



Porous Pavement Where?

A Green Infrastructure Success Story in an Unlikely Place

NEWEA SPRING MEETING 2017

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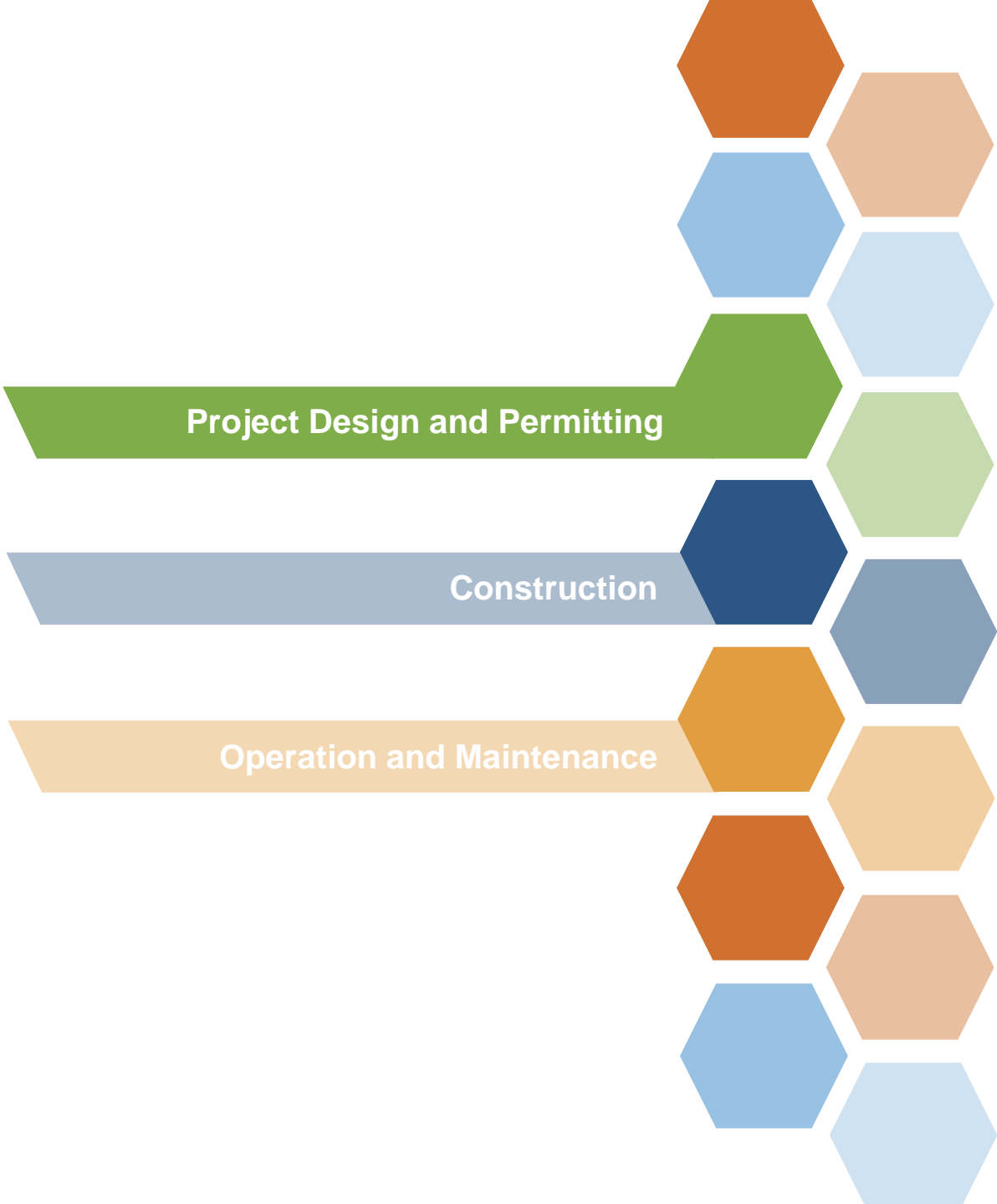
Jennifer Johnson, PE, LEED AP BD+C, CPSWQ

June 5, 2017



@nitscheng

Building better communities with you





A · W · P E R R Y

Owner/Developer

GALLERY Automotive Group

Facility Operator



CURTISgroup
ARCHITECTS LTD

Architect



INTEGRATED
BUILDERS

Construction
Administration



Nitsch Engineering

Engineer

Project Design and Permitting



State

Local

Mass. EOEEA

Hingham, MA

MassDOT

Rockland, MA



A · W · P E R R Y

Owner/Developer



Facility Operator



Architect



Construction Administration

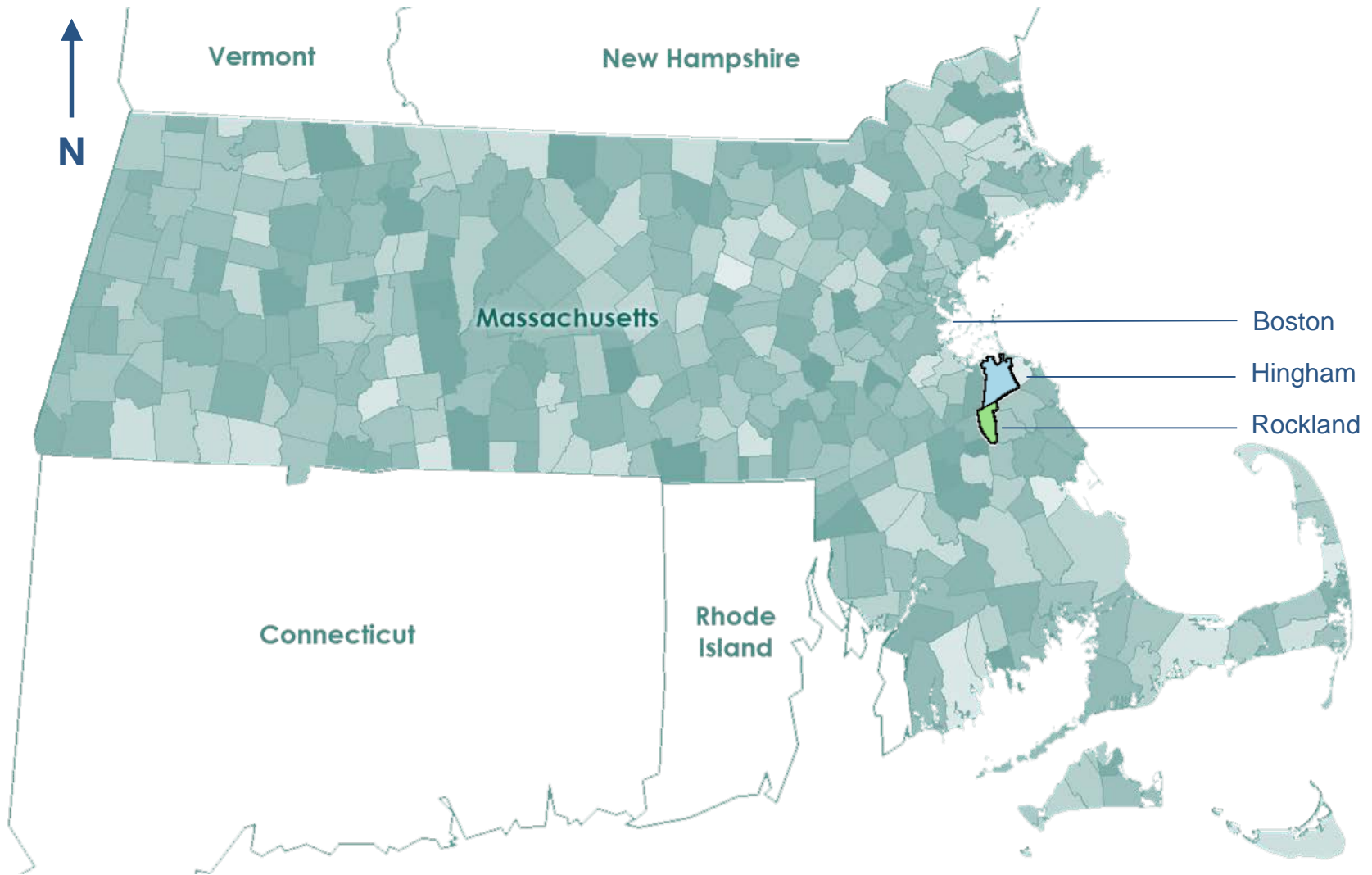


Nitsch Engineering

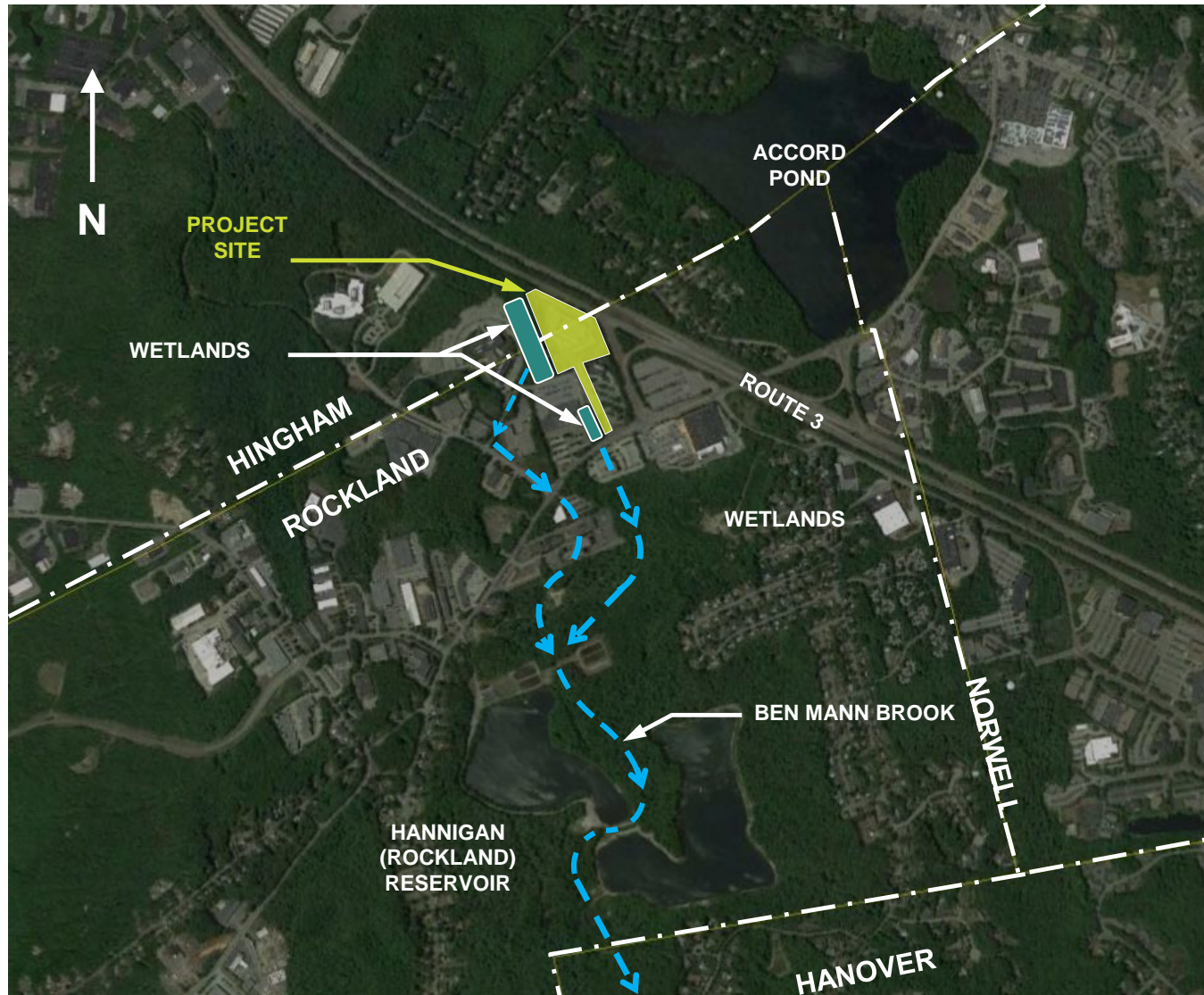
Engineer

Project Design and Permitting

Project Location



Project Location



Why Green Infrastructure



Environmentally-Responsible Approach

- Forward thinking owner/developer
- Wetland and water supply protection
- Suitable site conditions (Great Soils!)



Regulatory Drivers

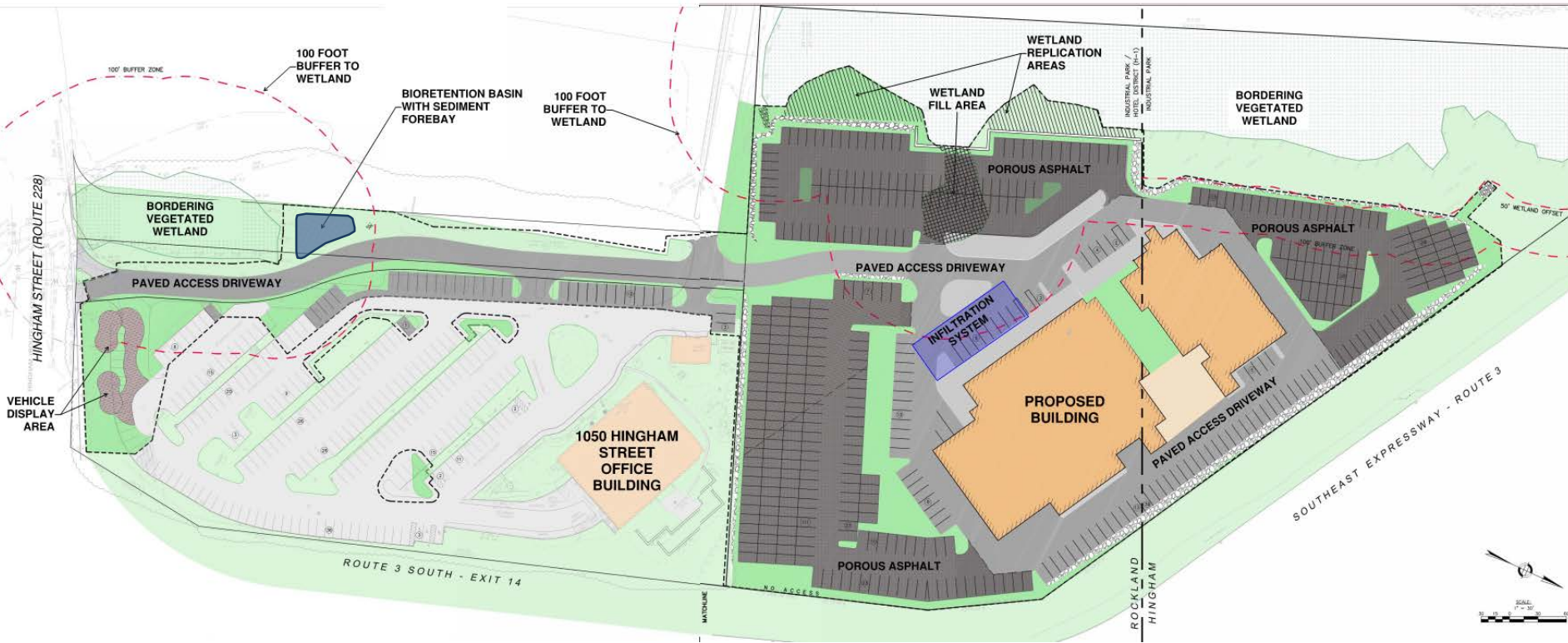
- Challenging stormwater requirements
- GI/LID consistent with new (draft) MS4 permit requirements
- GreenDOT initiative supports remediating highway runoff



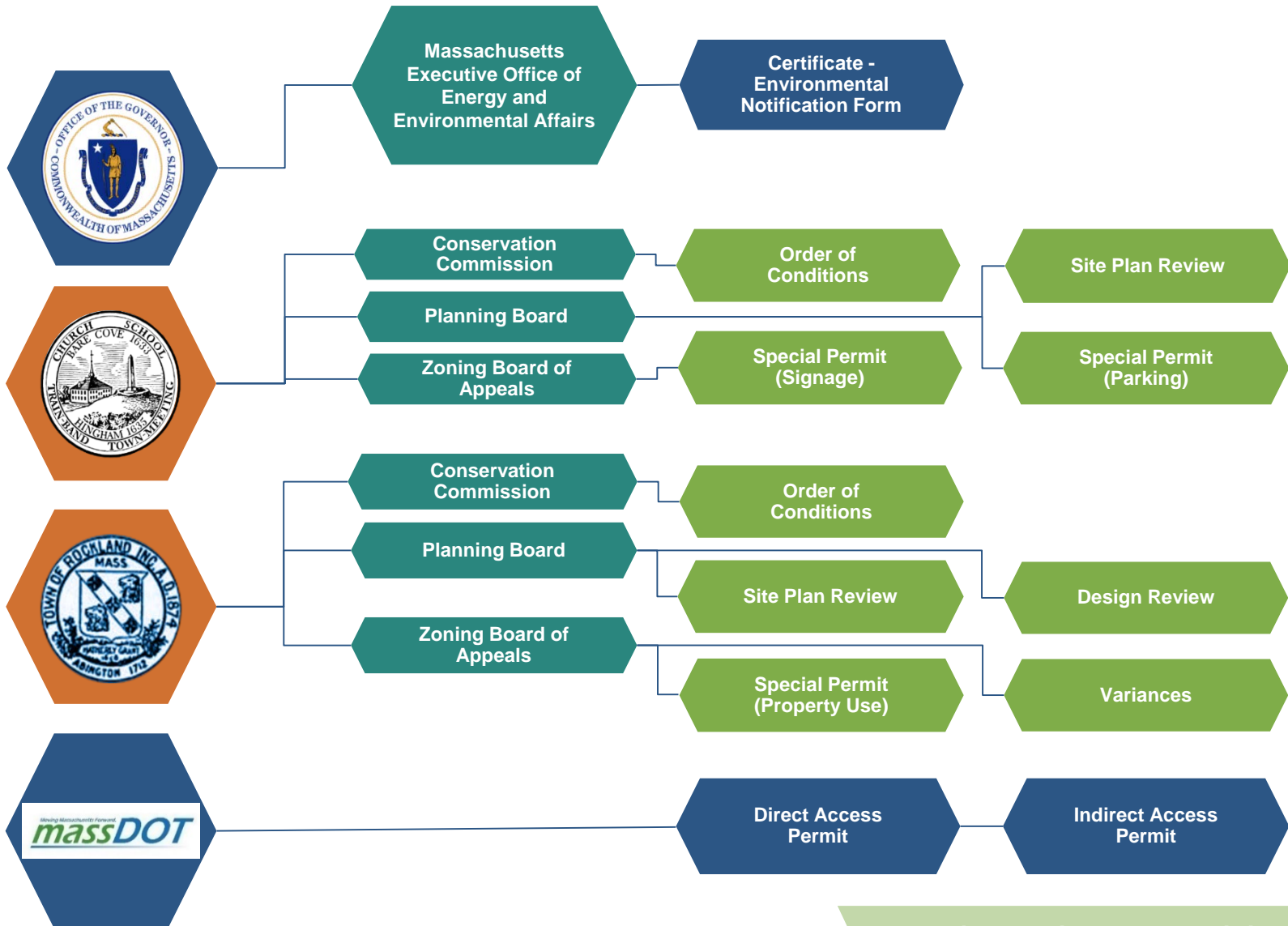
Project Benefits

- Both towns assumed to support Green Infrastructure implementation → Benefits to project schedule
- Cost savings

Original Project Site Plan



Project Permitting Requirements



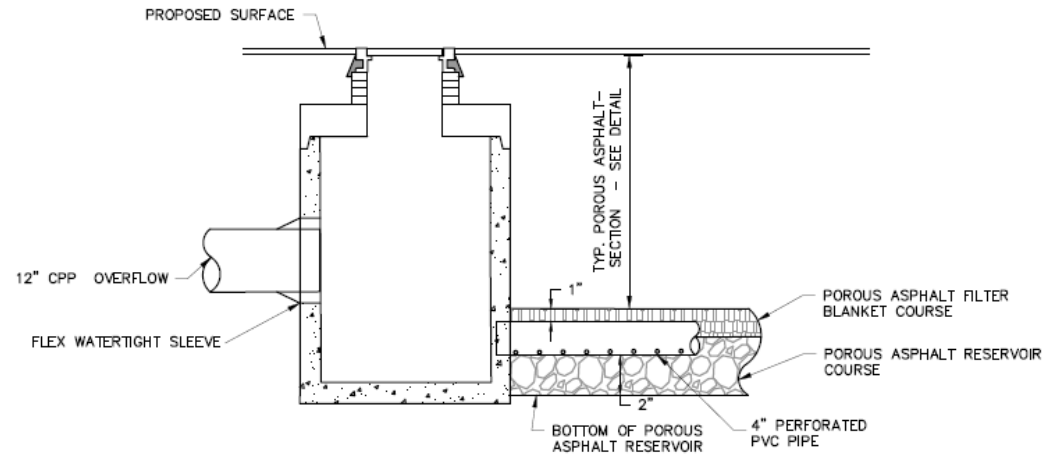
Hingham Review and Approval Process

Planning, Zoning, Conservation

- Requested additional offset from wetland line – 50 foot undisturbed Buffer
- Confirmed design met MassDEP Stormwater Management Standards and contacted UNH to confirm design assumptions

Town requested the following:

- Increased porous pavement filter course thickness from 8" to 12"
- Clarification on soil testing and infiltration rates
- Back-up distribution pipe in case of porous asphalt clogging



MANHOLE OVERFLOW FOR POROUS ASPHALT DETAIL

NOT TO SCALE

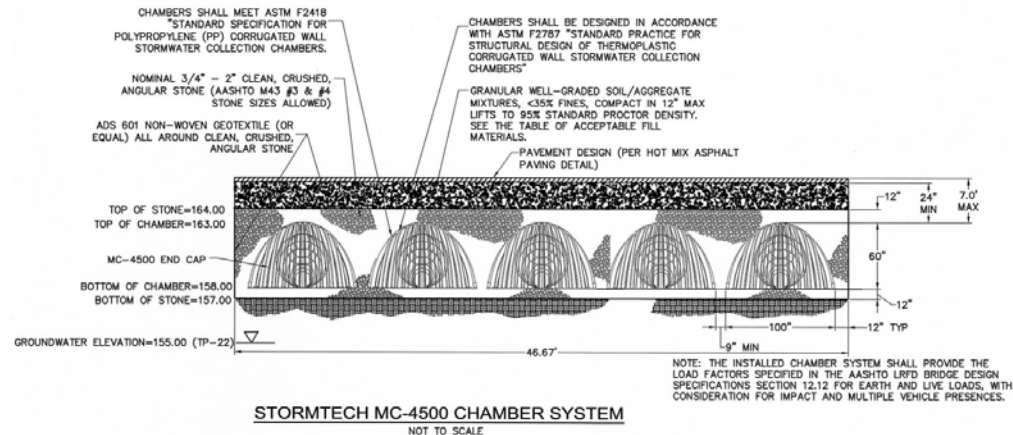
Rockland Review and Approval Process

Planning and Zoning

- General design clarifications on stormwater management system
 - **No major design changes required or concerns with Green Infrastructure**
- Confirmed design met MassDEP Stormwater Management Standards and Town of Rockland Stormwater Requirements

Town requested the following:

- Confirmation that flow to wetland will meet Rockland volume requirement
- Retrofits of existing developed area to increase treatment
- Increased cover over subsurface infiltration systems



Rockland Review and Approval Process

Conservation

Engineering Peer Review focused on the following:

- Wetland impacts and required replication
- Wetland buffer preservation and tree protection
- **Porous asphalt suitability for the project site**



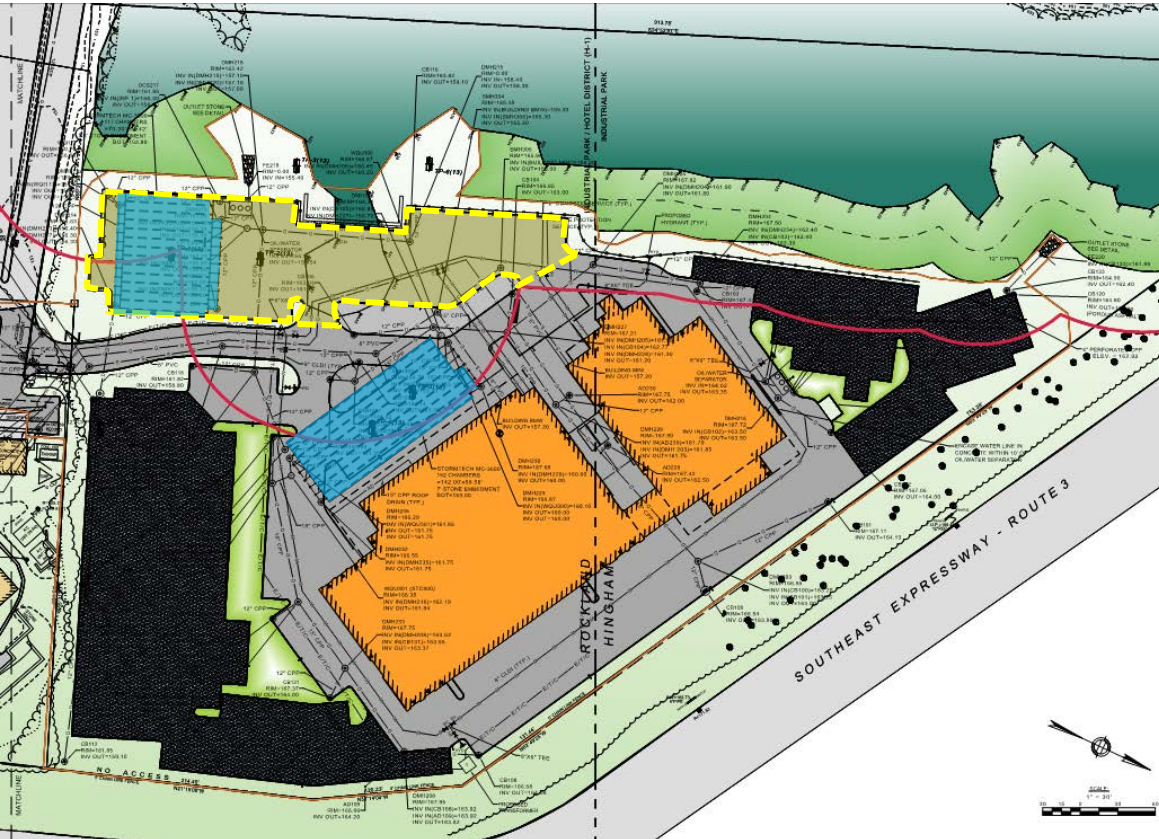
Rockland Review and Approval Process

Conservation Peer Review – Porous Asphalt Suitability

Addressing Uncertainty with Porous Asphalt

The stormwater management system for the project retrofits the existing system on 1050 Hingham Street with a bio-retention basin to treat the reconfigured common access drive and uses a combination of conventional and LID (porous asphalt) infiltration systems to treat and control the impervious surfaces on the 1040 Hingham Street site. Porous asphalt has a mixed history of performance that has hampered its widespread adoption of usage. Recent advances in design, installation, maintenance commitment, and production quality control have addressed these concerns and its usage is highly advocated by the University of New Hampshire Stormwater Center (UNHSC), a recognized authority on stormwater BMP performance. questions whether its usage is appropriate for the proposed development that has components considered Land Uses with Higher Potential Pollutant Loads (LUHPPLs).

Project Changes Due to Permitting



- Redesign site layout
- Increase retaining wall height
- Convert to standard asphalt within the buffer zone
- Build underground stormwater infiltration system
- Additional cost of apx. \$75,000

Project Changes Due to Permitting



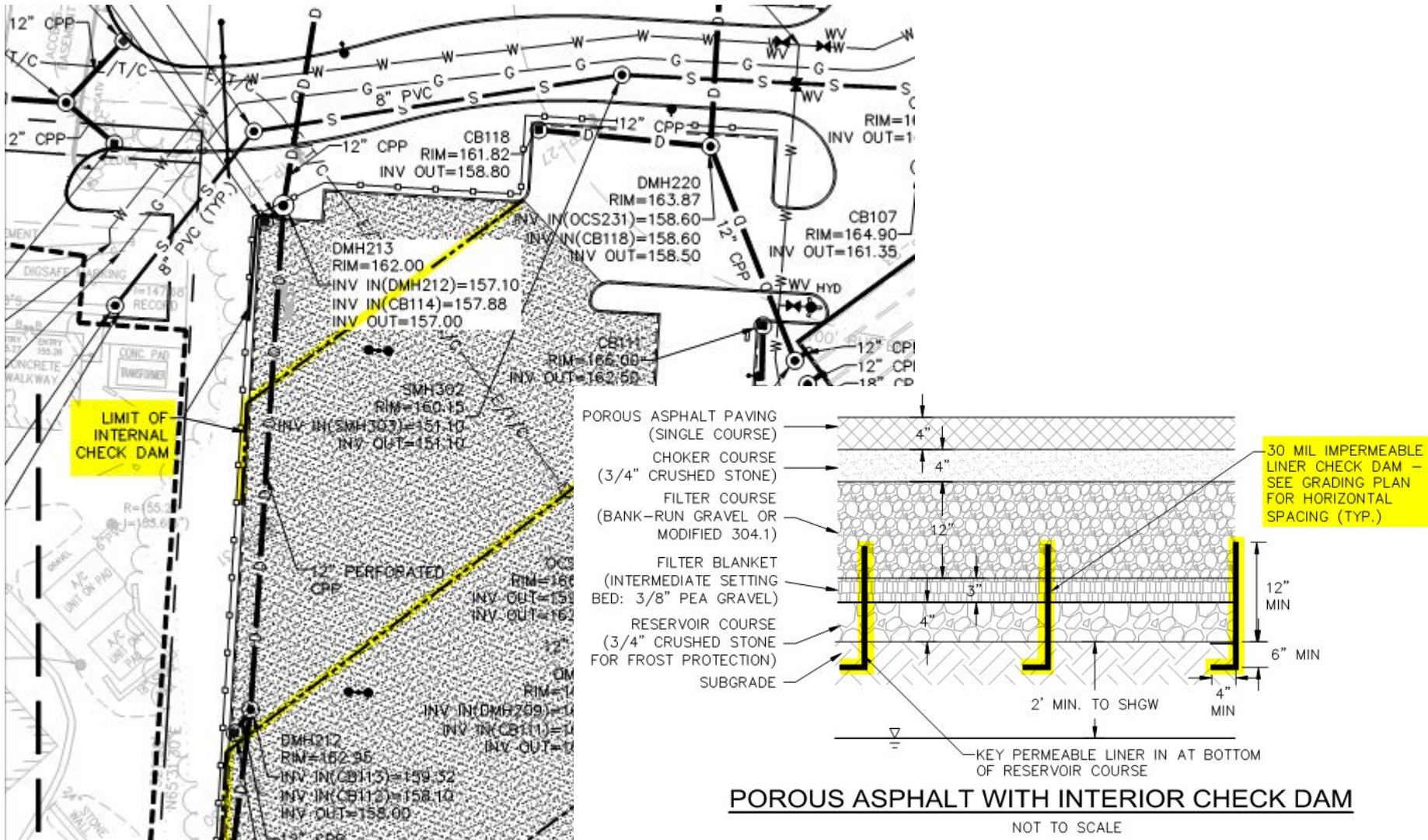


Project Design and Permitting

Construction

Operation and Maintenance

Porous Asphalt Construction – Construction Documents



Porous Asphalt Construction - Specifications



UNHSC Design Specifications for Porous Asphalt Pavement and Infiltration Beds



February 2014
Revision September 2016

University of New Hampshire Stormwater Center (UNHSC)
Gregg Hall • 35 Colovos Road • Durham, New Hampshire 03824-3534 • <http://unh.edu/unhsc/>

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Figure 1: Typical Cross-Section for Pervious Pavement System

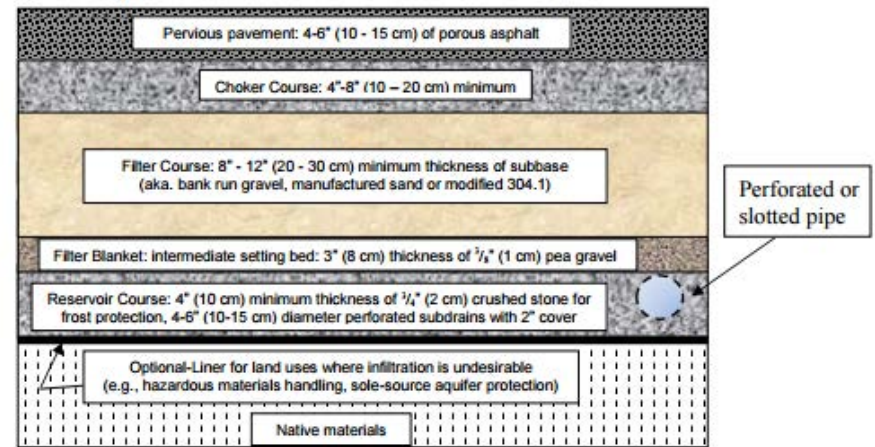


Table 2: Gradations of choker, filter, and reservoir course materials.

US Standard Sieve Size Inches/mm	Per Cent Passing (%)			
	Choker Course (AASHTO No. 57/ No. 67*)	Filter Course (Manufactured Sand/Modified NHDOT 304.1)	Reservoir Course (AASHTO No. 3)	Reservoir Course Alternative** (AASHTO No. 5)
6/150	-	100	-	-
2 1/2/63	-	-	100	-
2 /50	-	-	90 - 100	-
1 1/2/37.5	100	-	35 - 70	100
1/25	95 - 100	-	0 - 15	90 - 100
3/4/19	-	-	-	20 - 55
1/2/12.5	25 - 60	-	0 - 5	0 - 10
3/8/9.5	-	-	-	0 - 5
#4/4.75	0 - 10	70-100	-	-
#8/2.36	0 - 5	-	-	-
#200/0.075	-	0 - 6***	-	-

* Alternate gradations (e.g. AASHTO No. 67) may be accepted upon Engineer's approval.

** Alternate gradations (e.g. AASHTO No. 5) may be accepted upon Engineer's approval.

*** Preferably less than 4% fines

Porous Asphalt Construction – Subgrade Preparation



Porous Asphalt Construction – Reservoir Course & Check Dams



Porous Asphalt Construction – Filter Blanket



Porous Asphalt Construction – Filter, Choker, & Pavement



Porous Asphalt Construction – Finishing Touches





Site Operation – Pavement Transition



Site Operation Procedures for Porous Pavement

Winter Protocols

- Minimize Salt
- Do Not Sand
- Plow with Rubber Blades

Site Management

- Maintain Landscaped Areas to Minimize Erosion



Commitment to Operation and Maintenance



October 2015

**LONG-TERM POLLUTION
PREVENTION AND
STORMWATER OPERATION
AND MAINTENANCE PLAN**

For

**SOUTH SHORE BMW/MINI
1040 HINGHAM STREET
ROCKLAND, MA 02370**

Prepared for:

GALLERY AUTOMOTIVE GROUP
918 Providence Highway
Norwood, MA 02062

Prepared by:

NITSCH ENGINEERING, INC.
2 Center Plaza, Suite 430
Boston, MA 02108

Nitsch Project #8970.2

Building better communities with you.

**Gallery Automotive Stormwater Management System
Inspection and Maintenance Program**

2015 Inspection and Maintenance Schedule (1/2)

Note: Additional inspection and maintenance may be needed following storm events and fuel/oil/chemical spills and in the case of heavy debris accumulation

January
<input type="checkbox"/> Porous Asphalt- Quarterly Inspection
<input type="checkbox"/> Catch Basin- Quarterly Inspection and Cleaning*
<input type="checkbox"/> Area Drain- Monthly Inspection and Cleaning* of Debris
<input type="checkbox"/> Oil/Water Separator- Monthly Inspection
<input type="checkbox"/> Bioretention Area- Monthly Inspection and Maintenance
<input type="checkbox"/> Level Spreader- Monthly Inspection
<input type="checkbox"/> Sewer Oil/Gas Separator - Monthly Inspection
<input type="checkbox"/> Car Wash Reclaim Tank- Monthly Inspection
<input type="checkbox"/> Grasspave2- Monthly Inspection and Maintenance
February
<input type="checkbox"/> Area Drain- Monthly Inspection and Cleaning* of Debris
<input type="checkbox"/> Oil/Water Separator- Monthly Inspection
<input type="checkbox"/> Bioretention Area- Monthly Inspection and Maintenance
<input type="checkbox"/> Level Spreader- Monthly Inspection
<input type="checkbox"/> Sewer Oil/Gas Separator - Monthly Inspection
<input type="checkbox"/> Car Wash Reclaim Tank- Monthly Inspection
<input type="checkbox"/> Grasspave2- Monthly Inspection and Maintenance
March
<input type="checkbox"/> Area Drain- Monthly Inspection and Cleaning* of Debris
<input type="checkbox"/> Oil/Water Separator- Monthly Inspection
<input type="checkbox"/> Bioretention Area- Monthly Inspection and Maintenance
<input type="checkbox"/> Level Spreader- Monthly Inspection
<input type="checkbox"/> Sewer Oil/Gas Separator - Monthly Inspection
<input type="checkbox"/> Car Wash Reclaim Tank- Monthly Inspection
<input type="checkbox"/> Grasspave2- Monthly Inspection and Maintenance

April
<input type="checkbox"/> Porous Asphalt- Quarterly Inspection and Semi-Annual Cleaning**
<input type="checkbox"/> Street Sweeping
<input type="checkbox"/> Catch Basin- Quarterly Inspection and Cleaning*
<input type="checkbox"/> Area Drain- Monthly Inspection and Cleaning* of Debris
<input type="checkbox"/> Subsurface Infiltration System- Semi Annual Inspection
<input type="checkbox"/> Oil/Water Separator- Monthly Inspection
<input type="checkbox"/> Bioretention Area- Monthly Inspection and Maintenance
<input type="checkbox"/> Level Spreader- Monthly Inspection
<input type="checkbox"/> Sewer Oil/Gas Separator - Monthly Inspection
<input type="checkbox"/> Car Wash Reclaim Tank- Monthly Inspection
<input type="checkbox"/> Sewer Oil/Gas Separator - Monthly Inspection and Semi-Annual Cleaning*
<input type="checkbox"/> Car Wash Reclaim Tank- Monthly Inspection and Semi-Annual Cleaning*
<input type="checkbox"/> Grasspave2- Monthly Inspection and Maintenance
May
<input type="checkbox"/> Area Drain- Monthly Inspection and Cleaning* of Debris
<input type="checkbox"/> Oil/Water Separator- Monthly Inspection
<input type="checkbox"/> Bioretention Area- Monthly Inspection and Maintenance
<input type="checkbox"/> Level Spreader- Monthly Inspection
<input type="checkbox"/> Sewer Oil/Gas Separator - Monthly Inspection
<input type="checkbox"/> Car Wash Reclaim Tank- Monthly Inspection
<input type="checkbox"/> Grasspave2- Monthly Inspection and Maintenance
June
<input type="checkbox"/> Area Drain- Monthly Inspection and Cleaning* of Debris
<input type="checkbox"/> Oil/Water Separator- Monthly Inspection
<input type="checkbox"/> Bioretention Area- Monthly Inspection and Maintenance
<input type="checkbox"/> Level Spreader- Monthly Inspection
<input type="checkbox"/> Sewer Oil/Gas Separator - Monthly Inspection
<input type="checkbox"/> Car Wash Reclaim Tank- Monthly Inspection
<input type="checkbox"/> Grasspave2- Monthly Inspection and Maintenance

* All cleaning to take place if needed - Refer to O&M Plan for specific requirements for each BMP

Commitment to Operation and Maintenance

Porous Pavement Inspection and Maintenance

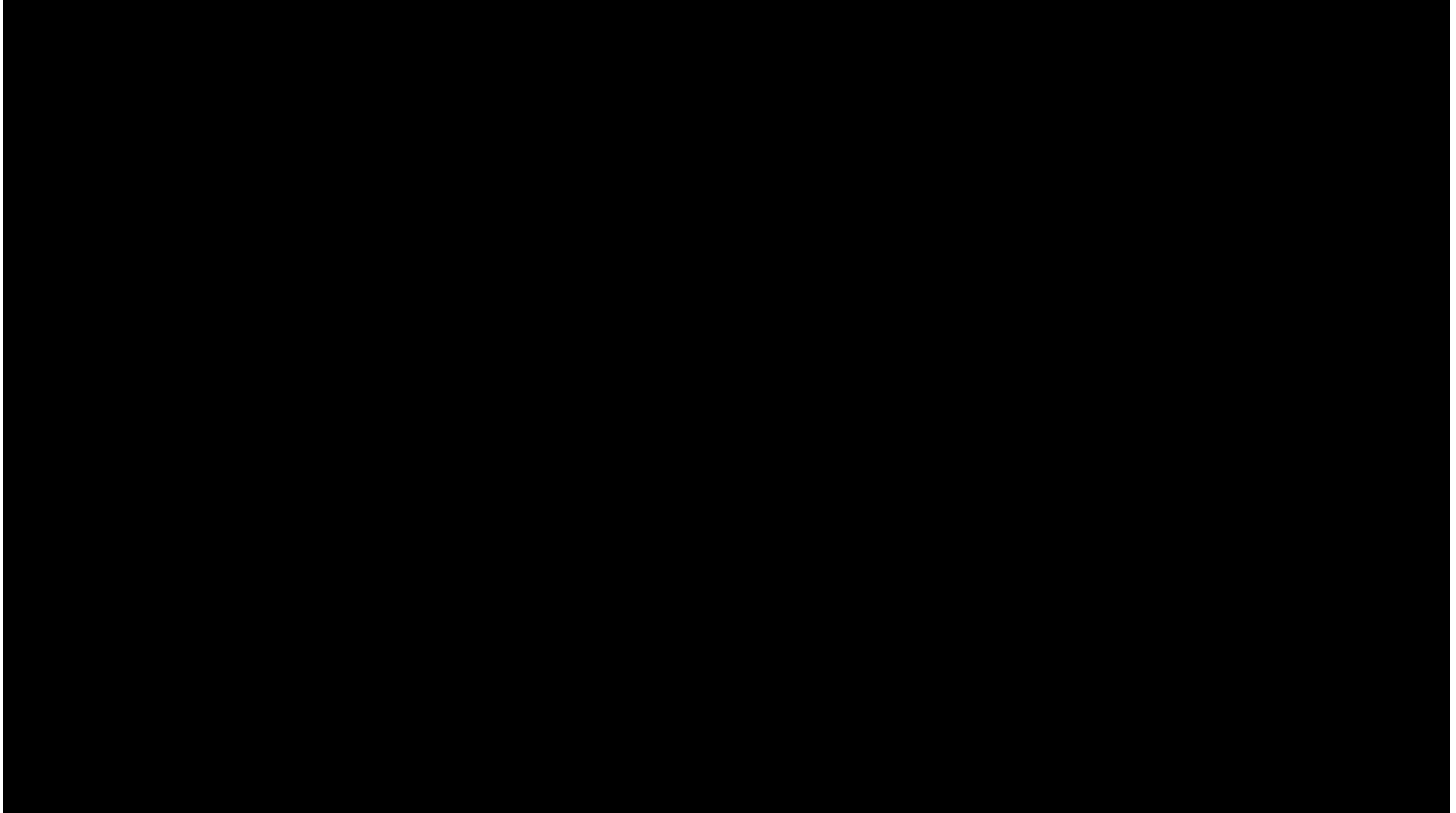
- Monitor Regularly
- Vacuum Surface 2X Annually
- Check Infiltrative Capacity

Gallery Automotive Stormwater Management System Inspection and Maintenance Program		PURPOSE OF INSPECTION/MAINTENANCE	
Porous Asphalt Checklist (Lot 1)			
Name of Inspector:		<input type="checkbox"/>	Quarterly visual inspection
Inspection Date:		<input type="checkbox"/>	Annual infiltrative capacity check
		<input type="checkbox"/>	Cleaning following winter season (April)
		<input type="checkbox"/>	Cleaning following foliage season (November) Date: _____
		<input type="checkbox"/>	Inspection following storm event. Depth of storm: _____
INSPECTION		MAINTENANCE	
<input type="checkbox"/>	Check asphalt for damage and deterioration. Indicate locations and extent:	<input type="checkbox"/>	Repair damaged porous asphalt (rutting, etc.) by heating and rerolling the asphalt Indicate locations and extent:
<input type="checkbox"/>	Ensure proper drainage after storm events. Comments:	<input type="checkbox"/>	Clean the surface of each porous asphalt area using vacuum sweeping as required to keep the pavement functioning as designed Comments:
<input type="checkbox"/>	Check infiltrative capacity of the porous asphalt by running a hose over each porous asphalt area for 30 minutes. Indicate Results:	<input type="checkbox"/>	If infiltrative capacity of porous asphalt is reduced to less than the design rate, replace by milling to the choker course. Indicate locations and extent:

aterial disposed of in accordance with applicable local, state and federal guidelines and regulations.



Porous Pavement in Action!

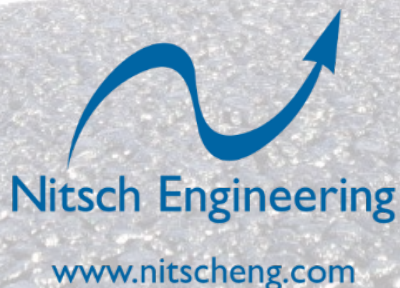


<https://www.youtube.com/watch?v=V4lJagzSYTk>



Q+A on Green Infrastructure

- What can other Cities and Towns do to encourage the use of Green Infrastructure?
- What are municipalities' roles in educating their Town staff, boards and public on the benefits of Green Infrastructure?
- Small MS4s will be required to include LID strategies/Green Infrastructure into Town regulations
- What are the operations and site maintenance considerations for Green Infrastructure?



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