Donald W. McIntosh Associates, Inc.

MEMORANDUM

TO: Eric Livingston
Florida Department of Environmental Protection

FROM: Eric S. Shroyer, P.E.
Donald W. McIntosh Associates, Inc.

COPY: John M. Florio, P.E.

DATE: June 18, 2010

RE: Comments on the March 2010
Draft Stormwater Quality Applicant's Handbook

Civil Engineers

Land Planners

Surveyors

Donald W. McIntosh Associates, Inc. has been tracking the progress of the development of the Environmental Resource Permit Stormwater Quality Applicant's Handbook with great interest. As a consulting firm that will be charged with designing stormwater management systems in compliance with the requirements of the Handbook, once adopted, we have professional and vested interests in ensuring that the Handbook is practical and sound, scientifically and economically. As such, in order to gain a better understanding of the new rule, we have attended several workshops on the subject that have been held by the Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (FDEP). Pursuant to the FDEP request for public comment on the March 2010 Draft of the Environmental Resource Permit Stormwater Quality Applicant's Handbook, the following comments are provided.

1. As evidenced by the chart below that was included in the presentation provided by the FDEP at the May 19, 2010 public workshop in Orlando, Florida, the stormwater management practices that have been employed since 1982 have resulted in significant reductions of phosphorous levels, dramatically reversing the trend prior to 1982, even as development has increased considerably during the same period. While it is acknowledged that nutrient management is still a concern and more may need to be done, it would appear that only slight modifications are needed to the existing methods of stormwater quality management to increase the effectiveness and possibly achieve the desired levels of nutrient management. The methodologies and requirements provided in the March 2010 Draft Stormwater Quality Applicant's Handbook represent a sea change in the management of stormwater quality within the State of Florida. Unfortunately, the Draft Handbook has the potential for also causing a sea change in the costs and complexity associated with design, construction, land, operation, maintenance and compliance for stormwater management systems in the State of Florida. Steep increases in costs that will provide only minor increases in nutrient reduction over current treatment criteria will result in wasted economic resources.

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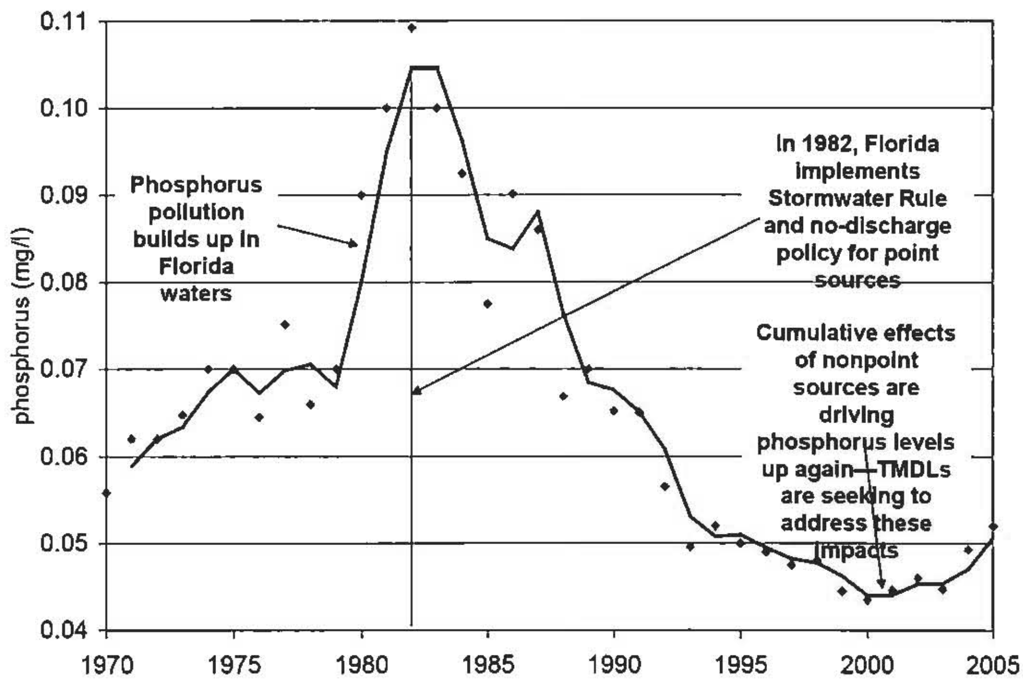
Phosphorus Trends in Florida Waters 1970 - 2005



2. The draft Handbook requires that nutrient reduction be quantified in units of kilograms per year. While this may be appropriate in a closed basin, this approach may, in fact, be counterproductive to the protection of downstream receiving waters in an open drainage basin. In an open drainage basin, the annual volume of stormwater runoff discharged in the post-development condition would likely be greater than in the existing conditions. By limiting the annual discharge quantity of TN and TP by weight, while simultaneously increasing the annual volume of runoff, TN and TP concentrations have the potential to be reduced due to dilution. Reductions in concentrations below levels that are required for supporting a healthy environment could be similarly as harmful as discharging excessive concentrations of TN and TP. Using the wet detention treatment train example provided in Section 25.2 on page 187, the following table was prepared to illustrate the differences in annual mass (kg/yr) and average concentration (mg/L) between the post-development and pre-development conditions.

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	Pre-Development		Post-Development (85% Reduction)		Post-Development (Post ≤ Pre)	
	kg/yr	mg/L	kg/yr	mg/L	kg/yr	mg/L
TN	35.19	1.0303	31.76 (-10%)	0.2775 (-73%)	35.19 (=)	0.3075 (-70%)
TP	0.75	0.0220	5.32 (+609%)	0.0465 (+111%)	0.75 (=)	0.0066 (-70%)

Note that the 85% reduction criteria results in a 10% reduction of TN by mass, but a 73% reduction in the concentration due to dilution. More importantly, the 85% reduction criteria actually results in a very significant increase in TP discharge, in both mass and concentration. This increase in TP discharge is due to the vast differences in the pre- versus post-development land use loading rates that are not compensated for by applying an 85% reduction factor. This indicates that the 85% reduction requirement may not be protective, but may actually contribute to the impairment of downstream waters. When the post-development annual masses of TN and TP are limited to the pre-development annual masses, the increased post-development runoff causes the concentration of both nutrients to be significantly reduced by 70%. Further, throughout the background literature that has been used in the development of the Handbook, concentrations of nutrients have been used almost exclusively to evaluate biological responses. Therefore, it may be more appropriate within open drainage basins to determine allowable TN and TP discharges by concentration, in units of mg/L or parts per billion (ppb), such as is the current phosphorous criterion for Lake Apopka, rather than by annual mass, in units of kg/yr.

3. The draft Handbook refers to phosphorous and nitrogen inconsistently as either pollutants or nutrients. Phosphorous and nitrogen are naturally occurring elements in the environment that are essential for plant growth and should be consistently referred to as nutrients. Harmful effects to the environment can result from three basic nutrient conditions; excessive levels, deficient levels or an imbalance of nutrient ratios, but none of these conditions justify the labeling of nitrogen and phosphorous as pollutants.

4. The EPA is proposing numeric nutrient criteria for discharges from proposed developments. The FDEP draft Handbook, however, is proposing that the post development nutrient runoff be the lesser of either the pre-development nutrient runoff or 85% reduction of the post-development nutrient runoff. The criteria appear to conflict.

5. The use of meteorological zone, soil type and vegetative community to determine the existing conditions nutrient loading does not account for ecological adaptation to current and historic conditions. It may have been 100 years since the loading was similar to the loading that would be calculated using this method, if it ever was. In the meantime, the ecosystem of the receiving waterbody may have adapted and thrived under the altered conditions. Basing the required post-development reduction on a condition that may not have ever existed, or in which the ecosystem has since

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adapted, may result in the impairment of a currently healthy ecosystem. Instead, an analysis could be performed by a qualified professional to determine the appropriate nutrient loadings that would provide for the maintenance of a currently healthy downstream ecosystem or for contributing toward the restoration of an impaired downstream ecosystem, regardless of the natural vegetative community. This would require the FDEP to establish guidelines for such an analysis. Otherwise, the establishment of TMDLs by the FDEP in receiving water bodies or regions of the State would be a potential alternative. The expanded creation and use of TMDLs throughout the State would eliminate the need to determine the pre-development loadings and would standardize the criteria for specific regions.

6. Due to the lower efficiency in reducing nitrogen in wet detention ponds, as compared to phosphorous reduction, the use of additional BMPs, such as dry retention, to reduce nitrogen will likely lead to phosphorous being reduced at greater amounts than required. This may result in phosphorous deficiencies in the receiving water bodies, indicating that strict adherence to limiting TN or TP, either individually or together, may not be appropriate. Ecosystems are dependent upon not only the appropriate individual levels of nutrients, but equally as important, the appropriate ratio of nutrients. Using the example given in comment #1, the pre-development nitrogen to phosphorous ratio of 47:1 (in units of mg/L) is reduced to 6:1 when the 85% reduction is applied and is again at 47:1 when the post-development nutrient levels are limited to the pre-development levels. Therefore, the nitrogen to phosphorous ratio should also be evaluated along with the type of receiving water body (i.e. freshwater or estuarine) and whether or not it is nitrogen or phosphorous impaired, or both, before discharge loading requirements are established. Further, it remains to be determined whether the BMPs proposed in the draft Handbook are capable of providing nutrient discharges in the appropriate ratios. Therefore, it is possible that the use of currently available BMPs to provide nutrient reduction may actually result in causing nutrient impairments of downstream waters.

7. The Handbook criteria for the stormwater treatment BMPs ignore rate attenuation, recovery times and storage needs for design storm events. Since the water quality and water quantity treatment will both be provided within the same BMP, the effects of both must be considered in the design. The FDEP needs to determine if the routing of design storms through the BMPs has an effect on the annual nutrient reduction efficiencies as stated in the Handbook.

8. The use of BMPs such as dry retention, green roof/cisterns, stormwater harvesting, exfiltration trenches and swales to provide the required level of nutrient reduction have the potential to also reduce the volume and rate of water discharging from the site to levels that are below the existing conditions. In addition to nutrient reduction, the stormwater management system should be analyzed to ensure that detrimental reduction of discharge runoff volume and rate does not result, particularly with regard to wetland hydration. The Handbook should provide a statement on which governs when conflicting, nutrient reduction or maintaining minimum flow rates or volumes.

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9. Allowance for over-treatment of portions of a project to compensate for under-treatment in other portions of the project has been removed from the latest draft Handbook. The use of over-treatment is commonly used when site constraints prevent an area from achieving sufficient treatment and it allows for flexibility and efficiency in project design. Therefore, the Handbook should be revised to provide an allowance for the use of over-treatment.

10. The Handbook should differentiate the efficiencies achieved by wet-detention and dry retention ponds in on-line and off-line configurations. For example, in the case of off-line wet detention ponds, the residence times would likely be significantly greater than on-line ponds, resulting in greater efficiency.

11. An economic impact analysis for the proposed Handbook has not been presented. Initial, operational and maintenance costs associated with the proposed BMPs will likely be significantly higher than current BMPs. A comparison of the initial, operational and maintenance costs and efficiencies for each type of BMP should be performed so that cost/benefit can be used to determine the most economical and efficient design. It would appear that the requirements of the draft Handbook may disproportionately economically burden specific types of development because of nutrient loading, BMP practicality, BMP land requirements and other factors. It is also possible that the requirements of the draft Handbook may disproportionately economically burden specific regions of the state. For instance, as compared to areas with permeable soils and low groundwater, areas with high groundwater will either have to import more fill in order to provide dry retention, if possible, or potentially employ multiple BMPs to reduce nitrogen. In addition, a cost/benefit analysis should be performed to evaluate the potential use of regional treatment facilities in lieu of individual treatment facilities.

12. The draft Handbook greatly increases the complexity of stormwater treatment calculations compared to current criteria. In order to reduce the difficulties that may be associated with the transition to the new Handbook requirements, the draft Handbook should be uniformly applied across the state to prevent multiple interpretations by the water management districts, counties and cities. Separate interpretations of the proposed criteria among various entities could also add significantly more complexity and cost to the design and construction of projects.

13. It is not clear why the nutrient reduction efficiency for Managed Aquatic Plant Systems (MAPS) applies to the nutrient concentrations following wet detention nutrient reduction, but stormwater harvesting reduction efficiency applies to the nutrient concentrations prior to wet detention reduction. Both systems similarly utilize the permanent pool of a wet pond as the source of runoff for providing nutrient reduction. In the case of stormwater harvesting, applying the nutrient reduction efficiency prior to the wet detention nutrient reduction assumes that the harvested runoff is utilized prior to discharge to the wet detention permanent pool. In practice, the harvested runoff is withdrawn from the permanent pool, which contains a diluted solution of both the treated pool volume and the untreated runoff inflow. In addition, the harvested runoff is filtered prior to its use which would likely further reduce the

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concentration of nutrients in the harvested runoff withdrawn from the pond. In the case of horizontal well withdrawal systems, the nutrient laden algae, turbidity and other solids in the permanent pool would remain in the pond and may cause increased nutrient concentrations in the pond that may then be discharged. One possibility for the differences in the sequence of applying the reduction efficiencies is, as stated in the Handbook, the harvesting efficiencies are based on REV charts that were developed as a result of long-term simulations of reuse ponds over time. What the Handbook does not indicate is whether the REV chart efficiencies are based solely on the stormwater harvesting process or the combined effects of the harvesting process and wet detention reduction within the reuse ponds. If the results of the simulations used to develop the REV charts accounted for both, then further investigation may be needed to provide clarification on the extent to which varying amounts of permanent pool volume (i.e. residence time) may have on the efficiencies of wet detention stormwater harvesting ponds. For example, a stormwater harvesting pond that provides a wet detention nutrient reduction efficiency of 40% would certainly have an overall efficiency that is lower than a harvesting pond with a wet detention nutrient reduction efficiency of 80%. Further, if the REV charts do account for the effects of the wet detention nutrient reduction, then the pond efficiency should not also be calculated separately and added as shown in the design examples provided in the Handbook.

14. Existing conditions may include natural water bodies such as lakes and wetlands that provide some level of nutrient reduction, but the draft Handbook does not address reduction calculations for existing conditions.

15. Nutrient reduction within man-made canals is not discussed in the Handbook. Man-made canals are very common within the State and should be included in future revisions to the Draft Handbook.

16. Page 10: The pre-development loading rates are now based on meteorological zone, soil type and vegetative community. A table included in Appendix B is used to determine a vegetation group for TN and TP based on soil type and vegetative community. TN and TP each have two vegetation groups (Group1 or Group 2) that are then used to determine the natural vegetative community areal loading rates, in units of kg/ac-in-yr, as provided in Table 3.2 on page 10. These loading rates are multiplied by the acreage and annual rainfall to determine the TP and TN annual loadings. Natural variations would very likely prevent nutrient loading rates from neatly fitting into one of only two groups as stated. For instance, the loading rates presented in Table 3.2 indicate that the TP loading rate for Group 2 is approximately 15 times greater than Group 1. Similarly, the average TN loading for Group 2 is approximately 9 times greater than the average for Group 1. Analysis of field collected data would most assuredly result in loading rates that fit into neither group. The described method for determining the existing conditions nutrient loading appears to have been decided upon in order to provide some standardization and simplicity. However, standardization and simplicity rarely applies to nature and this approach may prove more harmful than beneficial. Since the establishment of the pre-development loading is critical to the design of BMPs to manage post-development nutrient discharges, the methodology must be scientifically defensible, quite possibly at the expense of simplicity and standardization.

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17. Page 14: The Rainfall Isopleth Map (Fig. 3.2) appears to have been revised slightly since the June 2007 report by Harvey Harper. The source of the map and date of revision is not cited.

18. Page 19: The use of nutrient rich reclaimed water for irrigation would likely increase the post-development nutrient loading as compared to sites with no irrigation or those that use potable water for irrigation. Therefore, the Handbook needs to include an option to determine the post-development nutrient loading for sites that use reclaimed water for irrigation. In addition, some municipalities require the use of reclaimed water for irrigation use. If the nutrient loading associated with the use of reclaimed water is included in future revisions to the Handbook, it will result in a financial burden on property owners in that they must account for the nutrient loading of the mandated reclaimed water in the stormwater treatment system design. Requiring the reclaimed water providers to provide sufficient treatment to reduce nutrient levels to that which could be directly discharged to receiving waters without causing downstream impairments would resolve this issue. With that in mind, source control may be significantly more efficient and economical than treatment and should be made more prominent in the Handbook.

19. Page 19: Section 3.8 states, "If stormwater runoff from off-site areas is allowed to co-mingle with on-site runoff, then the effects of the runoff from these off-site areas must be considered in the load reduction calculations for the project site." This statement appears to mean that the effects of the contributing off-site flows on residence time, in-pond TP levels, etc. must be calculated, but the TP and TN quantities in the contributing off-site flows do not need to be reduced. The Handbook should provide clarification that reduction of nutrients in off-site contributing flows is not required.

20. Page 58: The Handbook does not specifically indicate that the runoff coefficient to be used in the peak flow rate calculations for determining swale lengths is the annual runoff coefficient. The Handbook should include references to runoff coefficients tables that are to be used in the calculations.

21. Page 64: Section 10.4.c states that "The seasonal high groundwater table shall be at least two feet below the bottom of the vegetated natural buffer…" This is not likely to be the case since VNB areas are usually adjacent to wetlands.

22. Page 64: Section 10.4.h: Residential side lot grading may result in concentrated points of discharge and prevent uniform sheet flow across the VNB as required.

23. Pages 83-108: Nutrient reduction in green roof/cistern systems is provided by the biological uptake of the nutrients in the vegetation grown on the roof. Unlike the Managed Aquatic Plant Systems, there is no mention of periodic removal and replacement of mature plants to maintain the desired level of nutrient uptake.

24. Pages 83-108: There is no differentiation in post development loading rates between the runoff that results from rainfall that falls on the ground and that which falls on a green roof. Runoff from ground surfaces are likely to have higher TN and TP concentrations due to fertilization, use of reclaimed water for irrigation, decaying vegetation, soil erosion, animal waste and other sources, but runoff from a green roof

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only includes TN and TP concentrations present in the rain and possibly from limited fertilization. Therefore, the nutrient reduction efficiency for green roof/cistern systems is likely overstated. However, if the irrigation source water for the green roof were provided by a wet retention pond that captures runoff from the entire site, including the roof, the actual efficiency would be more reasonable.

25. Page 109: The bleed-down volume (fka PAV) in a wet detention pond shall be the first inch of runoff from the contributing area and shall be at a depth of no deeper than 18 inches in the pond. The purpose of providing a bleed-down volume and its benefit in providing TN and TP reduction is not stated. The proposed Handbook focuses entirely on permanent pool volumes for TN and TP removal in a wet detention pond. The Evaluation of Current Stormwater Design Criteria within the State of Florida by Harvey Harper, Ph.D., P.E. and David M. Baker, P.E. indicates that the bleed-down volume does very little for water quality as compared to the treatment achieved in the permanent pool volume. Therefore, the bleed-down volume requirement should be eliminated. Eliminating the bleed-down volume would provide for greater flexibility in providing rate attenuation and controlling design storm peak stages without effecting the nutrient reduction calculations.

26. Page 110: Figure 13.1 – The typical cross section of a wet detention system should illustrate the inflows to the permanent pool to be constructed at some minimum elevation above the pond bottom that will prevent the re-suspension of nutrient laden sediments. In deep ponds that have anoxic zones, the inflows may be able to enter the pond within the anoxic zone to provide mixing within the permanent pool, provided that the sediments do not get re-suspended.

27. Page 110: There is no maximum residence time stated for wet detention ponds. Is there a limit that should be applied, especially in the use of chained ponds?

28. Page 112: The wet detention section of the draft Handbook discusses the anoxic depth only in terms of determining the residence time for calculating the TP and TN removal efficiencies. The anoxic zone itself is not discussed in terms of its potential for reducing nitrogen through the denitrification process. The removal efficiency of total nitrogen in wet detention ponds as a function of residence time as shown in Figure 13.3 does not differentiate between ponds with an anoxic zone and those without. It is not known whether this differentiation was made in the studies that were used in preparing Figure 13.3. Studies should be performed to determine whether anoxic zones in man-made stormwater ponds provide nitrogen reduction through denitrification.

29. Page 112: The draft Handbook states that calculation of the anoxic depth in wet detention ponds should be based on monthly analyses of the pond. This is problematic in that the pond has not been constructed at the time of pond design.

30. Page 112: Wet detention ponds can be greater than 12 feet deep, but owner must do monthly analyses of anoxic depth to determine the most limiting time of the year (see preceding comment on pond construction timing). As an alternative, Equation 13-1 can be used to calculate the anoxic depth for average annual conditions and multiply the resultant depth by 0.75. (The design example on pages 182-197 does not include the 0.75 factor and does not mention monthly analysis.) Requiring that anoxic depth

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be based on either the most limiting time of the year as determined by monthly analyses or 75% of the anoxic depth calculated for average annual conditions results in the shallowest anoxic depth being applied to the system year round, causing an underestimation of the average annual nutrient reduction efficiency. This approach does not account for the possible increase in anoxic depths that would be expected during the least limiting times of the year. Both approaches are contrary to the concept of an average annual analysis that is the basis of the draft Handbook. Utilizing monthly analyses to establish the average annual anoxic depth would be more appropriate, as would eliminating the factor of 0.75 from the calculation that is used for determining the anoxic depth for average annual conditions.

31. Page 113: Section 13.4.c references Section 23.3 incorrectly.

32. Page 114: The Handbook states that when the control elevation in a wet detention pond is located more than six inches below the SHGWT, nutrient loads from the baseflow must be considered. However, the Handbook does not provide the procedure for determining the nutrient load from baseflows.

33. Page 120, Section 14: Managed Aquatic Plant Systems (MAPS), such as littoral zones and floating wetland mats, are included as BMPs with TN and TP reduction efficiencies of 10%-40%. Is the efficiency of littoral zones and floating wetland islands consistent throughout the year? If not, does the peak efficiency coincide with the rainy season when nutrient loading is at its greatest? Can the MAPS provide adequate nutrient reduction efficiency for increased nutrient loading that results from intense summer storms since this BMP relies on the slow process of plant growth to provide nutrient reduction? Should MAPS efficiencies be tied to residence time? The Handbook should also address the need for restrictions on the use of herbicides that are used for aquatic weed control when MAPS are incorporated into the stormwater quality management system.

34. Page 120: The reduction credit for littoral zones is only 10% for the remaining TP and TN remaining after the wet detention efficiency is applied. Therefore, the use of littoral zones may prove to be counterproductive if they result in a significant reduction in the permanent pool volume to the extent that the reduced residence times produce a corresponding reduction of the wet detention efficiencies that are not positively offset by the littoral zone credit. The use of littoral zones may also significantly reduce the amount of fill material that may be available from the excavation of the pond. Floating wetland islands appear to be much more effective than littoral zones since their efficiency is greater and they do not require a reduction in the permanent pool volume.

35. Page 120: The Handbook does not indicate whether littoral zones and floating wetland islands can be used in the same pond to receive the combined credit for each.

36. Page 127: Floating wetland islands in wet detention ponds shall cover at least 5% of the surface area of the wet detention pond to earn a reduction credit of 20%-40% as shown in Table 14.1 on page 120. There is no description of how to determine how much credit within the 20%-40% can be achieved. It is stated that the applicant must provide independent scientific data based on Florida field monitoring to validate the nutrient load reduction of any MAPS proposed for use, but does not provide

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additional details for doing so. It is not clear whether floating wetland islands that are greater than 5% can earn greater nutrient removal credits.

37. Page 128: The very first sentence incorrectly states that "Stormwater harvesting uses treated stormwater for beneficial purposes before it is discharged to surface waters, thus reducing the stormwater volume and mass of pollutants discharged." The harvested stormwater is not discharged as stated, but is subtracted from the volume of runoff that is discharged. Please remove the words "before it is discharged to surface waters" from the first sentence so that the sentence correctly reads, "Stormwater harvesting uses treated stormwater for beneficial purposes, thus reducing the stormwater volume and mass of pollutants discharged." Also, please define the term "beneficial purposes."

38. Page 128: The stormwater harvesting section does not provide any guidance on reclaimed water discharges into ponds that are used for stormwater harvesting. Reclaimed water is frequently used to maintain water elevations in stormwater harvesting ponds. The addition of reclaimed water into a stormwater harvesting pond would likely prevent the use of the REV charts in determining the nutrient reduction efficiency due to the increased nutrient concentrations in the reclaimed water as compared to stormwater runoff. It is also common practice to discharge reclaimed water to the pond intermittently, only as needed to maintain water levels. The Handbook needs to address the procedure for determining the annual nutrient loading for the intermittent discharge condition. Also, the Handbook needs to provide a procedure for calculating the inflow and discharge loadings when a pond is used for stormwater harvesting, but also discharges.

39. Page 128: There is no differentiation in the stormwater harvesting section between open and closed basins. In a closed basin, the pond may not have an outfall and the stormwater harvesting system flow rate must be sufficient to recover the peak water levels in the pond to the normal water level in the appropriate timeframe following the design storm event. For both, open and closed basins, the stormwater harvesting system flow rate must be sufficient to recover the treatment volumes in the appropriate timeframes. This may prove to be difficult during the wet season when there is a lack of irrigation demand. Commercial projects with high percentage of impervious areas may also have trouble recovering the treatment volumes due to a lack of irrigable area.

40. Page 128: The Handbook does not indicate whether stormwater harvesting systems will be subject to irrigation restrictions.

41. Page 129: The Handbook does not specify that the C-value used for stormwater harvesting equations is the annual runoff coefficient. Appendix B does not provide C-values as stated below Equation 15-1.

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42. Page 137: Wetlands may be used as a BMP, but must be designed as an off-line system. Continuous simulation modeling is required, but the specifics are not fully explained. The Handbook does not specify whether man-made wetlands can be created for this purpose and if so, whether the wetlands have to meet minimum/maximum depth and side slope requirements.

43. Page 142: When the underdrain invert in an underdrain filtration system is more than 2 feet below the SHGWT, the nutrient loads in the baseflow must be accounted for. The Handbook does not specify the procedure for determining the nutrient load from baseflows.

44. Page 172, Section 22.1.d: The equation results in a curve number of 43.53, but we are told to round to 49. The CN of 49 is then carried forward and used in determining the retention volume required.

45. Page 177: The math in the dry retention in series example is incorrect. For example, Basin 1 starts with 1.88 pounds of TP, 1.61 pounds is removed in Retention Basin 1, 0.17 pounds is removed in retention Basin 3 and 0.03 pounds is removed in retention Basin 6, for a total of 1.81 pounds removed. This would result in a discharge of 0.07 pounds, but the table indicates 0 pounds.

46. Page 183: It is stated that wet detention alone cannot achieve 85% reduction of TP. In fact, a residence time of 328 days achieves 85% reduction.

47. Page 185: The calculated pond volume at the top of the page is 11.1 ac-ft, but it is changed to 11.21 ac-ft at the bottom of the page, and then becomes 26.3 ac-ft in the middle of page 187. Example problems need to be thoroughly checked and revised as needed.

48. Page 187: The dry retention/wet detention design example does not include the BMP as part of the development area and implies that the entire stormwater management BMP (dry bottom areas, water surface areas, pond embankments, pond maintenance berms, etc.) should not be included in the nutrient loading calculations. This should not apply in all cases, specifically when the pond bank and berm is irrigated with reclaimed water and potentially fertilized. Also, it is assumed that the resultant BMP area is outside of a fixed development area. In reality, the BMP will most likely be located internally to a project and the sizing of the BMP will be an iterative process that will determine the BMP/Development ratio.

49. Page 193: The TN and TP loading rates in Table 25.4.2 do not match those in Table 3.4 on page 19.

50. Page 198: The stormwater harvesting example does not use the annual runoff coefficients that are provided in Appendix E to establish the effective impervious area for use with the REV charts. The Handbook should include a reference source for the coefficients that are to be used.

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51. Page 198: The stormwater harvesting example states that the irrigation area is an offsite area under the same ownership as the project site. This will most likely not be the case for most projects. In most cases, the irrigation area will be within the project boundaries and is limited by the amount of imperviousness on the site. The example should illustrate the more likely scenario of on-site irrigation area. Also, by relying on an offsite irrigation area, the example assumes that the offsite area will never be developed and will always be available for the disposal of the harvested stormwater.

52. Page 198: It is stated in the example problem for stormwater harvesting that the pond provides nitrogen removal of 50%. The formula and Figure 13.3 on page 112 indicate that a pond can only provide a maximum reduction of nitrogen of approximately 43%.

53. Pages 198-200: The stormwater harvesting examples do not explain the effect of stormwater harvesting on the efficiencies of the wet detention ponds with regard to residence time, anoxic depth, phosphorous concentration, etc. The examples only state the expected wet detention nutrient reduction efficiency. The Handbook needs to address the effect on annual wet detention efficiency that would result if reclaimed water were needed to supplement the stormwater harvesting system.

54. Page 200: It must be assumed that the harvested stormwater used for the cooling towers and vehicle washing does not return to the treatment pond, but is disposed of in some other way, possibly into the sanitary wastewater system. This could create a conflict with FDEP wastewater permitting requirements.

55. Pages 205-206: Karst area Figures 30.2 and 30.3 appear to be identical.

56. Page 210: The last sentence of the last paragraph states "retention" basin, but the aesthetic and functional maintenance requirements should apply to all types of BMPs.

57. Page 241: Appendix B – Correlation of Natural Vegetative Community Types with Soil Series assumes that the project site is in an untouched, pristine condition with regard to the vegetative community for the site. The process to determine the vegetative community is not explained for sites with more than one possible vegetative community that have been altered in the past.

58. Pages 257-259 and 267-321: The dry retention depths for the 85% mass removal tables in Appendix D do not produce the same results as the tables in Appendix F. For example:

Appendix D	Appendix F
CN=30, DCIA=10%, **85% = 0.24 in.**	**85% = 0.28 in.**
CN=50, DCIA=40%, **85% = 0.76 in.**	**85% = 0.75 in.**
CN=75, DCIA=70%, **85% = 1.36 in.**	**85% = 1.35 in.**

Or

CN=45, DCIA=10%, **85% = 0.30 in.**	**82.8% = 0.30 in.**
CN=35, DCIA=45%, **85% = 0.80 in.**	**85.4% = 0.80 in.**
CN=70, DCIA=65%, **85% = 1.25 in.**	**85.2% = 1.25 in.**

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59. Pages 266-321: Dry retention efficiency tables only go up to 4 inches of retention. In closed basins, the retention provided may be in excess of 4 inches. Therefore, the dry retention tables that are provided in the Handbook should be expanded to include retention depths greater than 4 inches or provide a default efficiency for retention depths greater than 4 inches.

Thank you.
End of Memorandum.
ESS/lt

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