



RIDEM Guidance on Siting Stormwater Management Practices on Properties with Subsurface Contamination

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WHAT CHANGED?

IN RHODE ISLAND,
RECENT DRIVERS TO REQUIRE MORE INFILTRATION OF STORMWATER

- THE 2010 RI STORMWATER DESIGN AND INSTALLATION STANDARDS MANUAL (RISDISM)
- THE GOALS OF THE NARRAGANSETT BAY COMMISSION OF REDUCING FLOW TO THE COMBINED SEWER SYSTEMS DISCHARGING TO COMBINED SEWAGE OUTFALLS (CSOs)
- POLICIES BY RIDOT (NO INCREASE IN VOLUME FROM SITE TO RIDOT DRAINAGE SYSTEM)



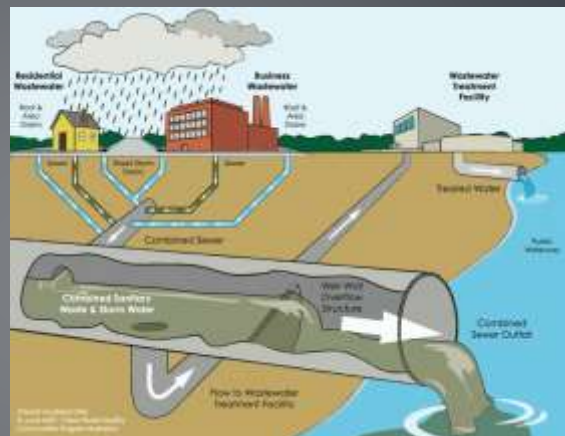
SIGNIFICANT CHANGES IN RI TO THE HANDLING OF STORMWATER (2010 – AMENDED 2015)

- SITES MUST ADDRESS 50% OF THE RECHARGE AND WATER QUALITY FROM **REDEVELOPED** CONSTRUCTION AREAS
- ALL SITES (NEW CONSTRUCTION AND REDEVELOPMENT) MUST ADDRESS RECHARGE (PERCENTAGES OF RECHARGE ARE BASED ON SOIL TYPE)



COMBINED SEWERAGE

- A LARGE AMOUNT OF PROVIDENCE, CENTRAL FALLS AND PAWTUCKET SEWER INFRASTRUCTURE CONSISTS OF COMBINED SANITARY AND STORM SEWER SYSTEMS. THESE SYSTEMS HAVE RELIEF OUTLETS, KNOWN AS COMBINED SEWER OVERFLOWS (CSOs), THAT DISCHARGE THE COMBINED SEWAGE TO SURFACE WATERS IN MODERATE TO LARGE STORM EVENTS
- IN RI THIS DISCHARGE IS ABOUT 2 BILLION GALLONS OF UNTREATED STORMWATER PER YEAR
- WWW.NARRABAY.COM/





NBC – FIELDS POINT AND BUCKLIN POINT

- NBC WAS CREATED BY RI LEGISLATURE IN 1980 TO IMPROVE AND TAKE OVER PROVIDENCE'S FAILING FIELD'S POINT WWT, ALONG WITH ASSOCIATED SEWER INFRASTRUCTURE.
- BUCKLIN POINT FACILITY WAS ALSO ACQUIRED IN 1992.
- CONTAMINATED SHELLFISHING INDUSTRY AND BEACH CLOSURES RESULTED IN RIDEM AND EPA REQUIRING REDUCTIONS OF COMBINED SEWER OVERFLOWS

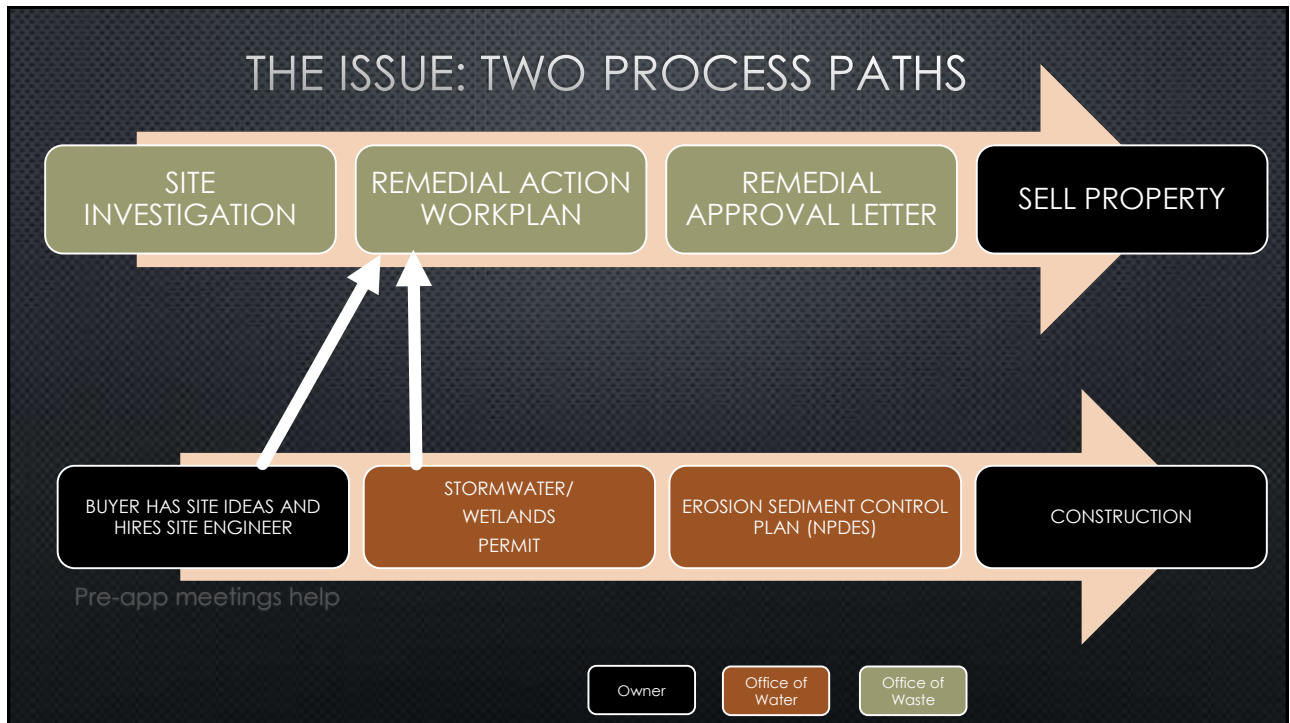


NBC PLAN— STORAGE TUNNELS AND GREEN INFRASTRUCTURE (1.5 BILLION DOLLARS)

- A CSO REDUCTION PROJECT ON-LINE WITH PHASE I & II IN 2013 AND 2014 RESPECTIVELY. PHASE I INVOLVED THE CONSTRUCTION OF A 66 M.G. SEWAGE STORAGE TUNNEL; PHASE II INVOLVED CONNECTION TO THIS TUNNEL TO GREATLY REDUCE CSO DISCHARGES TO SURFACE WATERS
- A PHASE III PROJECT IS PLANNED TO INCLUDE ANOTHER TUNNEL AND ADDITIONAL REDUCTIONS IN FLOWS TO CSOs. PHASE III WILL INCLUDE A GREEN INFRASTRUCTURE COMPONENT

Bottom Line – You're going to have to treat stormwater too





WHY INFILTRATE?

- ONE OF THE MAJOR BENEFITS OF RECHARGE IS TO RESTORE GROUNDWATER FLOW, MIMIC THE NATURAL HYDROLOGIC CYCLE AND REDUCE FLASH FLOWS.
- INFILTRATION = BETTER TREATMENT OF STORMWATER. ESPECIALLY FOR BACTERIA
- REDUCES COMBINED SEWER OVERFLOWS
- MAY BE LIMITED BY EXISTING DRAINAGE SYSTEMS

BUT....

- "INFILTRATION PRACTICES SHOULD NOT BE USED WHERE SUBSURFACE CONTAMINATION IS PRESENT FROM PRIOR LAND USE DUE TO THE INCREASED THREAT OF POLLUTANT MIGRATION ASSOCIATED WITH INCREASED HYDRAULIC LOADING FROM INFILTRATION SYSTEMS, UNLESS THE CONTAMINATION IS REMOVED AND THE SITE HAS BEEN REMEDIATED, OR IF APPROVED BY RIDEM ON A CASE BY CASE BASIS."

The Problem With Infiltration

What we have:

-Properties with residual contamination that have the potential for reuse, restoration or redevelopment.

What we want:

-To better manage storm water onsite.

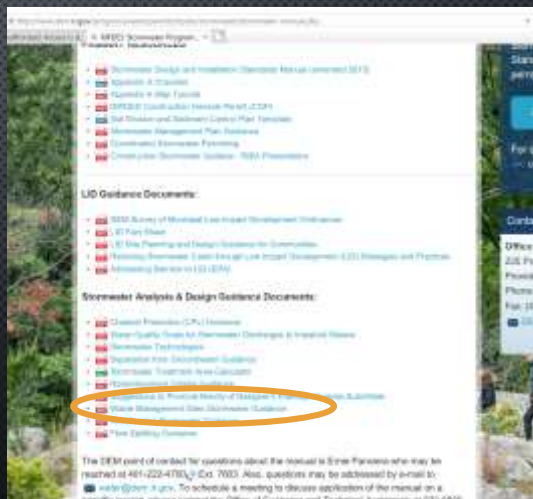
What we don't want:

-To cause further environmental damage by infiltrating storm water through contaminated soils.

-Jessica Dominiques,
Sustainable Reuse Lead
Brownfields Program
EPA Region 1
2017 Presentation "Green Meets Brown"

RIDEM DEVELOPED GUIDANCE TO INFILTRATE WHERE FEASIBLE

GUIDANCE WAS DEVELOPED BY ALISA DIAZ RICHARDSON, MS, P.E., PMP, DURING HER TENURE AS SUPERVISING SANITARY ENGINEER AT RIDEM OFFICE OF WATER RESOURCES/ STORMWATER PROGRAM, IN CONJUNCTION WITH KELLY OWENS, SUPERVISOR OF THE SITE REMEDIATION PROGRAM OF RIDEM OFFICE OF WASTE MANAGEMENT



GENERAL PRINCIPLES FOLLOWED

1. RULES OF THUMB - SIMPLIFY
2. DIFFERENTIATE BETWEEN GROUPS OF CONTAMINANTS
 - MOBILE-LEACHABLE
 - NON-MOBILE
 - NON-LEACHABLE
3. PREVENT MIGRATION OF SUBSURFACE CONTAMINATION DUE TO HYDRAULIC LOADING
 - NO LOAD (PAVED AND LINED BASINS)
 - MINIMAL LOAD (DIRECT RAINFALL AND LINED BASINS)
 - CONCENTRATED LOAD (INFILTRATION BASINS)

IN SOME CASES ENVIRONMENTAL LAND USE RESTRICTIONS (ELURs) MAY BE PLACED ON ENTIRE PARCELS SIMPLY BECAUSE DEFINING THE EXACT LIMITS OF CONTAMINATION WOULD REQUIRE ADDITIONAL SURVEY COSTS EXAMINE THE SPECIFIC LIMITATIONS ASSOCIATED WITH THESE PROPERTIES

RED-YELLOW-GREEN CRITERIA TO PROTECT GROUNDWATER



RED – TYPICALLY DETERMINED BY ACTIVE FLUID REMEDIATION UNDER THE SITE THAT CONTAINS A MOBILE PLUME.

YELLOW – DIRECT PRECIPITATION AND INFILTRATION IS ALLOWED. NO CONCENTRATED FLOW UNLESS LINED, HOWEVER, PVIOUS PAVERS MAY BE USED

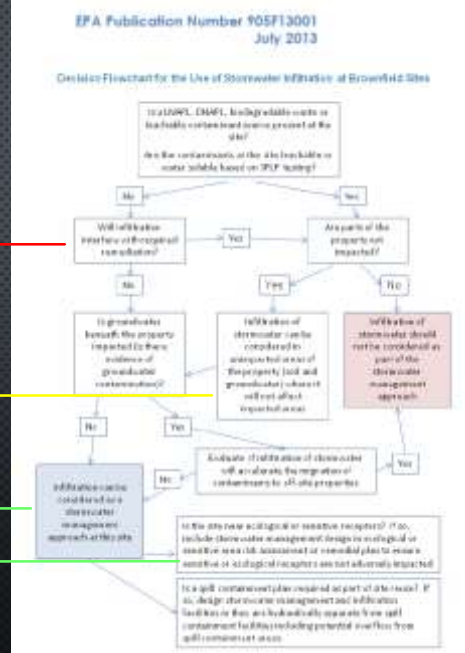
GREEN – CONCENTRATED HYDRAULIC LOADING ALLOWED
NOTE - YELLOW CAN BE TURNED TO GREEN IN CERTAIN CASES.

GREEN – IF CLASS A GROUNDWATER STANDARD, THE SOILS MUST MEET GA LEACHABILITY STANDARDS.

- IF CLASS B OR C GROUNDWATER, THE SOILS MUST MEET GB LEACHABILITY STANDARDS. BUT IF NEAR AN ENVIRONMENTALLY SENSITIVE AREA, IT MUST MEET GA LEACHABILITY STANDARDS.

[HTTP://WWW.DEM.RI.GOV/PROGRAMS/BENVIRON/WATER/PERMITS/SW
COORD/PDF/WASTSWG.U.PDF](http://www.dem.ri.gov/programs/benviron/water/permits/swcoord/pdf/wastswgu.pdf)

- ▶ **RED** – Typically determined by active fluid remediation under the site that contains a mobile plume.
- ▶ **Yellow** – direct precipitation and infiltration is allowed. No concentrated flow unless lined, however, pervious pavers may be used
- ▶ **Green** – if Class A Groundwater Standard, the soils must meet GA leachability standards.
- ▶ If Class B or C Groundwater, the soils must meet GB leachability standards. But if near an Environmentally sensitive area, it must meet GA leachability standards.



MAXIMUM EXTENT PRACTICABLE

- GOALS OF A WORKABLE SOLUTION:
 - AVOID SPREAD OF CONTAMINATION
 - WHERE POSSIBLE AND IF FEASIBLE, PROVIDE STORMWATER MANAGEMENT INCLUDING INFILTRATION TO THE MAXIMUM EXTENT PRACTICABLE (MEP)
- IF NOT POSSIBLE, ADVISE HOW BEST TO DOCUMENT A TECHNICAL JUSTIFICATION OF THE DESIGN PRESENT AND JUSTIFY THAT IT REPRESENTS MEP

“RED” CONTAMINATION AND AVAILABLE STORMWATER TREATMENT

- AREAS DESIGNATED AS “RED” ARE THOSE WHERE NO HYDRAULIC LOADING IS ALLOWED. THESE ARE AREAS THAT HAVE HIGH LEVELS OF CONTAMINATION AND/OR HAVE CONTAMINATION THAT WOULD BE READILY MOBILIZED AND TRANSPORTED BY INFILTRATION OF ANY AMOUNT
- NO HYDRAULIC LOADING AREAS ARE REQUIRED TO HAVE AN ENGINEERED HARD/IMPERVIOUS CAP BY THE OFFICE OF WASTE MANAGEMENT
- ANY STORMWATER PRACTICES IN “RED” AREAS WOULD LIKELY BE:
 - LINED AND SUB-DRAINED SAND FILTERS
 - LINED AND SUB-DRAINED BIORETENTION PRACTICES
 - LINED DETENTION (FOR PEAK FLOW MANAGEMENT ONLY)



“YELLOW” CONTAMINATION AND AVAILABLE STORMWATER TREATMENT

- “YELLOW”/DIRECT PRECIPITATION ALLOWED AREAS ARE THOSE WHERE FLOW FROM CONCENTRATED STORMWATER PRACTICES COULD DEGRADE GROUNDWATER QUALITY BY MOBILIZING CONTAMINATION WITHIN THE SOILS. HOWEVER, THESE AREAS DO NOT REQUIRE AN IMPERVIOUS CAP
- STORMWATER PRACTICES THAT ARE APPROPRIATE FOR “YELLOW” AREAS WOULD BE:
 - PERVIOUS PAVEMENT
 - PERVIOUS PAVER SYSTEMS



“GREEN” – CONTAMINATED AND AVAILABLE STORMWATER TREATMENT

- AREAS DESIGNATED “GREEN” / UNRESTRICTED HYDRAULIC LOADING / CONCENTRATED-HYDRAULIC-LOADING-ALLOWED ARE THOSE ALLOWED TO ACCEPT ANY STORMWATER DIRECTED TO THEM
- THEY CAN ACCEPT DIRECT PRECIPITATION, SHEET FLOW FROM ADJACENT AREAS, AND COLLECTED RUNOFF DISCHARGED INTO AN ENGINEERED INFILTRATION SYSTEM
- GREEN AREAS ARE STILL SUBJECT TO INFILTRATION RATE RESTRICTIONS AND SIZING CRITERIA
- TYPICAL STORMWATER PRACTICES WOULD BE:
 - UNDERGROUND INFILTRATION SYSTEM (CHAMBERS IN A STONE BED)
 - SURFACE INFILTRATION BASIN
 - INFILTRATING SAND FILTER
 - QPA: BROAD AREAS OF PERVIOUS SOILS TYPICALLY WITH GRASS COVER THAT RECEIVE RUNOFF FROM ADJACENT IMPERVIOUS AREAS IN A DISPERSING MANNER



PRE-APP MEETINGS

- ITEMS OF DISCUSSION:
 - THE PROJECT BEING PROPOSED IN GENERAL
 - STORMWATER MANAGEMENT REQUIREMENTS AND GOALS FOR
 - ~ RIDEM
 - ~ LOCAL AND NBC REQUIREMENTS
 - WHAT LEVEL OF ENVIRONMENTAL SITE ASSESSMENT HAS BEEN DONE TO EVALUATE SITE CONTAMINATION
 - OPTIONS AVAILABLE FOR INFILTRATION
 - ADDITIONAL TESTING NEEDS
 - PROVIDING GUIDANCE FOR ARRIVING AT A (HOPEFULLY)WORKABLE SOLUTION

STORMWATER FEASIBILITY ON CONTAMINATED SITES

STEP 1 – PRE-APPLICATION MEETINGS

- IF THE PROPOSED SITE IS A STATE LISTED SITE WITH THE OFFICE OF WASTE MANAGEMENT, IT IS CRUCIAL THAT THERE IS ENOUGH INFORMATION ABOUT THE SITE TO ASSIGN THE LEVEL OF HYDRAULIC LOADING ALLOWED TO PROTECT CRITICAL CLEAN-UP SYSTEMS AND PREVENT FURTHER CONTAMINATION.

- THEREFORE, IT IS RECOMMENDED THAT YOU NOT APPLY FOR A STORMWATER PERMIT UNTIL YOU HAVE AT LEAST RECEIVED A REMEDIAL DECISION LETTER (RDL) AND A HYDRAULIC LOAD ASSESSMENT (RED-YELLOW-GREEN) FROM THE OFFICE OF WASTE MANAGEMENT

STORMWATER FEASIBILITY ON CONTAMINATED SITES

STEP 2

- PROVIDE A REMEDIAL DECISION LETTER OR REMEDIAL ACTION WORK PLAN APPROVAL AS PART OF YOUR SUBMISSION TO THE OFFICE OF WATER RESOURCES FOR A STORMWATER PERMIT

AND

- PROVIDE THE HYDRAULIC DESIGNATION LOADING AS REVIEWED BY OFFICE OF WASTE MANAGEMENT

RI GROUNDWATER CLASSIFICATIONS

- 150-05-3.9 A.1-A.3: DEPT. OF WATER RESOURCES, WATER QUALITY, GROUNDWATER QUALITY RULES
- GAA: SUITABLE FOR PUBLIC DRINKING WATER USE WITHOUT TREATMENT. LOCATED WITHIN GROUNDWATER RESERVOIRS, WELLHEAD PROTECTION AREAS FOR COMMUNITY WATER SUPPLY WELLS AND GROUNDWATER DEPENDENT AREAS THAT ARE PHYSICALLY ISOLATED FROM REASONABLE ALTERNATIVE WATER SUPPLIES AND THE EXISTING GROUNDWATER SUPPLY WARRANTS THE HIGHEST LEVEL OF PROTECTION
- GA: SUITABLE FOR PUBLIC OR PRIVATE DRINKING WATER USE WITHOUT TREATMENT AND NOT LOCATED WITHIN ABOVE LOCATIONS
- GB: NOT SUITABLE FOR PUBLIC OR PRIVATE DRINKING WATER USE WITHOUT TREATMENT DUE TO KNOWN OR PRESUMED DEGRADATION. LOCATED IN HIGHLY URBANIZED AREA WITH DENSE CONCENTRATIONS OF HISTORIC INDUSTRIAL AND COMMERCIAL ACTIVITY, A PERMANENT WASTE DISPOSAL AREA AT SITES OF HISTORICALLY PERMITTED OR APPROVED INACTIVE LANDFILLS AND INACTIVE LAND DISPOSAL SITES, ACTIVE SITES PERMITTED FOR THE LAND DISPOSAL OF SEWAGE SLUDGE AND THE AREA IMMEDIATELY SURROUNDING THE GB AREA OR THE GC AREA
- GC: MORE SUITABLE FOR CERTAIN WASTE DISPOSAL PRACTICES THAN FOR DEVELOPMENT AS A DRINKING WATER SUPPLY. LOCATED AT LICENSED SOLID WASTE LANDFILLS AND AREAS THAT HAVE BEEN RECLASSIFIED FOR SOLID WASTE LANDFILLS AND FACILITIES FOR THE DISPOSAL OF HAZARDOUS WASTE

INFILTRATION BMPS/GREEN AREAS/GAA OR GA

- IF A STORMWATER BMP IS IN A GAA OR GA AREA, ALL SOILS TO THE GROUNDWATER TABLE IN THE DETENTION/INFILTRATION AREA NEED TO MEET GA LEACHABILITY STANDARDS PER TABLE 2 OF THE REMEDIATION REGULATIONS FOR VOCs, SVOCs, PESTICIDES, PCBs AND INORGANICS
- INCLUDES SPLP ANALYSIS FOR INORGANIC CONTAMINANTS AND THE GA TPH LEACHABILITY CRITERIA PER RULE 8.02(A)(IV)(2) OF THE REMEDIATION REGULATIONS

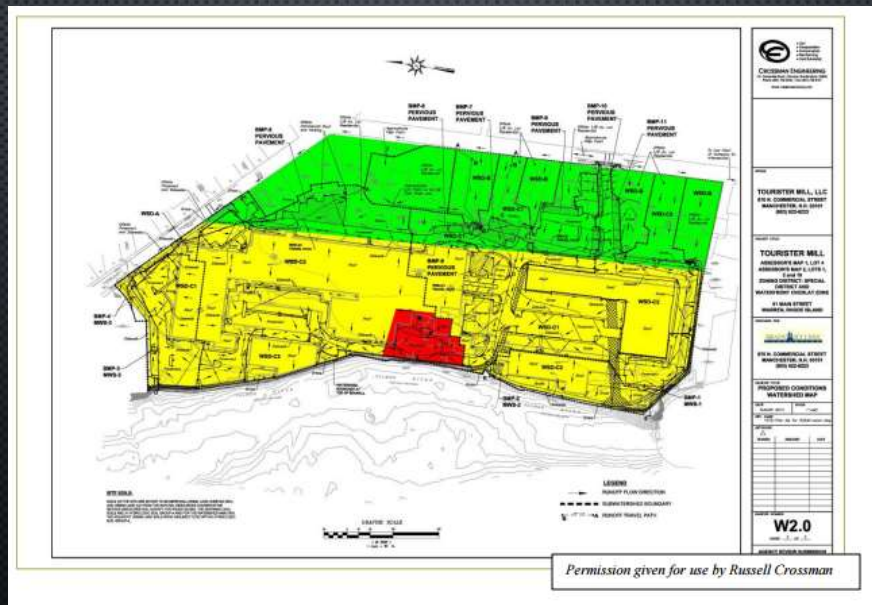
INFILTRATION BMPS/GREEN AREAS/GB OR GC

- IF THE PROPOSED BMP IS IN A GB OR GC AREA, ALL SOILS TO THE GROUNDWATER TABLE IN THE DETENTION/INFILTRATION AREA NEED TO MEET GB LEACHABILITY STANDARDS AS LISTED IN TABLE 2 OF THE REMEDIATION REGULATIONS FOR VOCs AND PCBs, UNLESS THE INFILTRATION AREA IS WITHIN 200 FT OF AN ENVIRONMENTALLY SENSITIVE AREA
- THIS ALSO INCLUDES THE GB TPH LEACHABILITY CRITERIA PER RULE 8.02(A)(IV)(2) OF THE REMEDIATION REGULATIONS

INFILTRATION BMPS/GREEN AREAS/GB OR GC, WITHIN 200 FT OF ENVIRONMENTALLY SENSITIVE AREA

- IF THE PROPOSED BMP IS IN A GB OR GC AREA BUT ALSO WITHIN 200 FT OF AN ENVIRONMENTALLY SENSITIVE AREA, ALL SOILS MUST MEET GA LEACHABILITY STANDARDS.
- A WAIVER MAY BE SUBMITTED IF:
 - A) SUFFICIENT NUMBER OF SPLP SAMPLES ARE TAKEN OF THE SOIL TO PROVE ALL CONTAMINANTS OF CONCERN ARE NOT LEACHING OUT OF SOIL INTO GROUNDWATER
 - AND
 - B) GROUNDWATER SAMPLES SHOW SAID CONTAMINANTS OF CONCERN ARE NOT ABOVE APPLICABLE STANDARDS

EXAMPLE SITE



QUESTIONS?

[HTTP://WWW.DEM.RI.GOV/PROGRAMS/WATER/PERMIT
S/RIPDES/STORMWATER/](http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/)