North Country Stormwater Conference

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Porous Pavement Section

Sponsored by

Champlain Watershed Improvement Coalition of NY *(CWICNY)*

October 14, 2010

Presentor

Daniel R. Hershberg, P.E. & L.S.
Managing Partner
Hershberg & Hershberg

Porous Pavement is a method of Storm Water Management as well as providing stormwater treatment

Why is Storm Water Management Necessary?

Flood Control

- Local
  - Street Flooding
  - Home Flooding
  - Combined Sewer Outflows
- Regional
  - Rivers or Major Streams
  - Cities and Towns

NYSDEC (EPA) and Local Requirements

- New York State Department of Environmental Conservation GP#0-10-001
- Improve water quantity controls
- Improve water quality
- Sedimentation & Erosion Control
- Green Method

Porous Asphalt Applications

- Parking Lots
- Roads
  - on a limited basis
- Recreational Facilities
  -playgrounds, tennis courts, paths, etc.

Site Conditions

- Soil permeability/infiltration rate
  - Hydrologic Class A Soil is Ideal – Where infiltration rates in Gravel or Sands exceed 2”/hr, frost depth protection not needed
  - EPA recommends a minimum 0.5”/hour
  - 0.1”/hour may be OK with adequate reservoir space and depth must exceed frost depth
- Depth to bedrock > 2’
- Depth to ground water > 3’
  - Depth to ground water > 4’ in primary aquifer areas
- Fill – Systems not recommended in significant fill areas
- Frost
  - Pavement section should exceed frost depth except in Class A soils with infiltration rate greater than 2”/ hour

Predicted Infiltration Rate

- New York State Stormwater Design Manual defines methods.
- Preliminary determination can be made from test pits or augers.
- Actual determination requires careful infiltration tests at the proper level.
- Design should consider degradation in infiltration rate.

New York State

Stormwater Management Design Manual

June 2010

Prepared by:
Center for Watershed Protection
8391 Main Street
Ellicott City, MD 21043

For:
New York State
Department of Environmental Conservation
625 Broadway
Albany, NY 12233

David A. Paterson, Governor Pete Grannis, Commissioner

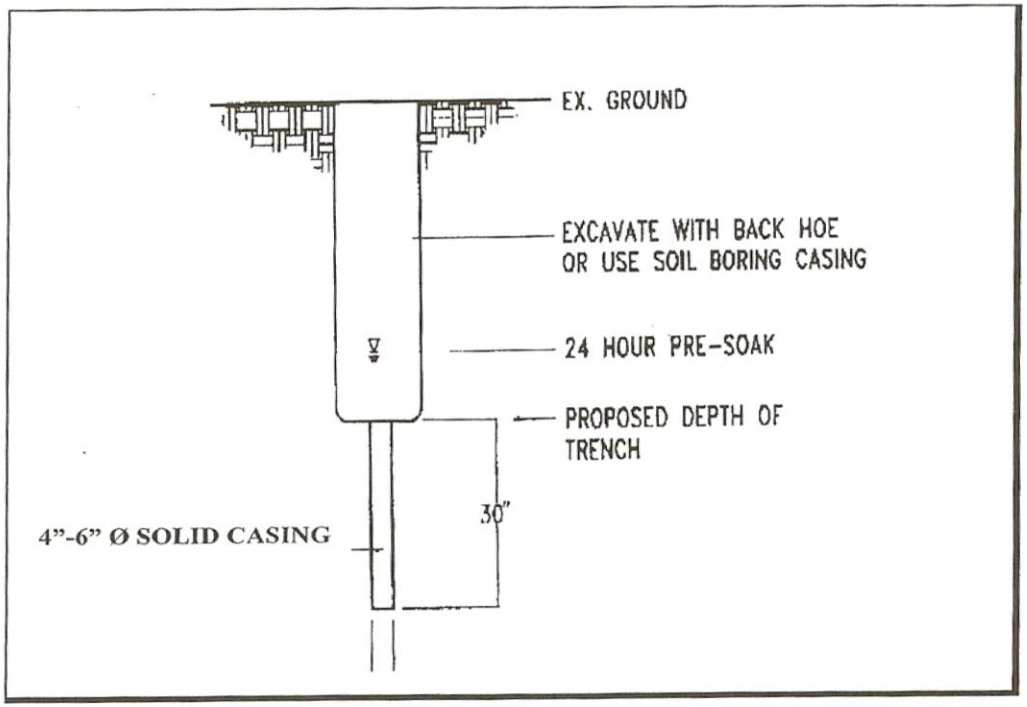
Recently Revised Stormwater Management Design Manual

Soil Investigation

- Borings and/or test pits
- Test permeability – see NYS SWDM
- Determine depth to seasonal high groundwater table
- Determine depth to bedrock

Infiltration Rate Testing

Figure D.1 Infiltration Testing Requirements



Test Method from NYSDEC Stormwater Management Design Manual

NYS SWDM Requirements

Documentation

Infiltration testing data shall be documented, which shall also include a description of the infiltration testing method, if completed. This is to ensure that the tester understands the procedure.

Test Pit/Boring Requirements

a. excavate a test pit or dig a standard soil boring to a minimum depth of 4 feet below the proposed facility bottom elevation

b. determine depth to groundwater table (if within 4 feet of proposed bottom) upon initial digging or drilling, and again 24 hours later

c. conduct Standard Penetration Testing (SPT) every 2' to a depth of 4 feet below the facility bottom

d. determine USDA or Unified Soil Classification System textures at the proposed bottom and 4 feet below the bottom of the SMP

e. determine depth to bedrock (if within 4 feet of proposed bottom)

f. The soil description should include all soil horizons.

g. The location of the test pit or boring shall correspond to the SMP location; test pit/soil boring stakes are to be left in the field for inspection purposes and shall be clearly labeled as such.

NYS SWDM Requirements

Infiltration Testing Requirements

a. Install casing (solid 4-6 inch diameter, 30" length) to 24" below proposed SMP bottom (see Figure D-1).

b. Remove any smeared soiled surfaces and provide a natural soil interface into which water may percolate. Remove all loose material from the casing. Upon the tester's discretion, a two (2) inch layer of coarse sand or fine gravel may be placed to protect the bottom from scouring and sediment. Fill casing with *clean* water to a depth of 24" and allow to pre-soak for twenty-four hours

c. Twenty-four hours later, refill casing with another 24" of clean water and monitor water level (measured drop from the top of the casing) for 1 hour. Repeat this procedure (filling the casing each time) three additional times, for a total of four observations. Upon the tester's discretion, the final field rate may either be the average of the four observations, or the value of the last observation. The final rate shall be reported in *inches per hour*.

d. May be done though a boring or open excavation.

e. The location of the test shall correspond to the SMP location.

f. Upon completion of the testing, the casings shall be immediately pulled, and the test pit shall be back-filled.

Infiltration Rate Testing

DENTE ENGINEERING

ALBANY AREA
594 Broadway
Watervliet, NY 12189
Voice 518-266-0310
Fax 518-266-9238

BUFFALO AREA
PO Box 482
Orchard Park, NY 14127
Voice 716-649-9474
Fax 716-648-3521

LIA TOYOTA
Colonie, New York
INFILTRATION TESTING RESULTS

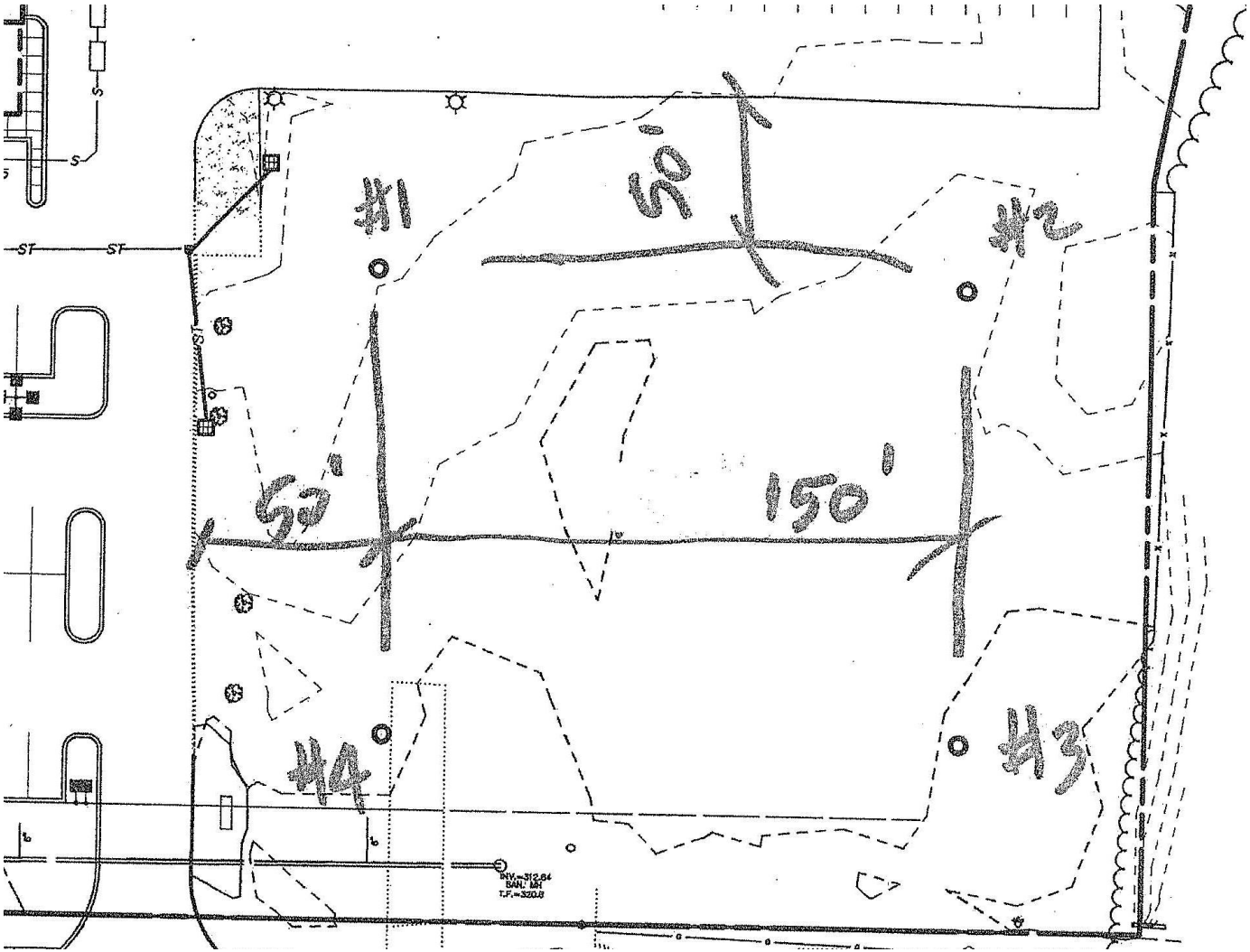
Test Location	Test Date	Elevation (in feet)		Water Drop (in inches)	Time Elapsed hours	Infiltration rate (inches/hour)
		Ground Surface	Bottom of Test Well			
I-1	9/29/2009	318.0	315.0	5.50	1.0	5.5
				6.00	1.0	6.0
				5.50	1.0	5.5
				4.50	1.0	4.5
I-2	9/29/2009	319.0	313.0	1.00	1.0	1.0
				0.50	1.0	0.5
				0.00	1.0	0.0
				0.50	1.0	0.5
I-3	9/29/2009	320.0	314.0	8.00	1.0	8.0
				7.00	1.0	7.0
				7.00	1.0	7.0
				7.00	1.0	7.0
I-4	9/29/2009	320.0	314.0	0.00	1.0	0.0
				2.00	1.0	2.0
				1.00	1.0	1.0
				3.00	1.0	3.0

NOTES: Test depths are measured from the existing ground surface. Infiltration test wells are solid 4" diameter PVC. Testing was performed in general accordance with procedures outlined in the New York State Stormwater Management Design Manual. Ground surface and Test Well elevations are approximate and are based on site plans provided by Hershberg & Hershberg. See attached subsurface logs for soil descriptions. Stabilized infiltration rate can be assumed as the final infiltration rate or an average of all test runs.

Note:

Variable nature of soil. Used 2.4 inches per hour

Infiltration Rate Test Hole Locations



Sample Boring Results

DENTE ENGINEERING, P.C. | SUBSURFACE LOG I-4

PROJECT: Lia Toyota | **DATE** START: 9/29/09 FINISH: 9/29/09

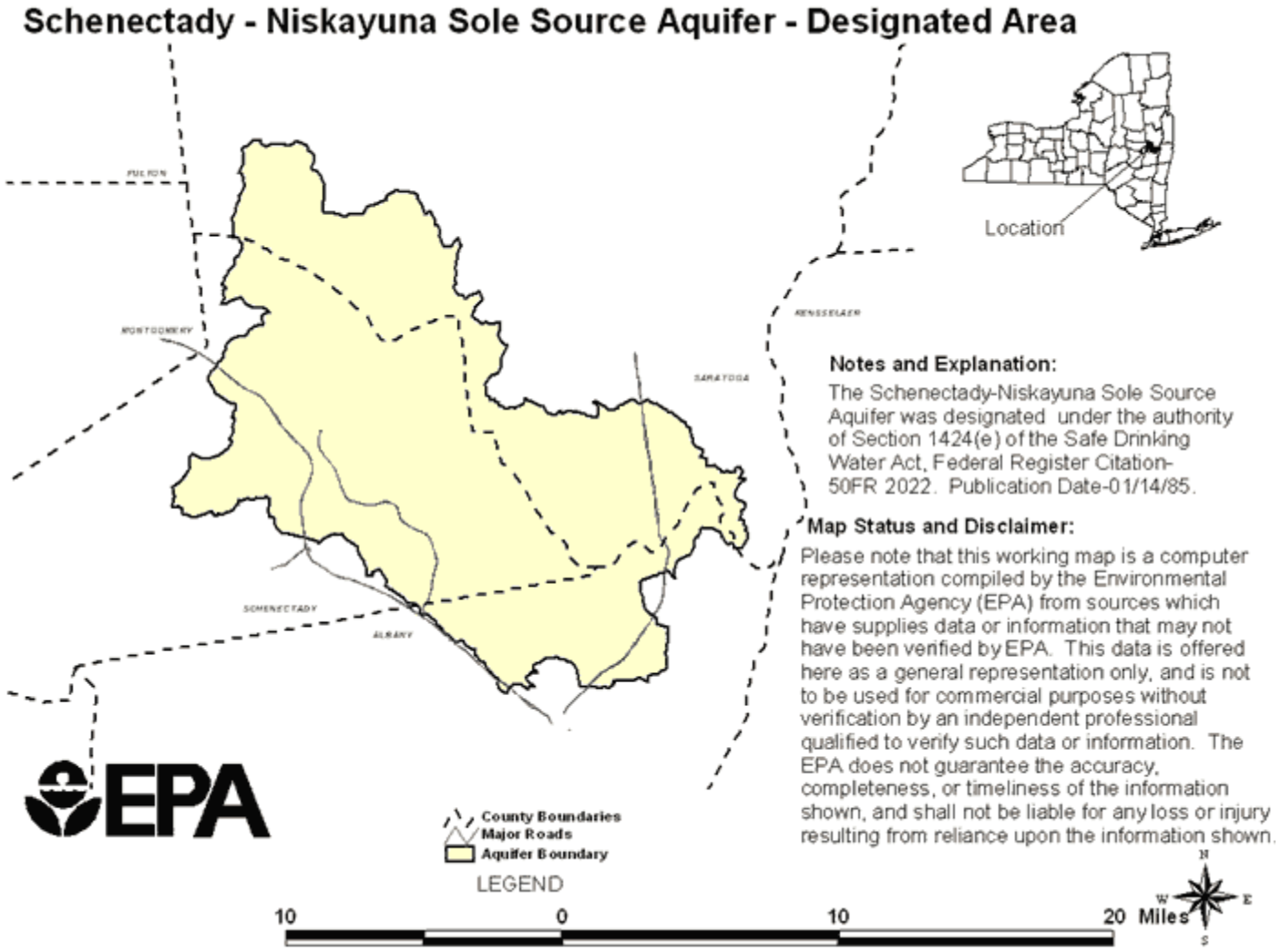
LOCATION: Colonie, New York | **METHODS:** 3 1/4" Hollow Stem Augers with

CLIENT: BBL Construction Services | ASTM D1586 Drilling Methods

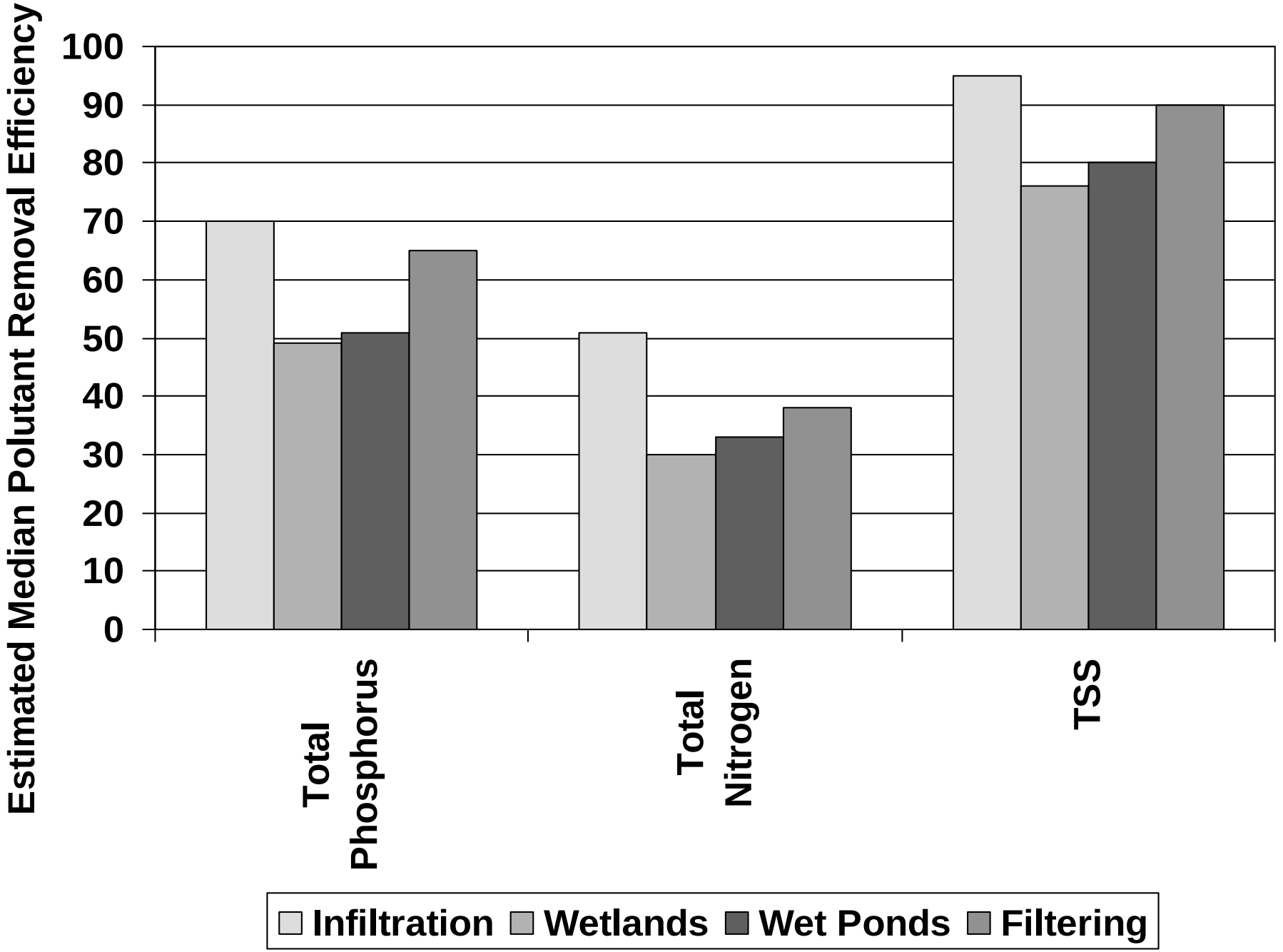
JOB NUMBER: FDE-06-243 | **SURFACE ELEVATION:** +/ 320.0'

DRILL TYPE: CME 45C | **CLASSIFICATION:** O.Burns

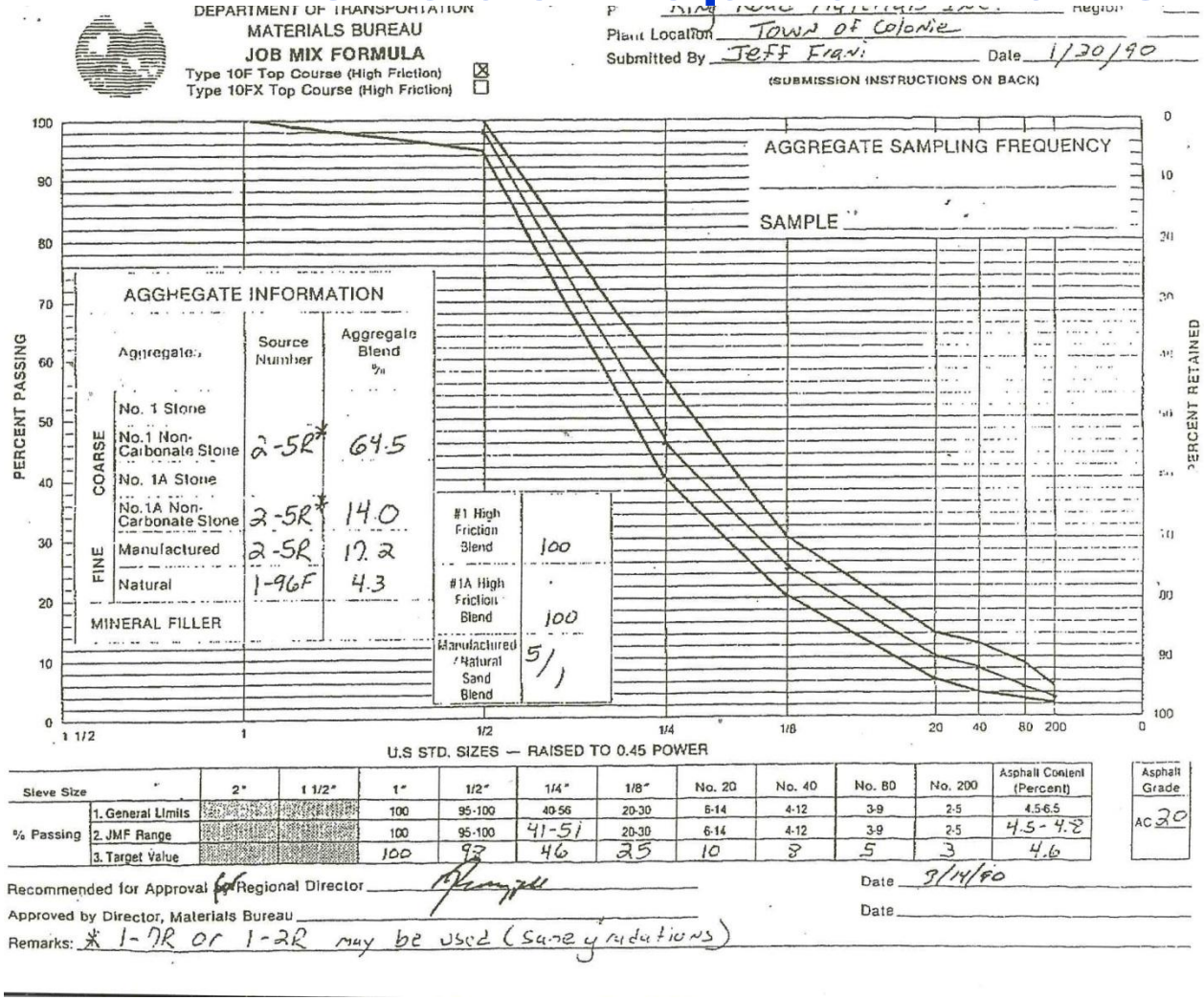
SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	+/- 1" Topsoil
	1	3	3				**FILL**: Dark Brown F-M SAND and SILT,
				4	3	7	Some Gravel, trace brick **(MOIST, LOOSE)**
	2	4	3				Brown F-M SAND, trace silt and gravel
				3	4	6	
	3	5	5				Grades Little Gray Mottling (WET)
5'				5	6	10	
	4	4	4				Grades (SATURATED)
				4	4	8	**(MOIST TO SATURATED, LOOSE)**
							End of boring 8.0' depth.
10'							Driller notes: Infiltration testing completed
							at 6.0' depth.



If located over a sole source aquifer, the separation between the bottom of an infiltration system (porous pavement including stone layers) and the groundwater table must be 4 feet.


Estimated Median Polutant Removal Efficiency
100
90
80
70
60
50
40
30
20
10
0
Total Phosphorus
Total Nitrogen
TSS
Infiltration
Wetlands
Wet Ponds
Filtering

Porous Asphalt Pavement



DEPARTMENT OF TRANSPORTATION
MATERIALS BUREAU
JOB MIX FORMULA
Type 10F Top Course (High Friction) ☒
Type 10FX Top Course (High Friction) ☐

Plant Location Town of Colonie
Submitted By Jeff Fiani Date 1/20/90
(SUBMISSION INSTRUCTIONS ON BACK)

AGGREGATE SAMPLING FREQUENCY
SAMPLE

AGGREGATE INFORMATION

	Aggregate	Source Number	Aggregate Blend %
COARSE	No. 1 Stone		
	No.1 Non-Carbonate Stone	2-5R*	64.5
	No. 1A Stone		
	No.1A Non-Carbonate Stone	2-5R*	14.0
FINE	Manufactured	2-5R	17.2
	Natural	1-96F	4.3
MINERAL FILLER			

#1 High Friction Blend	100
#1A High Friction Blend	100
Manufactured / Natural Sand Blend	5/1

PERCENT PASSING (100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 0)
PERCENT RETAINED (0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100)
1 1/2 | 1 | 1/2 | 1/4 | 1/8 | 20 | 40 | 80 | 200 | 0
U.S STD. SIZES — RAISED TO 0.45 POWER

Sieve Size		2"	1 1/2"	1"	1/2"	1/4"	1/8"	No. 20	No. 40	No. 80	No. 200	Asphalt Content (Percent)
% Passing	1. General Limits			100	95-100	40-56	20-30	6-14	4-12	3-9	2-5	4.5-6.5
	2. JMF Range			100	95-100	41-51	20-30	6-14	4-12	3-9	2-5	4.5 - 4.8
	3. Target Value			100	97	46	25	10	8	5	3	4.6

Asphalt Grade: AC 20

Recommended for Approval for Regional Director _____ Date 3/14/90
Approved by Director, Materials Bureau _____ Date _____
Remarks: * 1-7R or 1-2R may be used (same gradations)

Job Mix Formula For Former NYSDOT Type 10F Pavement

Porous Asphalt Pavement

Callanan Industries Inc.

1245 Kings Road Schenectady, NY 12303
(518) 374-2222 - Fax (518) 381-6775

Material : Porous Top
Technician: Cindy LaFleur
Date: 6/8/2010
Note:

Composite Gradation

Sieve Opening	% Passing
1 "	100.00
3/4"	100.00
1/2"	95.70
3/8"	75.00
# 4	25.00
# 8	9.10
# 200	0.70

Maximum Specific Gravity

A	1765	1835
D	1353	1513.7
E	2421.5	2625
Vol	696.5	723.7
Gmm	2.534	2.536
	2.535	

Bulk Specific Gravity

#Gyrations	30	
A	4460.8	
D	4621	
E	2251	
F	0.97	
Gsb	2.023	

Air Voids = 20.19

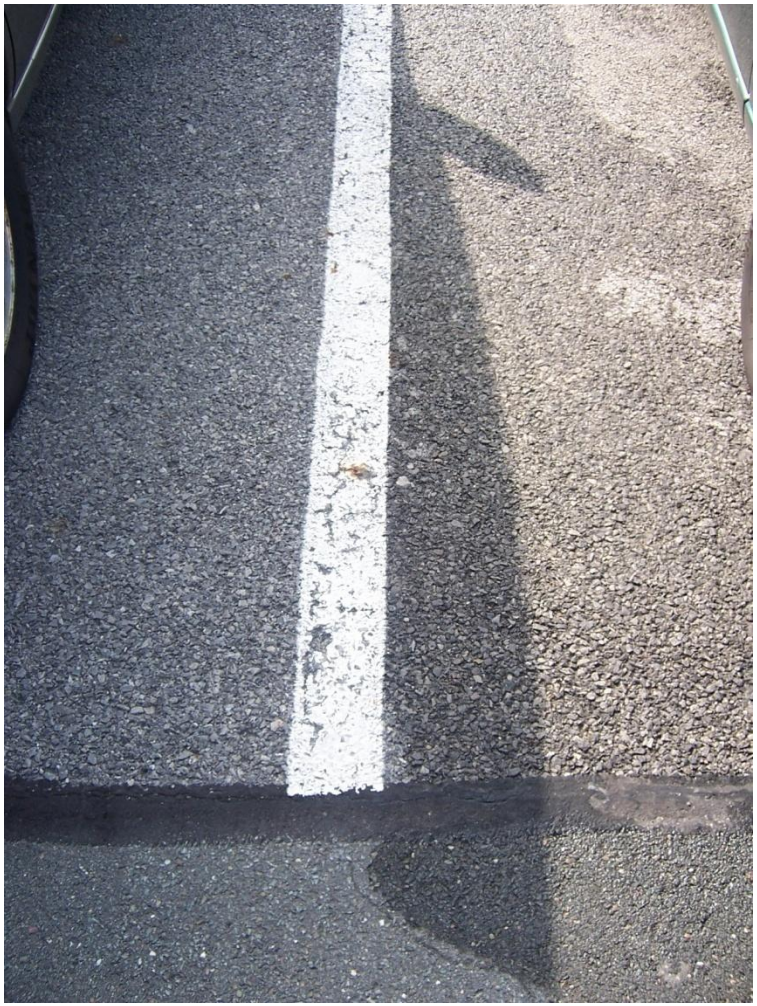
Batch Percentages

1's	1A's	Clean Scr	A/C
66.5	23.9	9.6	4.7

Cantabro Abrasion Testing
50 Gyration specimen - No Aging = 6.2% Loss
25 Gyration specimens - 5 Day Aging = 10.6% and 11.6% Loss

Current
Job Mix Formula
For
Porous Top Course

Porous Asphalt Pavement



NYSDOT Type 10X Pavement placed 12 years ago

Note the different texture of Type 6 at the bottom of the picture with the Porous Top at the top

Porous Asphalt Pavement

Recently Placed Porous Top CoursePavement

Immediately after a rainstorm which dropped 0.7 inches in less than one hour

Porous Asphalt Pavement

Recently Placed Porous Top Course Pavement

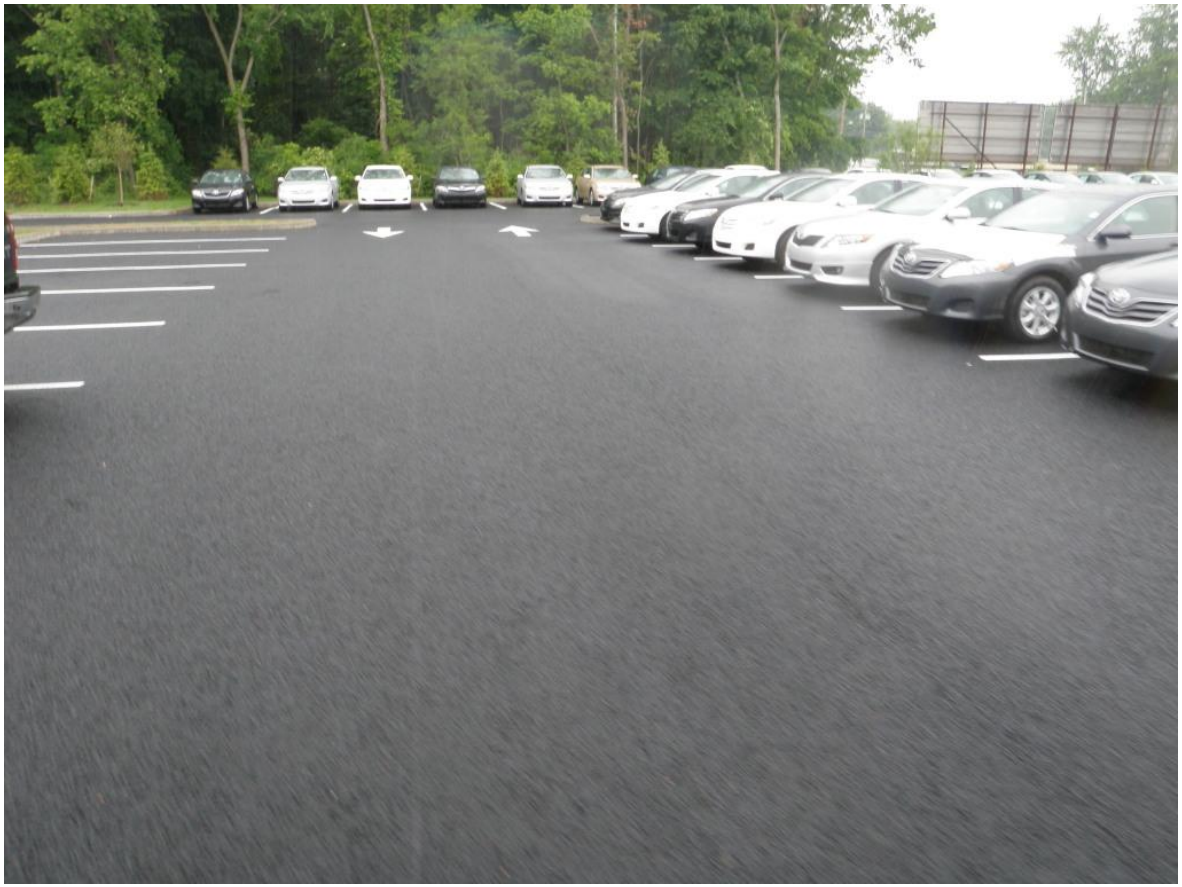
Note the surface texture

Porous Asphalt Pavement

Lia's Toyota Expansion Lot – 2116 Central Avenue

Photo Courtesy of John Dzailo, Town of Colonie MS4 Coordinator

Porous Asphalt Pavement



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Porous Asphalt Pavement

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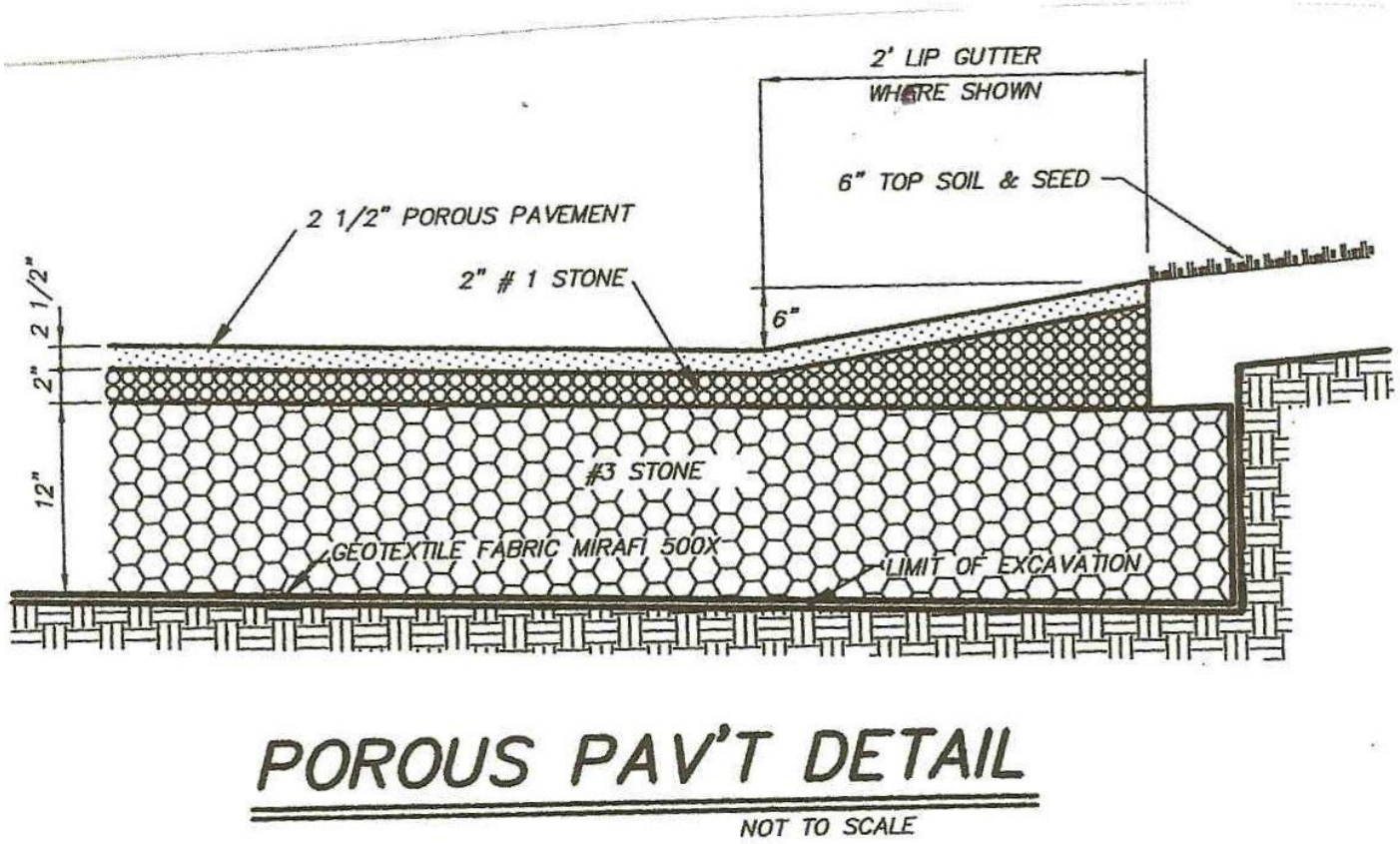
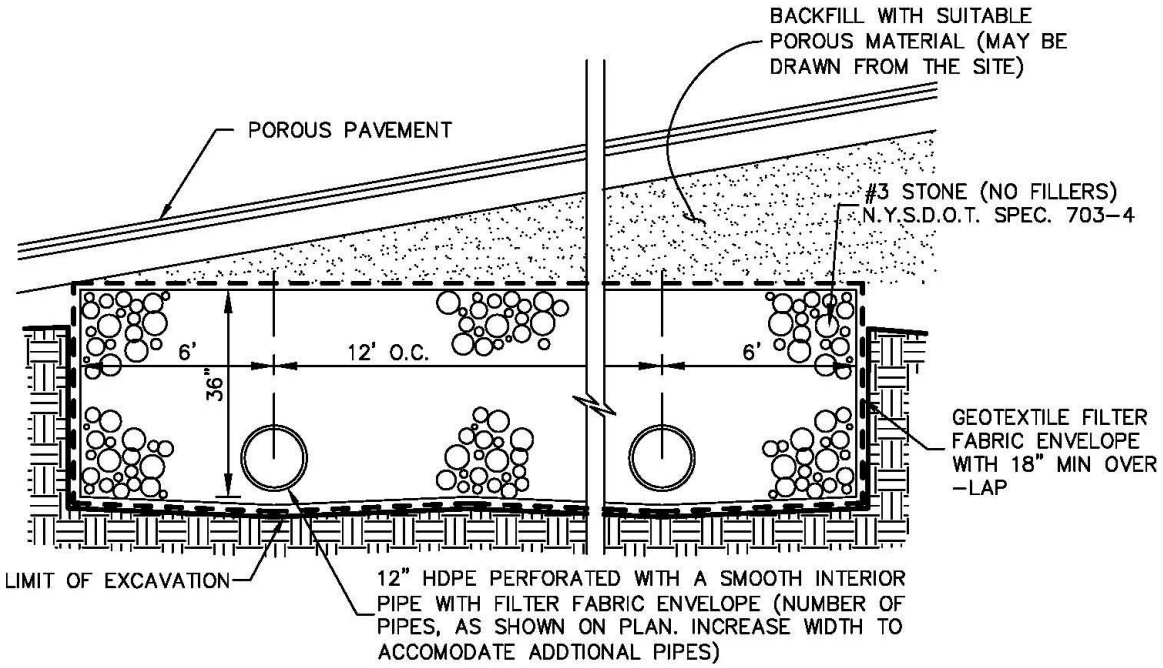


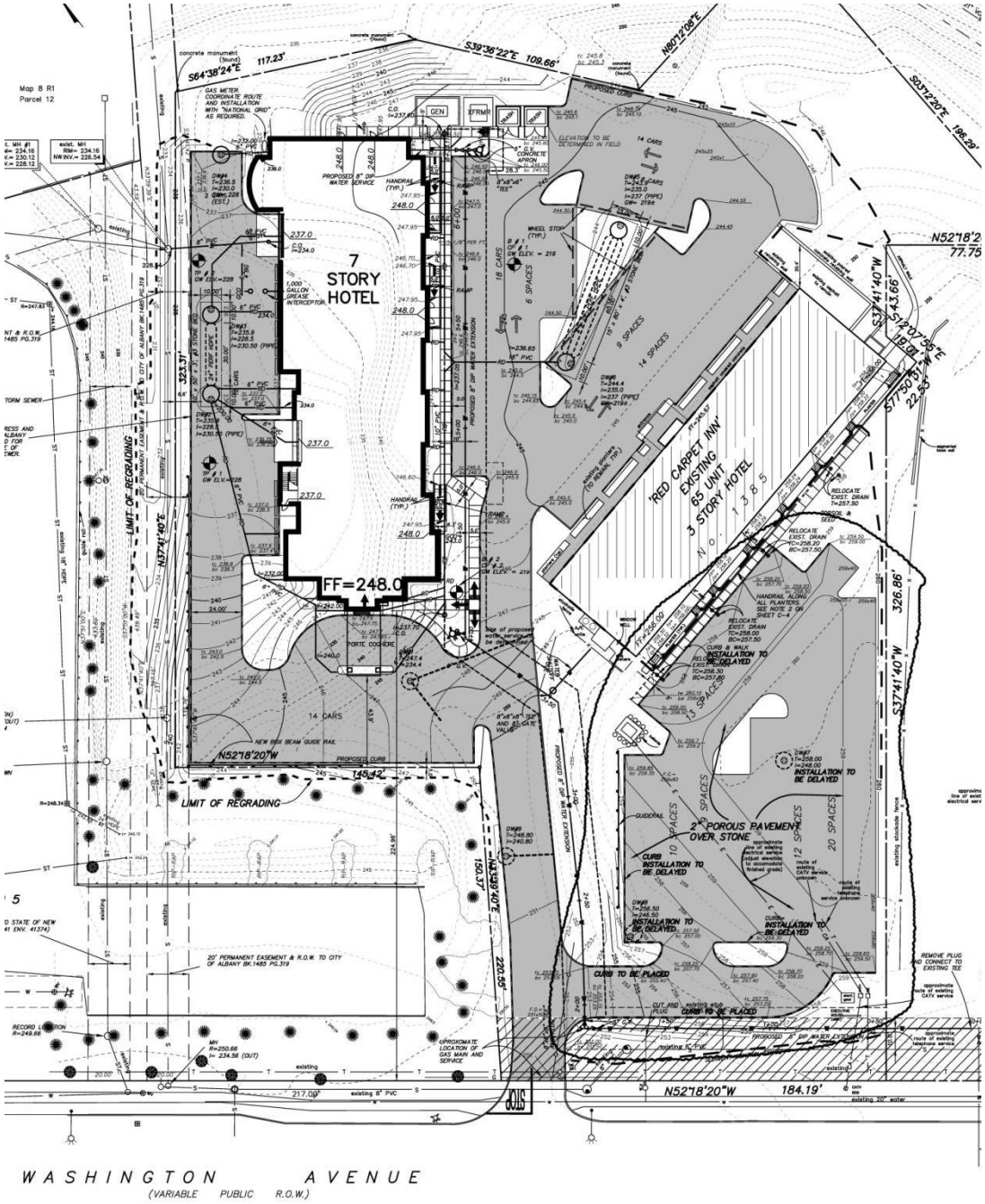
Detail for Porous Asphalt Pavement over Hydrolgic Class A soils with infiltration rate equal or greater than 2"/hr

Porous Asphalt Pavement



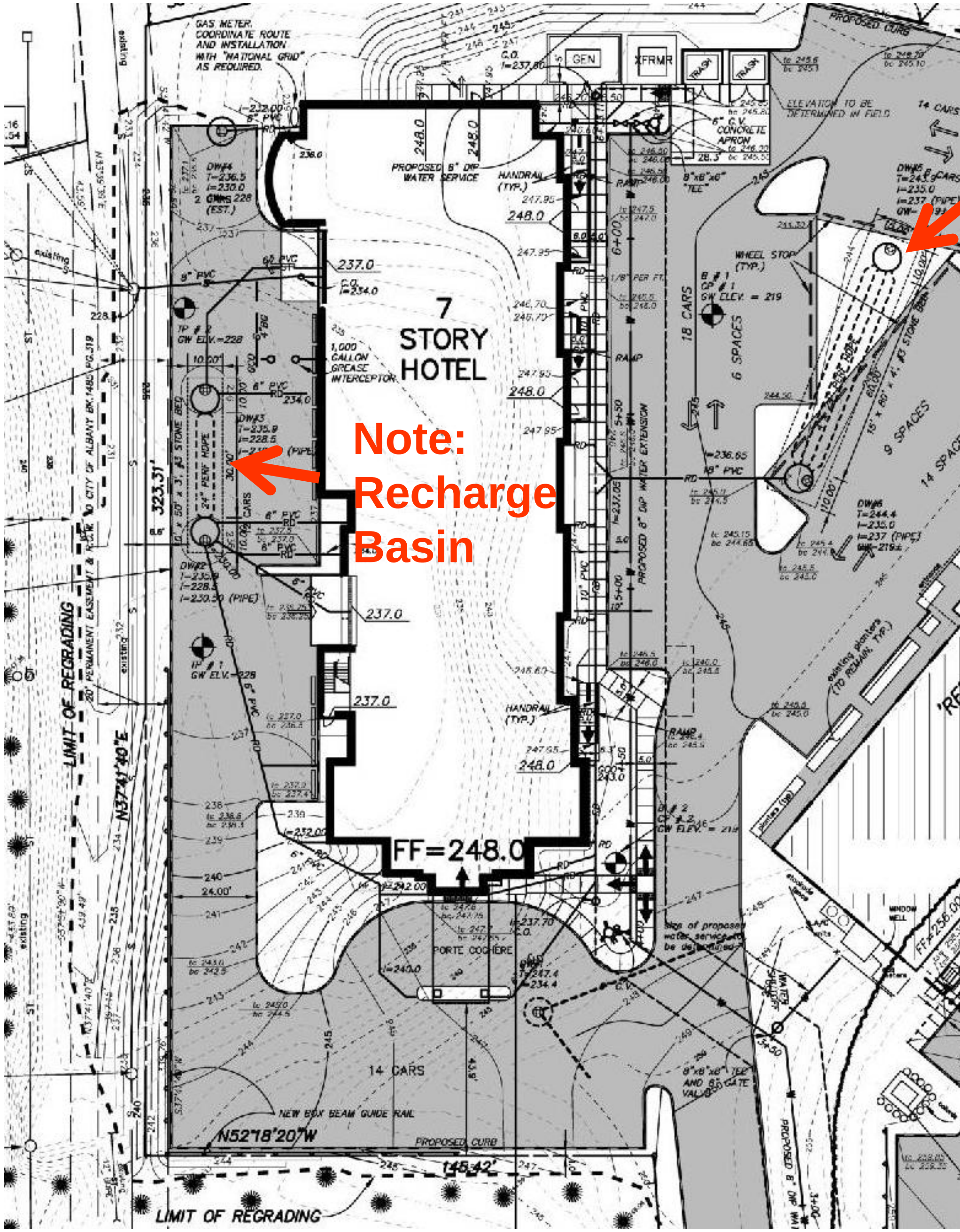
Detail for Porous Asphalt Pavement over soils where storage and depth beneath frost so required

Pipes are optional but can be used to overcome irregularities in soil conditions



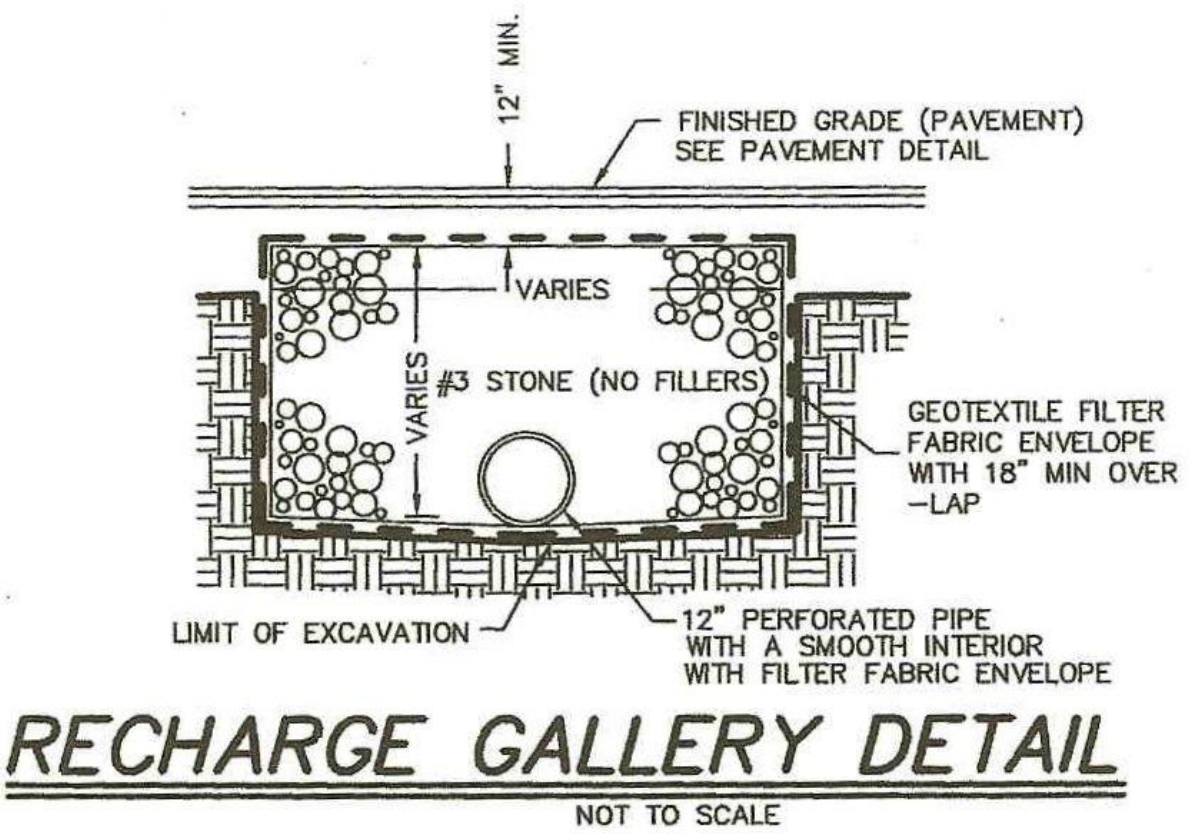
Site Plan Hilton Garden Inn – Red Carpet Inn Washington Avenue

Partial Site Plan Hilton Garden Inn – Washington Avenue



Note: Recharge Basin

Recharge Gallery Detail



It’s Time For