in this area is on the order of 1,440 gallons per day. The site's capacity could increase somewhat if additional topographic survey work reveals that the steep slopes to the northeast and southeast are less limiting than is currently estimated. The capacity could also decrease, however, if the steep slope breaks are closer to the proposed leachfield area than estimated here.

To estimate the hydraulic capacity of this area, the preliminary layout assumed the disposal area was designed as in-ground, filtrate absorption trenches. Once setbacks from steep slopes are accounted for, a trench length of approximately 100 feet can be located parallel to the ground contours. If the estimated capacity of 1,440 gallons per day is dosed over a 100-foot-long by 4-foot-wide trench, the resulting linear loading rate for the system is 14.4 gallons per linear foot per day. This linear loading rate is higher than 4.5 gallons per day, and so the state's small scale wastewater rules (Section 1-916(a)(3)(E) require that a hydrogeologic analysis be completed to demonstrate:

- The distance between the bottom of the leachfield and the seasonal high water table or induced groundwater mounding is maintained (this distance may include both naturally occurring soil and approved fill material); and
- The induced groundwater mounding is at least one foot below grade at the downhill toe of the filtrate effluent disposal system.

Completion of the analysis is beyond our current scope, but is recommended if the Committee chooses to proceed with further evaluation of this potential disposal area.

Area #2, Portion of Property West of Sodom Pond Brook

This area, located at 3035 US Route 2, is approximately 2.0 acres in size with an existing house and access drive, as well as a large, flat area east of the existing structure formerly occupied by a milkhouse and storage barn. The property immediately to the north, the former Washington Electric Co-Operative's garage, was also acquired by the Town in January 2016 and is presently being re-developed into a park-and-ride facility. According to the Soil Survey of Washington County, Vermont (USDA-SCS, 1969), relatively well-drained Salmon very fine sandy loam underlies the portion of this property located roughly east of the access drive. However, the eastern-most portion of the property is mapped as poorly drained Cabot silt loam. The original wastewater treatment system for the house was located near US Route 2 and was removed as part of the recent re-construction of the US Route 4/VT Route 14 intersection. The property's water supply appears to come from a drilled well located near the former storage barn (Map #3).

Five locations on this site (TP-1 through TP-5) were pre-marked during the September 13, 2016 site meeting. Eight soil test pits, TP-1 through TP-8, were advanced across this portion of the property. The pits tests were 24-58 inches (2.0- 4.8 feet) deep. The soil test logs are attached, and test locations are shown on Map #3.

The test pits revealed a great deal of variability in the soils in this area of the property. While the soils encountered were generally consistent with those mapped in the Soil Survey, the distribution of these soils was quite different than the survey map. Only the two western-most locations (TP-1 and TP-8) were consistently underlain by undisturbed, gravelly very fine sands to very fine sandy loams that are suitable for onsite wastewater treatment (attached soil logs and Map #3). Test pit TP-8 contained indicators of seasonal high groundwater at 22 inches below ground surface, in a soil horizon containing very finely interbedded layers of very fine sand and clay loam. These soils are suitable for a mound system (the mound height may be reduced with the addition of pre-treatment). Test pit TP-1, to the southeast of TP-8, contained well-drained gravelly very fine sandy loam soils to a depth of 56 inches. This location is likely within the 35-foot required setback between building foundations and leachfield systems, but demonstrates that suitable soils extend down-slope and thus down-gradient from at least 25 feet from TP-8 (Map #3). Test pits TP-2, TP-6, and TP-7, behind the house and west of the access drive, consisted of silty clay loam to clay loam, with indications of seasonal high groundwater high in the soil profile (6 inches below ground surface). Test pit TP-3, located north of the access drive, contained soils that would be suitable for an at-grade system provided that surficial fill material was removed—however, this location is also within the protective setback from the property's water supply well. Test pit TP-4, near the footprint of the former storage barn, contained 30 inches of fill material unsuitable for onsite wastewater treatment, though this was underlain by very well-drained, stony sand. TP-5, located east of the former storage barn, again contained silty clay loam to clay loam, with indications of seasonal high groundwater high in the soil profile (8 inches below ground surface). TP-4 and TP-5 are also within the water supply setback.

The best possible option for wastewater disposal on this property is in the areas of test pits TP-8 and TP-1, north-northwest of the existing structure. After accounting for a 25-foot separation from areas of unsuitable soils, as well as building and other relevant setbacks and limiting features, a rectangular area approximately 28 feet wide by 65 feet long (1,840 ft^2) is potentially available for wastewater disposal (Map #3). This area may be extended slightly to the north, but will be quickly constrained by construction related to the park-and-ride, which is designed to extend to the boundary of the Town-owned parcel immediately north.

Area #2 Capacity Analysis

Given the very small area identified as potentially available for wastewater disposal, we used the simplified method for prescriptive desktop mounding analysis specified in Vermont's *Wastewater System and Potable Water Supply* Rules for use with mound systems with design flows of less than 1,000 gallons per day, in order to ensure that the design unsaturated zone is maintained between the bottom of the system and seasonal high groundwater. This method, like the one used above, is also based on Darcy's Law. The method identifies a linear loading rate (LLR) based on site characteristics, including soil texture, natural ground slope, and soil thickness available for groundwater mounding. The LLR, once identified, is used to calculate required disposal system length and width. We used this method to develop a hydraulic capacity estimate of 420 gallons/day for this area, given the assumptions and calculations provided in Table 2. The estimated capacity of 420 gallons/day would be distributed in a 42-foot-long by 10-foot-wide mound absorption bed. This capacity would be sufficient to serve a 3-bedroom single family residence, or an office with up to 28 employees.

Area #3, South of Fontaine Millwork and Forestry

This undeveloped area, located near the northern boundary of the property and immediately south of the Fontaine Millwork and Forestry operation, is approximately 1.2 acres in size. According to the Washington County Soil Survey, the western portion of the property is mapped as Lamoine silt loam (poorly drained and marginally suited for soil-based wastewater disposal systems).

One location in this area was pre-marked during the September 13, 2016 site meeting. One backhoe test pit, TP-14, was excavated in the central portion of this area to confirm the soil survey data. The soil test was 30 inches (2.5 feet) deep. The soil test logs are attached, and test locations are shown on Map #1.

The test pit revealed that conditions on this site are consistent with the soil survey. The soils consisted of silty clay loam to silty clay, with indications of seasonal high groundwater high in the soil profile (8 inches below ground surface). These conditions are only marginally suitable for onsite wastewater treatment.

Additional Soil Survey Confirmation

According to the Washington County Soil Survey, the gently rolling upland portion of the property located east of Sodom Pond Brook is underlain by Lamoine silt loam (poorly drained marginally suited for soil-based wastewater disposal systems). Three locations on this site were pre-marked during the September 13, 2016 site meeting. Three test pits (TP-9, TP-10, and TP-11) were excavated to confirm the soil survey data. The soil tests were 28-30 inches (2.3-2.5 feet) deep. The soil test logs are attached, and test locations are shown on Map #1).

The test pits revealed that conditions in this area are consistent with the soil survey. The soils consisted of silty clay loam to clay, with indications of seasonal high groundwater high in the soil profile (6-10 inches below ground surface). These conditions are only marginally suitable for onsite wastewater treatment.

Conclusions and Next Steps

In summary, our field and desktop analyses indicate that a filtrate in-ground wastewater disposal system (with pre-treatment and an adsorption-trench dispersal field) with design flows of 1,440 gpd may be feasible as an expansion of the wastewater system proposed by Dufresne Group in 2010 in the northeast portion of the Old Laperle Farm Property. If confirmed, this design flow would be adequate to serve up to 13 additional units of senior housing (using the same basis of design outlined in the 2010 predevelopment work completed for the East Montpelier Senior Living Initiative).

Near the existing structure, a small area of soils suitable for a mound system was located with potential capacity of up to 420 gallons/day, sufficient to serve a 3-bedroom single family residence, or an office with up to 28 employees.

The soils in other areas of the property, whether in the open area proposed for construction of the senior housing development or south of Fontaine Millwork and Forestry, are generally not suitable for the construction and successful operation of new onsite wastewater treatment systems.

There are several steps to be taken in finalizing the capacity of each of these sites, keeping in mind that additional testing may increase or decrease the preliminary hydrogeologic capacity developed during this study.

1. Conduct percolation tests and topographic surveys. For the area already surveyed by Dufresne Group, extension of the existing topographic survey to the northeast and southeast of the treeline to better capture the slope breaks is highly recommended. The slope break locations were estimated by geo-referencing the topographic survey to current aerial photography, and should be considered rough approximations. For the area near the existing structure, a topographic survey will provide a refined estimate of ground surface slope, as well as a more precise determination of available area given setbacks from surrounding limiting features. In both cases, completion of topographic survey work would more precisely place the test pits completed for this work, and assist in determination of whether further soil tests are needed in support of final design.

2. As part of the topographic survey(s), locate and determine the current status of potable water supplies serving nearby properties. The horizontal isolation distances required to adequately protect these water supplies could significantly constrain the location and capacity of any wastewater disposal system on the portion of the property near the US Route 2/VT Route 14 intersection.

3. Use the site-specific topographic survey data and a preliminary disposal field design layout to refine the preliminary capacity analyses presented in this letter. For Area #1, the state's small scale wastewater rules will at minimum require completion of a hydrogeologic analysis to demonstrate that the distance between the bottom of the leachfield and the seasonal high water table or induced groundwater mounding is maintained, and that the induced groundwater mounding is at least one foot below grade at the downhill toe of the filtrate effluent disposal system. Given this system's proximity to steep slopes, this analysis may also be required to demonstrate that renovated effluent will not 'break out' to the ground surface. In both cases, the system layouts presented are conceptual

only, and in the case of the system proposed in Area #2, do not completely account for the amount of sand fill and cover needed for a system with this design flow. It may be difficult to successfully engineer a mound system with this design flow that meets minimum grading requirements, especially for setbacks between the toe of the mound and building foundations, in the small area of suitable soils defined during this investigation.

An additional consideration for potentially increased wastewater flows is to have discussions with the adjacent property owner to the east of the area previously tested by Dufresne Group. There is potential for limited additional capacity in this area if the 25-foot setback to the side property line could be waived with an easement, or if the abutting owner was interested in conducting soils testing on their property to determine whether there are additional suitable soils extending east from the area defined by Dufresne Group.

Sincerely,

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Encl.

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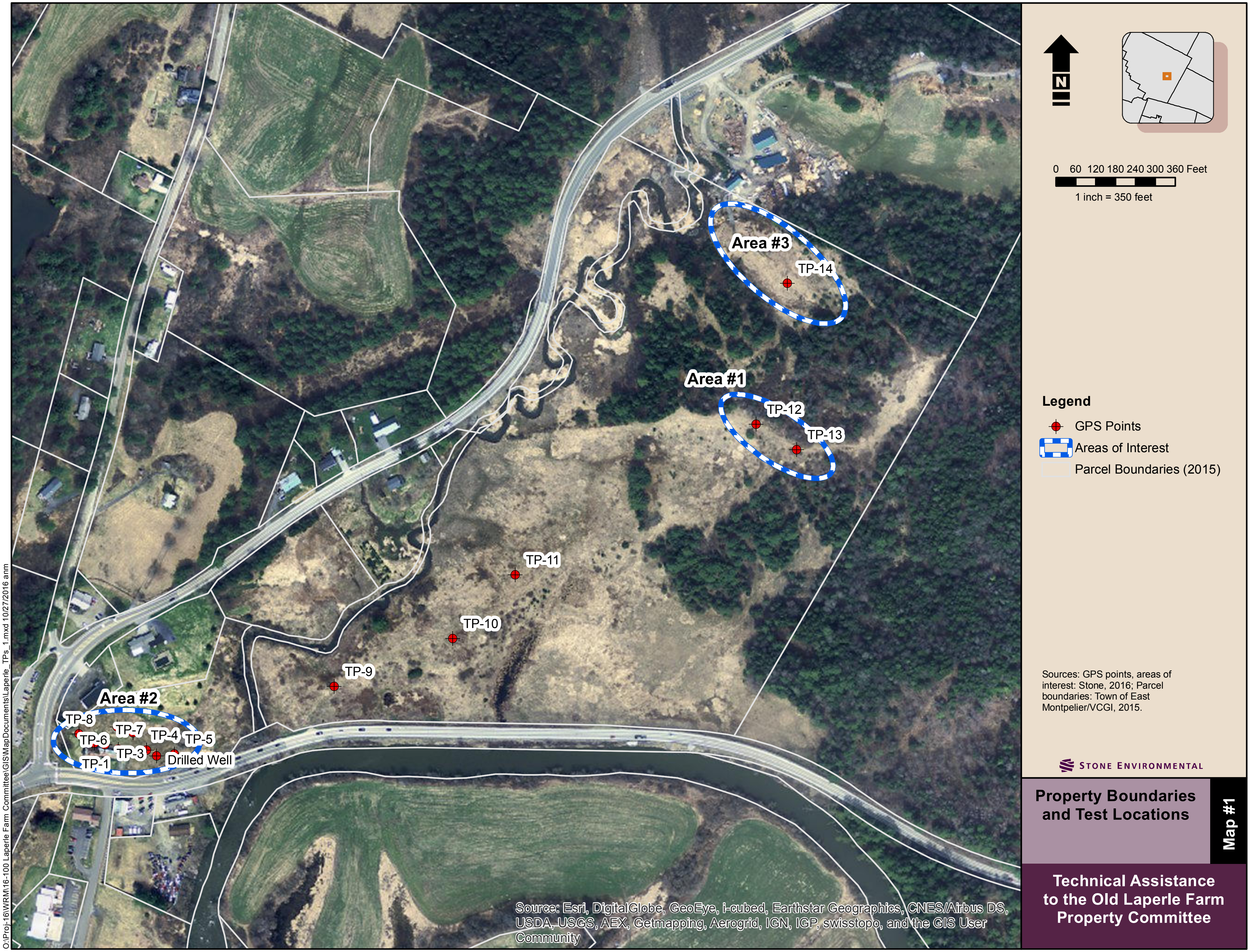

Property Boundaries and Test Locations

Map #1

Technical Assistance to the Old Laperle Farm Property Committee

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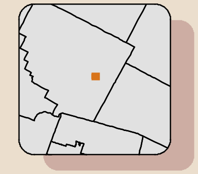

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0 20 40 60 80 100 120 Feet

Legend

- GPS Points
- Estimated 30% Slope Break
- Estimated 25 ft. Slope Setback
- Potential Leachfield Area (4,560 square feet)

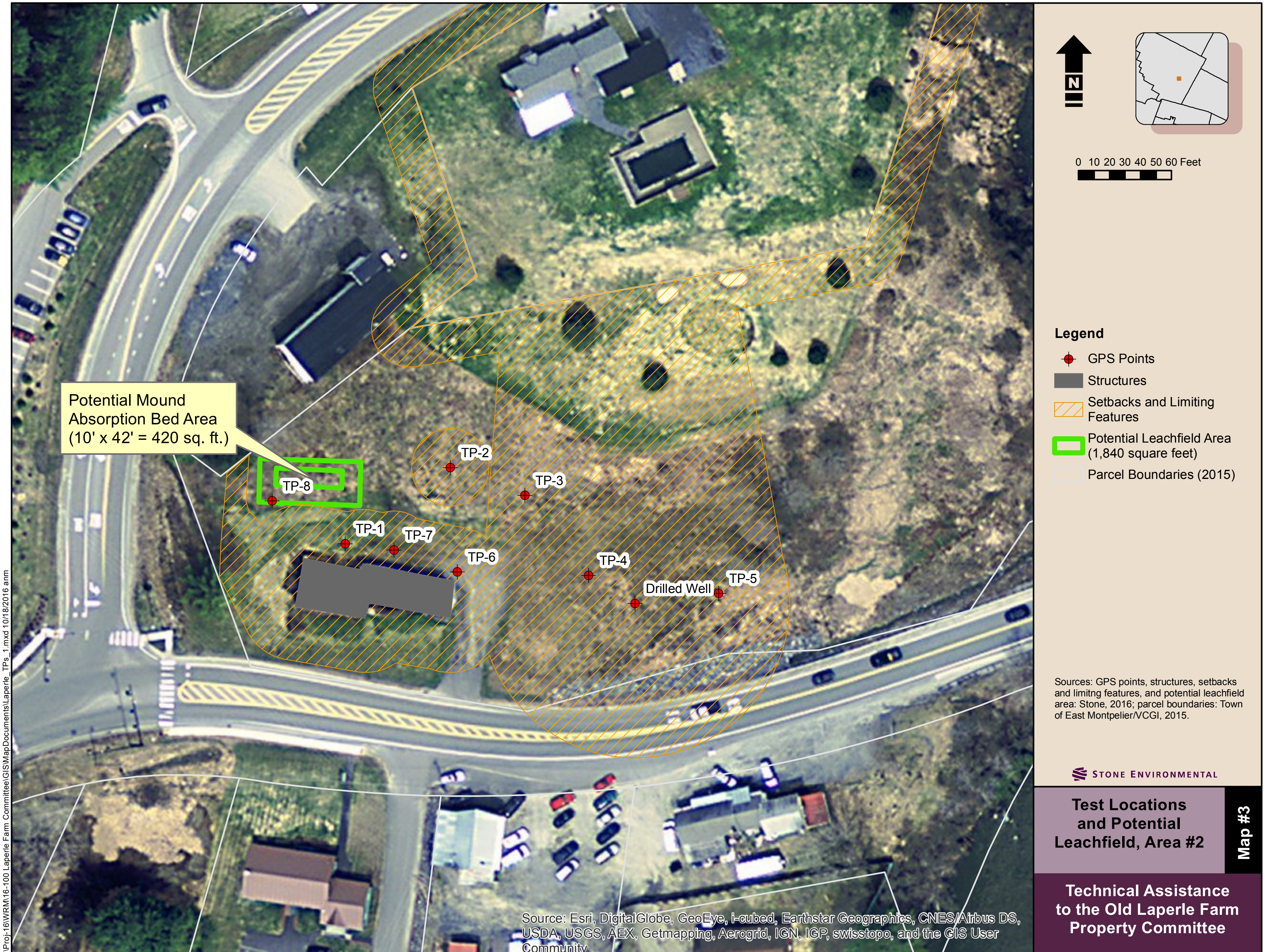
Sources: GPS points: Stone, 2016; topographic survey: Dufresne Group, 2010.

STONE ENVIRONMENTAL

Test Locations and Potential Leachfield Expansion, Area #1

Map #2

Technical Assistance to the Old Laperle Farm Property Committee


Potential Mound
Absorption Bed Area
(10' x 42' = 420 sq. ft.)
TP-8
TP-1
TP-7
TP-2
TP-3
TP-6
TP-4
TP-5
Drilled Well
N
0 10 20 30 40 50 60 Feet
Legend
GPS Points
Structures
Setbacks and Limiting Features
Potential Leachfield Area (1,840 square feet)
Parcel Boundaries (2015)
Sources: GPS points, structures, setbacks and limitng features, and potential leachfield area: Stone, 2016; parcel boundaries: Town of East Montpelier/VCGI, 2015.
STONE ENVIRONMENTAL
Test Locations and Potential Leachfield, Area #2
Map #3
Technical Assistance to the Old Laperle Farm Property Committee
Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Soils Investigations at the Old Laperle Farm Property, East Montpelier, Vermont

Soils investigation at various potential onsite or community wastewater treatment locations on the Old Laperle Farm property (3035 US Route 2) was conducted by Amy Macrellis of Stone Environmental, Inc. on October 11, 2016. Backhoe supplied and operated by Seth Gardner. No others were present during the investigations.

Area #1, Potential Expansion of Area Identified by Dufresne Group

<u>Test Pit TP-12</u>

0” – 4”	Strong brown (7.5YR 4/6) loamy fine sand, weak granular structure, loose consistence, dry. Topsoil.
4” – 10”	Yellowish brown (10 YR 5/6) loamy very fine sand, moderate subangular blocky structure, friable consistence, dry.
10” – 24”	Light olive brown (2.5Y 5/3) fine sand to very fine sand, weak subangular blocky structure, friable consistence, dry.
24” – 68”	Light yellowish brown (2.5Y 6/3) fine sand, single grain structure, friable consistence, dry. A single 1” band of silt at 36”, but no mottles present in that band. Becoming moist at 60”.
68” – 72”	As above, but overdigging the test pit, did not re-enter.
72” – 76”	Still fine sand, but becoming firmer, and few coarse faint mottles present. Wet at 76”.

No bedrock to depth. Indicators of seasonal high groundwater at 72” below ground surface.

<u>Test Pit TP-13</u>

0” – 3”	Dark brown (7.5YR 3/2) loamy fine sand, weak granular structure, loose consistence, dry. Topsoil.
3” – 10”	Strong brown (7.5 YR 5/8) loamy fine sand, weak granular structure, loose consistence, dry.
10” – 18”	Yellowish brown (10YR 5/6) fine sand, weak subangular blocky structure, friable consistence, dry.
18” – 60”	Light olive brown (2.5Y 5/3) fine sand, weak subangular blocky structure, friable consistence, dry. Massive fine sand – not much in the way of bedding structures to 60”.
60” – 96”	As above, but overdigging the test pit, did not re-enter. A few thin bands of wet very fine sand to silt at 96”, but no indicators of seasonal high groundwater.

No bedrock or indicators of seasonal high groundwater to depth.

Area #2, Portion of Property West of Sodom Pond Brook

<u>Test Pit TP-1</u>

0” – 6”	Brown (7.5YR 4/3) silt loam, weak granular structure, loose consistence, dry. Topsoil with many roots.
6” – 14”	Brown (7.5YR 4/2) gravelly very fine sandy loam, weak subangular blocky structure, friable consistence, dry.
14” – 24”	Brown (7.5YR 4/2) very gravelly very fine sandy loam, moderate subangular blocky structure, firm consistence, moist. Approximately 25% gravel to cobbles.
24” – 48”	Brown (7.5YR 4/2) very gravelly very fine sandy loam, moderate subangular blocky structure, friable consistence, moist. Approximately 25% gravel to cobbles.
48” – 58”	Brown (7.5YR 4/2) very gravelly very fine sandy loam, moderate subangular blocky structure, friable to firm consistence, moist. Few fine faint mottles at 56”. Approximately 25% gravel to cobbles.

No bedrock to depth. Seasonal high groundwater indicators at 56” below ground surface.

Test Pit TP-2

0" – 6"	Dark olive brown (7.5Y 3/3) silty clay loam, weak granular structure, loose consistence, dry. Topsoil.
6" – 50"	Olive brown (2.5Y 4/3) clay loam, moderate angular blocky structure, very firm consistence, moist. Many medium distinct mottles starting immediately below topsoil horizon, increasing contrast and size with increasing depth.

No bedrock to depth. Indicators of seasonal high groundwater at 6" below ground surface.

Test Pit TP-3

0" – 6"	Dark brown (7.5YR 3/3) sandy clay loam, friable consistence, dry. Possibly fill material, no topsoil.
6" – 15"	Olive brown (2.5YR 4/3) silty clay loam, moderate platy structure, firm consistence, dry. Few medium faint mottles throughout this horizon. Irregular lower boundary, ranging from 15-20" around the pit.
15" – 40"	Brown (2.5Y 5/4) gravelly loamy sand to coarse sand, weak subangular blocky structure, friable to firm consistence, dry. Abundant bedding structures – thin alternating bands of extremely coarse sand, fine sand, medium sand.
40" – 44"	Olive brown (2.5Y 4/3) sandy clay loam, weak platy structure, firm consistence, moist. Few fine faint mottles throughout the horizon.
44" – 51"	Olive brown (2.5Y 4/3) gravelly sand, weak subangular blocky structure, friable consistence, moist. Few fine faint mottles throughout the horizon.

No bedrock to depth. Indicators of seasonal high groundwater at 6-15" and 40+" below ground surface.

Test Pit TP-4

0" – 30"	Olive brown (2.5YR 4/3) gravelly silty clay loam, friable to firm consistence, dry. Few fine distinct mottles. Fill material – bricks, concrete, old boards in this horizon. Very irregular lower boundary with native material below.
30" – 54"	Brown (10YR 4/3) extremely stony sand to coarse sand, weak granular structure, friable consistence, moist. 50-60% cobbles and boulders.

No bedrock to depth. Indicators of seasonal high groundwater at 6-30" below ground surface.

Test Pit TP-5

0" – 8"	Very dark grayish brown (2.5Y 3/2) silty clay loam, weak granular structure, loose consistence, dry. Topsoil.
8" – 50"	Gray (2.5Y 5/1) clay, moderate platy structure, very firm consistence, dry to 40" and moist below 40". Many medium prominent mottles starting immediately below topsoil horizon.

No bedrock to depth. Indicators of seasonal high groundwater at 8" below ground surface.

Test Pit TP-6

0" – 6"	Grayish brown (2.5Y 5/2) silty clay loam, weak granular structure, friable consistence, dry. Topsoil.
6" – 30"	Olive brown (2.5Y 4/3) clay loam, moderate platy structure, firm consistence, dry. Many medium prominent mottles throughout horizon. Located what was likely an old drainage line from the former milkhouse (1 ½ inch diameter gray PVC pipe) in the east end of the pit, approximately 16" below ground surface.
30" – 34"	Light olive brown (2.5Y 5/3) fine sand, weak subangular blocky structure, friable, moist.
34" – 52"	Dark grayish brown (2.5Y 4/2) clay loam, moderate platy structure, very firm consistence, moist. Many medium prominent mottles throughout horizon.

No bedrock to depth. Indicators of seasonal high groundwater at 6" below ground surface.

Test Pit TP-7

0” – 6”	Dark olive brown (7.5Y 3/3) silty clay loam, weak granular structure, loose consistence, dry. Topsoil.
6” – 24”	Olive brown (2.5Y 4/3) clay loam, moderate angular blocky structure, very firm consistence, moist. Many medium distinct mottles starting immediately below topsoil horizon.

No bedrock to depth. Indicators of seasonal high groundwater at 6” below ground surface.

Test Pit TP-8

0” – 6”	Brown (7.5YR 4/3) very fine sandy loam, weak granular structure, loose consistence, dry. Topsoil with many roots.
6” – 16”	Brown (7.5YR 4/4) gravelly fine sandy loam, weak granular structure, friable consistence, dry.
16” – 30”	Dark brown (7.5YR 3/3) gravelly very fine sandy loam to silt loam, moderate subangular blocky structure, firm consistence, dry. Few fine faint mottles at 22”. Approximately 5% gravel to cobbles. Very finely interbedded layers of very fine sand and clay loam.
30” – 50”	Dark brown (7.5YR 3/3) very fine sand, weak granular structure, friable consistence, moist. Few fine faint mottles throughout this horizon.

No bedrock to depth. Seasonal high groundwater indicators at 22” below ground surface.

Area #3, Open Field South of Fontaine Millwork and Forestry

Test Pit TP-14

0” – 8”	Brown (7.5YR 4/2) silty clay loam, moderate granular structure, friable consistence, dry. Topsoil with many roots.
8” – 15”	Pale brown (10YR 6/3) silty clay loam, moderate granular structure, friable consistence, dry. Many fine faint mottles starting immediately below topsoil horizon.
15” – 30”	Dark grayish brown (2.5Y 4/2) silty clay, moderate platy structure, extremely firm consistence, dry. Many medium prominent mottles throughout.

No bedrock to depth. Indicators of seasonal high groundwater at 8” below ground surface.

Additional Soil Survey Confirmation

Test Pit TP-9

0" – 6"	Brown (7.5YR 5/3) silty clay loam, weak granular structure, loose consistence, dry. Topsoil with many roots.
6" – 30"	Brown (10YR 5/3) clay loam, weak angular blocky structure, firm consistence, dry. Many medium distinct mottles starting immediately below topsoil horizon.

No bedrock to depth. Indicators of seasonal high groundwater at 6" below ground surface.

Test Pit TP-10

0" – 8"	Brown (10YR 4/3) silty clay loam, weak granular structure, loose consistence, dry. Topsoil with many roots.
8" – 28"	Light olive brown (2.5Y 5/3) clay loam, moderate platy structure, very firm consistence, dry. Many medium prominent mottles starting immediately below topsoil horizon, becoming more pronounced with increasing depth.

No bedrock to depth. Indicators of seasonal high groundwater at 8" below ground surface.

Test Pit TP-11

0" – 10"	Brown (10YR 5/3) clay loam, weak granular structure, loose consistence, dry. Topsoil with many roots.
10" – 30"	Light olive brown (2.5Y 5/3) clay, moderate subangular blocky structure, very firm consistence, dry. Many medium prominent mottles starting immediately below topsoil horizon, becoming more pronounced with increasing depth. Moisture increased slightly with increasing depth.

No bedrock to depth. Indicators of seasonal high groundwater at 10" below ground surface.

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Table 1: Darcy's Law Capacity Analysis, Area #1

Project Title: Technical Assistance to the Old Laperle Farm Property Committee
Stone Project No.: 16-100
Date: October 18, 2016
Prepared by: Amy Macrellis

Darcy's Law Calculations: Q = KiA
Q = design flow (gallons / day)
K = Hydraulic conductivity (feet / day)
i = Hydraulic gradient (slope of water table, unitless)
A = transmitting soil cross-sectional area (D) times length of disposal system (L) in square feet, where
D = depth to impeding layer or water table, minus required vertical separation, minus system depth

Assumptions:

1. Hydraulic conductivity (K) = 40 feet/day (estimated based on DEC guidance for fine sand)
2. Water table slope (i) is similar to ground surface slope, estimated from Dufresne Group site survey only in the vicinity of test pits TP-12 and TP-13 (6%) - down-gradient slopes are much steeper
3. Depth to limiting feature or bottom of pit (average 7.0 feet below ground surface across both pits) is continuous across proposed leachfield area
4. Design is for in-ground trenches with the bottom of the trenches located 1.5 feet below ground surface
5. Required separation distance to seasonal high groundwater = 1.5 feet for filtrate effluent
6. System length (L) across slope (perpendicular to contours) = 20 feet (narrowest point, at northwest end of potential leachfield area)

Calculations:

K = 40 ft./day
i = 6%
L = 20 ft.
D = (7.0 ft. - 1.5 ft. - 1.5 ft.) = 4.0 ft.

Q = 40 ft./day x 0.06 x (20 ft x 4.0 ft) x 7.48 gal/ft^3
Q = 1,440 gallons / day

Table 2: Simplified Desktop Mounding Analysis, Area #2

Project Title: Technical Assistance to the Old Laperle Farm Property Committee
Stone Project No.: 16-100
Date: October 20, 2016
Prepared by: Amy Macrellis

Assumptions:

1 Anticipated design flow is <1,000 gal/day for mound systems, <2,000 gal/day for in-ground or at-grade
2 Soil conditions used for calculations are present beneath and within 25 ft. downgradient of disposal area
Ground slope used for calculations is representative of the disposal area and the area 25 ft. downgradient
3 Available thickness for mounding (h) is the thickness of soil from above the highest limiting condition
to within 6" of the naturally occurring soil surface.
4 The highest limiting condition in this area is 22 inches to seasonal high groundwater at TP-8.
Soil thickness available for mounding is therefore (22 - 6 = 16 inches or 1.33 feet).
5 Design intent is therefore a mound system
5 Soil texture above the limiting condition in TP-8 is predominantly very fine sandy loam.
6 Natural ground slope in the area of TP-8 and TP-1 is estimated to be 5%.
7 Linear loading rate factor from Appendix 7-A, Table 1 for the site-specific combination of soil texture and
natural ground slope = 7.5.
8 The anticipated capacity for the identified area of this site is on the order of 420 gallons/day.

Linear Loading Rate Calculation:

LLR = (h) (f)
Where:
h = 1.33 (soil thickness available for mounding (ft))
f = 7.5 (LLR factor from table 1, Appendix 7-A, based on soil and slope)

LLR = 10 gallons/day/linear foot

Anticipated capacity = 420 gallons/day

Required system length = Design flow divided by LLR = 42 feet

Maximum loading rate for mound system = 1 gallon/day/square foot

Therefore, required absorption bed bottom area = 420 ft^2 (design flow / loading rate)

System width = 10 feet (bed bottom area / required system length)

Absorption area length and width calculated above **meet** the minimum 2:1 ratio required by the Rules.