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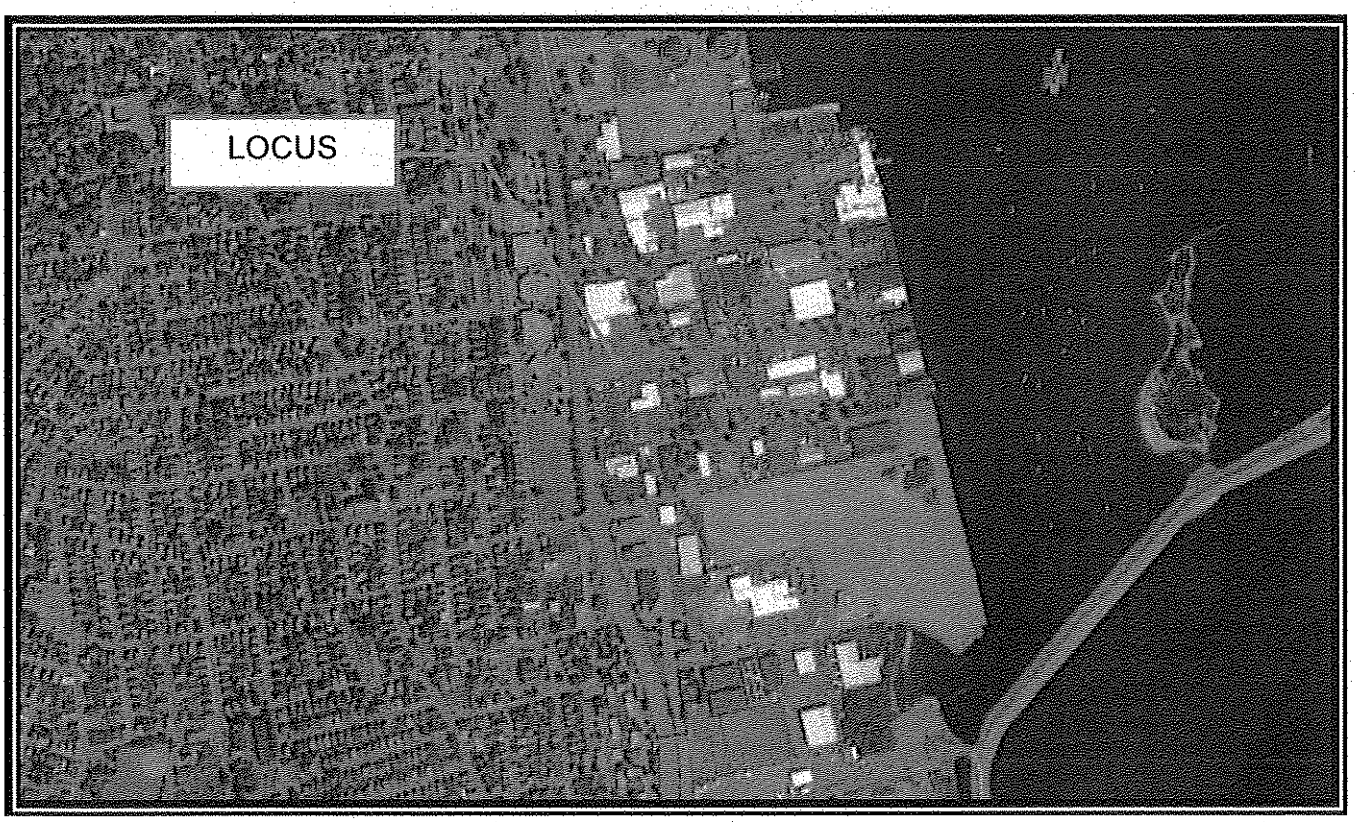
STORMWATER REPORT

OCTOBER 12, 2018

#75 MacArthur Drive

ASSESSORS MAP 31, LOTS 248 & 255
NEW BEDFORD, MASSACHUSETTS



PREPARED FOR:

Streetside Realty LLC
14 Hassey Street
New Bedford, MA 02740

STORMWATER MANAGEMENT REPORT AND HYDROLOGIC ANALYSIS

SECTION 1: Project Summary

The project area associated with the proposed development is located at the southwest quadrant of the intersection of MacArthur Drive and South Street, east of JFK Memorial Highway in the Waterfront Industrial Zoning District. The site is comprised of two existing parcels, identified as Assessors Plot 31, Lots 248 and 255. The parcel contains approximately 1.6 acres.

The site is currently developed, and includes a 13,100+/- square foot 1-story building with manufacturing and warehousing space. The perimeter of the building is paved parking and loading areas. The entire parcel is covered by pavement or the building, with the exception of small strip of grassed area at the back edge of the existing sidewalks on MacArthur Drive and South Street, and along the west side of the building. The property is abutted by commercial/industrial uses to the north, south, east, and west. The limit of proposed work is not located within a wetland resource area, or buffer zone to a resource area subject to protection under the Wetlands Protection Act. The site is located entirely within Zone X, areas of reduced flood risk due to levee. The site is not located within an area identified by the Natural Heritage and Endangered Species Program as a Priority Habitat of Rare Species or an Estimated Habitat of Rare Wildlife.

The applicant is seeking permission to construct a 115.5' x 186.8' 1-story warehouse addition on the south side of the existing building, located entirely within an existing paved parking area. In order to provide water quality treatment and recharge of stormwater runoff generated by the proposed impervious site coverage, stormwater management practices have been proposed. Proposed structural BMP's include a subsurface infiltration basin.

SECTION 2: Methodology

Drainage computations were performed using the Natural Resources Conservation Services (NRCS) TR-20 method and HydroCAD® Drainage Calculation Software to determine the change in the existing and post-development runoff rates from each drainage area for the 2-, 10-, 25-, and 100-year 24 hour storm events. The limits of the work proposed to construct the project do not fall within an area subject to protection by the Wetlands Protection Act, therefor, strict compliance with DEP Stormwater Management Standards is not required. The drainage facilities are designed to comply with section 5454 of the Zoning By-Law, which requires stormwater design to conform to City of New Bedford Subdivision Regulations. Sketches of the existing and proposed watershed areas, HydroCAD® Report, and copies of the calculation sheets are included as appendices to this report.

SECTION 3: Existing Conditions

The soils underlying the site are identified in the Natural Resources Conservation Service (NRCS) Soil Survey of Bristol County. The site soils are classified as 602 (Urban Land), which indicates that the soil consists of a significant amount of excavated and filled land.

Soil borings were performed by KMM Geotechnical Consultants, LLC on October 5, 2018 to confirm the soil survey and determine the soil suitability for the proposed addition.

Borings indicated site subsurface conditions generally include undocumented Fill underlain by stable glacial outwash deposits, then bedrock. Fill was encountered to depths of approximately 5-7 feet. Glacial outwash generally includes gravelly sand or sandy gravel. Refusal due to bedrock was encountered at depths of approximately 8-12 feet below grade. Groundwater was encountered in the borings at depths of 7-9 feet. A geotechnical summary report is included with this stormwater report.

SECTION 4: Stormwater Management Overview

Existing Conditions:

One design point has been analyzed for this project: flow off-site toward MacArthur Drive. The design point receives runoff from one subcatchment area. Much of the ground cover within the subcatchment area consists of existing paved areas which shed untreated runoff off-site to the street.

Proposed Conditions:

Under proposed conditions, the same design point has been analyzed. Two subcatchment areas contribute runoff to the design points in proposed conditions. One subcatchment area consists of area shedding runoff toward a proposed subsurface infiltration system, and includes proposed roof area. The other subcatchment area consists of areas shedding untreated, un-attenuated runoff toward the design point, as occurs in pre-development conditions.

In accordance with the Subdivision Regulations, the rate mitigation facilities have been engineered so that the aggregate peak discharge rates during a 2-year, 10-year, 25-year, or 100-year frequency storm event are no greater following development than the estimated rate prior to development.

Subdivision Regulations – New Bedford, Massachusetts

Article VI(B)(14):

Drainage provisions shall be made such that the peak run-off after development is not more than the peak run-off prior to development. Said condition shall be attained either through the containment of drainage on-site and/or the provisions for linkage to public storm drains. Further, provisions for collecting and discharging surface drainage shall be made, such that the drainage flowing onto surrounding properties after development is no more than the drainage flowing onto surrounding properties prior to development. All run-off calculations shall be based on the 100 year storm projections. This project meets this requirement.

Table 1 - Comparison of Pre- versus Post-Development Offsite Runoff				
	Pre-Development		Post-Development	
Storm Frequency	Rate (cfs)	Volume (af)	Rate (cfs)	Volume (af)
2-Year Storm				
Off-site flow	2.18	0.171	0.31	0.023
10-Year Storm				
Off-site flow	3.13	0.251	0.56	0.041
25-Year Storm				
Off-site flow	3.68	0.297	0.72	0.061
100-Year Storm				
Off-site flow	4.62	0.378	0.99	0.108

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kevinmartinpe@aol.com

MEMORANDUM

TO: Northern Wind, Inc.
16 Hassey Street
New Bedford, MA 02740

FROM: Kevin M. Martin, P.E.
Geotechnical Engineer

DATE: October 10, 2018

RE: **GEOTECHNICAL SUMMARY REPORT**
PROPOSED BUILDING EXPANSION
75 MACARTHUR DRIVE
NEW BEDFORD, MASSACHUSETTS

This memorandum report serves as a Geotechnical Summary Report for the referenced project. The contents of this memorandum are subject to the attached ***Limitations***.

SITE & PROJECT DESCRIPTION

Present development includes an existing commercial building with associated pavement. KMM has no knowledge of past development, use and/or construction of the property except what is present or shown on the *Site Plan*. Based on review of the *Site Plan*, grades in the project limits are relatively level being near elevation ≈9-11 ft.

The project includes a building expansion for freezer storage. The addition is understood to include a 1-story, steel and concrete masonry framed structure about ≈27,700 ft² in footprint. It is intended to support the building on a conventional shallow spread footing foundation (no basement). Limited Plans were available at this time. Minor grade change is expected for the project.

The purpose of this study is to review the subgrade conditions and provide a geotechnical evaluation related to the foundation design as required by the *Massachusetts State Building Code (MSBC)*. This report does not include an environmental assessment relative to oil, gasoline, solid waste and/or other hazardous materials. The environmental aspects of the project should be reviewed by others as necessary. This study also does not include review of site design or construction issues such as infiltration systems, dry wells, retaining walls, underground utilities, temporary shoring, crane pads, excavation support or other site and/or temporary design unless specifically addressed herein.

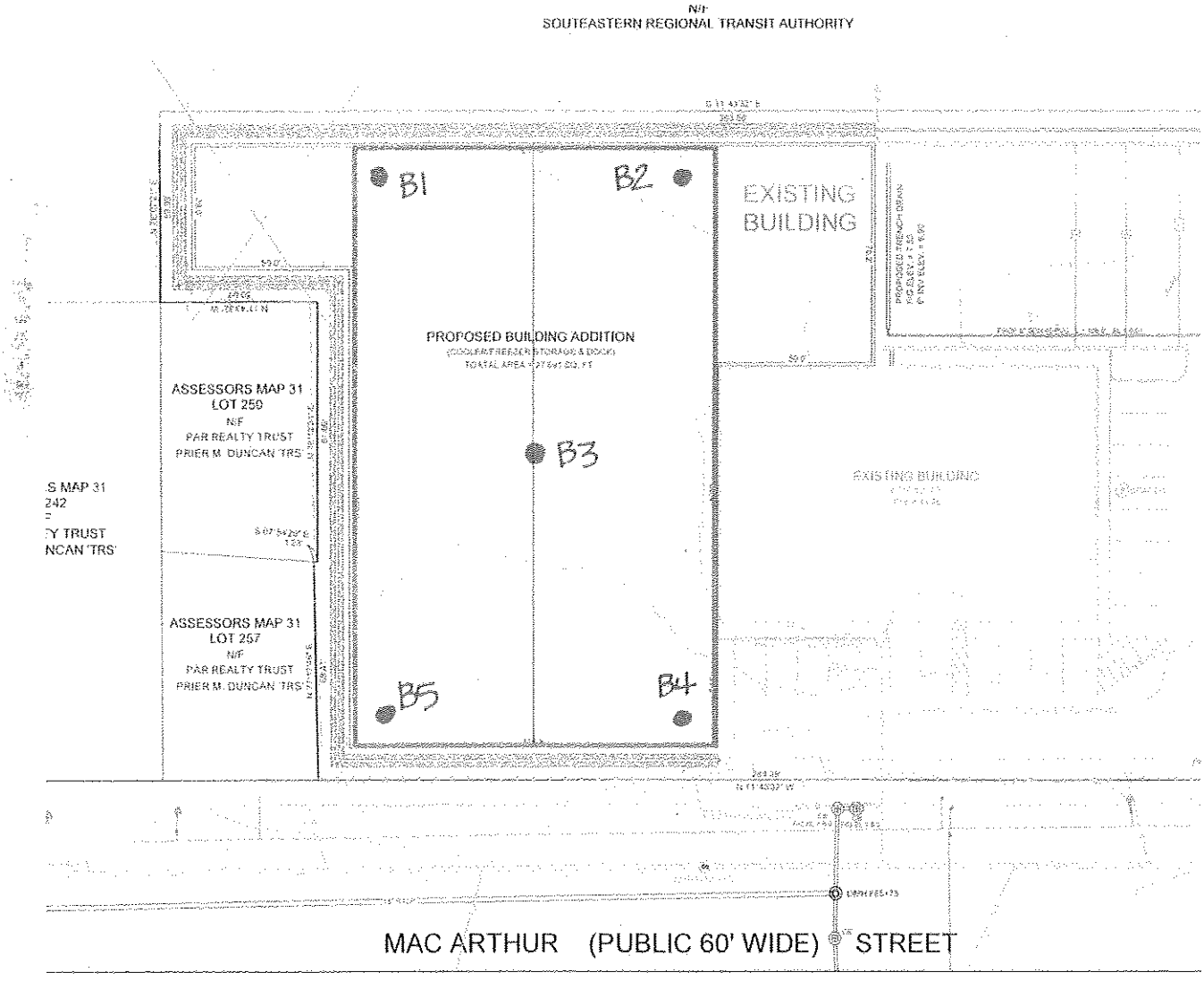

Google Earth


Google Earth

SUBSURFACE EXPLORATION PROGRAM

Test Borings

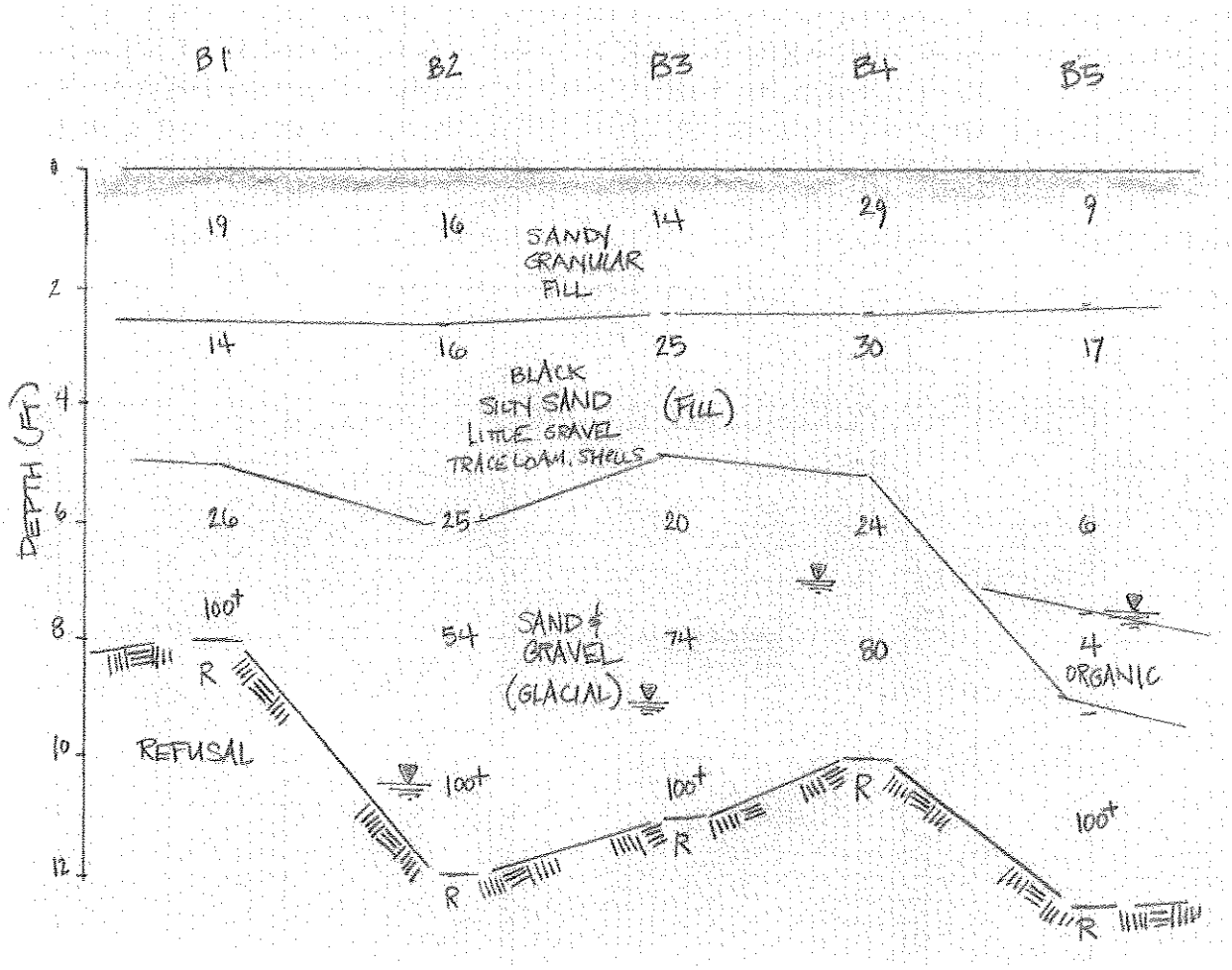
The exploration program for the project included five (5) test borings around the building expansion. The test borings (B1 to B5) were advanced to refusal depths of ≈8-12 ft utilizing 4¼ inch continuous flight hollow stem augers. Soil samples were typically retrieved at no greater than 5 ft intervals with a 2 inch diameter split-spoon sampler. Standard Penetration Tests (SPTs) were performed at the sampling intervals in general accordance with ASTM-D1586 (*Standard Method for Penetration Test and Split-Barrel Sampling of Soils*). Field descriptions and penetration resistance of the soils encountered, observed depth to groundwater, depth to refusal and other pertinent data are contained on the attached *Test Boring Logs*. The attached *Sketch* shows the test bore locations.



TEST BORE LOCATIONS

SUBSURFACE CONDITIONS

The site subsurface conditions generally include (1) undocumented Fill underlain by (2) stable Glacial Outwash deposits then (3) Bedrock. Some buried Organic Silt was identified in a lone test bore. A *Subsurface Profile* depicting the subgrade conditions is attached.



SUBSURFACE PROFILE

Fill

Fill was encountered at ALL the test locations to depths of ≈5-7 ft (typically ≈5 ft). The shallower Fill (≈2 ft) is generally Sandy and more granular consisting of a brown, fine to medium Sand, little gravel, little silt. The deeper Fill also varies but generally consists of a black, silty Sand, little gravel with trace amounts of loam, ash, shells, rubble, wood, etc. The Fill generally appears stable. Other Fill should be expected around the site being associated with underground utilities, foundation backfill and past construction.

Organic Silt

A black, Organic Silt & Fine Sand was identified about ≈7-10 ft below grade at B5. The Organic Silt is loose and compressible.

Glacial Overburden

The overburden soils typically include a Granular Outwash. These soils generally include a gravelly Sand or sandy Gravel with occasional cobbles and boulders. These soils are clean, granular, well-draining and compact.

Refusal

Test bore refusal, presumably Bedrock, was encountered at depths of ≈8-12 ft below grade. The relative consistent depth to refusal would suggest bedrock. Bedrock in the area is characteristically hard and of sound quality. There was negligible penetration with the hollow stem augers suggesting solid ledge.

Groundwater

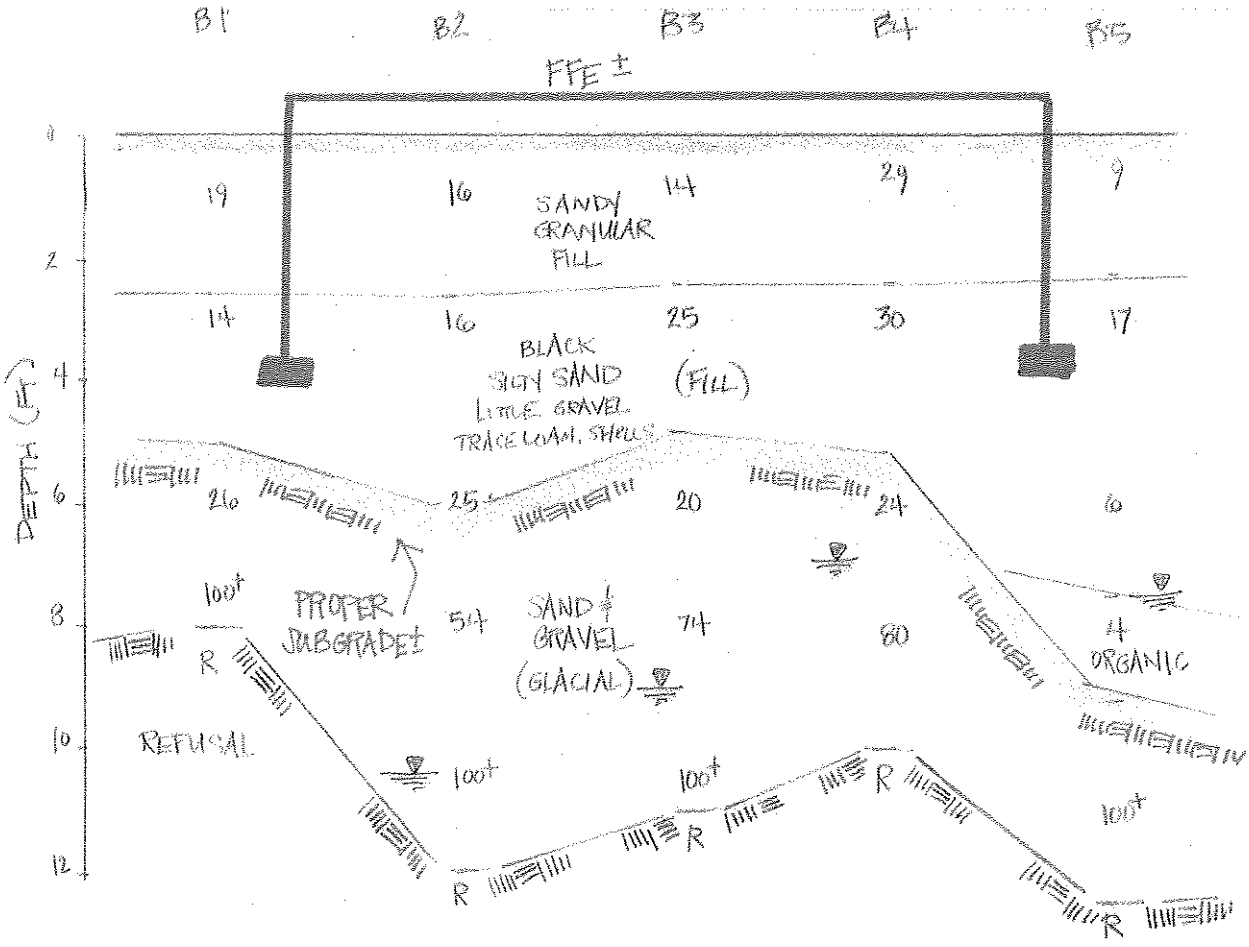
Groundwater was encountered in the test bores at depths of ≈7-9 ft. Wet soils were present below these depths. It should be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, utilities, flooding and other factors differing from the time of the measurements. This study was completed at a time of seasonally normal groundwater.

FOUNDATION SUBGRADE RECOMMENDATIONS

The subgrade conditions are favorable for supporting the proposed building expansion on a conventional spread footing foundation with a concrete floor slab-on-grade. The undocumented Fill and Organic laden soils are **not** rendered suitable for foundation support due to their questionable strength and compressibility characteristics. These soils, intersecting utilities and other questionable matter shall be removed from the *Footing Zone of Influence* (*FZOI*) to expose the Glacial soils . The *FZOI* is defined as that area extending laterally one foot from the edge of footing then outward and downward at a 1H:1V splay (up to a ≈3 ft lateral distance from the edge of footing). The footing subgrade preparation shall be completed for both interior and perimeter footings as well as other foundations where settlement may pose concern. There is about ≈5-10 ft of Fill & Organic based on the test bores. Some over-excavation below BOF should therefore be expected for the project. Structural Fill necessary to achieve foundation grade should conform to *Specification* (Table 1).

It is expected that the cleaner, Granular Fill may remain below the floor slab portions of the building with limited risk of post-construction settlement. The fill will need to be clean, free of organic matter and compact. The composition of the fill should be reviewed during the deeper footing excavations. Clean fill that is to remain shall be proof-rolled with heavy densification. Specifically,

proof-rolling shall include at least 6-8 passes with a minimum two-ton vibratory compactor operating at peak frequency. As a practical matter, the pad should be proof-rolled with a heavy vibratory compactor subsequent to stripping the pavement. The subgrade shall ultimately exhibit stable conditions and be essentially free of organic soils (less than ≈1% by weight). Further review of the dark brown, loamy, silty Sand Fill as well as the deeper Organic Silt (B5) should be necessary in this regard. The subgrade soils should be reviewed by the Geotechnical Engineer during the deeper footing excavations.



CONCEPTUAL SPREAD FOOTING FOUNDATION

The parent subgrade soils should be exposed in the foundation areas prior to casting the footings or placing structural fill. It is recommended that the parent subgrade soils be proof-rolled with vibratory densification and exhibit stable and compact conditions. The purpose of the proof-rolling is to densify the site soils and identify potential loose or unstable areas which should be removed as necessary. Recommended proof-rolling should involve at least 4-5 passes with a vibratory compactor (minimum 850 pound static weight) operating at peak energy. During the proof rolling process, the subgrade should be observed by an Engineer to identify areas exhibiting weaving or

instability. It will be necessary to remove weakened or unstable soils and replace with a Structural Fill. Proof-rolling should not be used when the subgrade is wet (groundwater, storm water, etc) as this may result in soil pumping and instability. The contractor should exercise extra precaution to minimize subgrade disturbance in these wet areas. A protective base of ¾-inch minus crushed stone or graded stone should be placed atop the earthen subgrade if wet conditions are present. The purpose of the stone base is to protect the wet subgrade, facilitate necessary dewatering and provide a dry/stable base upon which to progress construction. Proper groundwater control and storm water management are also necessary to maintain site stability.

The subgrade should ultimately be stable, dewatered, compact and protected from frost throughout construction. Bearing subgrades that become weakened or disturbed due to wet conditions will be rendered unsuitable for structural support. The Contractor shall ultimately be responsible for the means and methods of temporary groundwater control, subgrade protection and site stability during construction. An Engineer from KMM should be scheduled to review the foundation subgrade conditions and preparation during construction.

FOUNDATION DESIGN RECOMMENDATIONS

The footings are expected to gain bearing support atop the parent glacial soils and/or compacted structural fill. Footings may be designed using an allowable bearing capacity of 5 ksf (FS=3). The allowable bearing capacity may be increased a third (⅓) when considering transient loads such as wind or seismic. The bearing capacity is contingent upon the perimeter strip footings and isolated column footings being no less than 2 ft and 3 ft in width respectively. For footings less than 3 ft in lateral dimension, the allowable bearing capacity should be reduced to one-third and multiplied by the least lateral footing dimension in feet. Foundation settlement should be less than 1 inch with differential settlement less than ½ inch. The settlement should be elastic and occur during construction. Exterior footings shall be provided with at least 4 ft of frost protection. Proper frost protection should be necessary during winter construction.

The subsurface conditions were reviewed with respect to seismic criteria set forth in the ***Massachusetts State Building Code***. Based on the relative density of the soils and the depth to groundwater, the site is not susceptible to liquefaction in the event of an earthquake (*Section 1804.6*). Based on interpretation of the *Building Code*, the *Site Classification* is "C" (Very Dense Soil).

It is recommended that a minimum 10-inch base of *Gravel Base Fill* (Table 1) be placed below the concrete floor slab for moisture, strength and frost control. The gravel base shall be increased to no less than 12 inches for exterior concrete slabs exposed to frost (≈18 inches at ramps, entrances, aprons, etc). A subgrade modulus of 150 pci may be used for design of the floor slab. The subgrade modulus may be increased 25 pci for every 2 inch in additional gravel base thickness (200 pci @ 14 inch gravel base). A vapor retarder should be used below the floor slab dependent upon the floor treatment. A vapor barrier should be specified by others per ACI Standards. A 10-mil polyethylene or StegoWrap™ are often used as a vapor retarder. The slab details for freezer construction and frost protection shall also be by others.

Structural fill necessary within and below the foundation should also conform to the attached *Specifications* (Table 1). The shallow Granular Fill soils are considered suitable for re-use as general foundation backfill. The Black, silty Sand Fill should **not** be re-used for Structural Fill.

PROTECTION OF EXISTING FOUNDATION

It is recommended that where the building expansion adjoins the existing building that the footings be constructed at similar grade to mitigate the overlapping of stresses. The *Existing Footing Zone of Influence* of the existing foundation should not be encroached or disturbed without review by a Professional Engineer. The *Existing Footing Zone of Influence* is defined as that area extending laterally one foot from the edge of footing then outward and downward at a 1.5H:1V splay. Per the *Building Code (Section 1805.5)*, an imaginary line drawn between the lower edges of adjoining footings shall not have a steeper slope than 25° (2H:1V) with the horizontal unless the material supporting the higher footing is braced or otherwise retained. There is no present information regarding the adjacent building. This study did not include verification of the existing foundation via test pits. It is expected that the existing foundation extends the typical ≈4-5 ft (frost depth) below grade. KMM can provide additional technical assistance if the existing foundation needs to be shored or underpinned. It is expected that conventional concrete pit underpinning will be the most practical. It is recommended that an experienced Contractor be retained for the underpinning. A *Technical Submittal* prepared by a qualified Engineer should be provided to outline the proposed means and methods to protect the existing building and construct the new underpinning pits.

CONSTRUCTION CONCERNS

Subgrade Protection

The contractor should be required to maintain a stable-dewatered subgrade for the building foundation and other concerned areas during construction. Subgrade disturbance may be influenced by excavation methods, moisture, precipitation, groundwater control and construction activities. The granular glacial soils are typically not considered highly vulnerable to potential disturbance when exposed to wet conditions and construction activities. Nonetheless, the contractor should take precautions to reduce subgrade disturbance. Such precautions may include diverting storm run-off away from construction areas, reducing traffic in sensitive areas, minimizing the extent of exposed subgrade if inclement weather is forecast, backfilling footings as soon as practicable and maintaining an effective dewatering program. Soils exhibiting weaving or instability should be over-excavated to a competent bearing subgrade then replaced with a free draining structural fill or crushed stone. The moisture concerns are typically more problematic if construction takes place during the winter to spring season or other periods of inclement weather. A protective base of ¾-inch minus crushed stone may be placed ≈6 inches below and laterally beyond the footing limits for protection during construction. The stone base is to protect the site soils, facilitate any necessary dewatering and provide a dry/stable base upon which to progress foundation construction. The protective base should be considered elective and dependent upon the site conditions. The stone base should be considered necessary if wet conditions are encountered at footing grade. The protective stone base shall be tamped with a plate compactor and exhibit stable conditions.

The groundwater table, if encountered, will need to be temporarily controlled during construction to complete work in dry conditions and protect the competency of the subgrade. The groundwater table should be continuously maintained at least one foot below construction grade until backfilling is complete. The groundwater is expected to be controlled with conventional sumps and pumps. The temporary sumps should be filtered with stone and fabric and extend at least ≈18 inches below construction grade. A ≈6 inch lift of ¾-inch minus crushed stone should be placed atop the wet subgrade to protect its competency and facilitate dewatering. The stone base should have positive slope to the sump. Adequate dewatering and storm water management are necessary for maintaining the competency of the site soils.

The subgrade should ultimately be stable, dewatered, compact and protected from frost throughout construction. Bearing subgrades that become weakened or disturbed due to wet conditions will be rendered unsuitable for structural support. The Contractor shall ultimately be responsible for the means and methods of temporary groundwater control, subgrade protection and site stability during construction. An Engineer from KMM should be scheduled to review the foundation subgrade conditions and preparation during construction.

CONSTRUCTION MONITORING

It is recommended that a qualified engineer or representative be retained to review earthwork activities such as the preparation of the foundation bearing subgrade and the placement/compaction of Structural Fill. It is recommended that KMM be retained to provide construction monitoring services. This is to observe compliance with the design concepts presented herein.

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

NewBedford75MacAthurDrive.wpd

LIMITATIONS

Explorations

1. The analyses, recommendations and designs submitted in this report are based in part upon the data obtained from preliminary subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.

3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Review

4. It is recommended that this firm be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the recommendations provided herein.

5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by KMM Geotechnical Consultants, LLC.

Construction

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

Use of Report

7. This report has been prepared for the exclusive use of Northern Wind, Inc.in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

8. This report has been prepared for this project by KMM Geotechnical Consultants, LLC. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to preliminary geotechnical design considerations only.

TABLE 1

Proposed Building Expansion
Northern Wind
New Bedford, MA

Recommended Soil Gradation & Compaction Specifications

Gravel Base Fill
(Select Gravel Fill)

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

NOTE: For minimum 10-inch base below Concrete Floor Slab-on-Grade
For minimum 12-inch base for exterior concrete slabs exposed to frost
For minimum 18-inch base below ramps and entrances
Shall have less than 12% fines (No. 200 sieve) based on the Sand fraction

Structural Fill
(Gravelly SAND, trace Silt)

SIEVE SIZE	PERCENT PASSING BY WEIGHT
5 inch	100
3/4 inch	60-100
No. 4	20-80
No. 200	0-10

NOTE: For use as structural load support below the foundations
For use as backfill behind unbalanced foundation/retaining walls
A ¾-inch crushed stone may be used in wet conditions
Shall have less than 25% fines (No. 200 sieve) based on the Sand fraction

Structural Fill placed beneath the foundation should include the *Footing Zone of Influence* which is defined as that area extending laterally one foot from the edge of the footing then outward and downward at a 1H:1V splay. Structural Fill should be placed in loose lifts not exceeding 12 inches for heavy vibratory rollers and 8 inches for vibratory plate compactors. Structural Fill should be compacted to at least 95 percent of maximum dry density as determined by the Modified Proctor Test (ASTM-D1557). Structural Fill should be compacted within ±3% of optimum moisture content. The adequacy of the compaction efforts should be verified by field density testing which is also a requirement of the *Massachusetts State Building Code*.

TEST BORING LOG

SHEET 1

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Building Expansion
Site: 75 MacArthur Drive
New Bedford, MA.

BORING B-1

PROJECT NO. 18-1011

DATE: October 8, 2018

Ground Elevation:
Date Started: October 5, 2018
Date Finished: October 5, 2018
Driller: PGGG
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
10/5/18	n/a		

Depth Ft.	Casing bl/ft	Sample No.	Sample Pen/Rec	Sample Depth	Sample Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						4"	Asphalt
		1	15"	0'0" – 2'0"	6-8-11-16		Grey-Brown, f-m Sand, little gravel, little silt (FILL)
1						2'	
		2	21"	2'0" – 4'0"	10-8-6-5		Dark Brown, loamy, f-m Sand, some silt, trace gravel, minor ash (FILL)
						5'	
5		3	18"	5'0"- 7'0"	11-10-16-20		Brown, fine to medium Sand, some gravel, trace silt, cobbles, dry
		4	3"	7'0" - 7'8"	21-100/2"	8'	(GLACIAL)
10							Refusal with Auger at 8 ft No water encountered upon completion
15							
20							
25							
30							
35							

Notes: Hollow Stem Auger Size 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 2

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Building Expansion
Site: 75 MacArthur Drive
New Bedford, MA.

BORING B-2

PROJECT NO. 18-1011

DATE: October 8, 2018

Ground Elevation:
Date Started: October 5, 2018
Date Finished: October 5, 2018
Driller: PGGG
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
10/5/18	10 ft		

Depth Ft.	Casing bl/ft	Sample No.	Sample Pen/Rec	Sample Depth	Sample Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Asphalt
		1	15"	0'0" – 2'0"	6-7-9-11		Brown, fine to medium Sand, trace gravel, trace silt (FILL)
1						2'	
		2	21"	2'0" – 4'0"	15-8-8-6		Black, silty Sand, little gravel, trace loam, ash (FILL)
5		3	9"	5'0"- 6'0"	2-4	6'	
		4	9"	6'0" – 7'0"	21-24		
		5	18"	7'0" - 9'0"	19-21-33-32		Brown, fine to medium Sand, some gravel, trace silt, cobbles (GLACIAL)
10		6	8"	10'0" – 11'2"	41-53-100/2"	12'	Sand & Gravel/ Weathered Rock
							Refusal with Auger at 12 ft Water encountered at 10 ft upon completion
15							
20							
25							
30							
35							

Notes: Hollow Stem Auger Size 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 3

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Building Expansion
Site: 75 MacArthur Drive
New Bedford, MA.

BORING B-3

PROJECT NO. 18-1011

DATE: October 8, 2018

Ground Elevation:
Date Started: October 5, 2018
Date Finished: October 5, 2018
Driller: PGGG
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
10/5/18	9 ft		

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Asphalt
		1	15"	0'0" – 2'0"	5-6-8-13		Brown, Fine Sand, little silt, trace gravel (FILL)
1						2'	
		2	18"	2'0" – 4'0"	15-15-10-10		Black, f-m Sand, some silt, little gravel, trace loam, rubble (FILL)
						5'	
5		3	21"	5'0"- 7'0"	8-9-11-11		Brown, fine to medium Sand, little gravel, little silt, dry
		4	21"	7'0" - 9'0"	30-35-39-43		Brown, f-m Sand & Gravel, trace silt, cobbles, dry (GLACIAL)
10		5	3"	10'0" – 10'5"	100/5"		
						11'	Brown, Sand & Gravel, little silt, cobbles, wet
							Refusal with Auger at 11 ft Water encountered at 9 ft upon completion
15							
20							
25							
30							
35							

Notes: Hollow Stem Auger Size 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 4

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Building Expansion
Site: 75 MacArthur Drive
New Bedford, MA.

BORING B-4

PROJECT NO. 18-1011

DATE: October 8, 2018

Ground Elevation:
Date Started: October 5, 2018
Date Finished: October 5, 2018
Driller: PGGG
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
10/5/18	7 ft		

Depth Ft.	Casing bl/ft	Sample No.	Sample Pen/Rec	Sample Depth	Sample Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						2"	Asphalt
1		1	15"	0'0" – 2'0"	10-11-18-25	2'	Brown, fine to medium Sand, some gravel, little silt (FILL)
		2	9"	2'0" – 4'0"	15-16-14-21		
5		3	15"	5'0"- 7'0"	7-8-16-25	5'	Black, silty Sand w/ gravel, trace shells, rubble, loam (FILL)
		4	15"	7'0" - 9'7"	27-33-47-100/1"		Brown, fine to medium Sand & Gravel, trace silt, cobbles, wet
10						10'	(GLACIAL)
							Refusal with Auger at 10 ft Water encountered at 7 ft upon completion
15							
20							
25							
30							
35							

Notes: Hollow Stem Auger Size 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 5

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Building Expansion
Site: 75 MacArthur Drive
New Bedford, MA.

BORING B-5

PROJECT NO. 18-1011

DATE: October 8, 2018

Ground Elevation:
Date Started: October 5, 2018
Date Finished: October 5, 2018
Driller: PGGG
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION
10/5/18	7 ft		

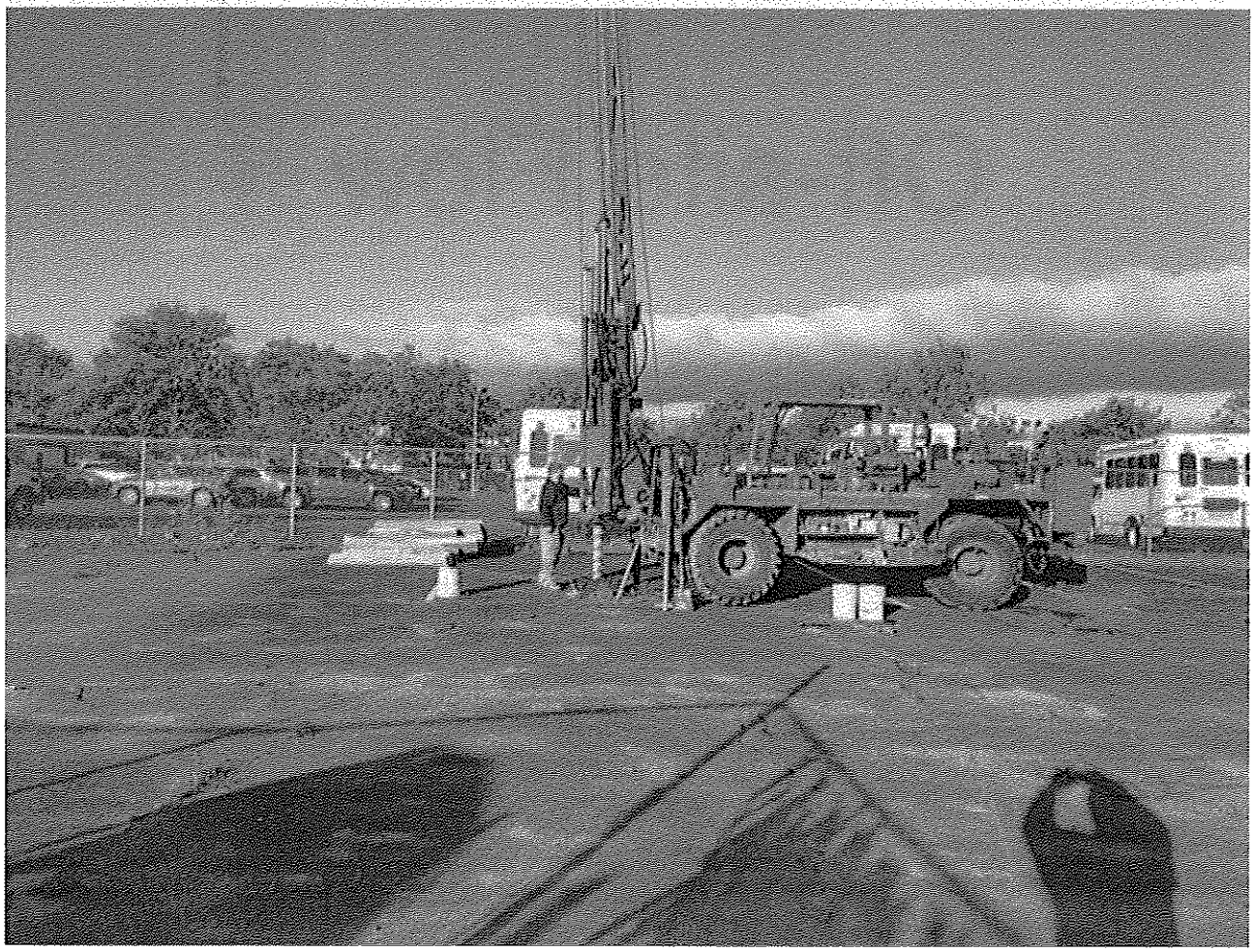
Depth Ft.	Casing bl/ft	Sample No.	Sample Pen/Rec	Sample Depth	Sample Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Asphalt
1		1	18"	0'0" – 2'0"	2-5-4-4	2'	Brown, Fine Sand, little silt (FILL)
		2	12"	2'0" – 4'0"	5-8-9-11		Grey-Black, f-m Sand, some gravel, little silt, trace ash, shells (FILL)
5		3	9"	5'0"- 7'0"	2-3-3-2	7'	Grey, f-m Sand, some gravel, some silt, trace wood, loam, rubble, dry (FILL)
		4	9"	7'0" - 9'0"	2-2-2-2		
						10'	Black, Organic Silt & Fine Sand, wet (ORGANIC)
10		5	15"	10'0" – 11'9"	18-27-41-100/3"		Brown, fine to medium Sand, some silt, little gravel, wet
						12'5"	Refusal with Auger at 12'6"
							Water encountered at 7 ft upon completion
15							
20							
25							
30							
35							

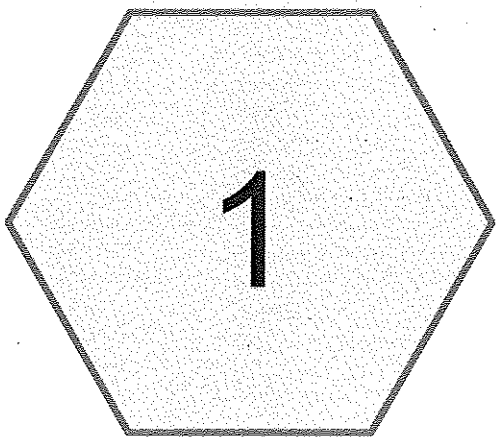
Notes: Hollow Stem Auger Size 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

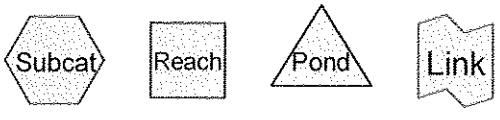
Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	





Off-site Flow



Drainage Diagram for 18850-PRE
Prepared by Farland Corp.

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Off-site Flow Runoff Area=30,296 sf 96.34% Impervious Runoff Depth=2.95"
Tc=6.0 min CN=96 Runoff=2.18 cfs 0.171 af

Total Runoff Area = 0.696 ac Runoff Volume = 0.171 af Average Runoff Depth = 2.95"
3.66% Pervious = 0.025 ac 96.34% Impervious = 0.670 ac

Summary for Subcatchment 1: Off-site Flow

Runoff = 2.18 cfs @ 12.09 hrs, Volume= 0.171 af, Depth= 2.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.40"

Area (sf)	CN	Description
29,187	98	Paved parking & roofs
1,109	39	>75% Grass cover, Good, HSG A
30,296	96	Weighted Average
1,109		Pervious Area
29,187		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Off-site Flow Runoff Area=30,296 sf 96.34% Impervious Runoff Depth=4.33"
Tc=6.0 min CN=96 Runoff=3.13 cfs 0.251 af

Total Runoff Area = 0.696 ac Runoff Volume = 0.251 af Average Runoff Depth = 4.33"
3.66% Pervious = 0.025 ac 96.34% Impervious = 0.670 ac

Summary for Subcatchment 1: Off-site Flow

Runoff = 3.13 cfs @ 12.09 hrs, Volume= 0.251 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
29,187	98	Paved parking & roofs
1,109	39	>75% Grass cover, Good, HSG A
30,296	96	Weighted Average
1,109		Pervious Area
29,187		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Off-site Flow Runoff Area=30,296 sf 96.34% Impervious Runoff Depth=5.13"
Tc=6.0 min CN=96 Runoff=3.68 cfs 0.297 af

Total Runoff Area = 0.696 ac Runoff Volume = 0.297 af Average Runoff Depth = 5.13"
3.66% Pervious = 0.025 ac 96.34% Impervious = 0.670 ac

Summary for Subcatchment 1: Off-site Flow

Runoff = 3.68 cfs @ 12.09 hrs, Volume= 0.297 af, Depth= 5.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.60"

Area (sf)	CN	Description
29,187	98	Paved parking & roofs
1,109	39	>75% Grass cover, Good, HSG A
30,296	96	Weighted Average
1,109		Pervious Area
29,187		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Off-site Flow Runoff Area=30,296 sf 96.34% Impervious Runoff Depth=6.52"
Tc=6.0 min CN=96 Runoff=4.62 cfs 0.378 af

Total Runoff Area = 0.696 ac Runoff Volume = 0.378 af Average Runoff Depth = 6.52"
3.66% Pervious = 0.025 ac 96.34% Impervious = 0.670 ac

Summary for Subcatchment 1: Off-site Flow

Runoff = 4.62 cfs @ 12.09 hrs, Volume= 0.378 af, Depth= 6.52"

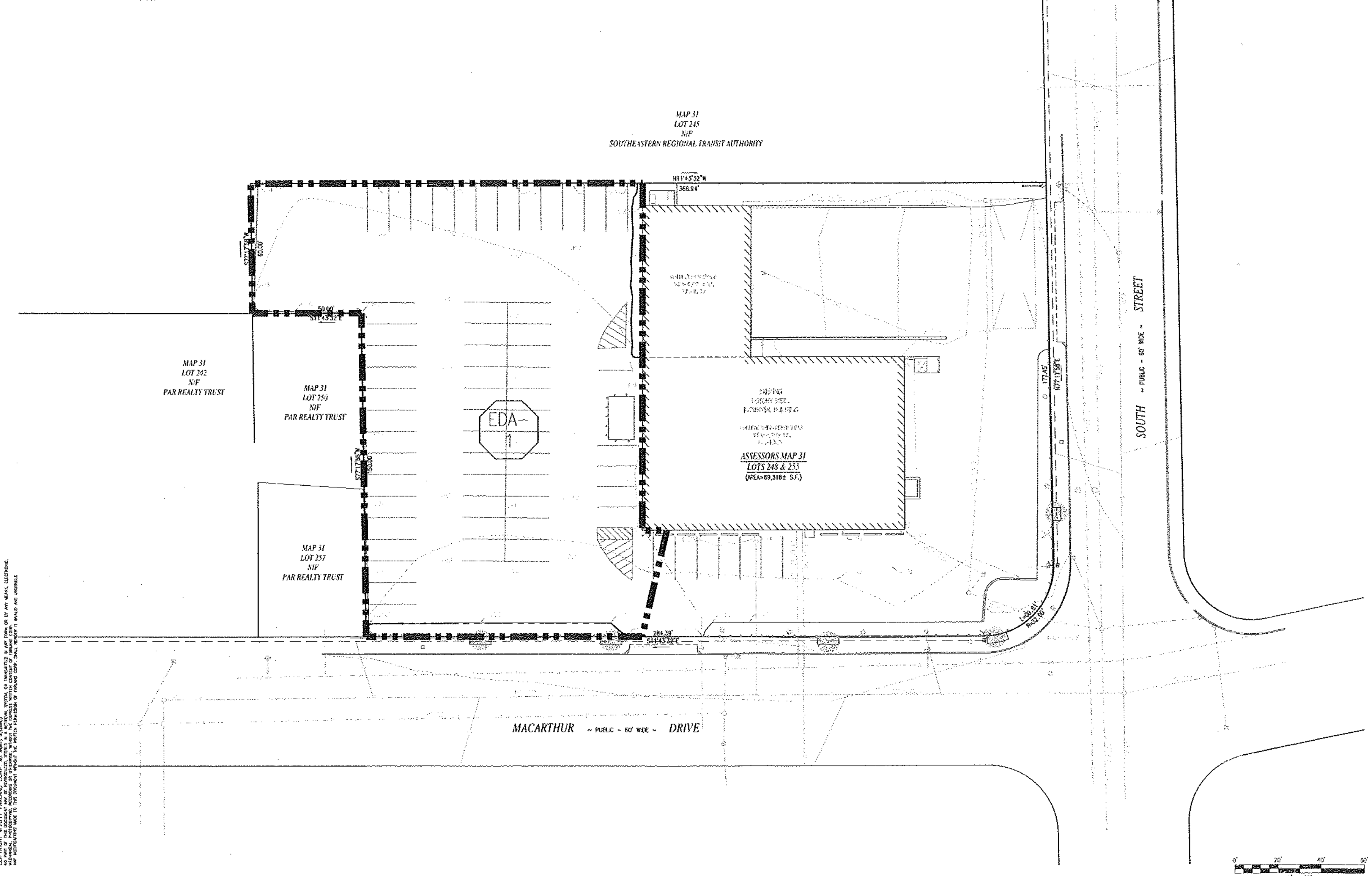
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.00"

Area (sf)	CN	Description
29,187	98	Paved parking & roofs
1,109	39	>75% Grass cover, Good, HSG A
30,296	96	Weighted Average
1,109		Pervious Area
29,187		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

—SUBCATCHMENT DATA—

SUCATCHMENT	AREA (S.F.)
EDA-1	30,296



REVISIONS

FARLAND CORP.

www.FarlandCorp.com

401 COUNTY STREET
NEW BEDFORD, MA 02740
P.508.717.3479
OFFICES IN:
•TAUNTON
•MARLBOROUGH
•WARWICK, RI

DRAWN BY: JKM
DESIGNED BY: JKM
CHECKED BY: CAF

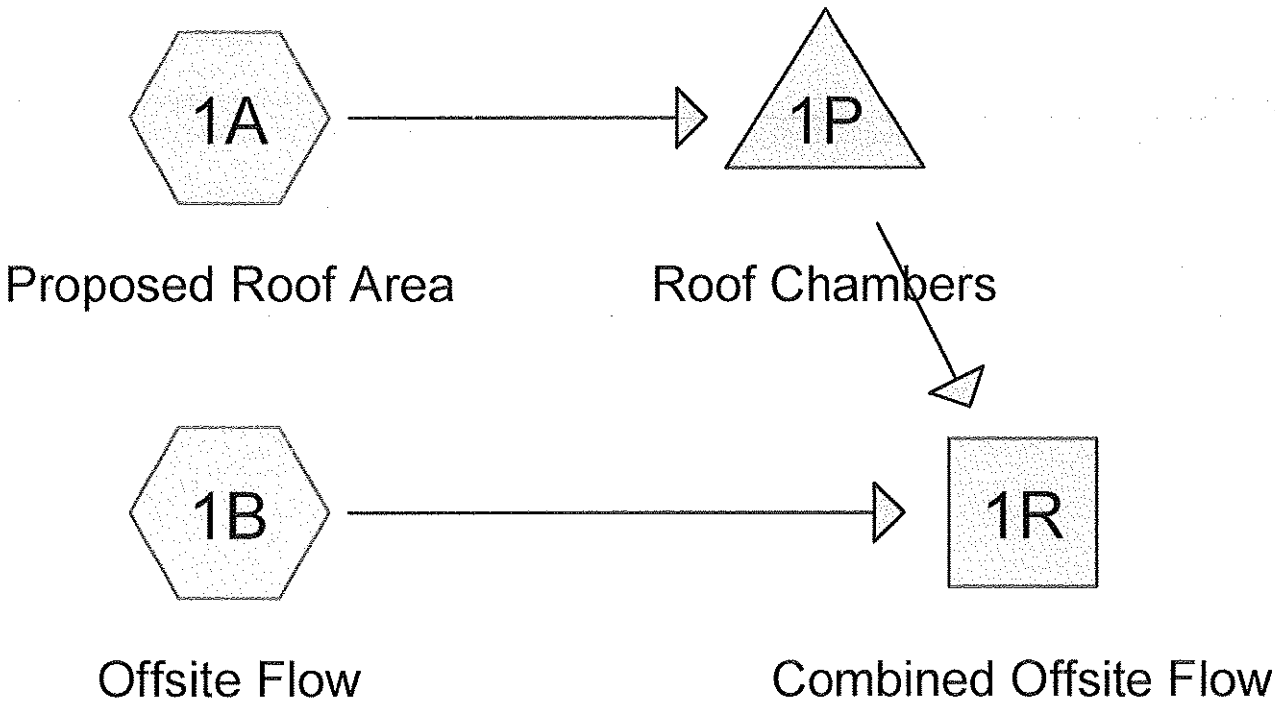
DRAINAGE MAP

#75 MACARTHUR DRIVE
ASSESSORS MAP 31 LOTS 248 & 255
NEW BEDFORD, MASSACHUSETTS

PREPARED FOR: STREETSIDE REALTY LLC
14 HASSEY STREET
NEW BEDFORD, MA 02740

DATE: OCTOBER 12, 2018
SCALE: 1"=20'
JOB NO. 18-850
LATEST REVISION:

PRE-DEVELOPMENT DRAINAGE MAP
SHEET 1 OF 1



Subcat Reach Pond Link

Drainage Diagram for 18850-POST
Prepared by Farland Corp.

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: Proposed Roof Area Runoff Area=21,607 sf 100.00% Impervious Runoff Depth=3.17"
Tc=6.0 min CN=98 Runoff=1.60 cfs 0.131 af

Subcatchment 1B: Offsite Flow Runoff Area=8,689 sf 64.06% Impervious Runoff Depth=1.36"
Tc=6.0 min CN=77 Runoff=0.31 cfs 0.023 af

Reach 1R: Combined Offsite Flow Inflow=0.31 cfs 0.023 af
Outflow=0.31 cfs 0.023 af

Pond 1P: Roof Chambers Peak Elev=6.27' Storage=0.033 af Inflow=1.60 cfs 0.131 af
Discarded=0.29 cfs 0.131 af Primary=0.00 cfs 0.000 af Outflow=0.29 cfs 0.131 af

Total Runoff Area = 0.696 ac Runoff Volume = 0.153 af Average Runoff Depth = 2.65"
10.31% Pervious = 0.072 ac 89.69% Impervious = 0.624 ac

Summary for Subcatchment 1A: Proposed Roof Area

Runoff = 1.60 cfs @ 12.09 hrs, Volume= 0.131 af, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.40"

	Area (sf)	CN	Description
*	21,607	98	Proposed Roof
	21,607		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Summary for Subcatchment 1B: Offsite Flow

Runoff = 0.31 cfs @ 12.10 hrs, Volume= 0.023 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.40"

Area (sf)	CN	Description
5,566	98	Paved parking & roofs
3,123	39	>75% Grass cover, Good, HSG A
8,689	77	Weighted Average
3,123		Pervious Area
5,566		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Summary for Reach 1R: Combined Offsite Flow

Inflow Area = 0.696 ac, 89.69% Impervious, Inflow Depth = 0.39" for 2-YR event
Inflow = 0.31 cfs @ 12.10 hrs, Volume= 0.023 af
Outflow = 0.31 cfs @ 12.10 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Roof Chambers

Inflow Area = 0.496 ac,100.00% Impervious, Inflow Depth = 3.17" for 2-YR event
Inflow = 1.60 cfs @ 12.09 hrs, Volume= 0.131 af
Outflow = 0.29 cfs @ 11.70 hrs, Volume= 0.131 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.29 cfs @ 11.70 hrs, Volume= 0.131 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Peak Elev= 6.27' @ 12.53 hrs Surf.Area= 0.035 ac Storage= 0.033 af

Plug-Flow detention time= 25.9 min calculated for 0.131 af (100% of inflow)
Center-of-Mass det. time= 25.8 min (781.0 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1	4.90'	0.030 af	**40.10'W x 38.00'L x 3.54'H Prismatoid**
			0.124 af Overall - 0.048 af Embedded = 0.076 af x 40.0% Voids
#2	5.40'	0.048 af	**47.8"W x 30.0"H x 7.00'L Cultec R-330XLHD** x 40 Inside #1
#3	5.40'	0.000 af	**15.8"W x 12.0"H x 1.00'L Cultec HVLV F-24** x 14 Inside #1
#4	4.90'	0.001 af	**4.00'D x 5.10'H Vertical Cone/Cylinder**
		0.080 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	4.90'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	7.15'	**6.0" x 282.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900
			Outlet Invert= 5.89' S= 0.0045 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.29 cfs @ 11.70 hrs HW=4.96' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=4.90' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: Proposed Roof Area Runoff Area=21,607 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=2.27 cfs 0.189 af

Subcatchment 1B: Offsite Flow Runoff Area=8,689 sf 64.06% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=77 Runoff=0.56 cfs 0.041 af

Reach 1R: Combined Offsite Flow Inflow=0.56 cfs 0.041 af
Outflow=0.56 cfs 0.041 af

Pond 1P: Roof Chambers Peak Elev=7.13' Storage=0.056 af Inflow=2.27 cfs 0.189 af
Discarded=0.29 cfs 0.189 af Primary=0.00 cfs 0.000 af Outflow=0.29 cfs 0.189 af

Total Runoff Area = 0.696 ac Runoff Volume = 0.229 af Average Runoff Depth = 3.96"
10.31% Pervious = 0.072 ac 89.69% Impervious = 0.624 ac

Summary for Subcatchment 1A: Proposed Roof Area

Runoff = 2.27 cfs @ 12.09 hrs, Volume= 0.189 af, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

	Area (sf)	CN	Description
*	21,607	98	Proposed Roof
	21,607		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Summary for Subcatchment 1B: Offsite Flow

Runoff = 0.56 cfs @ 12.09 hrs, Volume= 0.041 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.80"

Area (sf)	CN	Description
5,566	98	Paved parking & roofs
3,123	39	>75% Grass cover, Good, HSG A
8,689	77	Weighted Average
3,123		Pervious Area
5,566		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Summary for Reach 1R: Combined Offsite Flow

Inflow Area = 0.696 ac, 89.69% Impervious, Inflow Depth = 0.70" for 10-YR event
Inflow = 0.56 cfs @ 12.09 hrs, Volume= 0.041 af
Outflow = 0.56 cfs @ 12.09 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Roof Chambers

Inflow Area = 0.496 ac,100.00% Impervious, Inflow Depth = 4.56" for 10-YR event
Inflow = 2.27 cfs @ 12.09 hrs, Volume= 0.189 af
Outflow = 0.29 cfs @ 11.60 hrs, Volume= 0.189 af, Atten= 87%, Lag= 0.0 min
Discarded = 0.29 cfs @ 11.60 hrs, Volume= 0.189 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Peak Elev= 7.13' @ 12.63 hrs Surf.Area= 0.035 ac Storage= 0.056 af

Plug-Flow detention time= 49.8 min calculated for 0.188 af (100% of inflow)
Center-of-Mass det. time= 49.7 min (798.4 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1	4.90'	0.030 af	**40.10'W x 38.00'L x 3.54'H Prismatoid**
			0.124 af Overall - 0.048 af Embedded = 0.076 af x 40.0% Voids
#2	5.40'	0.048 af	**47.8"W x 30.0"H x 7.00'L Cultec R-330XLHD** x 40 Inside #1
#3	5.40'	0.000 af	**15.8"W x 12.0"H x 1.00'L Cultec HVLV F-24** x 14 Inside #1
#4	4.90'	0.001 af	**4.00'D x 5.10'H Vertical Cone/Cylinder**
		0.080 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	4.90'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	7.15'	**6.0" x 282.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900
			Outlet Invert= 5.89' S= 0.0045 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.29 cfs @ 11.60 hrs HW=4.95' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=4.90' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: Proposed Roof Area Runoff Area=21,607 sf 100.00% Impervious Runoff Depth=5.36"
Tc=6.0 min CN=98 Runoff=2.66 cfs 0.222 af

Subcatchment 1B: Offsite Flow Runoff Area=8,689 sf 64.06% Impervious Runoff Depth=3.13"
Tc=6.0 min CN=77 Runoff=0.72 cfs 0.052 af

Reach 1R: Combined Offsite Flow Inflow=0.72 cfs 0.061 af
Outflow=0.72 cfs 0.061 af

Pond 1P: Roof Chambers Peak Elev=7.54' Storage=0.065 af Inflow=2.66 cfs 0.222 af
Discarded=0.29 cfs 0.212 af Primary=0.24 cfs 0.009 af Outflow=0.54 cfs 0.222 af

Total Runoff Area = 0.696 ac Runoff Volume = 0.274 af Average Runoff Depth = 4.72"
10.31% Pervious = 0.072 ac 89.69% Impervious = 0.624 ac

Summary for Subcatchment 1A: Proposed Roof Area

Runoff = 2.66 cfs @ 12.09 hrs, Volume= 0.222 af, Depth= 5.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.60"

	Area (sf)	CN	Description
*	21,607	98	Proposed Roof
	21,607		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Summary for Subcatchment 1B: Offsite Flow

Runoff = 0.72 cfs @ 12.09 hrs, Volume= 0.052 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.60"

Area (sf)	CN	Description
5,566	98	Paved parking & roofs
3,123	39	>75% Grass cover, Good, HSG A
8,689	77	Weighted Average
3,123		Pervious Area
5,566		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Summary for Reach 1R: Combined Offsite Flow

Inflow Area = 0.696 ac, 89.69% Impervious, Inflow Depth = 1.06" for 25-YR event
Inflow = 0.72 cfs @ 12.09 hrs, Volume= 0.061 af
Outflow = 0.72 cfs @ 12.09 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Roof Chambers

Inflow Area = 0.496 ac,100.00% Impervious, Inflow Depth = 5.36" for 25-YR event
Inflow = 2.66 cfs @ 12.09 hrs, Volume= 0.222 af
Outflow = 0.54 cfs @ 12.51 hrs, Volume= 0.222 af, Atten= 80%, Lag= 25.6 min
Discarded = 0.29 cfs @ 11.50 hrs, Volume= 0.212 af
Primary = 0.24 cfs @ 12.51 hrs, Volume= 0.009 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Peak Elev= 7.54' @ 12.51 hrs Surf.Area= 0.035 ac Storage= 0.065 af

Plug-Flow detention time= 54.1 min calculated for 0.221 af (100% of inflow)
Center-of-Mass det. time= 54.0 min (800.2 - 746.2)

Volume	Invert	Avail.Storage	Storage Description
#1	4.90'	0.030 af	**40.10'W x 38.00'L x 3.54'H Prismatoid**
			0.124 af Overall - 0.048 af Embedded = 0.076 af x 40.0% Voids
#2	5.40'	0.048 af	**47.8"W x 30.0"H x 7.00'L Cultec R-330XLHD** x 40 Inside #1
#3	5.40'	0.000 af	**15.8"W x 12.0"H x 1.00'L Cultec HVLV F-24** x 14 Inside #1
#4	4.90'	0.001 af	**4.00'D x 5.10'H Vertical Cone/Cylinder**
		0.080 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	4.90'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	7.15'	**6.0" x 282.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900
			Outlet Invert= 5.89' S= 0.0045 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.29 cfs @ 11.50 hrs HW=4.95' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.24 cfs @ 12.51 hrs HW=7.54' (Free Discharge)
↑—**2=Culvert** (Barrel Controls 0.24 cfs @ 2.01 fps)

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: Proposed Roof Area Runoff Area=21,607 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=3.33 cfs 0.279 af

Subcatchment 1B: Offsite Flow Runoff Area=8,689 sf 64.06% Impervious Runoff Depth=4.37"
Tc=6.0 min CN=77 Runoff=1.00 cfs 0.073 af

Reach 1R: Combined Offsite Flow Inflow=0.99 cfs 0.108 af
Outflow=0.99 cfs 0.108 af

Pond 1P: Roof Chambers Peak Elev=9.98' Storage=0.080 af Inflow=3.33 cfs 0.279 af
Discarded=0.29 cfs 0.244 af Primary=0.61 cfs 0.035 af Outflow=0.90 cfs 0.279 af

Total Runoff Area = 0.696 ac Runoff Volume = 0.352 af Average Runoff Depth = 6.07"
10.31% Pervious = 0.072 ac 89.69% Impervious = 0.624 ac

Summary for Subcatchment 1A: Proposed Roof Area

Runoff = 3.33 cfs @ 12.09 hrs, Volume= 0.279 af, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.00"

	Area (sf)	CN	Description
*	21,607	98	Proposed Roof
	21,607		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Summary for Subcatchment 1B: Offsite Flow

Runoff = 1.00 cfs @ 12.09 hrs, Volume= 0.073 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.00"

Area (sf)	CN	Description
5,566	98	Paved parking & roofs
3,123	39	>75% Grass cover, Good, HSG A
8,689	77	Weighted Average
3,123		Pervious Area
5,566		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Summary for Reach 1R: Combined Offsite Flow

Inflow Area = 0.696 ac, 89.69% Impervious, Inflow Depth = 1.86" for 100-YR event
Inflow = 0.99 cfs @ 12.10 hrs, Volume= 0.108 af
Outflow = 0.99 cfs @ 12.10 hrs, Volume= 0.108 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Roof Chambers

Inflow Area = 0.496 ac,100.00% Impervious, Inflow Depth = 6.76" for 100-YR event
Inflow = 3.33 cfs @ 12.09 hrs, Volume= 0.279 af
Outflow = 0.90 cfs @ 12.45 hrs, Volume= 0.279 af, Atten= 73%, Lag= 22.1 min
Discarded = 0.29 cfs @ 11.30 hrs, Volume= 0.244 af
Primary = 0.61 cfs @ 12.45 hrs, Volume= 0.035 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Peak Elev= 9.98' @ 12.45 hrs Surf.Area= 0.035 ac Storage= 0.080 af

Plug-Flow detention time= 53.4 min calculated for 0.279 af (100% of inflow)
Center-of-Mass det. time= 53.3 min (796.3 - 743.0)

Volume	Invert	Avail.Storage	Storage Description
#1	4.90'	0.030 af	**40.10'W x 38.00'L x 3.54'H Prismatoid**
			0.124 af Overall - 0.048 af Embedded = 0.076 af x 40.0% Voids
#2	5.40'	0.048 af	**47.8"W x 30.0"H x 7.00'L Cultec R-330XLHD** x 40 Inside #1
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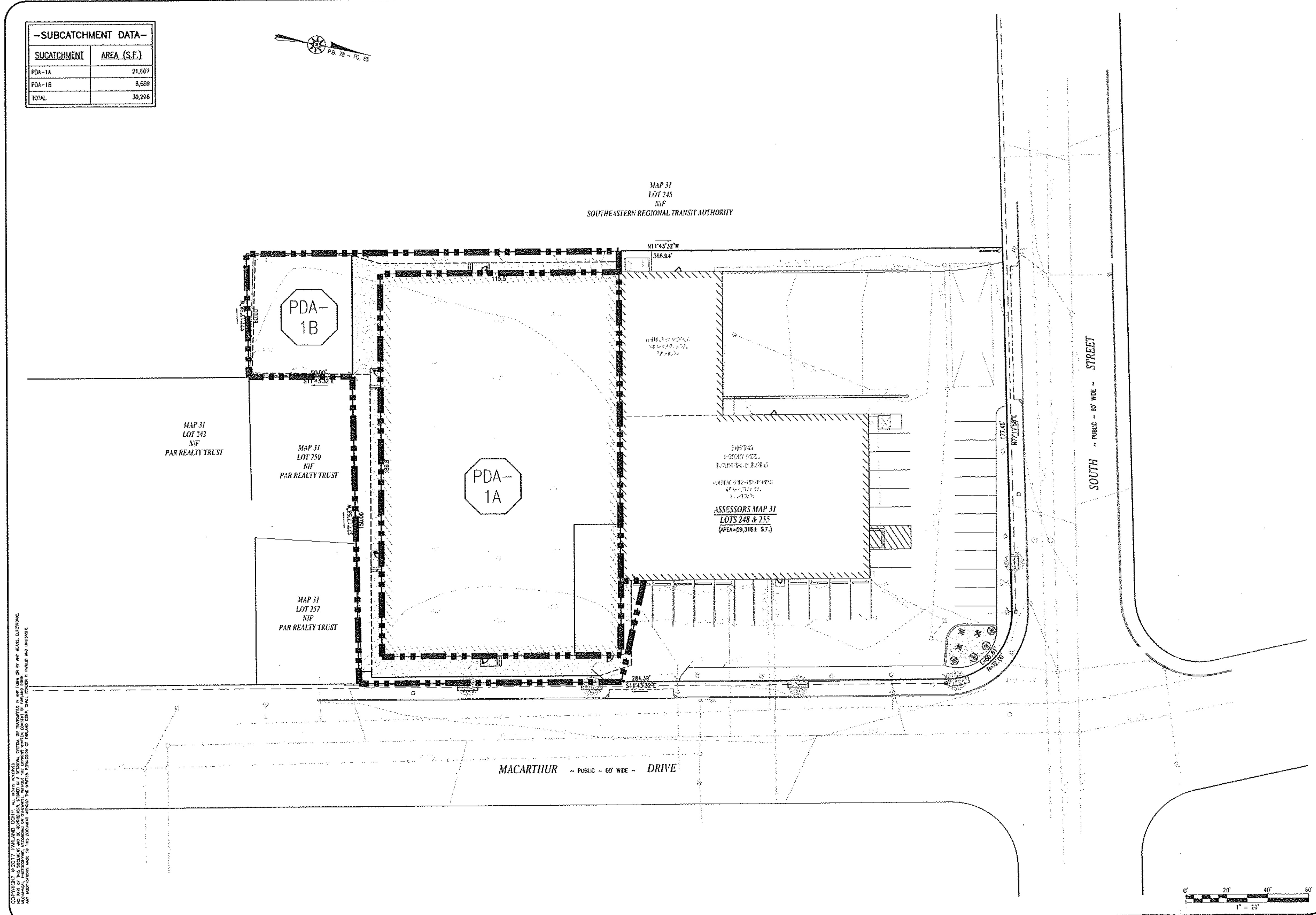
#4	4.90'	0.001 af	**4.00'D x 5.10'H Vertical Cone/Cylinder**
		0.080 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	4.90'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	7.15'	**6.0" x 282.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900
			Outlet Invert= 5.89' S= 0.0045 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior

Discarded OutFlow Max=0.29 cfs @ 11.30 hrs HW=4.96' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.60 cfs @ 12.45 hrs HW=9.89' (Free Discharge)
↑—**2=Culvert** (Barrel Controls 0.60 cfs @ 3.05 fps)

-SUBCATCHMENT DATA-	
SUCATCHMENT	AREA (S.F.)
PDA-1A	21,607
PDA-1B	8,689
TOTAL	30,296



REVISIONS

FARLAND CORP.

www.FarlandCorp.com

401 COUNTY STREET
NEW BEDFORD, MA 02740
P.508.717.3479
OFFICES IN:
- TAUNTON
- MARLBOROUGH
- WARWICK, RI

DRAWN BY: JKM
DESIGNED BY: JKM
CHECKED BY: CAF

DRAINAGE MAP

#75 MACARTHUR DRIVE
ASSESSORS MAP 31 LOTS 248 & 255
NEW BEDFORD, MASSACHUSETTS

PREPARED FOR: STREETSIDE REALTY LLC
14 HASSEY STREET
NEW BEDFORD, MA 02740

DATE: OCTOBER 12, 2018
SCALE: 1"=20'
JOB NO. 18-850
LATEST REVISION:

POST-DEVELOPMENT DRAINAGE MAP

SHEET 1 OF 1