RHODE ISLAND STORMWATER MANUAL – RESPONSE TO COMMENTS

The first Public Review Draft (Draft Manual) of the Rhode Island Stormwater Design and Installation Standards Manual (the manual)was completed in May 2009. An informal public meeting was conducted on June 4, 2009 where a general overview of the manual was presented, and public comment was solicited. A public comment period was opened until the end of June, 2009. Following receipt of comments, several meetings were held between Department of Environmental Management (DEM) and Coastal Resources Management Council (CRMC) staff and representatives of the Rhode Island Builders Association (RIBA) , municipal planners, Department of Administration (DOA) Statewide Planning and RIDOT. Additional comments were solicited up until as late as the beginning of November 2009. The following is a response to these comments and is formatted to include the commenter's name and organization (where applicable), with the responses in red.

1. **SFM Engineering - Scott Moorhead – Tuesday, May 26, 2009**

1. I presume that since the manual is complete we will have little likelihood of effecting any significant changes.

Response: The Draft Manual was developed sufficiently so as to enable an effective understanding of the scope and details of the changes proposed. This effort was preceded by significant stakeholder involvement by the original development team. The Draft Manual was successful in engaging the regulated public, design professionals, industry, local communities, and other state agencies and producing highly useful feedback. Comments received as a result of the workshop and during subsequent meetings with smaller groups were thoroughly–considered, and revisions were incorporated as outlined in this document.

2. There is an informational workshop on June 4. Will there be a public hearing on this manual? It is in effect a Regulation as it is an implementation of a public law.

Response: There will be a formal Public Notice and Public Comment Period following the two scheduled public workshops (May 26 and June 2). The DEM and CRMC intend to promulgate the Manual as part of its regulatory requirements and will follow the required process for adoption and filing with the Secretary of State.

3. My biggest concern is the mandatory requirement to use Low Impact Development as the primary method where possible. This is a back handed way to regulate land development practice. It appears this will mandate us to design cluster and conservation developments where allowed by local ordinance even when conventional subdivisions are allowed. It appears the Legislature is taking an indirect approach to effectuate land development policy that many Towns have been reluctant to implement.

Response: Cluster design and conservation developments are not mandated by the manual, but applicants will be required to complete the Stormwater Management Checklist in Appendix A, documenting compliance with the Minimum Standard 1: LID Site Planning and Design. The objective of LID is to avoid and minimize the environmental impacts of stormwater from development and redevelopment activities. Because local communities also have an important role in development, advancement of LID is expected to be accomplished in concert with local communities, and evolve and expand over time.

4. When will this manual be effective and how will that impact developments that are already in the design process? Will this require subdivisions that already have Master Plan approval to be redesigned to incorporate LID if they don't already have DEM permits?

Response: . The Manual will become effective within 20 days of filing with the SOS. Projects that can demonstrate that they are officially beyond the initial planning phase will be given a window of time to submit applications under the current manual and will not be required to comply with the new Manual.

5. Some of the drainage techniques preferred in this manual are ones that some municipalities reject. How do we "prove" these are not feasible when it is based on the Town staff or board bias rather than a codified ordinance?

Response: The Draft Manual has been revised in several places to provide increased flexibility in the selection and application of several of the stormwater management practices. Where a community may reject one method or technique, a substitute should be available. Applicants will be required to complete the Stormwater Management Checklist in Appendix A documenting compliance with the 11 Minimum Standards. Presumably municipalities will be less likely to reject practices that are codified in the Manual and deemed most effective in a particular application.

6. Most of the Towns I deal with have little or no provision for LID or conservation development. That will put us between the proverbial rock and a hard place as we try to permit these developments.

Response: See response to comment #3, above.

7. Engineering costs will be going up. Inspection costs to insure that the drainage facilities are constructed according to plan will be going up.

Response: Engineering costs for stormwater management systems are typically a function of complexity of the project and experience of the engineer with the design criteria, among other factors. As engineers become more familiar with the alternative design criteria, costs tend to decrease. It may be true, however, that since the new manual applies several new criteria that have to be evaluated, initial engineering costs may increase in the short-term. Studies have shown, however, that implementation construction costs may be less under the new criteria. The Manual should not increase the burden on construction inspections. The added attention to proper stormwater facility management may however result in similar expenditures which should have occurred under the 1993 manual but did not, and thus have the appearance of an increased cost.

8. Most Towns will not accept the required maintenance responsibilities for many of these drainage systems so the maintenance burden and cost will fall on the prospective homeowners. Based on my experience, long term maintenance will be a big problem.

Response: Long-term maintenance of all stormwater practices is required to ensure proper performance.

9. How will we deal with the subjective review of whether we have maximized LID design techniques? LID conflicts with how people want to use their land. The house and yard can always be smaller.
Will DEM be micromanaging our designs, telling us to reduce the limits of disturbance?

Response: It is the intent to establish a standing stormwater subcommittee to maintain a dialogue with the building community concerning the application of LID. This committee will include non-agency staff, including designers and builders. The objectives of the committee will include ensuring greater predictability in the permitting process, refinements to the manual and procedures where needed, and consistency among project reviews LID can also be a topic discussed at pre-application meetings and applicants will be encouraged to invite local community representation at such meetings where appropriate to help with meeting the LID requirements.

10. When we design subdivisions, we do not usually know what house will be constructed on a lot and what amenities the home owner will want. Will the permit conditions for drainage become so constraining that it will limit flexibility of design and the rights of homeowners to use their lots?

Response: Applicants will need to provide design information to DEM/CRMC that includes items listed in the Stormwater Management Checklist in Appendix A. As long as a project is documented adequately at the design stage and in the application, any restrictions relative to stormwater controls should be known and should not further limit homeowners in the use of their lots.

2. **Matthew Foley – Unilock – June 8, 2009**

After reviewing section 5.4 on permeable paving, I have several concerns that I would like addressed. My comments are below. In addition, the extensive data in figure 5-11 on porous asphalt supplied by UNH is good. This coming fall we will contribute permeable pavers to their monitoring site. Other studies across the country have provided extensive data similar for PICP (permeable interlocking concrete pavers) and I would like to see if there will be an opportunity to add that data in an additional figure 5-12. The amount of attention this draft places on porous asphalt is a bit unbalanced on the three porous options. I would like to share with you manuals for other states adopting LID and their approach to this topic.

Response: The permeable paving section (5.4) has been revised to clarify the definition of permeable paving as including permeable solid block as well as open-cell grid filled with either gravel or sandy soil. Figure 5-11 has been revised clearly identify that this is only an example of one type of permeable pavement.

5.4 PERMEABLE PAVING

• Paving stones (also known as unit pavers) are impermeable blocks made of brick, stone, or concrete, set on a prepared sand base. The joints between the blocks are filled with sand or stone dust to allow water to percolate to the subsurface. Runoff coefficients range from 0.1 – 0.7, depending on rainfall intensity, joint width, and materials. Some concrete paving stones have an open cell design to increase permeability.

Comment - Sand as a base and infill material is never used. Never stone dust anywhere. The base, bedding layer and infill are specific gradations of open-graded aggregates. The 0.1-0.7 coefficient is too broad of a range and requires clarification.

Response: The definition of paving stones has been removed and replace with a definition for pavers. References to sand and/or paving dust have been removed from the definition. Specific runoff curve numbers for infiltrating permeable paving practices have been provided in Table 5-5.

5.4.1 Feasibility

• This practice is not appropriate for high traffic/high speed areas, due to load bearing limitations and clogging potential (≥ 1,000 vehicle trips/day).

Comment - PICP has virtually no load bearing limitations and is used in industrial applications worldwide. It also is the only porous system where restoring permeability is a reality by vacuuming.

Response: Section 5.4.1 has been revised to eliminate the reference to load bearing limitations. The clogging potential referent to high traffic/high speed areas has been retained.

3. **Kate E. Venturini, Manager – June 17, 2009**

URI / CRMC Coastal Landscapes Program
URI College of the Environment and Life Sciences

I suggest correcting page B-3 in the Appendices, as there is no Soil-Testing Laboratory at the University of Rhode Island anymore. We (at the URI Outreach Center, 3 East Alumni Avenue, Kingston, RI 02881 or 401-874-2900) can handle delivered or mailed samples, but we actually send them to UMASS Amherst for analysis.

Response: This text has been revised.

4. **DEM Office, Providence RI – June 24, 2009**

Panel responding to questions (Q)/comments (C)
Eric Beck, RI DEM
James Boyd, RI CRMC
Russell Chateauneuf, RI DEM
Scott Millar, RI DEM

Q: Existing dry detention basins: Would it be better to allow growth of vegetation in the basin or should we continue to mow it?
A: These basins are not designed as water quality BMPs. They are designed to control stormwater volume. Therefore, the basin needs to be maintained (mowed) in order to ensure that the design volume of the basin is not reduced over time.
Additional Comment: Existing dry detention basins are also prime candidates for potential retrofitting; see Appendix C for more guidance on this matter.

Q: How does the new Manual and any subsequent rules based on the Manual address existing municipal stormwater systems?
A: The RIPDES Regulations together with the small MS4 General Permit require the municipalities to use the Manual in their permitting programs…The .Manual addresses new construction and redevelopment. As part of their MS4 permit, municipalities have to determine the best local approach for management of the existing stormwater system.

C: Most land is already developed. Need to deal with the existing development that has caused water quality impairments. It is not going to make a difference just addressing new construction.
A: Through the TMDL Program and grants provided by the federal Nonpoint Source Program and state bond initiatives, DEM has had separate efforts in place to identify water quality impairments, their causes, and to promote BMPs to address these problems. DEM will continue to investigate alternative strategies for correcting water quality impairments caused by stormwater.

Q: Are federal projects, including low income housing, exempt from the Manual requirements?
A: No. Federal projects, including those on Navy property, are not exempt.

Q: Is there any type of porous pavement that does not transfer oil to groundwater?
A: Research has shown that a properly constructed porous pavement system is effective at reducing total petroleum hydrocarbons from stormwater. However, this would not apply to a gasoline or oil spill, which would be subject to extensive and timely remediation to ensure contaminants do not enter groundwater. Porous pavement systems are not acceptable at industrial locations where such spills have a higher potential of occurrence.

C: CRMC should compile a list of plants that are low and effective as buffers. People want to see the water.
A: CRMC allows buffer management to provide view corridors under Section 150 of the coastal program and has produced an interactive list of acceptable vegetation, which is available through the CRMC website at: http://www.uri.edu/cels/ceoc/coastalPlants/CoastalPlantGuide.htm.

Q: Is a fountain acceptable in a retention pond?
A: As long as the fountain does not interfere with the permitted system in any way, it would be acceptable.

Panel members asked the attendees for feedback on how far the State should go in requiring LID to the maximum extent practicable, particularly the aspects of avoiding and reducing the impacts.

C: The State should be sensitive to how LID requirements in the Manual affect urban areas. There is a major difference between urban and rural areas when applying LID.

C: Need guidance for redevelopment. Note: The redevelopment standard has been clarified.

Q: Who determines if the project complies with the Manual if there is no State permit required?
A: Project is then not subject to the state requirements of the Manual and must comply solely with the local ordinances, which may however reference the Manual.

Q: How is porous pavement best applied to a parking lot?
A: Examples were provided wherein the high traffic area of the parking lot is standard pavement while other areas are porous pavement.

Q: On the subject of redevelopment (the redevelopment standard applies to projects disturbing greater than 10,000 square feet) – What happens if a property owner proposes a project that is 9,000 square feet this year and then comes back with another project a year later that is 3,000 square feet? It would appear that the property owner has circumvented the intent of the Manual?
A: Whether it was done deliberately or not, the property owner has circumvented the intent of the Manual under this scenario. Language has been added to Minimum Standard 6 that provides authority for DEM or CRMC to consider prior projects when applying the threshold criteria. .

Q: Has there been discussion between DEM and DOT on stormwater management?
A: There has been extensive collaboration with DOT on stormwater management. DOT is regulated by DEM as an MS4. In addition, DOT has provided funds to develop materials that municipalities can use to meet stormwater requirements. Additional meetings have been held with DOT on their specific concerns with the Draft Manual.

Q: Have there been discussions between DEM and the Narragansett Bay Commission?
A: Yes. NBC has made significant progress in implementing its stormwater management program by requiring property owners to use low impact development techniques, which has in part resulted in thousands of gallons of stormwater disconnected from its combined sewer system.

Q: When will the LID Guidance for communities be available?
A: Draft will be available by mid-fall of 2010.

Q: Will the State require LID certification for designers or require some other level of training for designers in order to be able to submit stormwater applications?
A: No.

5. **Kristine A. Stuart, Southern RI Conservation District – June 25, 2009**

Under Minimum Standard 7: Pollution Prevention (page 3-5), please consider mentioning the need to file a Notice of Intent for coverage under the RIPDES Construction General Permit if an area of 1+acres is to be disturbed, with reference to the GP for contents of a stormwater pollution prevention plan.
If you do not feel it is appropriate to mention in Chapter 3, perhaps a note in Appendix G would suffice.

Response: Section 1.2 "Applicability of the Manual" has been revised to direct readers to applicable permit agencies and requirements.

6. **Derek Berg CONTECH CONSTRUCTION PRODUCTS, INC. - JUNE 26, 2009**

Minimum Standard 3- We agree and commend your decision to move beyond "80% TSS" in establishing water quality criteria, but we question the ability of BMPs to consistently meet the specified performance criteria. In particular we question the presumption of 90% bacteria and 30% nitrogen removal given that available data indicates performance for these constituents varies considerably for most BMPs. If a presumption of performance is going to be granted we feel it is important that the standard reflect a level of performance that is consistently achieved across a wide range of sites. In our opinion existing data does not support the presumption that the BMPs currently in the manual will consistently achieve 90% bacteria removal and to a lesser extent 30% total nitrogen removal. Since additional BMPs will only be accepted if they demonstrate performance in a robust field trial it is important that performance presumptions reflect the results of equally robust studies. We recommend that the bacteria and nitrogen standards be revisited to ensure they will be consistently met given the available data for the BMPs assumed to comply.

Response: Minimum Standard 3 has been revised to reflect changes in the proposed criterion that reflects a balanced review and assessment of prior monitoring results, coupled with the broad management goals identified by DEM and CRMC in response to "The Smart Development for a Cleaner Bay Act of 2007." The applicable revised language is as follows: *"To provide adequate treatment of stormwater, the WQ_v must be treated by at least one of the structural BMPs listed in Chapter Five at each location where a discharge of stormwater will occur. Structural BMPs are generally required to achieve the following minimum average pollutant removal efficiencies: 85% removal of total suspended solids (TSS), 60% removal of pathogens, 30% removal of total phosphorus (TP) for discharges to freshwater systems, and 30% removal of total nitrogen (TN) for discharges to saltwater or tidal systems. Based upon results published in the scientific literature, the structural BMPs listed in Chapter Five will meet these standards when properly designed, constructed, and maintained. Pretreatment is required for water quality treatment practices where specified in the design guidelines within Chapter Five."*

Chapter 5, Infiltration Practices- Underground infiltration systems are more difficult to access for maintenance, so we recommend that pretreatment be provided for 100% of the WQv regardless of the infiltration rate of underlying soils when underground infiltration systems are utilized Chapter 5- Suggest removing the "x's" from the boxes on the various BMP summary sheets since they are easily confused with an acceptance Page 5-27- There is no mention of proprietary devices as an acceptable pretreatment option. Many proprietary systems such as hydrodynamic separators are ideally suited for pretreatment applications. We recommend making "approved proprietary devices designed to treat 100% of the WQv" an acceptable pretreatment option considered equivalent to a forebay. Section 5.5.3- We recommend making "approved proprietary devices designed to treat 100% of the WQv" an acceptable pretreatment option considered equivalent to a forebay. Page 5-68- The table at the top of the page assigns a 25% TSS credit to hydrodynamic devices based on the results of testing at the UNHSC. It is not appropriate to assign a number to all hydrodynamic separators based on the results of testing a small number of devices at a single location. Like all BMPs hydrodynamic separator performance is variable depending on site conditions, sizing, and numerous other variables. We suggest that a note be added to this table which indicates hydrodynamic separators will receive 25% TSS credit unless field testing demonstrates an alternate rating is more appropriate.

Response: Pre-treatment is intended to improve water quality and enhance performance of the downstream water quality BMP. Sizing at 100% of the WQv would be excessive for these purposes. The pretreatment and treatment requirements for infiltration practices have been revised. The BMP summary sheets for each practice have been revised. The allowable pretreatment practices for infiltration and other practices have been revised, and proprietary devices have been added to the list of acceptable options. Table 5-7 "BMP Selection Matrix 5-Pollutant Removal" has been moved to Appendix H. The 25% TSS removal rating for hydrodynamic structures has been retained. This rating must be justified for all proprietary treatment practices in accordance with language provided in Section 6.6 and Appendix J.

Section 6.1- At the bottom of the second paragraph it states that proprietary device design criteria should be obtained from the vendor. It is critical that non proprietary design criteria be put in place to avoid the downward spiral that occurs when vendors are given free reign over sizing and are tasked with competing with other vendors.

The end result is typically aggressively/undersized devices that provide less water quality protection. We recommend that specific language be developed regarding proprietary device design. Most proprietary devices are flow through systems making performance largely a function of operating rate. Design criteria should clearly state that the water quality flow (WQf) must be treated at an operating rate that does not exceed what was tested during performance evaluation. For example you might say device "x" is approved to treat the water quality flow at a maximum operating rate of "y" based on test results. Section 6.5- We suggest providing additional explanation of what is meant by catch basin to manhole configuration and catch basin to catch basin configuration to avoid misinterpretation.

Response: The design criteria for pre-treatment proprietary practices has been revised to require 25% TSS removal for the WQ_v or the WQ_f as verified by an independent third-party monitoring group (See Section 6.6.1).

Section 6.5- We suggest providing additional explanation of what is meant by catch basin to manhole configuration and catch basin to catch basin configuration to avoid misinterpretation

Response: Additional language has been added to Section 6.5.1.

Section 6.6- This section over simplifies the many types of proprietary devices now commercially available. At a minimum, separate categories should be created for hydrodynamic separators, media filters and catch basin inserts given that they represent unique classes of BMPs with drastically different performance expectations

Response: The design criteria for pre-treatment proprietary practices have been revised to require 25% TSS removal for the WQ_v or the WQ_f as verified by an independent third-party monitoring group. The applicable performance criteria is that a proprietary practice achieve the required TSS removal rating as verified by an independent third-party and, therefore, the method of removal (e.g., settling versus filtration) is not relevant.

TAP General- It is disappointing that the TAP was developed and subsequently included in the manual without input from critical stakeholders, namely BMP manufacturers. Additionally, the TAP in its current form lacks many of the critical details needed to successfully execute a study. We fail to see how the TAP improves upon existing protocols such as TARP, TAPE, or ETV. While we applaud and agree with your decision to require robust BMP evaluations we question why Rhode Island (RI) opted not to utilize a protocol such as the TARP or TAPE which were developed with input from diverse stakeholder groups and have been successfully executed in the field. Offering reciprocity for studies completed using the TARP or TAPE protocols is likely a better solution for RI. BMP manufacturers bear the full cost of field studies and can't afford to execute a separate field study in each state. Given the limited opportunities for BMP manufacturers in RI and the crude nature of the TAP most manufacturers are unlikely to participate in a field monitoring study that is only applicable to RI. We strongly suggest accepting studies conducted per the TARP, TAPE or ETV protocols as long as BMP performance meets RI's stormwater quality criteria. If there are specific provisions of these protocols RI feels are missing they can easily be listed as mandatory amendments. If RI opts to move forward with the TAP then a stakeholder group should be convened to revise and finalize the protocol.

Response: Independent third-party monitoring such as TARP and TAPE will be accepted for establishing the 25% TSS removal requirement and will be considered by the permitting agencies for full compliance with the Minimum Standard No. 3 with deficiencies addressed as needed. Addressing deficiencies will likely be required of all TARP and TAPE approved manufactured treatment devices as typically they would not included data for TP, TN, and bacteria. Appendix J has been revised to reflect many of the comments provided. The use of stakeholders for the development of the protocol will be considered for future iterations of the TAP. However, the referenced protocols continue to be updated and reviewed through a stakeholder process and that information is reflected in the revised Appendix J.

Appendix J- The opening paragraph states that practices must undergo a 3rd party evaluation before being used for primary or pretreatment applications. However, section 6.6 states that proprietary devices may be used for

pretreatment without mention of any prerequisite testing criteria. The inconsistencies between these two sections should be addressed and the policy with regard to use of proprietary devices must be clearly defined in the manual.

Response: Section 6.6 has been revised to require third-party testing for any proprietary device. Applicants or other interested parties may petition the permitting agencies to add one or more BMPs to the list of acceptable structural stormwater controls described in Chapter Five by submitting monitoring results and supporting information developed in accordance with the provisions of the Technology Assessment Protocol (TAP) included in Appendix J.

Who will be responsible for reviewing and administering approvals for BMPs tested per the TAP protocol? Language should be added to the manual to clarify how the process is expected to work and what manufacturers can expect should they choose to participate.

Response: The permitting agency or designated alternate will be responsible for reviewing and administering approvals.

Appendix J- J-2- The list of abbreviations contains numerous terms that do not appear in the TAP. The list should be refined to only include relevant terminology

Response: The list of abbreviations has been removed and included in text where needed.

Page J-3- The language in the first paragraph says to see appendix H for the TAP. Change to J or remove since the language appears in the appendix it intends to reference

Response: The text has been revised.

Please clarify the difference between pretreatment and secondary treatment designations.

Response: The term "Secondary treatment" replaced with "pretreatment."

Page J-3- The last paragraph states that the statistics review was adopted from a guidance document from EPA and ASCE. Where is the statistics review mentioned in the TAP?? We did not see any language on required statistical analysis in the TAP

Response: The TAP section on Data Evaluation Methodology was simplified and added (see Section J6.5 and J.9).

Page J-3- The last paragraph states that TAP addresses the shortcomings of the TARP. What short comings have been identified with the TARP and how are they addressed? The language also states shortcomings have prevented implementation of the TARP, but many studies are currently underway per the TARP suggesting this statement is not an accurate reflection of the TARP

Response: This statement has been clarified.

Page J-3- It is stated that devices not considered suitable for primary treatment will be considered pretreatment. However, there is wide range of technologies with different performance capabilities that could be classified as pretreatment. There should be a process in place to assign a specific level of expected performance to pretreatment technologies to distinguish them from less effective technologies. For example a pretreatment device that gets 70% TSS, 70% Bacteria, 30% TP and 25% TN should be distinguished from a device that only gets 25% TSS credit.

Response: Section 6.6 has been revised to require third-party testing for any proprietary device. Applicants or other interested parties may petition the permitting agencies to add one or more BMPs to the list of acceptable structural stormwater controls described in Chapter Five by submitting monitoring results and supporting information developed in accordance with the provisions of the Technology Assessment Protocol (TAP) included in Appendix J. Applicants who desire to have BMP considered for some level of treatment beyond pretreatment, would need to submit monitoring results developed in accordance with the provisions of Appendix J to the permitting agencies for review and approval.

Several sections of the TAP recommend field testing BMPs in a parallel configuration. We agree that testing BMPs in parallel allows for direct comparison of the results, but this is an unrealistic expectation since the vast majority of field tests are executed on sites without parallel treatment devices.

Response: Field testing of BMPs in parallel is a recommendation and, therefore, not a requirement. Parallel performance testing can be done at the UNHSC.

Page J-4- Says the TAP can also be used to evaluate public domain BMPs. We encourage you to do so since the majority of studies conducted on public domain BMPs do not comply with the criteria in the TAP, TAPE, TARP, ETV or other recognized protocols. If the TAP is the standard for field studies in RI than any BMP included in the manual must undergo studies in compliance with the TAP that demonstrate all performance criteria were met. It is essential that all BMPs are held to the same standards.

Response: The BMPs listed in Chapter Five are presumed to meet Minimum Standard 3 based on the revised criterion that reflects a balanced review and assessment of prior monitoring results, coupled with the broad management goals identified by DEM and CRMC in response to "The Smart Development for a Cleaner Bay Act of 2007." Any addition to this list, whether a proprietary device or a so-called "public domain BMP," will have to be evaluated in accordance with the requirements of Appendix J.

Section J.4.1- Criterion 1 says "remove 90% of TSS, 250 micron, and 75 micron particles". It is not clear what this means. Elsewhere in the TAP TSS is defined as particles less than 500 microns. Please clarify the TSS standard.

Response: Appendix J has been substantially revised and in particular the test methods for TSS and other contaminants Section J.5.6.6.

Section J.4.1- Criterion 2 requires demonstrating effluent concentrations of 10 mg/l when influent concentrations are less than 100 mg/l. This may not be feasible on many sites as evidenced by numerous studies for all types of BMPs. Consider changing effluent target to 20mg/l which available performance data indicates is consistently achievable.

Response: Appendix J has been substantially revised and in particular the test methods for TSS and other contaminants Section J.5.6.6.

Section J.4.1- Criterion 3- Very few BMPs consistently achieve 90% bacteria removal based on available research. Consider revisiting this criterion accordingly

Response: The bacteria criterion has been reworded and numerically reduced as given in Minimum Standard 3..

The pretreatment criteria in Appendix J indicate 50% TSS removal should be achieved. This is inconsistent with Chapter 6 of the manual which credits proprietary devices with 25% TSS and makes no mention of testing. Clear consistent language on this policy must be developed.

Response: The pretreatment criterion has been revised to be consistent with Chapter Six and other sections of the manual.

TAP Section J.5.7.6- It is not appropriate to include bypass flow in the performance calculations as long as bypass does not occur for flows up to and including the water quality flow. Public domain BMPs are designed for the water quality volume and evaluated based on the water passing through the BMP not what is bypassed around treatment. Proprietary BMPs must be evaluated in the same manner. Revise accordingly.

Response: Bypass sampling is an important aspect of the TAP but isn't always possible. The requirement to include documentation of bypass flow has been retained in the TAP. It is not uncommon to include bypassed volume in the overall performance evaluation.

Tap J.5.4- It is not realistic to only consider sites that produce sediment concentrations consistent with those published at the bottom of the page. Those numbers may represent average values, but the range of pollutant loads coming off sites varies dramatically with few sites matching an average. Acceptable ranges must be defined. It is extremely costly to execute field monitoring and it will not be feasible to continuously change locations in order to find "the perfect site".

Response: The requirement to collect monitoring data from sites that are typical of natural average concentrations has been retained. This criterion represents a greater degree of flexibility than has existed previously in TARP and TAPE. It now refers to the NSQD ranges, which are broader but have greater specificity by land use type. While medians are provided, ranges exist. Proponents should document that a particular site being evaluated falls within acceptable ranges.

TAP J.5.5- requires a minimum of 12 storm events to be sampled in order to achieve statistical significance, but the statistical methods to be used are not specified in the TAP. It is important that data be analyzed and presented in a consistent fashion, so all required calculations and statistical analysis should be specified.

Response: The number of storms has been changed to be consistent and now reflects TARP 2009 requirements. A table has been included to summarize.

TAP J.5.6- Why are storms lasting less than 1 hour excluded? This excludes high intensity events such as thunderstorms with the potential to transport significant pollutant loads.

Response: This section has been revised.

TAP J.5.7.7- Collecting 7000 liter bulk samples is not feasible for remote monitoring locations given the size of the storage container and need to transport this material to a lab. This criterion should be removed accordingly

Response: The requirement to collect bulk samples has been removed.

Tap J.7 – Multiple references to the Pacific Northwest and Washington State. Likely the result of cutting this section directly from the TAPE. Section should be revised accordingly.

Response: These references have been revised.

Be aware that testing is not likely to take place in RI unless a pilot installation program is implemented. There is currently no provision for pilot installations

Response: While pilot installation programs do not currently exist in Rhode Island, there is nothing stopping this from occurring in the future. Testing has occurred at UNHSC, and parallel testing is recommended.

Appropriate calculations should be specified in reporting criteria

Response: This has been added in section J.7.2

J-9. Several places "Ecology" appears in reference to WADOE. Correct accordingly

Response: This reference has been revised.

Page J-19 references a TEER which is inconsistent with the TER referenced elsewhere. Likely another paste from the TAPE.

Response: This reference has been revised.

We appreciate the opportunity to comment on the proposed stormwater manual and once again ask that you give our comments careful consideration. We have conducted field testing in accordance with all of the protocols currently employed in the US including TARP, TAPE, ETV and Sacramento and feel it is particularly important that the issues raised relative to the TAP protocol be addressed. It is also essential that clear policy be developed to govern proprietary BMP sizing. This should not be left to the vendors! Once you have had a chance to consider our comments I encourage you to contact me. We would be happy to discuss any of our comments in more detail and would be happy to meet with you and your staff on these issues.

Response: These comments have been careful considered, and several revisions to the manual have been made as a result.

7. **DiPrete Engineering June 30, 2009**

DiPrete Engineering Associates, Inc. respectfully submits a review of the DRAFT May *2009* Stormwater Design and Installation Standards Manual. Upon detailed review of the draft manual, we respectfully Request an extension for public comment. There are a number of new requirements which may be difficult to implement on a site by site basis. We feel additional time of *60* days, ending on Labor Day, will allow our firm to better address the effects of the new manual and provide examples for RIDEM consideration.

Response: The extension request for comment was granted.

Our general concerns include:

Requirement for a 3' separation to groundwater table from the bottom *of* infiltration practices without allowing installation of the infiltration practices in fill. Commercial sites requiring ADA maximum slopes may be problematic with the requirement for 3' separation. Due to the gradual slopes these parking lots require, many sites cannot necessarily mimic the existing grade to promote maximum recharge of stormwater, especially on the smaller sites with buildings being proposed dose to the street.

Response: The extension request for comment was granted. Several revisions have been made to the infiltration practice criteria; refer to Sections 5.3 and 5.4 related to separation distance to groundwater, whether practices may be constructed in fill, whether a practice will be designed to meet Minimum Standard 3, and separation distances, among other revisions.

24-hour extended detention of the one-year storm event to potentially offset the peak of the receiving water body. Many cases will require larger detention basins than are currently being constructed.

Response: The channel protection volume methodology has been clarified and described in further detail in Section 3.3.4 and Appendix D. In general, the requirement will not result in significant increases in the size of treatment devices.

How the Construction Erosion and Sedimentation Controls will be reviewed. Will this require more extensive specifications to be followed at the construction stages? This theoretical analysis is typically omitted and addressed on *site* during construction with variable site conditions taken into consideration.

Response: The requirements for construction erosion and sediment control measures are specified in Minimum Standard 10 and the Stormwater Management Checklist in Appendix A. This standard is similar to current RIPDES requirements. Flexibility exists to enable adjustments based on field conditions.

Disallowance of groundwater dewatering at a site. Many sites require control of the seasonal high groundwater to reduce fill. For example, control of groundwater in the area of the road base is a practice that has been accepted and has been effective for decades.

Response: Minimum Standard 2: Groundwater Recharge has been revised to remove the absolute prohibition on groundwater dewatering. However, applicants who propose dewatering may be required to provide a water budget analysis documenting that pre-development recharge levels have been maintained to the maximum extent practicable.

Residential drywells for roof leaders are set 2 to 3 feet above the groundwater table and must be in original soil. The stormwater quality is considered to be close to drinking water standards. Filtration of the discharge through natural soils is questioned. Hydraulic drainage is the primary concern. Groundwater mounding under the drywell for a 24-hour storm event will be negligible. The new requirement may restrict the use of an accepted successful practice of utilizing drywells to discharge clean stormwater from roofs.

Response: The criteria for the use and application of residential drywells has been substantially revised (refer to Section 5.3) and should provide for this use on most sites.

Stormwater quality/impervious coverage research. Is research available to quantify the effect of urban watersheds developed with stormwater management systems similar to those required by the 1993 RISDISM? Research that have been provided or that is found concerns urban watersheds without stormwater water quality improvements. The end of pipe analysis at drainage basins may not account for sheet flow discharge and the effect of the entire stormwater management system to the water resource.

Response: Significant research exists that documents the impacts of impervious cover and stormwater runoff, both with and without the application of BMPs, on water resource quality. Studies have been conducted for a range of indicators, including water chemistry, biological indicators (such as fish and macro-invertebrates), and physical indicators. In addition, researchers have evaluated the offsetting effects of increased buffers, among other factors, on resource quality. A good summary of much of this research can be found in the "Practice of Watershed Protection" (Schueler and Holland, 2000). In addition, an extensive reference listing was provided to the commenter separately.

DiPrete Engineering Associates, Inc. requests additional time to analyze a few of our engineered sites to evaluate the potential impact of the May 2009 RISDISM vs. the 1993 RISDISM as currently approved by the RIDEM. The analysis will evaluate applicability, constructability, and cost differential under the new requirements. We intend to complete this analysis over the next 60 days and would share this data with you if you are interested. A Labor Day deadline would be appreciated. We understand that you are working through a process and are likely trying to meet a deadline. If you believe a meeting on some of our concerns could save time, we would be available at your convenience.

We have attached a document that generally discusses some areas of concern. The document is not intended to be objections or conclusions and is more of a random collection of our thoughts. We understand that there could be clarification provided by the DEM which could resolve some of these issues.

Thank you for your consideration.

Sincerely,
DiPrete Engineering Associates, Inc.

No response necessary.

ATTACHMENT: REFERENCE TO MAY 2009 RISDISM (DRAFT)

Section 3.2.2 Minimum Standard 2: Groundwater Recharge
"groundwater dewatering at a site is not allowed."

Does groundwater dewatering only relate to stormwater management or for OWTS & remediation/pollution control as well? This should be pointed out in the regulations.

Recommendation: We would advise against the groundwater dewatering prohibition for all purposes. This restriction will have potential for the most impact to site development causing road bases, drainage basins, house foundations, etc. to be elevated resulting in more fill being imported to a site.

Response: Minimum Standard 2: Groundwater Recharge has been revised to remove the absolute prohibition on groundwater dewatering. Applicants who propose dewatering may be required to provide a water budget analysis documenting that pre-development recharge levels have been maintained to the maximum extent practicable.

Section 3.1 Stormwater Management Standards
Table 3-1 Design rainfall amounts for RI

100-year storm increase for design storms based on Atlas of Precipitation Extremes for the Northeastern US and Canada. NRCC release publication RR 93-5.

Has the NRCC study been adopted by USDA?
This may have a significant effect. A cost benefit analysis to control the 9 inch storm over the 7 inch storm will be needed.

Response: It is true that the 100-year event listed in Table 3-1 is larger than the value referenced in the 1993 manual. However, the data in Table 3-1 represents between 34 and 115 years of precipitation data through 2008 and represents the actual precipitation values for gage stations throughout Rhode Island. Protection from flooding effects from the 100 year storm event is required by law. The records show a demonstrable increase in the average rainfall depth for this frequency event. The widespread catastrophic flood event that occurred March 29 to April 1, 2010 only confirms the importance of maintaining this criterion.

Section 3.2.4 Minimum Standard 4: Conveyance and Natural Channel Protection
"Protection for natural channels downstream must be supplied by providing 24-hour extended detention of the one-year, 24-hour design storm event runoff volume."

Per Section 3.3.4 Channel Protection Volume: "Detention time for the one-year storm is defined by the center of mass method." If our understanding is correct, for an existing center of mass detention basin inflow of 12.0 hours, the resulting center of mass of the outflow would be required to be 36.0 hours. (A required 24 hour offset). It is our experience that this requirement would be prohibitive to the goal of minimizing of land disturbance due to the expansiveness of the "end of pipe" detention structure. In addition, the design volume would increase linearly to accommodate the 24-hour offset in discharge (dead storage) and the availability for a 2 to 100 year storm. Concerns would also be raised for back to

back storms. We would recommend offsetting the peak design in watersheds identified as developed beyond carrying capacity or where the receiving water courses have existing flooding problems.

Response: The channel protection volume methodology has been clarified and described in further detail in Section 3.3.4 and Appendix D.

Section 3.2.10 Minimum Standard 10: Construction Erosion and Sedimentation Control
"ESC practices must meet the following minimum design criteria: temporary sediment trapping practices must be sized for 1 inch of runoff, and temporary conveyance practices must be sized to handle flow from the 10-year, 24-hour design storm ".

Due to these distinct specifications, will the engineer be required to prepare a stand-alone Erosion Control Plan? Our concern is this will produce a new cost for the applicant before the engineering design is fully vested. In addition, there are many variables that must be confronted during construction. The Contractor may meet the requirements of the soil erosion plan, but may miss the intent of overall mitigation. A conflict could develop with the contractor's obligation.

Response: The requirements for construction erosion and sediment control measures are specified in Minimum Standard 10 and the Stormwater Management Checklist in Appendix A. This standard is similar to current RIPDES requirements. Flexibility exists to enable adjustments based on field conditions.

Section 5 & 7 General - Landscape Plan
From the structural practice sections in these chapters, Landscape Plans will be required for any aboveground structural practice.

This can be cost prohibitive for the applicant to produce a Landscape Plan prior to the engineering design being fully vested. Please clarify the requirements of this landscape plan: does it need a Registered Landscape Architect's stamp? Can it be conceptual in nature?

Response: The revised manual requires applicants to provide a planting plan for several of the stormwater control practices identified in Chapter Five. These plans will have to be developed by a qualified professional with the educational background and/or experience to select appropriate plants and incorporated into the design plans at the permitting stage. Questions concerning professional practice requirements should be addressed to the relevant state licensing board(s).

Section 4.6 LID Stormwater Credit
A. "If runoff from impervious areas are adequately directed to a QPA, the area can be deducted from total impervious area, thereby reducing the Required WQv and the size of the structural BMPs used to meet the removal requirement of Standard 3."

Does this statement entail removal of the impervious area from the WQv calculations only, or from the entire hydrology analysis for detention sizing (channel protection volume) as well? Does the regulation consider that the QPA area mitigates 100% of the stormwater runoff and can be eliminated from the site hydrology? If so, is this modeling technique consistent with TR 55?

Response: QPAs only apply to the Recharge (Re_v) and Water Quality (WQ_v) criteria. These areas do not get subtracted from the site hydrology for the larger storms. Refer to Section 4.6.

B. *QPA not applicable for soils with a seasonal high gets less than 18 inches. QPA applicable for sites less than 5%.* Are there groundwater hydrology studies or empirical evidence studies that can be referenced to evaluate these parameters?

Response: QPAs have been established as a credit to foster disconnection of impervious surfaces to enhance recharge and water quality treatment of small impervious surfaces. When groundwater is within 18" of the surface or slopes exceed 5%, adequate recharge and water quality treatment cannot be assured; thus, these limitations are applied.

C. The flow path through the QPA shall comply with the setbacks established for structural infiltration BMP's.

Is the set back from the QPA outer perimeter area or from the flow path center of the area?

Response: The flowpath for QPAs is from the discharge location (e.g., downspout or edge of pavement) to the required minimum flow length for the contributing area. Refer to Section 4.6.1.1 for specific limitations.

Section 5.3 Stormwater Infiltration Practices

Part 1: "Key consideration -Separation from groundwater table and bedrock of at least three (3) feet".

Research we have seen indicates most of the stormwater pollutant removal occurs in the first 18" of soil depth. Please clarify: is this 3' separation for water quality concerns or hydraulic concerns? Based on the new restriction of placing the bottom of infiltration practices in fill combined with this separation requirement will prevent infiltration on a large portion of our projects which are between 2'-3' depth to the groundwater table. These developments will require the traditional end of pipe detention basin designs which DEM and most developers agree are not ideal. This will be in addition to LINED water quality practices which will add cost to the overall project. We would recommend a revision to 2' separation to groundwater table, possibly with a minimum drained impervious area (for example, 10,000 square feet) or flow rate over which 3' will be required. For reference, the Mass DEP Stormwater Manual has required a 2-foot separation for all infiltration practices.

Response: Several revisions have been made to the infiltration practice criteria; refer to Sections 5.3 and 5.4 related to separation distance to groundwater, whether practices may be constructed in fill, whether a practice will be designed to meet Minimum Standard 3, and separation distances, among other revisions.

Part 2: "Infiltration practices that are designed for the 10-year storm event or greater and have a separation from the bottom of the system to the seasonal high groundwater of less than four feet shall provide a groundwater mounding analysis."

Will there be a minimum drained area or flow rate for this provision as well? For a simple home drywell or driveway trench, this seems to be an excessive requirement. The soil column beneath the bottom of the infiltration structure to the groundwater elevation will be saturated during the storm event. Groundwater mounding for a 24 hour storm event may be insignificant. Is the concern the laminar horizontal or vertical groundwater flow through the soil column? The current RIDEM accepted modeling for infiltration analysis accounts for storage vs. discharge at varied frequencies. Is this analysis acceptable?

Response: The requirements for conducting a groundwater mounding analysis have been revised. Refer to Sections 5.3.1 and 7.4.1. The separation to groundwater requirements required for water quality treatment do not apply for recharge or storage only applications.

Appendix A.1.2 Existing and Proposed Mapping and Plans

Checklist requirement: "8.5 x 11 inch copy of site plan for public notice".
Is this only if applicable? Public notice is only required for Application to Alter.

Response: The Stormwater Management Checklist in Appendix A has been revised to add "where applicable." The plan size requirements must be consistent with applicable regulation.

Section 2.2.1.2 Changes to stream geometry

Example photographs of drainage structures within the stream channel, as well as clearing and development of riverbank wetland. Could the source of the photographs be given? Are the practices employed consistent with the 1993 RISDISM?

Response: The sources of the photographs are provided.

Section 2.2.2 Impacts to water quality

Is there data to quantify the effect of the 1993 RlSDlSM practices that consider the entire stormwater management system measured at the water resource? Is it fair to conclude that historic Rhode Island villages and urban areas that have not employed measures of the 1993 RlSDlSM are of greater concern to the water quality of the state's water resources? Is there an analysis of the impact of existing urban areas?

Response: Significant research exists that documents the impacts of impervious cover and stormwater runoff, both with and without the application of BMPs, on water resource quality. Studies have been conducted for a range of indicators, including water chemistry, biological indicators (such as fish and macro-invertebrates), and physical indicators. In addition, researchers have evaluated the offsetting effects of increased buffers, among other factors, on resource quality. A good summary of much of this research can be found in the "Practice of Watershed Protection" (Schueler and Holland, 2000).

Section 2.0 why stormwater matters. The impact of development.

Table 2-1 Impervious cover associated with different land uses. The correlation of impervious cover per land development is stated. The analyses in the stormwater design manual are questioned. Should this analysis be specific to watersheds that are developed beyond carrying capacity? Are all developments that include impervious surfaces a concern?

Should this analysis be presented to individual towns for adoption into their Comprehensive Plan, Subdivision and Land Development Regulations and Zoning Ordinance? Many of the goals expressed in the RISDISM are beyond the requirements of the design engineer.

Response: Significant research exists that documents the impacts of impervious cover and stormwater runoff, both with and without the application of BMPs, on water resource quality. The organization and applicability of the manual is presented in Chapter 1 and includes new development, redevelopment, infill development and potentially retrofits of existing development.

8. Rhode Island Builders Association, Inc. – June 30, 2009

The purpose of this letter is to serve as our request that further action on the adoption of the Rhode Island Stormwater Design and Installation Standards Manual be stayed while DEM and CRMC seek wider input from the industry practitioners who will ultimately be the users of this manual.

As you are aware Russ Chateauneuf and other members of your staff held an advance workshop at RIBA to go over the highlights of this document. Also, several RIBA members attended the June 4th workshop at URI. As far as I am aware, that is the extent of our involvement in the development of this document to date. We did have the opportunity to appoint an individual to a Storm Water Advisory Committee established to provide storm water control education to municipalities and the public.

In short, it appears that this manual is the work product of a major environmental consulting firm working with staff from DEM & CRMC. Assuming the Advisory Committee played a role, it was largely made up of representatives from various federal, state and local governmental units and advocacy groups. The industry to which it is addressed has little or no opportunity to participate in its development and slightly over thirty days to review it.

During a review session we recently conducted, a number of issues were raised that should be addressed in greater detail. For example during the June 4 workshop, it was stated that one of the major reasons for the update was that "methods and techniques have failed to protect water resource quality." Also, the "80% TSS removal requirement has not prevented resources from degrading." A number of slides from different parts of the country were shown in support of those issues.

While this presentation didn't show what was degrading here in Rhode Island, we are left to conclude that the methods and techniques required by the1992 Manual are ineffective. Along with an absence of Rhode Island examples, the presentation failed to mention that only 10% or so of Rhode Island's total housing stock has been built since 1992. Assuming a comparable change in commercial development in that period, we question why 90% of the built environment that is subject to much less storm water mitigation, if any, is not considered a factor in whatever degradation has occurred here in Rhode Island.

Response: Following input from RIBA, three separate public meetings were held in the fall of 2009 to discuss specific issues with the manual and several revisions were made as a result. Significant research exists that documents the impacts of impervious cover and stormwater runoff, both with and without the application of BMPs, on water resource quality. The organization and applicability of the manual is presented in Chapter One and includes new development, redevelopment, infill development and potentially retrofits of existing development.

Practical application questions have been raised as well. For example:

There appears to be no distinction between property size and use. Why is a three-foot separation required for runoff from a roof when less can be approved for a septic system?

Response: Several revisions have been made to the infiltration practice criteria, refer to Sections 5.3 and 5.4 related to separation distance to groundwater, whether practices may be constructed in fill, whether a practice will be designed to meet Minimum Standard 3, and separation distances, among other revisions. Comparisons between septic system design criteria and stormwater design criteria are not readily comparable largely due to the differences in the loading rate at which water is discharged into the soil.

How can the "Maximum Extent Practicable" be a performance standard?
What is the maximum and who determines what is practicable?
Because infiltration is expensive, does the maximum extent practicable mean cost is no object?

Response: The definition of “Maximum Extent Practicable” is included in the manual on Page 1-2. The Stormwater Management Checklist in Appendix A further addresses how applicants may respond to specific items where an MEP evaluation will likely be involved. It is the intent to establish a DEM/CRMC review committee to maintain a dialogue with the building community concerning the application of LID. This committee will include non-agency staff, including designers and builders. The objectives of the committee will include ensuring greater predictability in the permitting process and consistency among project reviews LID can also be a topic discussed at pre-application meetings and applicants will be encouraged to invite local community representation at such meetings where appropriate to help with meeting the LID requirements.

Who is going to be responsible for post construction maintenance?

Response: The requirements for post-construction maintenance are defined in Minimum Standard 11 (see Section 3.2.11), and guidance on maintenance elements is provided in Appendix E. Maintenance responsibilities will vary depending on who is the applicant.

How do you prevent homeowners from filling in rain gardens and road-side swales?

Response: .
BMPs will be part of an overall approved site plan and the permit will be recorded in the local land evidence records. If the BMP serves more than one parcel, an easement will need to be shown that prescribes the perpetual right to maintain the BMP, which would legally prevent filling-in of the BMP. If the BMP serves an individual parcel, the agency would need to rely on the approved Stormwater Management Plan as legal protection. Any subsequent modification without a permit would be a violation and subject to applicable enforcement action.

We are concerned that this update will be the used as a support document to require all the new technology and methods that are available rather than a document to provide specific tools that can be selected to address specific circumstances. As our members are industry professionals as well, they welcome improved tools to do their job better. However, we see the possibility that the "maximum extent practicable" will become the de facto minimum to be imposed on every project from a smallest lot to the largest subdivision. Developers will be subject to thirty nine different interpretations of the "maximum extent practicable" and whatever is in the Manual will be required to be in the ground - cost no object.

RIBA has a long history of working collaboratively with DEM on such major issues as Wetlands and O M S regulatory changes and we are dismayed that more input wasn't sought for this issue as well. We submit that as any construction activity may occur over the near future will be subject to perfectly adequate stormwater protections, that there is no imminent need for this update at this time. This lull in the business cycle is an opportune time for DEM, CRMC and RIBA to examine this update and finds ways to ensure that it this Manual remains a resource to development rather than an impediment.

I will follow up next week to see if there is a convenient time for us meet and discuss these concerns further with you.

Sincerely,
Roger R. Warren

Response: The stormwater Manual revisions will likely bring more uniformity with local ordinance stormwater requirements, whereas the current practices amongst the 39 cities and towns may be quite different. Some jurisdictions have local stormwater requirements that already exceed those in the current stormwater manual. The agencies met with RIBA at three separate public meetings in the fall of 2009 to discuss specific issues with the Draft Manual. Several revisions were made as a consequence, in particular Appendix A which deals centrally with how compliance with LID requirements will be documented and explained.

9. **Lorraine Joubert - URI Cooperative Extension, NEMO – July 7, 2009**

p. 1.1 Introduction. It should be noted that a driving force for updating and applying the Stormwater Manual is the EPA Clean Water Act and specifically the Phase II storm water program. As a delegated state, RI is mandated to take effective action to reduce stormwater pollution through the RIPDES permit program.

Response: Chapter One has been revised to reference the RIPDES permit program specifically.

p. 1-2, Section 1.2 Applicability of the Manual
We are pleased to see that the standards are intended for use on single-family lots and other small projects typically regulated by municipalities and suitable for their use.

The methods and procedures should be reviewed to ensure they are truly appropriate for small sites with limitations such as high water tables, slowly permeable soils, and localized flooding problems, particularly where combined impacts of onsite systems, stormwater runoff, and wetland buffer loss is a threat to high quality waters.

For example:

- Are methods to calculate runoff volumes and to compare pre and post construction runoff volumes appropriate for individual residential lots, and can simplified methods be recommended for small parcels?
- Will additional design guidance be developed for small-scale bioretention such as rain gardens at homes, small businesses and schools? This could include for example, simple calculation tools for homeowners and contractors installing small rain gardens.
- There is a need for guidance on managing runoff from small lots to prevent pollution and avoid nuisance flooding to neighboring properties, particularly in urban areas and densely developed neighborhoods with slowly permeable soils, high water table, and limited pervious area. Technical recommendations are needed to remediate existing problems (disconnecting roof drains from stormsewers), and for new construction, expansion and redevelopment.
- On unsewered lots with high water table, rain gardens have been eliminated from design plans because of interference with an onsite system. Rather than waiving all stormwater controls, technical guidance is needed to identify feasible measures to reduce or mitigate impacts under these extreme situations, including for example, above ground plant filters and green roofs not typically used with single family dwellings. The guidance is needed for lots within wetland buffers under DEM/CRMC jurisdiction and for municipal use.

Response: The applicability of the manual is presented in Section 1.2 and includes reference to a range of applications. A design example for a single lot is presented in Appendix D. Several provisions have been added throughout the manual to address small site impacts, such as those presented in Chapter 4 (see Section 4.6 specifically) and modifications to infiltration requirements for residential land uses (see Section 5.3 and 5.4). However, addressing alternative sizing methods, or on-lot variations for homeowner-constructed facilities was deemed to be beyond the scope of this manual. A good guidance document for such approaches was referenced on page 1-3 and in Appendix D entitled "The Small Sites Guide for Stormwater Management," published by the Vermont Agency of Natural Resources in December 2009.

p. 1-6, Section 1.4 How to Use this Manual

Step 1 Determine specific regulatory requirements: DEM and CRMC should provide clear guidance on types of activities and applications subject to conformance with the final standards, and also outline procedures for coordinating with local regulations.

Response: Any project that meets the thresholds defined in Section 300.6 of the coastal program must conform to the current stormwater manual. CRMC plans to amend Section 300.6 to further define the regulatory thresholds for consistency with the revised manual. Likewise, DEM will be revising the Freshwater Wetland Regulations and other applicable rules to guide the design process.

p. 1-7 Step 2. We strongly recommend that soil characteristics be properly identified in the field using "Standards and Procedures for Site Specific Soil Mapping in Rhode Island" available at http://www.uri.edu/ce/wq/NEMO/Publications/PDFs/SOIL.pdf. Delineation of wetland edges, to include hydric soils, should also be done at this time. Results would provide the basis for initial site planning in Step 4 and help identify locations for "Field testing of soils" in Step 5 through more in-depth analysis such as permeability tests for infiltration basins and soil suitability for onsite wastewater treatment.

Response: While soil information is required at this step, the suggested method for identification of soil characteristics was deemed beyond that necessary for stormwater planning and design purposes. The identification

of regulated wetlands and wetland edges is governed under separate regulations by DEM and CRMC. Detailed soil evaluations are required for the design of several of the approved stormwater control practices as outlined in Chapter Five and Appendix H.

If NRCS RI Soil Survey maps are used for general planning, updated digital maps (available through RIGIS, from the RIDEM mapping website and other interactive map servers, or from NRCS at the Soil Data Mart at http://soildatamart.nrcs.usda.gov/ or Web Soil Survey at http://websoilsurvey.nrcs.usda.gov) should be used rather than the paper maps as the later have not been updated.

Response: The source of NRCS soil survey mapping was deemed to be up to the applicant, although we strongly believe that updated digital mapping will be the reference for most large projects.

p. 1-8. Step 4 second paragraph. "…minimizing the hydrologic alteration" of the site must take into account soil features, particularly hydrologic soil groups (HSG) and water table depths.

Response: The text was revised to include this provision.

p. 2-2. Last paragraph. It is important to note that stormwater impacts also occur because natural treatment processes are bypassed. Suggest the following: Development not only increases runoff quantity, but also introduces new sources of pollutants from everyday activities associated with residential, commercial and industrial land uses (CTDEP, 2004). When it rains, stormwater flowing over pavement and disturbed areas carries these pollutants directly into nearby wetlands and surface waters, either by direct runoff or via stormdrains, bypassing any treatment that would naturally occur when rainwater infiltrates into the ground.

Response: The text was revised to include this statement.

p. 3-4. Second paragraph from bottom. We agree jurisdictional wetland areas, including buffers, should be excluded from calculation of impervious area. Because of the opportunity for pollution renovation in hydric soils, especially denitrification, wetlands boundaries should be carefully delineated to include hydric soils. Also, the area occupied by stormwater facilities should also be excluded from the area calculation.

Response: The identification of regulated wetlands and wetland edges is governed under separate regulations by DEM and CRMC; labeling, as wetlands, hydric soils that are not regulated wetlands would be confusing. Note that the regulation of freshwater wetlands in RI is administered in a similar manner between DEM and CRMC. Despite nomenclature differences as applicable to jurisdictional boundaries, the freshwater wetlands delineations used by both agencies are consistent.

Last paragraph. What is the basis for exempting a site with less than 40% existing impervious cover from redevelopment standards? In watersheds of special resource protection waters or impaired waters this exemption may result in lost opportunities to protect or restore water quality. In addition, the type of land use and its location would be a factor since 40% impervious may be very reasonable for commercial or high density residential use in a designated compact growth zone but unnecessarily excessive in a low-density district.

Response: A site with less than 40% impervious is a redevelopment site but the stormwater compliance requirements are higher. The design must comply fully with the Manual with the exception that off-site mitigation/BMP is allowed. In addition, the agency will reserve the authority to impose more stringent treatment requirements in the case of a TMDL receiving water(see page 3-3). [Note: We recently observed an error in the new draft in that SRPWs were excluded from the listing of exceptions in this paragraph. SRPWs will be added.]

p. 3-9 Section 3.3.1 LID Site Planning and Design Criteria

Add new measure #1: Assess the site and its hydrologic context.

Response: The text was not revised to include this provision. It is assumed that site assessments are necessary to comply with all of the other criteria.

Add new measure #12: Provide for proper operation and maintenance of LID stormwater systems with appropriate easements, education, covenants and enforcement sanctions, management and

Response: The text was not specifically revised to include this provision. However, maintenance of all stormwater systems is governed under Minimum Standard 11, and guidance is provided in Appendix E. In addition, text under the maintenance of QPAs (Section 4.6.1.1) was revised.

Revise existing measures as follows:
2. Maximize the protection of natural drainage areas, streams, surface waters, hydric soils, wetlands and wetland buffers.

Response: The text was revised to include this provision.

3. Minimize land disturbance, including clearing and grading, and avoid areas susceptible to erosion and sediment loss.

Response: The text was revised to include this provision.

4. Minimize soil compaction and restore soils compacted as result of construction activities or prior development.

Response: The text was revised to include this provision.

p. 3-10 Section 3.3.2 Groundwater recharge. The recharge criteria applies only to the impervious area, however, pervious areas subject to site disturbance are likely to have lower post-construction infiltration rates and therefore reduced recharge unless restored through soil amendments. The recharge criteria should be expanded to account for the loss of recharge on pervious areas unless restoration of compacted soils is mandated in all areas subject to disturbance.

Response: The text was not revised to include this provision. It is acknowledged that compacted pervious surfaces have different recharge characteristics than undisturbed natural pervious areas, and when known as an existing condition, are taken into consideration as part of the pre- versus post- hydrological analysis. Language was added (see pp. 3-11, 4-4, and 4-11) drawing attention to care against compaction of pervious surfaces during construction Otherwise, the amount of lost recharge from these surfaces was too variable to provide further specific guidance. Insufficient methodology exists to establish a consistent and fair management policy. However, this issue is partly taken into account with the minimum WQ_v. .

p. 3-11. Second paragraph. Waiving recharge requirements for ledge, fill and other sites with physical limitations provides little incentive for developers to avoid highly marginal or unsuitable sites. Instead, additional measures should be required to maintain infiltration for example, by reducing building footprints, use of permeable pavements, green roofs, etc.

Response: The text was not revised to include this provision. It is acknowledged that this waiver does not provide an incentive to avoid these areas, but it was deemed that the purpose of the criteria was to mimic pre-developed recharge, and these areas represent small pre-development recharge rates. In addition, it is DEM's and CRMC's position that the other LID management measures and BMP design criteria will address this issue.

p. 4-9 last paragraph. Is 2" of topsoil sufficient for a QPA? In the Puget Sound area, 8 inches of soil with 2-4 inches of compost is required for disturbed areas (see Building Soil manual

http://www.soilsforsalmon.org/pdf/Soil_BMP_Manual.pdf and Low Impact Development Center http://www.soilsforsalmon.org/how.htm) Unless naturally vegetated and in good condition, greater depth should be considered for any pervious area disturbed during construction or previously compacted, and especially for QPAs. Standards for quality of compost and percent organic matter are also needed.

Response: The topsoil/organic soil requirement was revised to 4" minimum.

How can the function of the QPA be assured in the future with various land owners?

Response: QPAs will be part of an overall approved site plan and the permit will be recorded in the local land evidence records. If the QPA serves more than one parcel, an easement will need to be shown that prescribes the perpetual right to maintain the QPA, which would legally prevent disturbance to the QPA without a permit revision. If the QPA serves an individual parcel, the agency would need to rely on the approved Stormwater Management Plan as legal protection. Any subsequent modification without a permit would be a violation and subject to applicable enforcement action.

p. 4-11 Fourth bullet from bottom. A Professional Soil Scientist, not a Class IV Soil Evaluator is qualified to determine permeability based on a soils evaluation. Soil Evaluators are not trained to identify the HSG. Although the HSG may be obtained based on the soil series, Soil Evaluators are not trained to determine soil series type.

Response: The text has been revised to reference either a Class IV Soil Evaluator or a Professional Engineer as the required minimum professional qualifications for this topic. The HSG would be provided from available references, not determined by the Soil Evaluator.

p. 4-12 Second bullet. As noted above, specific standards and specifications are needed for restoring compacted soils, including for example, depth of tilling, type of organic amendment, and final depth and percent organic content of the soil.

Response: The text was revised to address this issue, and the topic was moved to the beginning of Section 4.6.1.1 to raise the importance of this issue.

p. 5-25. Second bullet from bottom. Only a Class IV Soil Evaluator or Professional Soil Scientist, not a registered PE, is qualified to verify the seasonal water table depth, unless that PE is also a Class IV.

Response: The text has not been revised. For stormwater purposes, it has been the policy of the agencies to deem either a Class IV Soil Evaluator or a Professional Engineer as meeting the required minimum professional qualifications for this topic.

p. 5-31. Paving stones are also commonly referred to as Block Pavers. Grass pavers should be referred to as Grid Pavers since these may be filled with either turf or gravel. Another source of information about these materials is the URI Cooperative Extension Bulletin, Permeable Pavement: What's it doing on my street, available at: http://www.uri.edu/ce/wq/NEMO/Publications/index.htm#porous

Response: The definition for alternative paving surfaces has been revised in Section 5.4 to only include pavers that are permeable solid blocks or open-cell grids filled with either gravel or with sandy loam.

p. 5-36. Maintenance Design Guidance. Second Bullet. Some porous pavement designers, such as Cahill Associates recommend that sanding be strictly avoided. Why not adopt this more conservative approach to help prevent clogging?

Response: The text has not been revised. The liability of prohibiting all sanding and salting was deemed to outweigh the potential for clogging. If a system clogs, it will be up to the owner to repair or replace the impacted area.

Regarding salt application, is it necessary to minimize salt use outside of drinking water supply source areas?

Response: The required setback to permeable pavements to drinking water source areas was deemed to be sufficient protection for these resources (refer to Table 5.4). Reducing salt applications for all permeable pavements is good policy to reduce overall concentrations in groundwater.

Since snow piles contain a great deal of sand and other particles, add the requirement to avoid stockpiling snow on permeable pavement, and to identify stockpile areas on design plans and in maintenance specifications and contracts.

Response: The text has been revised to include this provision.

p. 5-60. Selection criteria. It would be useful to offer more specific guidance in evaluating the effectiveness of site design / bmp options in meeting treatment goals, particularly in steps 4 - 6. For example, this might include use of TR55 to match pre and post development hydrology, and use of simple pollutant loading estimation methods to compare potential impacts of various development alternatives. This guidance, which could be included in this chapter or the appendix, would be particularly useful for large projects and those in watersheds of special resource protection and impaired waters.

Response: Treatment goals for water quality are covered in the Overview section in Chapter 3. In most cases, application of the eleven minimum standards should be sufficient to meet water quality objectives. The agency reserves the authority under Minimum Standard 3 – Water Quality to impose additional studies and/or requirements where a higher level of protection or treatment is warranted. [Note: We recently observed an error in the new draft in that SRPWs were excluded from the listing of caveats to Minimum Standard 3 – Water Quality.] SRPWs will be added.] Also, a pollutant loading analysis method has been added to Appendix H, and the former Table 5-7 BMP Selection Matrix 5: Pollutant Removal was moved to Appendix H. Furthermore, the design examples in Appendix D provide instruction on how to apply the LID site design versus stormwater management control practices. No further revisions were made to this Section.

p. 5-63, Table 5-4. Regarding water table depth, wouldn't constructing bmps in the water table result in groundwater seepage with increased runoff volume discharged from the bmp? Would this possibly exceed the hydraulic capacity of the treatment system in periods of seasonal high water table? Construction in restrictive soils with a dense hardpan layer should take into account potential for lateral water movement and seepage into the BMP. If the goal is to maintain pre-development hydrology, it would be important to maintain groundwater flow paths and avoid increased surface seepage and runoff.

Response: BMPs in groundwater for non-LUHPPLs have been a common practice across much of the country for many years. Groundwater flows, compared to surface water runoff volumes and rates, are usually negligible. The exception would be an extremely large surface area facility constructed below groundwater elevation compared to a relatively small drainage area. Some of these types of facilities have been constructed in the southeastern United States in areas of extremely flat terrain and in areas that are arguably wetlands. It is unlikely this condition would exist anywhere in Rhode Island. Thus, the concern of depleting groundwater or short-circuiting treatment does not seem to be an issue. However, if a case arises where the permitting agencies deem dewatering may occur as a consequence of a stormwater practice design, a water budget may be requested (see Section 3.2.2).

Glossary

p. 12 The definition of the seasonal high groundwater table should be consistent with other DEM regulations such as the OWTS regs.

Response: The text has been revised as suggested.

Appendix B: Landscaping Guidelines and Planting List
p. 3. Second paragraph from bottom. The Soil testing lab is at UMass, as noted in the reference fact sheet.

Response: The testing lab location has been revised.
Appendix H: Assorted Design Tools
p.1 H.1.1 General notes, item 3. Are Class IV soil evaluators qualified to determine infiltration rates?

Response: The text has been revised to include a Professional Engineer as meeting professional qualifications for this topic. Soil Evaluators are qualified to determine rates where they are based on soil texture. Engineers typically determine infiltration rates using special field equipment such as an infiltrometer.

H.1.1.1. First bullet. It was my understanding that percolation testing is not the preferred method for wastewater treatment suitability and may not be appropriate here.

Response: Percolation testing is not the preferred method of testing for design, but is acceptable for planning purposes. The required soil testing for design is described under Sections H.1.2 and H.1.3.

Third bullet - Ideally, site specific soil mapping should be used for initial feasibility, not NRCS mapping. All Hydrologic Group D soils, and some Group C soils are classified as hydric and are unsuitable development and stormwater management facilities. Wetland edges should be delineated and verified by DEM to include hydric soils in initial planning and design.

Response: While soil information is required at this step, the suggested method for identification of soil characteristics was deemed beyond that necessary for stormwater planning. The identification of regulated wetlands and wetland edges is governed under separate regulations by DEM and CRMC. Detailed soil studies are required for the design of several of the approved stormwater control practices as outlined in Chapter Five and Appendix H.

Soils with restrictive layers may also be unsuitable and should be identified. For planning purposes the NEMO MANAGE model identifies these as soil series with dense basal till (such as hardpan) with permeability of less than 0.2 in/hr at a depth of about 20-60 inches.

Response: The text was not revised to include this provision. The first bullet testing (actual test holes) should provide equal or better information for planning purposes.

Finally, congratulations to all involved in completing this draft. Obviously this represents a great investment of time and effort by many individuals, and promises significant improvement in the way we manage stormwater runoff. These comments are offered in a spirit of constructive cooperation and I appreciate your time and attention in considering them.

Response: No response necessary.

10. <u>RIDOT Engineering Design Comments – July 15, 2009</u>

The Manual dictates the means and methods of catchment and treatment of stormwater. The means and method are so restrictive that they be almost impossible to achieve with RIDOT linear ROW that in many cases and littered with underground and overhead utilities.

Response: The manual provides a range of alternative management strategies including provisions for linear projects. Many other state DOTs are implementing measures similar to those proposed in the manual and have not found them to be unachievable.

The purpose for this manual is to effectively manage the impacts of stormwater and prevent adverse impacts to water quality and habitat by:
A. Maintain groundwater recharge to predevelopment levels.
B. Maintain post-development peak discharge rates to not exceed pre-development rates.
C. Use LID techniques as the primary method of stormwater control to the maximum extent practicable.

LID techniques are engineering for site developments. RIDOT's Transportation System The issue for RIDOT is that LID techniques are not achievable in a cost effective manner for the water shed size and water volume of RIDOTS current systems nor is it economically achievable to design new systems of this size to LID techniques. However, that is not to say that the water quality contained within cannot be achieved by other means.

Response: The manual provides a range of alternative management strategies including provisions for linear projects. Many other State DOTs are successfully implementing measures similar to those proposed in the manual. Since this comment was made, the Draft Manual has been piloted with RIDOT on a major rehabilitation project in South Kingstown (RT 138) that uncovered a key omission in the redevelopment policy as it relates to handling of existing BMPs. Further changes to the manual redevelopment section have been made as a result. Note that some standards, including the LID standard, have a Maximum Extent Practical (MEP) provision as part of the standard. It is expected that RIDOT may not be able to achieve the full standard in some projects. Nevertheless, where the MEP standard is demonstrated, the project may still be found compliant with the manual.

The cost for RIDOT to implement and adhere with this manual will be in the millions.

For example:

1. **Maintenance** would be required to:
   - Clean every catch basin within the RIDOT ROW every other year. Failure to do so could result in fines assessed by DEM or CRMC.
   - Mow every drainage swale in the state in mid August to a height of 4 inches. Failure to do so could result in fines assessed by DEM or CRMC.
   - Aerate all swales every other year. Failure to do so could result in fines assessed by DEM or CRMC.

Response: The maintenance provisions have been carefully evaluated in both Chapter Five and Appendix E, and several revisions have been made that address the frequency of required or recommended maintenance.

2. **Engineering** would be required to:
   - Design pretreatment systems that have a manhole between every catch basin.

Response: Pretreatment systems are required for BMPs as described in Chapter Five. Pretreatment is not required between every catch basin. Pretreatment design requirements for deep sump catch basins do not affect RIDOT systems not being proposed as pretreatment.

   - Bring all drainage systems up to current standards even for resurfacing projects. For many rural roads (such as Route 102) this would require land acquisitions to widen and flatten swales. For many urban roads this would require land acquisitions to for treatment ponds that include forebay, channel pool, micro pool, 25 foot set backs and other minimum basin requirements.

Response: The Redevelopment criteria specifically exclude re-surfacing projects (see Section 3.2.6). For other projects that trigger the redevelopment threshold, management may only be required for up to 50% of the impervious cover. For new development projects, the manual provides a range of alternative management strategies including provisions for linear projects.

- Revamp the RIDOT Drainage Design Manual.

Response: It may be true that revisions to the RIDOT Drainage Design Manual may be required as a result of any update to the State's stormwater management manual.

- Surface detention is prohibited for cold water discharges.

Response: The prohibition language in Section 1.4 has been removed. Also, refer to Sections 3.2.4, 5.2.1, and 7.2.1 for discharge requirements to cold water fisheries.

3. **Construction** would be required to:
   - Inspect all Drainage components after each storm event.
   - Maintain daily inspection logs.

Response: The operation and maintenance provisions have been carefully evaluated in both Chapter Five and Appendix E, and several revisions have been made that address the frequency of required or recommended inspections.

The overall cost to implement this will be well in the tens of millions on an annual basis.

RIDOT should request that:

- It be relieved from the engineering design requirement and to only be required the meet the minimum pollutant loading requirement at the point of discharge regardless of how RIDOT chooses to meet the requirements.
- All components of our drainage systems (including swales and drainage ponds) be relieved of all regulations for ASSFs and wetlands to the point of discharge.
- Establish a more achievable maintenance schedule.
- Relieve maintenance level resurfacing projects form the requirement to upgrade to current standards.
- RIDOT would still be required to meet RIPDES and LUHPPL requirements.

Response: RIDOT cannot be relieved of the engineering design requirements in the manual. Notwithstanding, some standards have a Maximum Extent Practical (MEP) provision as part of the standard. It is expected that RIDOT may not be able to achieve the full standard in some projects. Nevertheless, where the MEP standard is demonstrated, a project may still be found compliant with the manual. Relief from restrictions related to ASSFs and other wetland features is a separate issue and should be discussed separately amongst the agencies. Maintenance provisions have been modified although we recognize that they will require effort or resources beyond that currently allocated for such purposes. We believe that there is agreement that the resources currently allocated for stormwater system maintenance is well short of what is required. Finally, resurfacing only projects are not required to comply with the new manual.

11. RIDOT NATURAL RESOURCE UNIT REVIEW COMMENTS July 15, 2009

Comments on Overall Document

As a State agency, RIDOT is responsible for the design, installation, and maintenance of literally thousands of drainage structures and stormwater management facilities, over hundreds of miles of State Highways. The new

Stormwater Manual includes many practices which will be unfamiliar to our design, construction, and maintenance personnel, as well as the consultants and contractors who work with RIDOT to implement their use. As the agencies preparing to implement these regulations, it is expected that RIDEM and CRMC will provide no or low-cost training for the regulated community in the application of the manual for all phases of a project lifecycle (i.e.: design, construction, and maintenance).

Response: DEM/CRMC are planning to provide initial training to the regulated community for at least the design and construction aspects of the manual. Maintenance aspects will be addressed to some degree in these training workshops but more detailed training on maintenance only items or issues will need to be a separate focus and separate effort.

The standards, criteria, and guidance included in this manual appear to have been developed with a strong emphasis on site development projects, rather than linear construction projects, and will not necessarily be feasible or practicable when undertaking the type of roadway projects with which RIDOT is generally involved. As an example, LID practices for site development are often different from LID practices for linear projects (i.e.: there are no rooftops in road projects). It would make sense for there to be a separate section in the manual relating to LID practices for linear projects as well as a separate Checklist for linear projects in Appendix A.

Response: The manual provides a range of alternative management strategies including provisions for linear projects. Many other State DOTs are implementing measures similar to those proposed in the manual. A separate manual for linear projects was deemed beyond the scope of work for this manual.

The manual does not include any reference to RIDOT Standards and Specifications or Standard Details, indicating that they were not consulted in the development of the manual. This is shocking, considering that the regulation of state and local road projects will be governed by this document. Had RIDOT been consulted in the development of the manual, there would have been opportunity to have collaborated with RIDEM and CRMC during the entire process to allow the State's construction specifications and the manual to better compliment one another.

Response: Several sections of the manual, most notably Appendix F, have been revised to reference RIDOT Standard Specifications and/or Details where applicable and appropriate.

Comments on Specific Sections

3.2.4 – This section directs project proponents to consult "DEM's Water Quality Regulations, Fish and Wildlife Division to determine if a project is in a watershed draining to a cold water fishery." The Water Quality Regulations do not appear to contain information on specific cold water fishery locations. There is also no information readily available on the Fish and Wildlife section of the RIDEM website relative to this issue. Is the project proponent supposed to use the GIS Environmental Resource Maps on the RIDEM website? Does the current version of the Freshwater and Anadromous Fishing Regulations contain adequate information to make the determination? Is the consultation supposed to occur on a case by case basis directly with RIDEM staff? If so, which office is the appropriate point of contact?

Response: The fishery habitat listings can be found in DEM's Water Quality Regulations, Appendix A. Found through the following link: http://www.dem.ri.gov/pubs/regs/regs/water/h20q09a.pdf.

3.2.6 – It is stated that "removal of roadway materials down to the erodable surface is an activity defined as 'redevelopment', but simply resurfacing of a roadway surface is not." There is no quantifiable definition of "erodable soil surface" included in the manual. Pavement structures typically include one or more Surface Course (bituminous asphalt or concrete), as well as Base and Subbase Courses, depending on pavement type and local conditions. There are different types of resurfacing which occur to different depths in the pavement structure with different types of pavements and over different types of foundation materials. RIDOT's Standards and Specifications for Road and Bridge Construction (Sections 301, 302, M.01.08 & M.01.09) includes several types

of Aggregate and Gravel Base and Subbase Courses. Clarification as to whether or not these materials are considered non-erodable is requested. Also, there is no mention of repairing sidewalks, parking lots, or other existing, non-building, impervious surface. How will these areas be treated?

In defining the limits of a "site" for linear projects, will the limits of the highway plat, including permanent easements, to the ends of the project length be sufficient to calculate site size? This is as opposed to having to include an entire plat beyond the project area, and the limits of entire parcels where an easement is proposed.

Response: Any course containing a concrete mixture such as bituminous base course is not considered erodable. Aggregate foundations including those made up of processed gravel are considered erodable. The site is considered to include the entire right-of-way including easements to the limit of the project. For purposes of drainage design, offsite runoff entering the site must be accounted for in the hydrological modeling and treated as the existing condition. Runoff generate from offsite sources unrelated to the project are not otherwise required to comply with the manual for purposes of project approval unless mandated by a RIPDES MS4 requirement.

It is indicated that storm water management may be proposed off-site for redevelopment projects, however, there is no hierarchy of preferred site types given. Will sites in the same watershed reach be preferable to that up- or downstream? Will the same watershed be more acceptable than a different watershed? Where will information be available to determine if a specific area has been approved as an off-site location for storm water management. How will a future perspective buyer of such a property be made aware that there are restrictions on the use of the property (i.e.: will any instrument be required to be recorded on land evidence records)?

Response: Offsite management is not a preferred method but is available where the standard cannot be met and where MEP is not demonstrated. Offsite mitigation should be accomplished as close as reasonably practical to the project site. Generally, the larger the project, the closer the offsite BMP should be. Each project will be handled on a case-by-case basis.

3.2.12 – States that stormwater management plans must be reviewed by local governments. As a separate MS4 and a State Agency, RIDOT is not required to obtain local approval of stormwater management plans.

Response: The text for Section 3.2.12 has been eliminated at a separate Minimum Standard and moved to Section 3.1. The reference to local review is for applicable projects.

3.3.3.1 – Are only gravel roads considered impervious? RIDOT has used (small) gravel parking areas on past projects to reduce the amount of area considered as impervious.

Response: The text referencing impervious surfaces in section 3.3.3.1 has not been revised. However, the Glossary more clearly defines impervious cover to include compacted gravel (e.g., roadways and parking lots). Thus, the presumption will be that small gravel parking lots will be considered as impervious.

3.3.6 – The criteria for determining if a downstream analysis is required for linear projects should be based on a value such as the proposed change in % impervious cover relative to existing conditions, rather than being a dependent of 'Site Size". The size of a linear project, which may travel through many watersheds, is generally less important to the local hydrology, than the change in impervious area. This would still leave the reviewing agency the latitude to require such an analysis when local conditions require it.

Response: The text section 3.3.6 has been revised to reference the size of the proposed disturbed area instead of site size (refer to Table 3-7). We agree that application of the criteria to a linear project that traverses multiple watersheds must be done on a watershed or sub watershed basis.

4.6 – This section disallows all wetlands, including riverbank and perimeter wetlands from being utilized as QPA's. This appears to be counterintuitive, when it is considered that some of the recognized functions/values of

these areas are to provide water quality renovation and storm water attenuation. If the stormwater is not being transferred from one subwatershed to another, why would these areas not be available for use as QPA's? There is not even an exception for previously existing and/or approved landscaped areas within riverbank, perimeter, and/or floodplain wetlands or areas within 200 feet of a coastal feature (as there is for WVTS and other structural practices)?

Response: The purpose of QPAs is to effectively disconnect impervious cover to augment recharge and provide enhanced water quality prior to discharge to Waters of the State. Wetlands are considered Waters of the State.

It is stated that "excessively fertilized lawn areas" are not considered eligible for use as a QPA. This term requires quantitative definition in the manual. It is implied that areas of non-excessively fertilized lawn are acceptable for use as QPA's. What will be required on the part of the project proponent to demonstrate that the QPA is not being excessively fertilized following construction? This should involve some type of maintenance requirement, similar to that required for structural practices, and at a minimum should require soil testing and submission of analytical results on a regular basis. Where will information be available to determine if a specific area has been approved as a QPA? How will a future perspective buyer of a designated QPA be made aware that there are restrictions on the use of the property (i.e.: will any instrument be required to be recorded on land evidence records)?

Response: In general, it can be assumed an area will be designated as a QPA during the design and permitting stage. The text has been revised to define QPA lawn area as consisting "of low-maintenance grasses adapted to the New England region." Long-term identification of QPAs will have to be resolved through either local or State recordkeeping, or some other mechanism. Initial fertilization during construction is not at issue here provided RIDOT specified rates are not exceeded.

4.6.1.1 – Registered Soil Scientists should be permitted to provide the evaluation of soil permeability and water table depth within a QPA.

Response: The text has been revised to reference either a Class IV Soil Evaluator or a Professional Engineer as the required minimum professional qualifications for this topic.

What records must be consulted to determine if there is a "history of groundwater seepage and/or basement flooding". Does a single event constitute a history? Are anecdotal reports subject to consideration?

Response: This criterion requires best professional judgment. If the site has strong evidence of high groundwater and nearby existing homes all have sump pumps, a designer can assume there is potential for groundwater seepage and/or basement flooding.

5.2 – These comments refer to the Summary Table at the beginning of the Section on WVTS, however they may apply throughout the section.

"Deepwater Zone" is an undefined term, however it is used in the design requirements.

Response: The text has been revised on page 5-12 (Section 5.2.4) that defines deep water zones as being greater than 4 feet in depth.

It is required that various volumes of water are stored at depths in 6" increments below the water surface, however 1-foot contour intervals are standard for construction plans. There is NO requirement included in Appendix A for the depiction of proposed contours on site plans, and existing contours are only required at 2-foot intervals. These required design depths should be revised to 1-foot increments.

Response: Appendix A has been revised to referenced proposed topography. The design of WVTS with depth zones ranging from 6" to 18" does not require topographic surveys to be conducted at a finer contour interval than 1-foot.

Does the use of the term "structures" refer to buildings only? Will there be a 35' setback required from non-occupied structures, such as roadways and bridge foundations?

Response: "Permanent structures" refers to buildings.

5.2.1 – Does the term "jurisdictional upland buffers" refer to the area within 200-feet of a coastal feature? RIDEM and CRMC Freshwater wetland regulations define riverbanks, perimeter wetlands, and floodplains as wetland, NOT upland or buffer.

Response: "Jurisdictional upland buffers" refers to areas that are regulated under the Freshwater Wetland Regulations, as regulated by DEM, as well as 200 feet from a coastal feature, as regulated by CRMC.

WVTS's are permitted "in areas already altered under existing conditions" within "jurisdictional wetland buffers" Will WVTS's be permitted on currently undeveloped/undisturbed portions of a site if that area is permitted to be disturbed during construction of a project for other reasons? (i.e.: disturbance required for construction access).

Response: In general, no. The area would have to have been altered prior to the project to comply with this criterion. Otherwise, the placement in such areas is subject to applicable regulation.

There is a prohibition on discharging from a WVTS "within 200 feet of jurisdictional waters, including wetlands" in the watershed of a cold-water fishery. Based on the usage of terms within the draft manual that do not appear to correlate directly with existing regulatory terminology, this requires clarification. Does the term "wetland" in this instance refer to all areas regulated as freshwater wetland (i.e.: including riverbank, perimeter, floodplain, etc), or only those areas which would be classified as wetland based on the federal classification criteria utilizing vegetation, soils, and hydrology (i.e.: biological wetlands).

Response: The text has been revised to clarify that the 200 feet shall be measured from streams and contiguous natural or vegetated wetlands. Note that there are additional requirements for discharges in watersheds of cold water fisheries (see Section 3.3.4)

It is stated that, for non-LUHPPL sites, "the volume below the permanent pool shall not be included in storage calculations...." Should this be interpreted as the volume below the surface elevation of the permanent pool?

Response: Yes. The text has been revised to specify that the volume below the surface elevation of the permanent pool shall not be included in storage calculations for peak flow management.

5.2.2 – the required Elements for the WVTS indicate that erosion may be prevented at the outfall "typically by use of appropriately sized rip-rap placed over filter cloth." It may be prudent to revise the wording to include appropriately sized and bedded rip-rap.

Response: The text has not been revised. The design of rip-rap stabilization is deemed to be within the purview of the designer.

The term well-drained gravel should be defined.

Response: This was a typo. Text has been revised to specific poorly-graded gravel (i.e., uniform stone size).

The Design Guidance section states that "Outfalls should be constructed such that they do not increase erosion or have undue influence on the downstream geomorphology of any natural watercourse by discharging at or near the stream water surface elevation or into an energy dissipating step-pool arrangement." The way the sentence is written makes it unclear as to whether or not the described conditions are desirable design elements or causes of erosion.

Response: The text has not been revised. We believe the criterion is clear.

5.2.4 – Is there a minimum length for the flow path? Is the 2:1 ratio required for each inlet? Is it acceptable to have a shorter flow path for an inlet carrying a small percentage of the total inflow?

Response: The text has not been revised. The overall length to width ratio of the facility shall be 2:1 where the majority of flow enters. The design flow path of individual outfalls shall also generally be 2:1, but details of these designs are deemed to be within the purview of the designer.

5.2.5 – Is it acceptable for the safety bench (Required Element) to contain portions of a sidewalk, road shoulder, bike path, and/or vehicle travel lane, provided that the slope requirement is met?

Response: This is a design-specific question and will be reviewed on a case-by-case basis. The design intent is to not create an unsafe condition immediately adjacent to a permanent pool of water.

The Design Guidance should include a caveat to the use of landscaping to attract wildlife that points out that this may not be desirable along roadsides and within airport flight paths, among other possible locations. Depending on the species, and the distance from the roadway, attracting wildlife in these areas may increase mortality and also increase the incidence of human injury and property damage resulting from animal-vehicle collisions with large vertebrates, such as white tailed deer. This is increasingly a liability issue for State and local DOT's.

Response: The text has been revised to incorporate this provision.

5.2.6 – Required Elements for Maintenance Access state that a ROW or easement shall extend from a public or private road to each WVTS. Any such access shall require the owner of the WVTS to obtain, at a minimum, a Physical Alteration Permit from RIDOT when the access is along any state road.

Response: No response necessary. This comment is related to RIDOT permit requirements and not to the design of WVTS.

5.3 - This comment refers to the Summary Table at the beginning of the Section on Infiltration Practices, however it may apply throughout the section. It is indicated that no infiltration system may be constructed in an area of known soil contamination. There may be instances where it would be appropriate to allow a variance to this rule. If a facility is proposed on an I/C site, and the exceedances are all below I/C DEC, there are is no exceedance of Method 1 Leachability criteria, and an ELUR will be recorded on the property, would RIDEM/CRMC consider allowing infiltration?

Response: The text has been revised to incorporate this provision.

It may be helpful to applicants if it is pointed out in the manual that the many of the practices described in this section will require approval by RIDEM's UIC program.

Response: Additional text has been added to Section 1.2 regarding permit compliance. DEM intends to modify permitting polices and regulations to eliminate duplication of permitting efforts. For example, stormwater infiltration designs complying with the manual that are reviewed under a wetlands application should

automatically satisfy the UIC permitting requirement. Any such consolidation will likely be clarified in regulation in conjunction with the manual adoption.

5.3.1 - The Required Elements indicate that infiltration practices must be located "50 feet from areas with natural slopes greater that 15%." Can it be assumed that this refers to areas of downgradient slope only?

Response: All setback information has been carefully reviewed and incorporated into a new table (see Table 5-2). The setback from steep slopes has been clarified.

One criteria states that "the bottom of infiltration practices cannot be located in fill" and the very next criteria states that infiltration practices cannot be located in areas of known contamination "unless contaminated soil has been removed and the site is remediated." In the second instance, wouldn't this mean that the bottom of the practice would be located in fill?

Response: Several revisions have been made to the infiltration practice criteria, refer to Sections 5.3 and 5.4 related to separation distance to groundwater, whether practices may be constructed in fill, whether a practice will be designed to meet Minimum Standard 3, and separation distances, among other revisions. Some sites may be remediated without requiring placement of fill. In deeper remediation cases, infiltration systems may incorporate a filtering media under the infiltration system and be allowed. (See Section 5.3.1)

The Required Elements state that infiltration facilities "shall be located <u>at least</u> 200 feet horizontally from all surface water supplies and tributaries." Can it be assumed that this means all surface <u>drinking</u> water supplies? Also, there are multiple references to setback distances from non-critical surface waters. The term "non-critical surface waters" requires definition in the manual. No mention is made regarding any limitation on the use of these practices within the boundary of a Sole Source Aquifer (SSA). What is the reason for this? Typically the EPA requires RIDOT to provide impermeable liners on all stormwater practices within SSA's to prevent contamination of drinking water.

Response: All setback information has been carefully reviewed and incorporated into a new table (see Table 5-2). Several clarifications have been provided to address these comments. While DEM allows stormwater infiltration into a sole source aquifer after treatment, we recognize the authority of local or federal agencies to regulate the practice under their respective laws, ordinances and regulations. In such cases, another BMP may be selected. The recharge standard however still applies and treated stormwater may be considered suitable for infiltration by these other authorities in some cases. DEM would request that applicants demonstrate compliance with this standard or present evidence as to why it cannot be achieved.

It is stated that Infiltration cannot be used where it may cause "water problems...to downgradient properties" What criteria are to be used to determine the potential for this to occur? Aren't the other Required Elements (i.e.: <15% slope requirement) designed to prevent this type of situation?

Response: This criterion requires best professional judgment. If the site has strong evidence of high groundwater and nearby existing homes all have sump pumps, a designer can assume there is potential for water problems to down-gradient properties. This broad discretion exists based on experience of regulators who have observed questionable designs in the past and to protect the public interest.

5.4 - Why is there no Summary table for the Permeable Paving section as there is for the others?

Response: The text has been revised to include this provision.

5.4.1 - Registered Soil Scientists should be permitted to provide verification of the SHGT.

Response: The text has been revised to reference either a Class IV Soil Evaluator or a Professional Engineer as the required minimum professional qualifications for this topic and mirrors current practice and policy.

The term “non-critical surface waters” requires definition in the manual.

Response: The text has been revised to include this provision.

5.4.4 – Is there an approved method for evaluating compaction?

Response: The text has been revised to clarify this issue. However, designers will need address this issue on a case-by-case basis depending on load bearing requirements and sub-surface conditions.

5.8.1 – Why are all roads grouped together? It would seem reasonable to expect that different practices would be more suited to urban roads versus rural roads.

Response: The BMP selection matrix is included to help designers in the selection process, and not every site or land use condition is included. Designers will have to exercise professional judgment when looking at all the factors for a particular situation.

6.3.2 - Where will information be available to determine if a specific area has been approved as a filter strip? How will a future perspective buyer of such a property be made aware that there are restrictions on the use of the property (ie: will any instrument be required to be recorded on land evidence records)?

Response: Filter strips will be part of an overall approved site plan and the permit will be recorded in the local land evidence records. If the filter strip serves more than one parcel, an easement will need to be shown that prescribes the perpetual right to maintain the filter strip., which would legally prevent disturbance to the filter strip without a permit revision. If the filter strip serves an individual parcel, the agency would need to rely on the approved Stormwater Management Plan as legal protection. Any subsequent modification without a permit would be a violation and subject to applicable enforcement action.

6.3.3 – Requires corrective action with the buffer of a filter strip. The term “buffer” as it applies to filter strips requires definition in the manual.

Response: Terminology has been revised such that there is no confusion with the regulated buffer from a wetland resource and a filter strip.

6.5.1 - Why is the contributing area used as the limiting factor for deep sump basins, rather than flow rates? If there is an area larger that 0.25 acres that will not exceed 3 cfs for the 10 year storm what is the reason that it should not be directed to a single deep sump basin?

Response: The text has been revised to increase the contributing area to 0.5 acres.

6.5.3 – The requirement to inspect catch basins 4 times a year is excessive and burdensome for most applicants. The RIPDES General Permit for Small MS4’s only requires an annual inspection of catch basins, and allows an exemption to even this frequency for RIDOT , when the system is located outside of a UA or CDPA (See RIPDES Gen. Perm. For MS4’s Section IV.B.6.b.1.iii).

Response: The operation and maintenance provisions have been carefully evaluated in both Chapter Five and Appendix E and several revisions have been made that address the frequency of required or recommended inspections. Maintenance requirements are applicable for deep sump catch basins that were specifically designed as pretreatment practices for downstream BMPs.

Why is the MADEP Standard Detail for deep sump basins used in the Manual. It is recommended that the RIDOT Standard Detail be incorporated, as this is the detail used most frequently in this State. If there are concerns with the RIDOT Detail, this office should be contacted to discuss revisions to comply with the manual.

Response: We are not aware that RIDOT has a standard detail that complies with the requirements in this section. Once RIDOT adopts a standard deep sump detail that meets these requirements, we will incorporate it.

Appendix A

A.1.1 – Registered CPESC and RLA should be adequate as contact for Stormwater Plan, in accordance with the RIPDES Program requirements.

Response: The text was not revised. However, the RIPDES program allowances still apply.

A.1.2 – There is no requirement for proposed contours to be included on plans.

Response: A requirement for proposed contours has been added.

The *Guidance for Preparation of Subwatershed Maps* should be included in the manual to avoid conflicts if other agencies besides RIDEM develop different guidelines. The maximum scale requirement for these maps should be clearly stated to avoid confusion regarding required scale.

Response: Several revisions have been made to Appendix K: Hydrologic and Hydraulic Modeling Guidance. Note that the information in this appendix is considered guidance. The recommended scales for these maps are provided.

There is a requirement to include perennial and intermittent streams and ASSF's on the plans, however these terms are not defined in the manual.

Response: A definitions for ASSFs has been added to the glossary and references the State Wetlands Act. Perennial and intermittent streams have common use definitions that are not unique to the manual and therefore have not been added to the Glossary.

Registered Soil Scientists should be permitted to provide soils information from test pits or borings.

Response: Either a Class IV Soil Evaluator or a Professional Engineer has the required minimum professional qualifications for this topic and mirrors current policy.

Not all projects including stormwater management facilities will be required to undergo public notice (PN), therefore the required 8.5 X 11 plan should be conditional, based on the determination of the need for PN. It is often a burdensome and expensive drafting exercise to develop these reduced scale plans and make all of the text legible at the reduced size.

Response: The words "as applicable" have been added to this requirement.

A.1.3 – What actions will be adequate to satisfy the requirement in MS#9 to "Demonstrate that there are no illicit discharges to the stormwater management system"? How will physically interconnected systems be handled? If an illicit discharge is detected, will RIDEM enforce it's removal? Once the illicit discharge is referred to RIDEM for enforcement, can the applicant proceed with the design of the system based on the anticipated conditions following disconnection of the illicit connection?

Response: The text for this item has been revised to address this provision.

MS #10 requires the identification of staging and stockpiling areas. It is not always possible for RIDOT to supply this information, as it is often left up to the contractor to secure such areas after award of the contract, and often they are outside of property that is owned or controlled by RIDOT. One approach we have used in these situations is to develop constraint mapping showing the contractor the areas within RIDOT control that are acceptable and unacceptable for such activities.

Response: The provision to adequately address construction site erosion control measures will be reviewed as part of the permit review process. Appropriate information will be necessary to establish that construction site runoff will not cause or contribute to water quality problems. The site-specific nature and construction bidding constraints will be evaluated on a case-by-case basis.

A.1.5 – It is assumed that the only permits and legal agreements required to be listed are those relating to stormwater and to the maintenance of the proposed stormwater management system.

Response: Yes. The words "related to stormwater" have been added to this requirement.

Appendix B

B.6 – Table used to present acceptable grass species is from a document prepared for use in Virginia. What sources were used to verify that these species are appropriate for use in Rhode Island? At least two of the species included in this section are listed as unacceptable or invasive by ACOE New England District in their *Guidance for New England District Mitigation Plan Checklist.*

Response: The text has been revised to address this comment.

B.9 – No fewer than 6 of the species listed in this section are included on the list of unacceptable or invasive plants in the ACOE New England District in their *Guidance for New England District Mitigation Plan Checklist*

Response: The table has been revised to address this comment.

The CRMC URI Interactive Plant Guide is cited as a resource for additional acceptable plant species. While this is a useful resource, it was developed specifically for use in coastal areas. Are there other/additional plants that would be acceptable for use in the inland portions of the state?

Response: Appendix B provide guidance across a range of BMPs and planting zones and contains several lists of species appropriate for planting within and around stormwater management practices.

Appendix C

C.6.5 – ASSF's (which are not defined in the manual) are regulated wetlands in Rhode Island. Alteration of these areas requires a wetland permit. This should be clearly stated in this section of the appendix, as the use of regulated wetlands has been discouraged in other sections and is seemingly encouraged here.

Response: The text has been revised to include the suggested edit.

Appendix D

It is noted that this section is stamped "Revision Pending". It is recommended that whatever revisions are forthcoming to this Appendix, the inclusion of at least one linear project example be added to the document. This should include specific examples of how the LID techniques, determination of downstream analysis requirement, QPA's (with contributing areas of no more than 1000 sq ft each), and deep sump catch basin configurations are envisioned to be incorporated into roadway redevelopment projects (ie: a full depth road reconstruction project).

Response: Appendix D has been revised to include a comprehensive case study that describes the LID site planning and design process, documents the management criteria, and steps though the design of bioretention, dry

swales, and an extended detention facility. The incorporation of specific design examples for every type of development was deemed to be beyond the scope of the manual. DEM is willing to meet with DOT to pilot review a project where these elements can be explored in detail prior to detailed design. This was deemed helpful with the RT 138 rehabilitation project.

Appendix E

While it is understood that many stormwater facilities will require a registered engineer to review and stamp the design plans and any structural repairs to the system, it is unreasonable to require that Registered Engineers perform or oversee maintenance inspections. If RIDEM is going to let homeowners "self certify" their compliance with wetland permits, how can this requirement be justified? Anyone with a reasonable level of experience working on a roadway maintenance crew and familiarity with reading a site plan is capable of performing these tasks for a RIDOT stormwater facility.

Response: We agree. The text has been revised to address this issue (Refer to Page E-1 under the heading "Inspections").

Throughout this appendix, there is a requirement to include inspection of every stormwater management system after every storm even which equals or exceeds the 1-year storm event. While it may be reasonable to require this type if inspection schedule for a limited period following construction (ie: until stabilization is documented), this is an unfeasible and unacceptable requirement for RIDOT. There simply are not the resources within the Department to mobilize the number of (non-existent) staff to inspect the hundreds of structures owned by RIDOT every time this threshold is exceeded. This requirement also exceeds the inspection frequency typically required by RIDEM's and CRMC's Wetland Programs as well as the RIDEM Water Quality Certification and RIPDES Programs.

Response: The operation and maintenance provisions have been carefully evaluated in both Chapter Five and Appendix E, and several revisions have been made that address the frequency of required or recommended inspections and maintenance operations.

There are also several times that a requirement is given to mow 4 times annually around various practices. This required frequency is excessive and unacceptable to RIDOT. The State does not have the personnel or the equipment available to meet this schedule. An annual mowing is adequate to prevent the establishment of woody vegetation. If RIDEM and/or CRMC have the capacity to support the FTE's (and/or seasonal employees) and fund the acquisition of the equipment to make such a schedule feasible, RIDOT will be pleased to discuss housing and maintaining the equipment.

Response: The operation and maintenance provisions have been carefully evaluated in both Chapter Five and Appendix E, and several revisions have been made that address the frequency of required or recommended inspections. The maintenance requirements for grass channels and swales have been revised to address this comment.

E.1.3 – The requirement to vacuum permeable pavement every 3 months is excessive. The University of New Hampshire Stormwater Center, on their website, recommends a minimum of 2 times annually.

Response: The recommended (but not required) frequency to vacuum permeable pavement has been retained as once every 3 months to maintain the long-term permeability.

E.1.5 – What methods are permitted for the "removal" of burrowing animals?

Response: Maintenance personnel should apply best professional judgment in management of wildlife, such as contacting the appropriate local and/or State animal control authorities.

There is a statement that sediment should be removed from the bottom of the swale. Is there a maximum depth or volume of sediment above which removal is required?

Response: Refer to Chapter 5.7.6 where required maintenance elements are included.

Appendix F

Various sections reference NRCS and other specifications. RIDOT specifications and standards will govern on RIDOT projects. It is requested that RIDOT Specifications be referenced in this section. If there are any concerns with the existing specifications, RIDOT is willing to discuss revisions to comply with the intent of the manual.

Response: Appendix F has been carefully reviewed for compliance with RIDOT Standard Specifications. In several areas, RIDOT Specifications have been referenced where appropriate.

Various sections refer to approved products for use as filter fabrics. Was the RIDOT Approved Products list consulted in developing the "partial listing of available filter fabrics" that meet the Class "C" filter fabric requirements for rip-rap? This would be useful as the products that are included on the RIDOT Approved list are most likely to be available locally. What "Specifier's Guide" was consulted for this information (see section F.1.4.3)? No listing was apparent in the references? Is there no more recent reference available other than a 1997 product listing?

Response: Appendix F has been carefully reviewed for compliance with RIDOT Standard Specification, but identification of Approved Products lists was deemed beyond the scope of the manual. Note that clarifying language has been provided for the purpose and intent of Appendix F; refer to the introductory text on page F-1.

F.1.4.3 – Is there a reason that bedding stone is not indicated for use with riprap and filter fabric? The use of bedding stone typically extends the life of the filter fabric.

Response: Bedding stone is not prohibited for use with riprap and certainly can be specified.

F.1.7 – States that a Dam O&M plan is required for all basins. Is this the intent of this section, or is this requirement meant to apply only to those basins which meet the definition of significant or high-hazard dams, as stated in Section 5.2.1?

Response: The text has been modified to clarify the requirement for development of maintenance plans for earthen embankments by referencing the Dam Safety Rules and Regulations.

It is stated that "written records of maintenance and major repairs need to be retained in a file." For what period of time are records required to be retained?

Response: Unless otherwise directed by specific regulation or permit/assent condition, maintenance records should be maintained for at least seven (7) years. DEM/CRMC will clarify this in the manual.

Item 3 states that a PE must certify compaction for "all stormwater management facilities". It is assumed that this refers only to WVTS's as that is the subject of this section.

Response: The text has been clarified to address this issue.

F.2.1 – This section makes various references to Figure 5-3, however, the terms used in the text are not included on the diagram. It would be helpful to the reader if the labels were provided.

Response: Some revisions have been made to Figure 5-3 to help clarify the different components identified on the diagram.

It is stated that the risers must have a maximum spacing of 15 feet. 15 feet from what? There are no minimum distances indicated on Figure 5-3. Are they supposed to be 15 feet from each other? The inlet pipe? The wall of the cell? The riser in the next cell? The outlet?

Response: The text has been modified to clarify this issue.

The Appendix states that the vertical cleanouts are to be perforated in the stone layer, however they are pictured as solid in Figure 5-3.

Response: The Figure is an illustration of an example Gravel WVTS, and the level of detail shown on the figure may not always match the written text. Refer to the text in Section 1.2 on page 1.4, and page 5.1, regarding this topic.

The recommended construction described for the berms, described in the Appendix, is not depicted on Figure 5-3.

Response: The Figure is an illustration of an example Gravel WVTS, and the level of detail shown on the figure may not always match the written text. Refer to the text in Section 1.2 on page 1.4, and page 5.1, regarding this topic.

Appendix G

G.4.1 - This section points out that street sweepings may be regulated as hazardous waste. Earlier sections of the manual have indicated that sediment removed from structural practices "that do not receive runoff from designated LUHPPL are generally not considered toxic or hazardous material, and can be safely disposed by either land application or land filling." (see 5.2.6) It appears that this contradictory information could pose a problem for the facility owner attempting to properly handle the material.

Response: Text has been added to clarify that only those sweepings from streets and parking lots identified as LUHPPLs would be required to be disposed of as hazardous material.

12. Stormwater Manual Workshop Evaluations - June 4, 2009

Under Draft Manual Comments

1. For infiltration practices, you mentioned stabilizing the site prior to installation of infiltration practices, but I didn't hear anything about protecting the infiltration area from compaction during the construction. Is that part of the manual or are you simply requiring roto-tilling of soil in all cases? 2. How do you prevent developers from "clustering" the entire site? Is there a minimum open space percentage required in the manual for LID? Or is that up to the town?

Response: The manual addresses construction provisions of infiltration practices in Section 5.3 and 5.4 as well as Appendix F. The "clustering" question seems to be more appropriately directed to a local planning board and is beyond the scope of the manual. Chapter 4, Appendix A, and the design example in Appendix D provide guidance on open space provisions and how they relate to compliance with Minimum Standard 1.

Please consider requiring that any determinations made regarding soil characteristics essential to BMP choice and sizing be certified by a licensed soil evaluator

Response: The manual specifies that either a Class IV Soil Evaluator or a Professional Engineer meets the required minimum professional qualifications for this topic.

1. Does the new manual meet the requirements of the Phase II plan for construction and post-construction? 2. Is a 3-foot separation required for an infiltration system that receives rooftop runoff only? Is a UIC permit required for rooftop runoff? 3. If 33 of 39 cities/towns are going to be required to comply/use these practices. Wouldn't it make sense to make this a state-wide manual??

Response: Text has been added to the manual with reference to meeting RIPDES permit requirements (see Section 1.2). The required separation distance to groundwater for infiltration practices can be found in Section 5.3 and 5.4. Permit compliance language has been added to the manual in Section 1.2. The manual is intended to serve multiple parties, refer to Section 1.2.

Show a design example where there are high water tables, C&D soils as these are very typical to RI sites; Q&A periods were not moderated well; questions should be limited to relevant material relating to stormwater manual

Response: Appendix D has been revised to illustrate 3 design examples. Design Example #2, beginning on page D-24, illustrates a site with fill soils and high groundwater.

Under "What We Did Well/Not Well"
How is this going to be enforced? Has RIDEM received funding or added inspectors?

Response: In general, the agencies acknowledge that compliance checks and enforcement of stormwater management plans is lacking. DEM and CRMC has been working on several fronts to address this concern, including development and revision to the MS4 permits and the initiation of a special project to catalogue compliance with stormwater facility construction permit requirements. Training efforts have increased markedly in recent years. In addition, grant monies have been available for stormwater retrofit projects to address discharges that currently have no controls. Anecdotal reports indicate that these efforts have resulted in local communities and some state agencies giving more attention and spending of local dollars to stormwater management. Interest and activities by citizens and no-profit groups have contributed significantly to awareness of stormwater control needs. Unfortunately, little if any new monies are available to expand enforcement efforts. The agencies however are programming their scarce resources towards stormwater issues where possible.

13. Woodard and Curran Comments - June 26, 2009

Woodard & Curran appreciated the opportunity to attend the informational session on June 4, 2009 for the introduction of the Draft Stormwater Design and lnstallation Standards Manual. We found the session to be informative and provided an excellent overview of the proposed changes. We have since reviewed the draft document and offer the following comments for your consideration. Comments are listed below by Section number for your convenient reference.

Section 1.2 - Applicability of the Manual

Please clarify the applicability of the manual regarding when and by whom are designers required to adhere to the standards. Do the standards only applying when permitting through CRMC, DEM or when directed by another permitting authority?

Response: The manual is intended to serve multiple parties and has been clarified; refer to Section 1.2.

Section 3.2.3 - Minimum Standard 3: Water Quality

The water quality volume referenced here and in the glossary is specified as one inch of runoff from impervious surfaces without regard to whether the impervious surface is a roadway or a roof. While studies have shown that

the first inch of runoff is a good representation of the water quality volume for a roadway system, a much smaller volume of water is required to capture the water quality runoff from a roof system. The manual should reflect this difference and define the water quality volume from roof runoff to be something on the order of % inch.

The prescriptive standard of treating one inch of precipitation in a properly designed Best Management Practices (BMP) was established based on analyses performed using an urban runoff model for the Nationwide Urban Runoff Program's NURP 50 particle size distribution, which is typical of highway runoff. The NURP 50 particle size distribution is such that 50% of the particles are retained on the No. 20 sieve and all particles are retained on the No. 200 sieve. It is not characteristic of roof runoff, which typically contains particles in the silt and clay-size range.

Literature consistently reports that the majority of contaminants present in roof runoff are removed within the first 0.10 inch or less of rainfall. A study conducted in 2003 by P.C. Van Metre and B.J. Mahler entitled "The Contribution of Particles Washed from Rooftops to Contaminant Loading to Urban Streams" found there was no difference in suspended sediment concentrations between asphalt and metal rooftop types, and that typically less than 5 percent sand-sized particles were present in the first flush and composite (event-mean) samples. The Van Metre and Mahler study concluded that the great rnajority of particles that are easily mobilized and washed off rooftops during rainfall are removed by the first 2.6 rnm (0.1 inch) of rain or less. Similar results were reported by Forster in 1996 and 1999. And Mason, Ammann, Ulrich, and Sigg in 1999. Therefore, based on the above referenced studies, defining the water quality volume from roof runoff as %-inch of depth would provide greater than 80% solids capture of roof runoff. This is superior to the 80% of solids captured within the 1-inch depth of water quality volume for roadway runoff that was measured by the model used to set this standard.

Response: These comments were carefully evaluated, and it was decided to retain the criterion for water quality as previously written for a number of reasons, including variability in the pollutant load from atmospheric sources depending on the type of pollutant, and the complexity of having multiple criteria for different types of impervious surfaces, among other reasons. However, requirements for residential rooftop runoff infiltration have been reduced in light of some of the considerations raised. (See Section 5.3.1)

Section 3.2.4 - Minimum Standard 4: Conveyance and Natural Channel Protection

This Section excludes the use of the Rational Method to estimate the peak discharge rate for conveyance systems. Utilizing the Rational Method for pipe conveyance design is a standard engineering practice and provides reliable results when applied to small, developed watersheds and particularly to roadway drainage design. The engineer should be able to decide which method to employ based on project conditions. Why has it been excluded? We understand your rationale for not using the Rational Method for determining the water quality volume; however, the same reasoning does not apply to conveyance systems for larger storm events.

Response: Conveyance systems may be designed using the Rational Formula (refer to Table 3-8).

Section 4.6.1 .I - Minimum Criteria for Stormwater Credit

All soil suitability testing and evaluation should be allowed to be conducted by a professional engineer. Several sections of the document are inconsistent as to the requirements of the professional conducting soil evaluations and testing. This Section requires a Soil Evaluator to confirm depth to groundwater for HSG "A" and "B" soils, but requires a Registered Professional Engineer to evaluate water table depth for HSG "C" soils. Section 5.3.1 states that soil testing must be conducted by a Soil Evaluator or a P.E., however, Appendix H states that all testing shall be completed by a Soil Evaluator. Both soil evaluators and civil engineers are educated in soil properties, however, in-place permeability testing is typically performed under the direction of a geotechnical engineer.

Response: The manual specifies that either a Class IV Soil Evaluator or a Professional Engineer meets the required minimum professional qualifications for this topic.

Section 5.4 - Permeable Paving

The multilayer system that is required by this section and Appendix F for porous asphalt is not necessary for many applications. The designer should be allowed to design the system based on site specific conditions. Many of the pavement systems installed in conjunction with the UNH Stormwater Center have been successfully operating with a more simplified cross section -for example, without a choker course, with a combination filter and reservoir course, or other more simplified designs. If the calculations supporting the porous pavement system design demonstrate that it will operate effectively, the Owner of a porous pavement system should not be required to spend additional funds to install the more complex system prescribed by Appendix F.

Response: The choker course illustrated in Figure 5-11 has been referenced as an option. The Figures of stormwater practices in the manual are illustrations and may not always match the written text. Refer to the text in Section 1.2 on page 1.4, as well as page 5.1, regarding this topic.

Section 5.5 - Pollutant Removal

Table 5-7 does not include pollutant removal efficiencies associated with Water Quality BMPs for bacteria. How do RIDEM and CRMC evaluate the capability of each BMP option achieve the required 90% reduction requirement for bacteria per Minimum Standard 3?

Response: The manual uses the presumptive approach that acceptable BMPs designed per the manual meet Standard 3. Minimum Standard 3 has been revised to reflect changes in the proposed criterion that reflects a balanced review and assessment of prior monitoring results, coupled with the broad management goals identified by DEM and CRMC in response to "The Smart Development for a Cleaner Bay Act of 2007." In addition, bacteria removal efficiencies have been added to this table, but moved to the pollutant loading analysis section in Appendix H.

Section 5.8.5 - Step 5 - Pollutant Removal

We noticed that the pollutant removal efficiency for bacteria was not addressed in Table 5-7 although 90% removal of bacteria is required. Why is bacteria not addressed in this matrix?

Response: see response above.

General Comment

We expect that many questions will arise as we apply the design steps to a particular project. Will RIDEM have a Help Center focused on assisting designers when this manual first becomes effective?

Response: This is an excellent suggestion and will be considered. It is the intent to establish a standing stormwater subcommittee to maintain a dialogue with the building community concerning the application of the manual. This committee will include non-agency staff, including designers and builders. The objectives of the committee will include ensuring greater predictability in the permitting process, refinements to the manual and procedures where needed, and consistency among project reviews.

In Summary, we find the manual to be comprehensive. The project examples in the Appendices will help reduce the learning curve for stormwater designers and engineers. We congratulate you on the organization and presentation of the manual.

If you would like to discuss any of our comments, please feel free to call either of the undersigned at (401)-273-1007. Also, we are interesting in participating as a representative from the engineering community in the proposed stakeholder review committee as mentioned in the information session.

Sincerely,
WOODARD & CURRAN INC.

14. Crossman Engineering Comments – November 4, 2009

We appreciate the willingness of your department to accept additional comments on the Draft Stormwater Manual and have prepared the following listing of comments/questions for the author's consideration. As you are aware, the document represents a significant change to current design methods and our comments are intended to assist in refining the draft document into a useful tool.

1. Introduction, Section 1.1: The second paragraph states that advances since the 1993 Manual now demand attention to both water quantity and quality. It should be recognized that the 1993 Manual notes the same concerns. The new manual represents a refined approach to addressing an issue recognized in the original manual.

Response: No response necessary.

2. Introduction, Section 1.1: The third paragraph states that RI General Laws require the new manual to "Maintain groundwater recharge to predevelopment levels". We believe that the general laws actually state that the manual must "Maintain pre-development groundwater recharge and infiltration on site to the maximum extent practicable." The language of item (a) should be edited to reflect the actual language.

Response: The text has been revised to insert the actually wording from The Smart Development for a Cleaner Bay Act of 2007.

3. Introduction, Section 1.1: It is suggested to reword item (b) to state that "Post development peak discharge rates are not to exceed pre-development peak discharge rates".

Response: See response above.

4. **General:** Throughout the Manual, specific engineering data, methods, assumptions and design factors are mandated. Do the authors certify to the accuracy and use of the formulas and data for design and maintain any responsibility for its use? We recommend that design engineers be allowed to utilize all accepted engineering methods for design and not be limited to the author's preference.

Response: Clarifying text has been added to Section 1.2 on page 1.4 regarding designer responsibilities and limitations presented by the manual authors. Designers can certainly use a range of tools and models to perform the required calculations except where specifically prohibited.

5. General: Guidelines for assessing conformance to "maximum extent practicable" are recommended to minimize subjective decisions by designers and reviewers.

Response: It is the intent to establish a standing stormwater subcommittee to maintain a dialogue with the building community concerning the application of the manual and the term MEP. This committee will include non-agency staff, including designers and builders. The objectives of the committee will include ensuring greater predictability in the permitting process, refinements to the manual and procedures where needed, and consistency among project reviews. A definition of maximum extent practicable is provided in the footnote on Page 1-2.

6. Introduction, Section 1.2: The first paragraph states that the standards should be applied to single family lots of record. This requirement should not be applicable if the lot of record is within a development with a previously permitted stormwater management system.

Response: The applicability section of the manual has been carefully reviewed and revised in some places with specific reference to permit applicability. Most single family lots within developed plats in DEM jurisdiction are exempt of stormwater permitting. Note that for multi-family lots, lot development may qualify as an "infill" lot (see section 3.2.6) and be relieved of some of the minimum standards.

7. Introduction, Section 1.4: Will the Manual supersede local and other agency ordinances? Are the requirements of the Manual applicable in areas outside of RIDEM and CRMC jurisdiction?

Response: The applicability section of the manual has been carefully reviewed and revised in some places with specific reference to permit applicability. Generally, the manual will need to be applied in conjunction with local ordinance. Also, local ordinance may be expected to change overtime, and some or all elements of the manual could be adopted by local ordinance.

8. Introduction, Section 1.4: To what degree does a homeowner, municipality, state agency, business, developer, etc. need to justify their proposed limit of disturbance and impervious area? For example, on RIDOT Projects lane widths, shoulder widths, side slopes, and the use of retaining walls impact the limit of disturbance but are critical for vehicular safety. Also, a developer may propose additional parking spaces above the zoning requirements to satisfy the anticipated needs of a prospective tenant.

Response: The Draft Manual has been revised in several places to provide increased flexibility in the selection and application of low impact development (LID) strategies and of several of the stormwater management practices. Applicants will be required to complete the Stormwater Management Checklist in Appendix A documenting compliance with the 11 Minimum Standards.

9. Introduction, Section 1.4, Step 6: We are concerned with the following statement in Standard 4; "if stormwater discharge is to a coldwater fish habitat, surface detention is prohibited". Instead of eliminating a potential component of a treatment train, discharge requirements should be stated. Also, we recommend that all coldwater fish habitats as of the date of the Manual be identified within the Manual.

Response: The text has been revised to address this comment. Surface detention is allowed with special conditions, including infiltration of the WQv.

10. Introduction, Section 1.4, Step 6, Standard 6: Frequently, roadway safety, durability and integrity depend upon the replacement of varying depths of the pavement structure. The depths to be replaced will vary depending upon the site specific conditions and many include the surface, binder, base or subbase materials. This type of maintenance or reconstruction where no increased impervious areas or increased roadway capacity are proposed should not be classified as redevelopment but classified as maintenance. If BMPs were installed on a Maintenance project, the installation should count as a BMP credit for other projects which the owner may have within the same watershed.

Response: The Redevelopment criterion is clearly defined in Section 3.2.6. Roadway improvement projects that do not increase pavement width and do not disturb an erodable surface generally will not require an upgrade to stormwater management systems. Exceptions exist, including areas where a TMDL requires added water quality treatment to roadway runoff to achieve standards in impaired waters.

11. Introduction, Section 1.4, Step 6, Standard 7: A statement is made that "Designers must implement pollution prevention practices.. . . . . " The designer frequently does not control the implementation stage; therefore this statement as written does not appear appropriate.

Response: This portion is written for designers, who are expected to be responsible for preparing designs that meet the manual requirements. In this case, it is understood that implementation will be by others, but in accordance with procedures developed or written by designers. Refer to Minimum Standard 7 in Section 3.2.7 for what is required at the design/permit stage.

12. Chapter 2.0: The first paragraph states that prior to 1993, stormwater was routed to the nearest discharge point. This implication is inaccurate. Stormwater volume, flow and quality have been addressed by engineers, municipalities and state agencies for greater than 25 years. The new Manual represents a different naturalized approach to addressing a long recognized engineering issue.

Response: The text has been revised to address this concern.

13. Chapter 3.0, Table 3-1, Design Rainfall: The 24 hour rainfall amounts identified in Table 3-1 represent a significant increase over the currently used values. A cursory review of the available Atlas and historical daily rainfall from TF Green does not appear to indicate significant increases. For example, the draft Manual has a 30% increase in 100 year rainfall in southern counties (7.7" to 9.3"). The use of larger rainfall events creates a significant increase in infrastructure costs and can overstate existing conditions and allowable discharges. Are the amended rainfall amounts actual events or the result of a statistical projection by the authors?

Response: The data in Table 3-1 represents between 34 and 115 years of precipitation data through 2008 and represents the actual precipitation values for gage stations throughout Rhode Island. Protection from flooding effects from the 100 year storm event is required by law. The records show a demonstrable increase in the average rainfall depth for this frequency event. The widespread catastrophic flood event that occurred March 29 to April 1, 2010 only confirms the importance of updating this criterion.

14. Chapter 3.0, Section 3.2.2: Standard 2 states that groundwater dewatering is not allowed. Does this refer to temporary and permanent installations? This requirement is not always feasible or necessary. Dewatering can be necessary for proper construction of subsurface structures, therefore should not be excluded. Also, the author of the Manual must recognize that isolated dewatering at some site locations may have no impact on wetland systems or regional hydrology. Site specific dewatering which is properly designed will only impact groundwater levels within a specific radius and may have no impact to wetland systems. Without isolated dewatering, the feasibility of some projects will be eliminated. Therefore, the exclusion should be reconsidered.

Response: The language in Standard 2 has been revised to remove the absolute prohibition on groundwater dewatering and language has been added that the reviewing agencies may require a water budget analysis where dewatering is proposed.

15. Chapter 3.0, Section 3.2.3: This section states that 90% of TSS, 90% of bacteria, and either 40% of TP (freshwater) or 30% TN (saltwater) are required. The wording should be refined to clarify that this is the theoretical removal of the constituent content. For example, it is understood that the intent of the Manual is to establish design standards based upon most current accepted practice for pollutant removal. It is not believed that the program proposes to monitor influent and effluent concentrations. It is also not believed that the authors are certifying that the methods identified within the manual will achieve these removal rates for each site and runoff condition.

Response: Minimum Standard 3 has been revised to reflect changes in the proposed criterion that reflect a balanced review and assessment of prior monitoring results, coupled with the broad management goals identified by DEM and CRMC in response to "The Smart Development for a Cleaner Bay Act of 2007." The applicable revised language is as follows: *"To provide adequate treatment of stormwater, the WQ_v must be treated by at least one of the structural BMPs listed in Chapter Five at each location where a discharge of stormwater will occur. Structural BMPs are generally required to achieve the following minimum average pollutant removal*

efficiencies: 85% removal of total suspended solids (TSS), 60% removal of pathogens, 30% removal of total phosphorus (TP) for discharges to freshwater systems, and 30% removal of total nitrogen (TN) for discharges to saltwater or tidal systems. Based upon results published in the scientific literature, the structural BMPs listed in Chapter Five will meet these standards when properly designed, constructed, and maintained. Pretreatment is required for water quality treatment practices where specified in the design guidelines within Chapter Five."

16. Chapter 3.0, Section 3.2.4: The manual should clarify Standard 4, Conveyance. For example, the manual requires storm flow mitigation for the 100 Year storm event, but Standard 4 only appears to require conveyance capacity of the 10 Year storm event. Later in Standard 5, it is stated that conveyance of the 100 Year storm must be demonstrated. Therefore, it would be appropriate to clarify the intent of Standard 4. Also, it would be beneficial if current "cold water fisheries" and related requirements were provided in the manual.

Response: The language in Standard 5 addresses the issue of conveyance of the 100-year storm to a facility. Standard 4 is self explanatory. The fishery habitat listings can be found in DEM's Water Quality Regulations, Appendix A. Found through the following link: http://www.dem.ri.gov/pubs/regs/regs/water/h20q09a.pdf

17. Chapter 3.0, Section 3.2.6: Frequently, roadway safety, durability and integrity depend upon the replacement of varying depths of the pavement structure. The depths to be replaced will vary depending upon the site specific conditions and may include the surface, binder, base or subbase materials. This type of maintenance or reconstruction where no increased impervious areas are proposed should not be classified as redevelopment but classified as maintenance. The pre-maintenance condition represents an existing hydrologic condition and should be excluded from conformance to new standards. If BMPs are deemed to be feasible by the owner and installed, the installation of the BMPs should count as a BMP credit for other projects which the owner may have within the same watershed.

Response: The Redevelopment criterion is clearly defined in Section 3.2.6. Roadway improvement projects that do not increase pavement width and do not disturb an erodable surface generally will not require an upgrade to stormwater management systems. Exceptions exist, including areas where a TMDL requires added water quality treatment to roadway runoff to achieve standards in impaired waters.

The use of 10,000 sf (for projects of all magnitudes) as the definition of a Redevelopment Project is questioned. A 10,000 sf disturbance at a 0.5 acre site is reasonably redevelopment, but 10,000 sf disturbance of a 10 acre site is probably a routine maintenance undertaking. We recommend a varying threshold based upon a site's size, the project's magnitude in relation to the site and the net change in imperviousness.

Response: The Redevelopment criterion is clearly defined in Section 3.2.6. The 10,000 sf threshold of disturbance was carefully selected based on a balance of objectives. We weighed the practices and experiences in other jurisdictions, the need to maintain incentives for development of brownsfields, and the need to restore water quality in receiving waters in developed areas. The redevelopment requirements vary somewhat depending on the characteristics of the remaining portions of the site.

Portions of the Manual, such as Section 3.2.6 Standard 6 Redevelopment Projects, have an underlying assumption that increasing infiltration volumes above current conditions will have positive . In urban settings, increasing infiltration volumes could create negative groundwater impacts to surrounding infrastructure and environment.

Response: The Recharge Criterion has exceptions where appropriate (see Section 3.2.2) that take into account these potential negative impacts.

Roadway projects typically receive runoff from adjacent privately owned land and local streets. The Manual is not clear if the computation of the existing impervious area is based upon the roadway drainage system's watershed, the entirety of the road length or the road project work area. The computation of the existing impervious percentage for roadway projects should be limited to the work areal project limits.

Response: Specific reference is made to how to accommodate off-site runoff in Sections 3.3.3, 3.3.4 and 3.3.5.

Do the Redevelopment requirements apply to projects which occur beyond RIDEM and CRMC regulatory limits when there is no alteration of runoff conditions from a site?

Response: This appears to be a question related to jurisdictional limits and whether a permit is required. Text related to the applicability of the manual can be found in Section 1.2. In brief, the redevelopment requirements apply where a local or state permitting authority requires application of the manual.

18. Chapter 3.0, Section 3.2.8: Table 3-3 within this section lists "allowable" BMPs for LUHPPLs. Is this intended to be the sole allowable list of BMPs or recommended BMPs? Numerous other BMPs can appropriately be utilized; therefore we do not recommend a limitation.

Response: Table 3.3 lists the acceptable BMPs meeting Standard 3 for LUHPPLs. Other practices may be used for pretreatment as appropriate.

19. Chapter 3.0, Section 3.3.2: The manual provides specific Recharge Factors (based upon the soil group) that must be used by the designer. The actual recharge is not solely dependent upon the soil group. Slopes, ground cover, vegetation, upper soil layers, soil compaction, past urbanization, etc. are some of the many factors which influence the existing recharge volumes. The design engineer should be allowed more flexibility to account for site specific existing conditions.

Response: The criterion was developed as a consistent way to calculate a minimum recharge rate to offset the change in hydrology associated with impervious cover. It is recognized that other factors contribute to recharge, but it was deemed unmanageable and impracticable to have a criterion that would address the full range of variability.

20. Chapter 3.0, Section 3.3.3: The Water Quality Volume analysis has two computational steps: the runoff from the impervious areas and the minimum 0.2" runoff over the entire disturbed area. Is the intent to require that all runoff within a project disturbance limit (pervious and impervious) be conveyed into a treatment system? If so, this requirement does not appear to be warranted to provide environmental protection.

Response: The criterion does not require all runoff from pervious surface to be conveyed to a treatment system. Applicants can meet the criterion by several means, including treatment by an acceptable practice that meets Minimum Standard 3 or through the Stormwater Credit (see Section 4.6).

21. Chapter 3.0, Section 3.3.3.1: Since rooftop runoff (excluding rooftops of LUHPPLs) typically does not include the same contaminants as pavement runoff, we question if the WQV calculation needs to include rooftops in a manner equivalent to paved surfaces.

Response: The criterion for water quality as previously written has been retained for a number of reasons, including variability in the pollutant load from atmospheric sources depending on the type of pollutant, and the complexity of having multiple criteria for different types of impervious surfaces, among other reasons. However, requirements for residential rooftop runoff infiltration have been reduced in light of some of the considerations raised.

Table 3-6 within this section lists "allowable" BMPs for water quality treatment. Is this intended as the sole allowable list of BMPs or recommended BMPs? Numerous other BMPs can appropriately be utilized; therefore we do not recommend a limitation. The manual expresses a bias away from proprietary or swirl type systems. The author should recognize that these systems do offer a degree of treatment and that in many situations, such as

redevelopment, urban settings and roadway projects, these systems may be the only viable alternative. Therefore it would be in the environment's best interest to address these systems within the Manual.

Response: Minimum Standard 3 has been revised to reflect changes in the proposed criterion that reflect a balanced review and assessment of prior monitoring results, coupled with the broad management goals identified by DEM and CRMC in response to "The Smart Development for a Cleaner Bay Act of 2007." Based upon results published in the scientific literature, the structural BMPs listed in Chapter Five will meet the standard when properly designed, constructed, and maintained. Pretreatment is required for water quality treatment practices where specified in the design guidelines within Chapter Five. Other practices have been referenced in Chapters Six and Seven and may be used in retrofit situations, depending on actual permit requirements (refer to Appendix C).

A footnote to Table 3-6 (and Table 5- 1) states that the bottom of the infiltration practices must be in the natural soil profile. Due to site limitations it may be necessary to place an infiltration system in fill and special design of the underlying materials will be necessary to ensure infiltration. If properly designed, this system can be effective and should not be excluded as an option.

Response: Several revisions have been made to the infiltration practice criteria; refer to Sections 5.3 and 5.4 related to separation distance to groundwater, whether practices may be constructed in fill, whether a practice will be designed to meet Minimum Standard 3, and separation distances, among other revisions.

22. Chapter 3.0, Section 3.3.3.2: The requirement that the Water Quality Flow must be based solely upon the modified curve number method is a subjective conclusion. Licensed engineers should be allowed to utilize all acceptable practices including the Rational Method. The modified CN method is no more reliable than the designer's assumptions and calculations and may be no more accurate than the Rational Method. Also, if the manual provides an equation, such as the Modified CN calculation, the source should be stated and the author should clarify his/her and RIDEM's responsibility for its accuracy.

Response: The required methodology is based on a design presumption that to meet minimum Standard 3, the runoff volume from the 1.2" precipitation event over the impervious surfaces must be diverted to an acceptable stormwater treatment practice. The requirement to calculate the water quality flow using the modified curve number is based on significant research and understanding of how the runoff coefficient is not just a function of land use, land cover, slope and soil type, but also of rainfall intensity. The Rational Formula does not contain provisions for adjusting runoff coefficients for variable rainfall intensity, to our knowledge, nor are there intensity/duration/frequency curves for the 1.2" – 24 hour (type III) storm.

23. Chapter 3.0, Section 3.3.4: Prior to commenting on the appropriateness of the 200' setback for the use of surface detention within watersheds draining to cold water fisheries, please provide a listing of the watersheds with this requirement. We also question the need to limit the discharge through an underdrained gravel trench.

Response: The fishery habitat listings can be found in DEM's Water Quality Regulations, Appendix A. Found through the following link: http://www.dem.ri.gov/pubs/regs/regs/water/h20q09a.pdf. The gravel trench discharge system was developed to address the potential thermal impacts from warm water discharges from surface detention practices.

The manual again limits the engineer's ability to use widely accepted methods for determining peak discharge rates, such as the Rational Method. The manual should not be used by the author to eliminate proven engineering methods.

Response: Compliance with Minimum Standards 4 and 5 requires attenuation of the runoff from the NRCS 24-hour Type III storms. The rational method does not meet performance standards required by these standards.

24. Chapter 3.0, Sections 3.3.4 - 3.3.6: The Manual excludes the need to provide peak flow mitigation for site's which represent less than 5% of a watershed. This will eliminate the need to provide peak flow mitigation for a significant number of projects statewide. For clarification, is this RIDEM's intent and acceptable to the Wetlands Section?

Response: The text has been revised to address this comment. The 5% threshold has been removed, but other protective triggers remain or have been revised. In some cases, peak flow mitigation requirements will change from past practice. In making these refinements, we acknowledge that on-lot peak flow mitigation is unnecessary, or not beneficial, or possibly harmful in certain circumstances.

25. Chapter 3.0, Section 3.3.5 and later Sections: The Manual continues to limit the design engineer's calculation methods. Refer to the comment on Section 3.3.4.

Response: Refer to response above.

26. Chapter 3.0, Section 3.3.5: Bullet 4 of the facility sizing criteria states that an "applicant must also demonstrate safe passage of the 100 Year event, assuming an "ultimate build out" condition upstream. It appears that this requirement would force RIDOT and municipalities to design roadway drainage systems, which receive runoff from adjacent areas, to assume that the entire watersheds are impervious. The apparent meaning could result in unnecessary infrastructure costs. This requirement does not seem necessary for all parties, since RIDOT and municipalities have ordinances which limit the future flows from adjacent parcels.

Response: The criterion requires designers to evaluate spillway systems of detention facilities based on the anticipated ultimate up-gradient flow. It does not require the drainage system that receives the runoff from these areas to be sized for this condition.

27. Chapter 3.0, Section 3.3.6: The author is stating that even with full conformance with LID techniques, downstream protection is not assured and that further downstream analyses may be necessary. We question the thresholds within Table 3-7. Instead of using the impervious site coverage as the main deciding factor, it should be based upon the "net change" in impervious cover. Otherwise, some projects, such as roadway upgrades, will always exceed the minimum threshold unnecessarily.

Response: Table 3-7 has been revised to reference area of disturbance.

Footnote 1 for Table 3-7 references the "disturbed area" contributing to discharge locations. Is this intended to be the total site area of a project including previously developed portions or only the new activity?

Response: See response above.

A Waiver to this requirement should be allowed if the design engineer can demonstrate that the existing and proposed hydrographs as runoff exits their project site are comparable.

Response: The downstream analysis criterion is required for a condition where on-site attenuation may contribute to exacerbated conditions downstream. Where the existing and proposed condition hydrographs are identical in terms of rate, volume and timing, one would presume that no change in land use would have occurred; thus, this condition might warrant a waiver of the requirement.

28. Chapter 3.0, Section 3.3.6: Table **3-8** provides a footnote that states that the Rational formula is not allowed for determining volumes. This exclusion is incorrect and not appropriate. The Modified Rational Method is a long established method which is appropriate for small, urbanized sites and, when properly used, can provide more accurate results than CN methods in some applications.

Response: The Modified Rational Method is not based on an NRCS 24-hour Type III storm as is required by Minimum Standards 4 and 5. The Modified Rational Method produces different volumes of runoff than required by the Standards and is therefore not acceptable as a tool for sizing BMPs.

29. Figure 5-1, Shallow WVTS: Are the items noted on the Figure, such as the waterfowl island, mandatory or recommended? One concern is the creation of a habitat in a WQ BMP which would increase bacteria loadings within the BMP.

Response: The Figures of stormwater practices in the manual are illustrations and may not always match the written text. Refer to the text in Section 1.2 on page 1.4, as well as page 5.1, regarding this topic.

30. Figure 5-2 & **Figure 5-3, Gravel WVTS - Alternatives 1** & **2:** Based upon the direct pipe connection to a subsurface perforated pipe, does this system require a UIC Permit? The figure references VTANR but the meaning of the notation was not evident. When the author proposes a unique installation such as the one in Figure 5-2, specific maintenance programs should be provided. (Generic guidelines are included in the appendix.) Is information available concerning the actual performance and maintenance of similar units?

Response: The Figures of stormwater practices in the manual are illustrations and may not always match the written text. Refer to the text in Section 1.2 on page 1.4, as well as page 5.1, regarding this topic. Refer to Section 1.2 for language regarding permit requirements. The Gravel WVTS will not require a UIC permit. Note that the unit must maintain a permanent pool; movement of stormwater is generally through the BPM to the pipe outlet.

31. Chapter 5.0, Section 5.2.1: The first bullet states that the BMP shall not be installed within wetlands but they may be allowed in buffers. It is our understanding that the RIDEM Wetland Program does not have regulated buffers and that perimeter wetlands and riverbank wetlands fall within the definition of wetlands. Therefore, clarification is recommended.

Response: The text has not been modified. The criterion specifically references “jurisdictional buffers” as those regulated areas beyond the actual resource; these include jurisdictional riverbank and perimeter wetlands.

32. Figure 5-4(A): Based upon the graphic image, a perforated pipe surrounded by stone is depicted to be placed on a pond embankment. If so, the installation could represent a hazard to the stability of the embankment. Is this design also within the jurisdiction of UIC?

Response: The Figures of stormwater practices in the manual are illustrations and may not always match the written text. The subject figure has been clarified to address the concern. The gravel trench outlet occurs after treatment and therefore will not be subject to UIC permitting. Refer to the text in Section 1.2 on page 1.4, as well as page 5.1, regarding this topic. Refer to Section 1.2 for language regarding permit requirements.

33. Chapter 5.0, Section 5.3: It was not clear what the author's recommended offset is between private drinking wells and infiltration systems that collect runoff from public roads.

Response: Several revisions have been made to the infiltration practice criteria; refer to Sections 5.3 and 5.4 related to separation distance to groundwater, whether practices may be constructed in fill, whether a practice will be designed to meet Minimum Standard 3, and separation distances, among other revisions. A new table 5-2 has been added for clarity.

34. Chapter 5.0, Section 5.3: A statement is made that a mounding analysis is required if the infiltration system is designed for a 10 Year storm event or greater and have a separation from the bottom of the system to the seasonal high groundwater level is less than 4'. This statement implies that a mounding analysis is not necessary in other situations and will not always be valid.

Response: The criterion for conducting a mounding analysis was revised (refer to Section 5.3.1). A mounding analysis is not required for infiltration systems treating the WQv only.

35. Chapter 5.0, Section 5.3.1: (First bullet) Alternatives are available which do not warrant the system to be built within the A or B horizons. The use of the term "should" instead of "shall" is recommended. (5" bullet) There are also engineering alternatives which would allow systems to be built in fill, therefore the exclusion of systems in fill is not necessary. **(**8th bullet) The minimum standard of a 25' separation to a private well, especially gravel wells, does not appear to provide adequate protection. (10" bullet) We question the justification of the minimum setback of 25' from an infiltration system to an OWTS. Depending upon the soils and infiltration volumes, 25' could be substandard.

Response: Several revisions have been made to the infiltration practice criteria; refer to Sections 5.3 and 5.4 related to separation distance to groundwater, whether practices may be constructed in fill, whether a practice will be designed to meet Minimum Standard 3, and separation distances, among other revisions.

36. Chapter 5.0, Section 5.3.4: In the infiltration analysis, credit should be allowed for sidewalls.

Response: The text has been revised to allow sidewall credit under specific conditions, refer to Section 5.3.4.

37. Chapter 5.0, Section 5.3.4: The formula for sizing the surface area of infiltration systems assumes a void rate of 40% for gravel fill. The 40% is an extremely optimistic value, unless a specific gradation is mandated. The T value of 2 hours appears to be an arbitrary value which can significantly impact the design outcome. Is the 2 hour time based upon the Type III storm event for an assumed rainfall frequency?

Response: The allowable volume of voids has been reduced to 0.33. The 2-hour duration is derived from the NRCS Unit Hydrograph where the majority of the inflow volume occurs within a 2-hour duration, and thus, the exfiltration time is limited to this value.

38. Chapter 5.0, Section 5.4: The discussion of permeable paving provides runoff coefficients which are used by the Rational Method, a widely accepted engineering method. We concur that the Rational Method is suitable for use in design. Also, refer to comments within Section 5.3 for related computations.

Response: This text has been revised; refer to the revised text in Section 5.4

39. Figure 5-11: The cross-section of porous pavement should be identified as an example and not presented as the sole design option when using porous pavement.

Response: The text has been modified to address the comment.

40. Chapter 5.0, Section 5.4.1: The 7th bullet provides a series of setback distances. The Manual states that the setbacks should be "at least" the value given. To provide useful guidance for regulators and designers, guidance on the applicability of the "at least" criteria should be provided.

Response: This is meant as a minimum setback and has been revised as such.

41. Chapter 5.0, Section 5.7: The Open Channel Wet Swale is to be designed to intercept the groundwater table. This feature appears to contradict the Manual's goals of resource protection.

Response: The wet swale is an acceptable stormwater control practice that complies with the resource project goals of the manual in general, and Minimum Standard 3 in particular.

42. Table 5-7: Section 3.2.3 stated that the measures within Chapter 5 can be assumed to meet the 90% TSS, 90% bacteria and either 40% TP or30% TN, but the BMP Matrix does not address bacteria.

Response: The manual uses the presumptive approach that acceptable BMPs designed per the manual meet Standard 3. Minimum Standard 3 has been revised to reflect changes in the proposed criterion that reflects a balanced review and assessment of prior monitoring results, coupled with the broad management goals identified by DEM and CRMC in response to "The Smart Development for a Cleaner Bay Act of 2007." In addition, removal efficiencies have been added to this table, but moved to the pollutant loading analysis section in Appendix H.

43. Chapter 6.0, Section 6.4.1: The formula for sizing the forebay (As = 5,750 x Q) appears to be based upon the removal of silt, but the text states that the goal is to remove sand particles.

Response: The text has been revised to address the comment.

44. Figure 6.4: The deep sump catch basin detail should be replaced with a RIDOT standard precast structure and related detailing.

Response: We are not aware that RIDOT has a standard detail that complies with the requirements in this section. Once RIDOT adopts a standard deep sump detail that meets these requirements, we will incorporate it.

45. Chapter 6.0, Section 6.6: With the significant volume of studies on proprietary products (pro and con), the author should provide a more objective discussion on proprietary alternatives, their performance and application in retrofits and in a treatment train.

Response: The design criteria for pretreatment proprietary practices has been revised to require 25% TSS removal for the WQ_v or the WQ_f as verified by an independent third party monitoring group. The applicable performance criterion is that a proprietary practice achieves the required TSS removal rating as verified by an independent third party.

46. Chapter 7.0, Section 7.2: The manual states that basins can be designed to intercept the groundwater table. This feature appears to contradict the Manual's goals of resource protection.

Response: The interception of groundwater flow will not, in and of itself, contradict the goals of the manual. BMPs in groundwater for non-LUHPPLs have been a common practice across much of the country for many years. Groundwater flows, compared to surface water runoff volumes and rates, are usually negligible. The exception would be an extremely large surface area facility constructed below groundwater elevation compared to a relatively small drainage area. Some of these types of facilities have been constructed in the southeastern United States in areas of extremely flat terrain and in areas that are arguably wetlands. It is unlikely this condition would exist anywhere in Rhode Island. Thus, the concern of depleting groundwater or short-circuiting treatment does not seem to be an issue. However, if a case arises where the permitting agencies deem dewatering may occur as a consequence of a stormwater practice design, a water budget may be requested (see Section 3.2.2).

47. Chapter 7.0, Section 7.2: The Manual states that all stormwater basins (wet and dry) are not an acceptable option for meeting water quality goals, but Table 5-7 and literature past studies show that they do provide water quality treatment. Therefore, credit should be allowed if they are part of a treatment train and for redevelopment alternatives.

Response: Basins listed in Chapter Seven do not alone meet the performance requirements of Minimum Standard 3. Their pollutant removal performance has been listed in Appendix H. Basins may be used as part of a project where a pollutant loading analysis finds that added treatment is required or where a redevelopment project is proposed (refer to Section 3.2.3 and 3.2.6), but ONLY if designed with water quality components described on page 7.4.

48. Appendix C: The intent of Appendix C should be clarified. It should be stated that the described "how to approach" represents the opinion of the author and is being provided as a reference document only.

Response: The intent of Appendix C is to be a guidance document. The text and title have been revised to address this issue.

49. Appendix E: The intent of Appendix E should be clarified. It should be stated that the described Maintenance represents the opinion of the author and is being provided as a reference document only. A site specific maintenance plan should be prepared for each system.

Response: The intent of Appendix E is to be a guidance document. The text and title have been revised to address this issue.

50. Appendix F: Based upon a cursory review of the specifications, we are concerned that contradictions will exist between proven RIDOT and municipal standards and the Manual's specifications. It also appears that portions of the specifications do not include all proven alternatives. For example, the pipe material specifications do not appear to include all appropriate circular pipe materials. Similar comments could be provided for paving and other sections of the appendices. The appendices do provide valuable information, but the manual was not intended to be an all encompassing reference document for design and construction. Does the author assume responsibility for use of these construction specifications?

Response: Appendix F has been carefully reviewed for compliance with RIDOT Standard Specifications. In several areas, RIDOT Specifications have been referenced where appropriate. The responsibility for construction specifications is not changed.

51. General: Throughout the document environmental limitations are provided which restrict the feasibility of BMP installations. One element which does not appear to be addressed is the potential impact of BMPs on existing infrastructure, such as sewer, water, gas, electric, cable systems, communication systems, etc. The Required Element and Limitation sections of BMPs could be expanded to identify physical limitations in relation to the pre-existing infrastructure to guide the designers and reviewers.

Response: The presumption is that limitations of existing infrastructure are site specific and potentially an impact to any given BMP, and therefore, specific guidance for this topic has not been provided. Readers of the manual should refer to Section 1.2 for language regarding applicability of the manual. Clearly, actual site conditions may be a basis to establish that the MEP standard is met or justify an exception as per Section 1.2.

52. General -Maintenance: In regards to the numerous maintenance recommendations, for Municipalities and RIDOT it would be more appropriate for them to follow the maintenance requirements of their RIPDES Permit.

Response: Specific language regarding permit compliance in the context of the RIPDES permit program has been included in Section 1.2.

To summarize the main issues, we support the following aspects of the Manual;

- The 1" Water Quality Volume concept for impervious areas, as required by the 1993 Manual
- The fractional 1" Recharge Requirement
- The use of natural mitigation systems, where feasible

In addition to the list of miscellaneous items previously noted, we remain concerned with the following;

- The elimination of the use of recognized engineering formulas and methods and the mandated use of formulas and factors which possess no more accuracy than other recognized methods
- The minimal credit and guidance on the use of proprietary or "non-natural" systems
- The elimination of credit for pre-existing conditions in areas with impervious surfaces
- The lack of use of proven RIDOT Standards and Specifications
- Clarification of the applicability of the Manual versus conflicting requirements of other agencies and municipalities
- Clarification of which systems also require UIC Permitting
- The use of maintenance requirements that may conflict with an agency's or municipality's RIPDES Permit and exceed their abilities
- The 100 Year Storm conveyance requirement for upstream flows, which may exacerbate downstream flooding

Response: No additional response necessary.

We also recommend that winter and early spring conditions be addressed within the manual and the impact on the proposed systems. The main concern is runoff being controlled by the natural systems with frozen soils.

Response: Significant research on the effects of cold climates on BMPs has been conducted by the Univ. of New Hampshire Stormwater Center, among others, in recent years. The general conclusion is that runoff is better controlled by more natural systems than the prior suite of conventional systems. However, readers of the manual should refer the language in Section 1.2 that directs the designers to apply "sound engineering judgment" in the selection, design, and implementation of these practices.

The focus of the Manual is clearly for site development projects; therefore one final suggestion is to provide a chapter which focuses on roadway (RIDOT & Municipal) projects. The chapter could address the appropriate standards for the different types of roadway projects, such as lR, 3R, Reconstruction and New Alignment Projects. Each project type has differing scopes and limitations, and we do not concur with highway reconstruction projects which exceed 10,000 sf being grouped with the Redevelopment category.

Response: The comment would best be addressed by a separate contract commissioned by RIDOT and with the cooperation of DEM and CRMC to develop a manual specific to RIDOT projects. To do so in this manual is deemed beyond the scope of this project. The Draft Manual has been piloted with RIDOT on a major rehabilitation project in South Kingstown (RT 138) that uncovered a key omission in the redevelopment policy as it relates to handling of existing BMPs. Further changes to the manual redevelopment section have been made as a result.

Thank you for the opportunity of commenting on the draft Manual and we are looking forward to future workshops.

Sincerely,

Steven M. Cabral, PE
President

Bruce G. Hagerman, PE
Sr. Project Director