TECHNICAL MEMORANDUM

To: Doug Thomas,
Board of Water and Soil Resources

From: Mark R. Deutschman PhD, PE. Drew Kessler
Houston Engineering, Inc.

Chuck Fritz,
International Water Institute

Cc: Melissa Lewis, Board of Water and Soil Resources
File 4875-027

Subject: Prioritizing, Measuring and Targeting Application (PTMApp)
Categorization of Best Management Practices and Conservation Practices for Estimating
Pollutant Removal Effectiveness

Date: December 3, 2014

Project: 4875-027

BACKGROUND

The International Water Institute (IWI) on behalf of the Red River Watershed Management Board, received a 2014 Clean Water Fund Accelerated Implementation Grant from the Board of Water and Soil Resources (BWSR) for the development of the Prioritization, Targeting and Measuring Water Quality Improvement Application (PTMApp) (referred to as "the Project"). The stated purpose of the Project is to leverage the geospatial data created by the IWI during the completion of their 2012 Accelerated Implementation Grant by developing, testing and deploying an operational application for prioritizing subwatersheds and targeting fields for the implementation of nonpoint source Best Management Practices (BMPs) and Conservation Practices (CPs) based on water quality. The PTMApp is also being developed, in part, to "measure" the effectives of BMPs and CPs in reducing nutrient and sediment loads. Although the application is being developed for pilot areas, the intended outcome is to develop a flexible application applicable for statewide use.

This Technical Memorandum (TM) is one of several envisioned to describe development issues and proposed direction to BWSR. These TMs serve as a communication tool to discuss, resolve and obtain concurrence with BWSR staff and others about application development. The purpose of this TM is to identify the BMPs and CPs proposed for inclusion within the application and their categorization into "treatment groups" for the purposes of estimating their pollutant removal effectiveness.

Including all possible BMPs and CPs into the application is infeasible because of the large number of them. Therefore, we propose to include the "most commonly used" non-urban nonpoint source BMPs and CPs in the

FINAL

web portion of the application[1], based upon a statewide analysis of the e-link database. The complete list of BMPs and CPs recommended for inclusion in the PTMApp has been provided in **Appendix A** along with their proposed treatment group (see **Table 2**). An example of how some of the most common BMPs and CPs have been mapped to treatment groups is shown in **Table 1**. Included in the table is the proposed treatment group for each BMP. Our intent is to group BMPs into treatment groups based upon the bio-physical process by which they provide treatment to remove sediment, total nitrogen, total phosphorus, and reduce peak discharge. The reason for this approach is many specific BMPs and CPs lack treatment data. However, the physical, chemical or biological mechanism for how they remove pollutants is known and can be described mathematically. We also plan to include a User Defined BMP which would use one of the treatment approaches within the Web application. This option will allow the user to input a BMP not included and assign them to a treatment category, or input their own BMP effectiveness. Our suggestions for "default" BMP coding to treatment groups for the extended list of BMPs has been provided in **Appendix A**. The BMP list and treatment groups are IWI and HEI's preferences for the development of PTMApp.

Table 1. List of proposed BMPs and CPs for inclusion in PTMApp development by categorized by treatment group.

Treatment Group[‡]	BMP Type	NRCS Practice Code	BWSR Practice Code	MDA BMP Handbook Category
Infiltration	Alternative Tile Intakes	606	170M – 173M	Controlling
Filtration	Grassed Waterways	412	412	Controlling
Filtration	Filter Strip	393	393	Trapping
Protection	Grade Stabilization Structure	410	410	Trapping
Source Reduction	Nutrient Management	590	590	Avoiding
Storage	Water and Sediment Control Basin (WASCOB)	638	638	Trapping
Protection	Critical Area Planting	342	342	Avoiding
Storage	Pond for Water Use	378	378	Trapping
Protection	Streambank and Shoreline Protection	580	580	Controlling
Storage	Wetland Restoration	657	657	Trapping
Filtration	Conservation Cover Easement	327	327	Avoiding
Bio-Filtration	Vegetated Subsurface Drain Outlet (Saturated Buffers)	739	739	Trapping
Storage	Drainage Water Management	554	554	Controlling

[1] The desktop application will identify suitability for representative BMPs within each treatment group. The suitability analysis is not expected to include all BMPs in Table 1. Expectations are that the user will be table to select and place BMPs from Table 1 in the web environment. These will be mapped to the appropriate treatment group for purposes of estimating load reductions.

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| Bio-Filtration | Denitrifying Bioreactor | 747 | 747 | Trapping |
| User Selected | User Defined† | User Input | User Input | User Input |

‡ All BMPs will be categorized into Filtration, Bio-Filtration, Infiltration, Storage, Protection, Source Reduction, or User Defined treatment groups. BMP specific treatment will be derived based upon treatment type.

† For site specific "tailoring" within the web application, users will be able to select a BWSR practice code. Based upon the practice code, the BMP will default to one of the pre-determined treatment types.

BEST MANAGEMENT AND CONSERVATION PRACTICE TREATMENT GROUPS

Within the PTMApp, we intend to calculate percent reduction of a water quality constituents by BMP treatment group. The groups are established based upon the bio-physical process through which treatment occurs within a BMP or CP (**Table 2**). While a multitude of different BMP practices can be implemented, the process by which they treat water quality constituents generally falls into one of these treatment groups. In the event that a user's wishes to define a BMP that does not fit within these treatment groups, IWI and HEI also intend to provide a "User Defined" category. The "User Defined" category will allow the user to input any BMP not included in PTMA and assign it to a treatment category, or allow local knowledge to be used to assign BMP effectiveness for reducing water quality constituents (i.e. override the treatment categories).

Table 2. Proposed treatment groups and treatment processes.

	Storage	Filtration	Bio-Filtration	Infiltration	Protection	Source Reduction	User Defined
Treatment Process	Sedimentation	Sedimentation	Sedimentation & biological	Volume abstraction	Physical protection of the landscape	Reduction of Mass Potential	User selects method (from those to left) or enters percentage
Form of Treatment	Particulate	Particulate	Particulate	Dissolved	Total (Dissolved & Particulate)	Total (Dissolved & Particulate)	Total (Dissolved & Particulate)

CONCLUSIONS

This TM has been provided to BWSR to facilitate review of the BMP and CP types and treatment groups proposed for inclusion in the PTMApp. After obtaining agreement on the BMP treatment groups and BMP
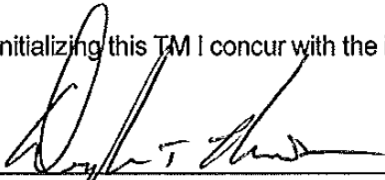
types, IWI and HEI will submit an additional TM to obtain agreement on the methods used to estimate their pollutant removal effectiveness

Once finalized, the BMP list and BMP treatment groups will be used for the development of the PTMApp. Future changes to the BMP list and treatment groups after initial establishment, could result in a need to adjust the overall project scope and timeline. Should clarification be necessary, please call (763.493.6679) or email (mdeutschman@houstoneng.com) Mark Deutschman at Houston Engineering, Inc.

Acknowledgement

By initializing this TM I concur with the intended direction for application development.

12/2/14

Doug Thomas
Board of Soil and Water Resources

Appendix A. Coding of Best Management Practices to PTMApp Treatment Groups.

BMP (BWSR Naming)		Storage	Filtration	Biofiltration	Infiltration	Protection	Source (Load) Reduction	User Defined	BWSR ID	NRCS id	In BMP Handbook	BMP Handbook Group
Primary Treatment Process	===========>	Sedimentation	Sedimentation	Sedimentation & biological	Volume abstraction	Reduction in Mass Leaving Landscape?	Reduction of Mass Potential	User selects method (from those to left) or enters percentage				
Form	===========>	Particulate	Particulate	Particulate & dissolved	Dissolved	Total (Dissolved & Particulate)	Total (Dissolved & Particulate)	Total (Dissolved & Particulate)				
Effectiveness Scaled By	===========>	BMP Treatment Volume / Runoff Volume Delivered	BMP Overflow rate / velocity design standard	BMP Overflow rate / velocity design standard	BMP Abstraction Volume / Volume Delivered	Modified RUSLE Parameters	Actual reduction in mass	User selects method (from those to left) or enters percentage				
Alternative Tile Intake - Dense Pattern Tiling					x				170M	606	*	Controlling
Alternative Tile Intake - Gravel Inlet			x						172M	606	*	Controlling
Alternative Tile Intake - Other Blind Intake			x						173M	606	*	Controlling
Alternative Tile Intake - Perforated Riser Intake		x	x						171M	606	*	Controlling
Anaerobic Digester								x	366	366		NA
Bioretention Basin				x					712M	570		NA
Conservation Cover			x						327	327	*	Avoiding
Conservation Crop Rotation			x						328	328	*	Avoiding
Conservation Tillage							x		329	329	*	Controlling
Constructed Wetlands		x								656	*	Trapping
Contour Buffer Strips			x						332	332	*	Avoiding
Contour Farming							x		330	330	*	Avoiding
Cover Crop			x						340	340	*	Avoiding
Critical Area Planting (heavy use area stabilized by vegetation)						x			342 includes 329, 345, 3460	342 includes 329, 345, 3460		NA
Culvert Sizing		x									*	Controlling
Dam		x							402	402		NA
Drainage Water Management		x							554	554	*	Controlling
Filter Strips			x						393	393	*	Trapping

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BMP (BWSR Naming)		Storage	Filtration	Biofiltration	Infiltration	Protection	Source (Load) Reduction	User Defined	BWSR ID	NRCS id	In BMP Handbook	BMP Handbook Group
Primary Treatment Process	===========>	Sedimentation	Sedimentation	Sedimentation & biological	Volume abstraction	Reduction in Mass Leaving Landscape?	Reduction of Mass Potential	User selects method (from those to left) or enters percentage				
Form	===========>	Particulate	Particulate	Particulate & dissolved	Dissolved	Total (Dissolved & Particulate)	Total (Dissolved & Particulate)	Total (Dissolved & Particulate)				
Effectiveness Scaled By	===========>	BMP Treatment Volume / Runoff Volume Delivered	BMP Overflow rate / velocity design standard	BMP Overflow rate / velocity design standard	BMP Abstraction Volume / Volume Delivered	Modified RUSLE Parameters	Actual reduction in mass	User selects method (from those to left) or enters percentage				
Forage and Biomass Planting							x		512	512		NA
Grade Stabilization Structure						x			410	410	*	Trapping
Grassed Waterways and Swales			x						412	412	*	Controlling
Infiltration Trench					x				803M			NA
Irrigation Water Management							x		449	442	*	Controlling
Lined Waterway or Outlet					x				468	468		NA
Multi-stage Ditch					x				807M		*	Controlling
Nutrient Management							x		590	590	*	Avoiding
Pest management								x	595	595		NA
Pond for Water Use		x							378	378		NA
Prescribed Burning								x	338	338		NA
Prescribed Grazing							x		528	556		NA
Riparian Forest Buffer			x						391	391		NA
Riparian herbaceous Cover			x						390	322	*	Controlling
Roof Runoff Management								x	558	558		NA
Rotational Grazing							x		808M		*	Controlling
Sediment Basin		x							350	350	*	Trapping
Saturated Buffer				x					NA	729 (interim)		NA
Septic System Improvement								x	126M			NA
Storm Water Retention Basins		x							155M	570		NA
Channel Bed & Stream Channel Stabilization						x			584	584		NA

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Form	==========>	Particulate	Particulate	Particulate & dissolved	Dissolved	Total (Dissolved & Particulate)	Total (Dissolved & Particulate)	Total (Dissolved & Particulate)				
Effectiveness Scaled By	==========>	BMP Treatment Volume / Runoff Volume Delivered	BMP Overflow rate / velocity design standard	BMP Overflow rate / velocity design standard	BMP Abstraction Volume / Volume Delivered	Modified RUSLE Parameters	Actual reduction in mass	User selects method (from those to left) or enters percentage				
Streambank and Shoreline Protection						x			580	580	*	Controlling
Strip cropping					x				585	585	*	Controlling
Structure for Water Control		x							587	587		NA
Terrace			x						600	600	*	Controlling
Tree/Shrub Establishment						x			612	612		NA
Water and Sediment Control Basin		x							638	638	*	Trapping
Water Reuse								x	636	636		NA
Wetland Creation		x							658	658		NA
Wetland Restoration		x							657	657	*	Trapping