DISTRICT DEPARTMENT OF THE ENVIRONMENT

CONSOLIDATED TMDL IMPLEMENTATION PLAN & REVISED MONITORING FRAMEWORK

(STAKEHOLDER GROUP MEETING)

MEETING MINUTES

Meeting Date: June 26, 2014

Meeting Location: DDOE

Approval: Final

1 ATTENDANCE

Name	Organization	Present
Jeff Seltzer	DDOE	Y
Jonathan Champion	DDOE	Y
Brian Van Wye	DDOE	Y
Martin Hurd	DDOE	Y
Mary Searing	DDOE	Y
Mohsin Siddique	DC Water	Y
Anouk Savineau	Limnotech	Y
Dan Herrema	Limnotech	Y
Michael Sullivan	Limnotech	N
Chancee Lundy	Nspiregreen	N
Veronica Davis	Nspiregreen	Y
Tim Fields	MDB, Inc.	Y
Ryan Campbell	MDB, Inc.	Y
Becky Hammer	NRDC	Y
Kaitlyn Bendik	EPA Region 3	N
Meredith Upchurch	DDOT	Y
Jenny Molloy	EPA	Y
Karl Berger	MWCOG	Y
Kate Rice	DC BIA	Y
Sarah Rispin	Potomac Riverkeeper	N
Mike Bolinder	Anacostia Riverkeeper	Y
Andrea Nagel	ICPRB	Y
Hye Yeong Kwon	CWP	N

Presentation is Attached (Attachment A)

2 MEETING PURPOSE

The purpose of this Stakeholder meeting was to provide an update on the Implementation Plan (IP) Draft Comprehensive Baseline Analysis and preview upcoming work.

3 MEETING LOCATION

Building: District Department of Environment

Conference Room: 612

4 MEETING START

Meeting Actual Start: 1:10 PM

5 AGENDA

Welcome

Jeff Seltzer and Jonathan Champion, DDOE, welcomed everyone to the meeting.

- **Introductions:** Everyone stated their name, title, and the organization they represent.

- **Overview of the Agenda:** Dan Herrema from LimnoTech provided an overview of the agenda.

Website

- Veronica O. Davis, Nspiregreen, provided a preview of the website. The website contains Stakeholder meeting minutes, calendar with upcoming meetings, all documents previously shared with the Stakeholder Group, and other resources. The website is a tool for proactive communication and will be used more frequently to communicate project updates. The team will keep the website updated and inform the stakeholders when documents are added.
- The home page of the website will always list upcoming meetings. The background tabs lists all of the stakeholders in the Stakeholder Group and the reason for the TMDL project. The updates tabs will provide a brief summary of recent discussions/meetings and documents from those meetings will be posted.
- The calendar tab will list upcoming meeting dates and users can add the invite to their personal Google or Outlook calendars. The documents tab has all documents related to the project such as the Draft Comprehensive Baseline Analysis. The resources tab lists information from other relevant DDOE programs.
- Mr. Seltzer stated the team is open to ideas and suggestions to improve the website.
- Mr. Champion stated that the project team will be posting documents to the website as they are available.
- Mike Bolinder, Anacostia Riverkeeper, asked why the website address is a '.org' and not a '.gov'. Mr. Champion stated that the website address is a '.org', because it is not being hosted on a government server. The website is being maintained externally by the project team, which allows more flexibility. There is a link from the main DDOE page to this page and vice versa.

Presentation – Draft Comprehensive Baseline Analysis (Attachment B – Presentation)
Ms. Anouk Savineau, Limnotech, provided an update on the IP Draft Comprehensive Baseline Analysis. The draft baseline conditions without best management practices (BMPs) were completed in April and presented to the Stakeholder Group in May. Based on feedback from DDOE and the stakeholders at the May meeting, the project teams made revisions to the IP Draft Comprehensive Baseline Analysis. In June and July, the project team will work on quantifying the reduction from BMPs and the gap analysis between the Waste Load Allocations (WLAs) and the Total Maximum Daily Loads (TMDLs). There will be a separate meeting to review and discuss the gap analysis once it is complete.

The methodology for the IP Draft Comprehensive Baseline Analysis was presented at previous Stakeholder meetings. The tool consists of three different parts: Runoff, pollutant load, and BMP reductions. Since the last Stakeholder meeting, the team has updated the pollutant load calculations and developed a methodology to calculate the BMPs reductions.

- **Review of Runoff Calculations:** As stated in previous meetings, the project team used the Simple Method to calculate runoff. The inputs for the Simple Method include runoff coefficients, area (land), and precipitation.

- ***Runoff Coefficients*** are a representation of land cover and land use. This was discussed in detail at the May meeting. (For more detail, see the May meeting minutes)
- ***Drainage Areas:*** New drainage areas were delineated in the MS4 areas based on more up-to-date geospatial information. This difference between the IP Model and the TMDL drainage area was discussed in detail at the May meeting. As a review of the difference, Ms. Savineau used the Klingle Valley Watershed as an example of where the drainage areas are significantly different. As a result, the load is redistributed and it is required to be met in smaller sized area. The waste load allocation does not change. This redistribution will be summarized in the draft report that the Stakeholder Group will review.
  - Mohsin Siddique, DC Water, asked why there is a difference between the drainage for the IP Modeling Tool and the TMDLs drainage areas? Mr. Seltzer stated that there are better tools and data available than when the TMDLs were developed.
  - Ms. Savineau emphasized that the purpose of delineating the drainage area using better tools and data was to ensure all the TMDLs have consistent drainage area assumptions.
  - Ms. Jenny Molloy, EPA, requested the team document when there was a difference between the drainage area in the IP Modeling Tool and the TMDLs. The project team is documenting the methodology and assumptions.
- **Pollutant Load Module:** Ms. Savineau provided an overview of the calculations for the pollutant loads. For Total Suspended Solids (TSS), Total Nitrogen (TN), Total Phosphorus (TP), the load is equal to the land-based load and the stream bank erosion load. The land-based load is a function of runoff and Event Mean Concentrations (EMCs). Erosion is a function of stream conditions and the percent impervious surface. For all other pollutants except trash, the pollutant load is based on the land-based load, which is a function of runoff and EMCs. For trash, the pollutant load is based on the land-based loads, which is a function of land use loading rates.
  - **Refined the EMCs:** At the May meeting it was stated that the IP Model would use EMCs from wet-weather monitoring data. If the data were not available, the EMCs from the original TMDLs would be used. At the May meeting EMCs were presented as the same across all water bodies.
    - **Update:** The project team conducted research to see if there were any differences in EMCs between the three major watersheds (Anacostia River, Potomac River, Rock Creek). Ms. Savineau stated the project team applied statistical analyses of the data to address or eliminate uncertainty (on non-detects, qualified data and outliers). There was a second statistical test to determine is EMCs are different across watersheds.
    - **Results:** There is a statistical difference in EMCs between watershed for four pollutants (TSS, BOD, O&G, Zn). Ms. Savineau showed a table of EMCs used to develop the TMDLs and the EMC used in the IP Modeling Tool. For some of them there are three values; one for each major watershed. In some instances the IP Modeling Tool has lower EMCs than used to develop the TMDLs. In some instances the

    IP Modeling Tool has higher EMCs than used to develop the TMDLs. For toxics, the project team will use the EMCs from the TMDLs.
  - There are EMCs used from the original TMDLs because some of the wet weather monitoring data did not include data on organics, toxics and mercury.
  - Ms. Savineau stated that it was difficult to determine how the EMCs were calculated from the originals TMDLs because of data challenges. It was highlighted that refinement of EMCs could be a recommendation from this process.
- o **Stream Bank Erosion (SBE):** In-stream erosion contributes sediments and nutrients to stormwater. The project team is examining stream bank erosion as a function of overall watershed load, imperviousness, and stream condition. This will be considered as part of the MS4 area WLA. Further refinements since the May meeting were to establish a link between SBE and watershed imperviousness and stream erosion potential. Ms. Savineau noted a reason to include stream bank erosion in the IP Modeling Tool is that DDOE can get credit for stream restoration or reducing watershed imperviousness.
  - **Allowing SBE Loads:** The project team recommends applying SBE towards WLA for the Chesapeake Bay (CB) TMDLs. This is approved and recommended by the Chesapeake Bay Program (CBP). For the local TMDLs, the project team recommends applying it towards the LA. Calculating SBE is a big driver for getting credit in the CB TMDL. Stream restoration can also be used to meet local LAs.
    - Becky Hammer asked about the implications of including SBE in the IP Modeling Tool. Mr. Champion stated that stream restorations would allow DDOE to get credit in the CB TMDLs. However, DDOE would not get credit for the local TMDLs, as SBE was not incorporated into the original modeling and setting of WLAs.
    - Mary Searing, DDOE, stated that DC is different than other areas in the Bay because the District does not have agriculture land uses and it is a dense, urban area. She stated the streams impacted in DC would be comparable to other large cities where SBE is included as part of their WLA and that it may be of value to identify how other urban areas or cities like DC have handled this issue.
    - Mr. Bolinder stated that even if DC does not get credit for stream restoration, it is something the public can see. The public cannot see TSS.
    - Ms. Molloy suggested that as the IP Modeling Tool is being development, DDOE will examine if the District should revisit TMDLs and how the next WLAs should be structured.
    - Mr. Bolinder stated the DDOE should examine if it is possible for the District to take advantage of a trading approach, as has been approved for nutrients.

- **BMPs Calculations:** Ms. Savineau provided an overview of the methodology the team used to create an inventory of current MS4 BMPs and finalized BMP efficiencies. The existing

BMPs in the MS4 area have been incorporated, and the load reduction efficiencies have been applied.

- **MS4 BMP Inventory:** The project team collected data from a variety of different agencies such as DDOE, DDOT, DC Water, and GSA. All of the data was consolidated into a single database. The team removed duplicates, developed a consistent nomenclature, grouped the BMPs into 12 categories, added spatial coordinates, and assigned missing drainage areas.
  - There were more than 3,000 BMPs, but the project team retained about 2,000. BMPs were removed because there was missing data. The project team did not want to take credit for pollutant reductions based on incomplete information. The BMPs are only treating about 1.4% of the MS4 area. The highest percentage of BMPs is rainwater harvesting (37%), such as rain barrels. However, they are a small percentage of the treated drainage areas (1%).
  - Other strategies included in the IP Modeling Tool are stream restoration, trash removal strategies, street sweeping. The team is still working on the methodology for pet waste removal, new tree planting, and catch basin cleaning.
    - Meredith Upchurch, DDOT, asked if the model was differentiating between catch basins and treated catch basins and if tree cover is included. Ms. Savineau stated the model does differentiate between catch basins and treated catch bases. Only new tree plantings are counted as BMPs.
- **BMP Load reduction efficiencies Methods:** There are three methods to determine load reduction efficiencies. Each BMP only gets one method and all three are used in the model. The project team created a decision tree to determine which method should be used for each BMP.
  - If BMP runoff volume retention is known, calculate the load reduction based on volume reduction efficiency. Need to evaluate BMPs designed under the new stormwater guidance.
  - If BMP runoff volume is unknown, calculate load reduction based on percent load reduction efficiency. Needed to evaluate design under the old stormwater guidance. The CBP has an approved list for TSS, TN, and TP. For non-CBP parameters the project team used literature efficiencies.
  - Other reduction efficiency. Retention volumes provided by rain barrels and trees are calculated based on total retention per year. Trash traps and street sweeping have a predetermined load reduction per year. For stream restoration the project team will use CBP interim rates.
- Ms. Savineau presented a BMP vs pollutant efficiency matrix. The efficiencies range from green (low efficiency) to red (high efficiency). Ms. Hammer asked why the pollutant efficiencies for trees are zero for all pollutants. Ms. Savineau stated they were unable to find data, but the team will use another methodology.
- **Volume Reduction Efficiencies:** A SWMM model was used and hypothetical bioretention rates were added. The retention volume was changed for it to run on a long-term basis to then evaluate the decreased runoff volume. This was also done by the CBP. All figures were accessed on an annual basis. This model then creates runoff curves which Ms. Savineau showed to the Stakeholder Group.

- **Baseline Load Implications:** As discussed at previous meetings, the modeled baseline loads will differ from TMDL baseline loads. About 2/3 are higher than the TMDL. Ms. Savineau shared a table that reflects the reason for the differences between the IP Modeling Tool and the TMDL.
- **Existing conditions**
    - Base line loads – BMP reduction = *Basis for the gap analysis*.
- An overview chart of the BMPs illustrated that 70% of all the BMPs in the MS4 area are not making much of an impact on reducing loads, and that there is still a lot of work to be done. The trash removal BMP has yielded the greatest impacts.
- **Gap Analysis:** The comprehensive baseline analysis and existing conditions will soon be finalized, and more information is being collected from DDOE programs. LimnoTech will share the result with DDOE during the week of June 30. The existing conditions and differences will be noted in a summary report. There will be six appendices to the report, and it will be available to the Stakeholder Group for download.
- **Future Scenario Modeling:** Mr. Herrema stated that the project team is developing a future scenario model. The team has collected data from multiple sources, such as GSA and Office of Planning. The future scenario model will incorporate the retention requirements for development and redevelopment under the new stormwater regulations.

Discussion

- Dr. Siddique asked if it was possible to do an analysis of what would be achievable by applying BMPs over the entire drainage area. Mr. Herrema stated that the first step is to look at the volume of water that needs to be treated.
- Ms. Molloy stated that she is impressed with the assumptions and the decision making the project team is making as they build the IP Modeling Tool. She suggested the team consider having their model peer reviewed by independent experts, such as ICPRB. Karl Berger, MWCOG, stated the the Bay program uses the STAC to peer review. Ms. Hammer stated she would ask around to see what NRDC has used in the past. Hamid Karimi, DDOE, stated that he is a member of STAC and could follow up if needed.

Next Steps

- Timeline:
    - Late June: The project team will complete a draft comprehensive baseline report. It will have the existing conditions and the difference between the model and the TMDL. The modeling approach, EMCs, and BMPs are appendices as technical memos. The stakeholders will be alerted when the document is available on the project website.
    - Late Summer: The purpose of the stakeholder meeting will be to present the comprehensive baseline report and implementation scenario modeling.
    - Fall 2014: The project team will present the scenario modeling and implementation planning

6 POST MEETING ACTION ITEMS

Action	Assigned To	Deadline
Send the meeting minutes, presentation, and list of attendees out to participants	Chancee` Lundy	Week of June 30th
Update the project website	Chancee' Lundy	Week of June 30th
Send a poll to the stakeholders for a meeting in July or August	Chancee' Lundy	Week of June 30th

7 DECISIONS MADE

- None

8 NEXT MEETING

Next Meeting: July/August 2014

9 MEETING END

Meeting End: 2:40 PM

10 ATTACHMENTS

- A – Presentation with Agenda
- **For attendance, please see roster on page 2 of this document

Draft Comprehensive Baseline Analysis

District Consolidated TMDL Implementation Plan and Monitoring Program

June 26, 2014

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Purpose of Meeting

- Update on modeling methodology
- Opportunity for additional feedback and discussion
- Preview upcoming work

Agenda

- Website
- Modeling Updates
- Analysis of Baseline & Existing Conditions
- Next Steps

WEBSITE

DC Stormwater Plan

Consolidated TMDL Implementation Plan

Reducing Stormwater Runoff and Pollution in District Waterways

The District of Columbia is committed to improving the quality of its urban waterways. Under a Municipal Separate Storm Sewer System (MS4) permit, the District is obligated to manage and reduce pollution in urban stormwater. In highly urbanized areas, rainfall is unable to drain naturally, instead running off paved surfaces and rooftops, picking up and carrying pollutants (such as toxic chemicals, bacteria, dirt, and trash) to rivers and streams.

The District Department of the Environment (DDOE) is the agency designated with primary responsibility to administer and oversee the District's MS4 permit. A major component of the MS4 permit is the development of a Consolidated Total Maximum Daily Load (TMDL) Implementation Plan which will guide the agency in reducing pollution from the District's MS4, supporting achievement Clean Water Act goals for District waterways.

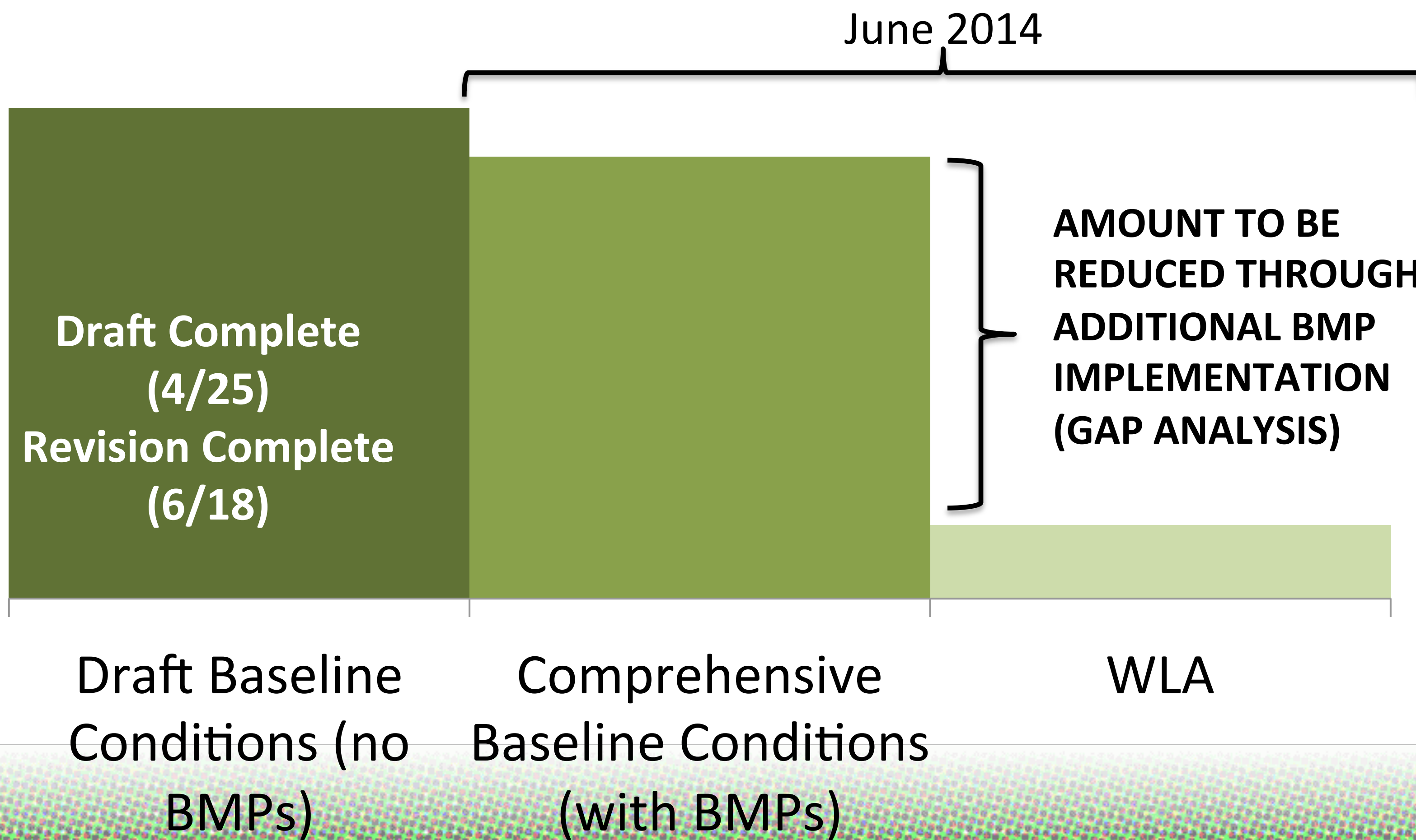
Calendar/Timeline

Stakeholder Meeting @ DDOE – May 6, 2014

Stakeholder Meeting @ DDOE – June 26, 2014

MODELING UPDATES

Context/Purpose: Gap Analysis



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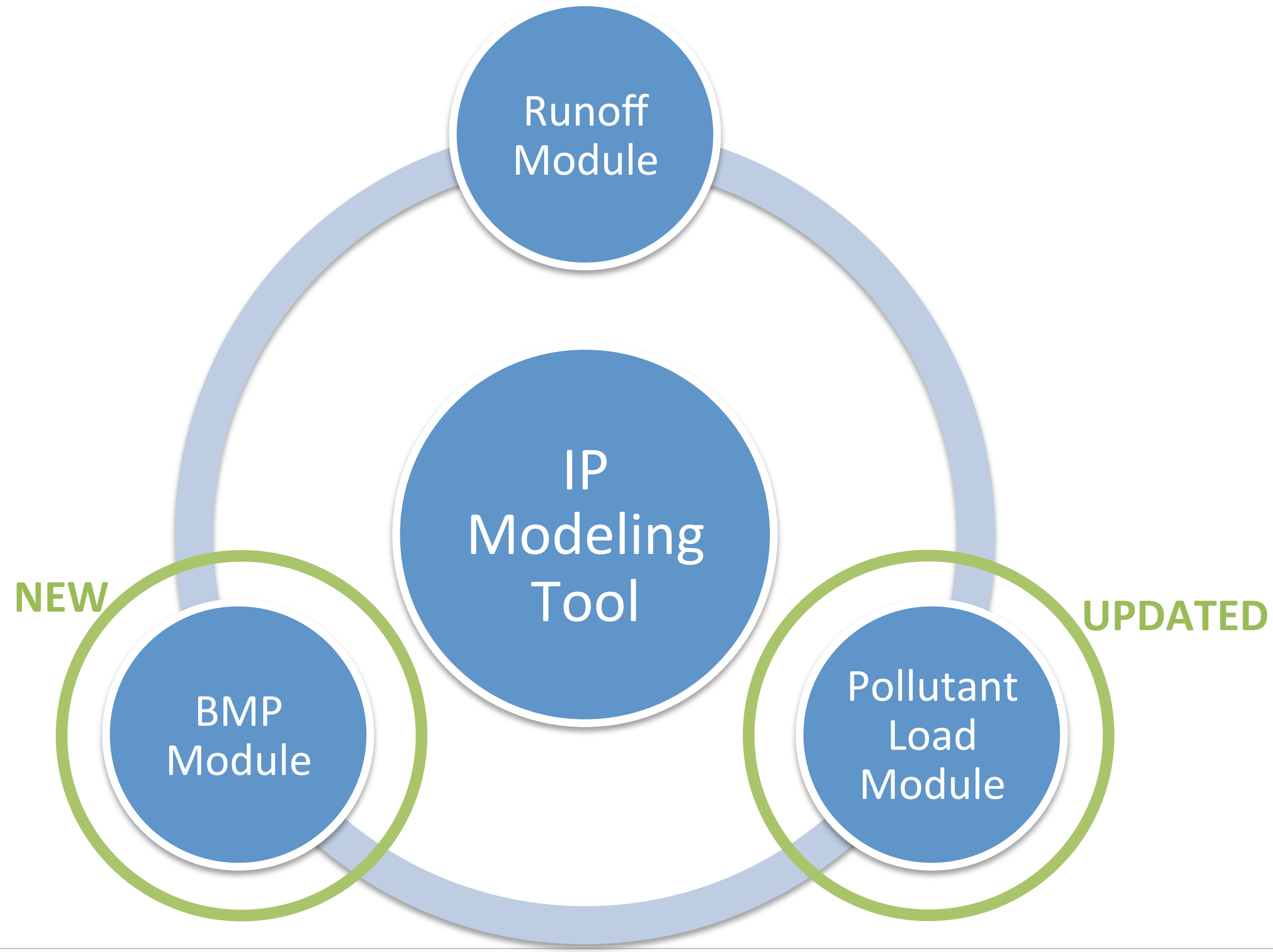
Modeling Updates

- Methodology updates:
  - EMC
  - Stream Bank Erosion
  - BMPs
- Modeling tool updates:
  - Baseline conditions update
  - Incorporated BMPs (inventory, efficiencies)
  - Current conditions calculated (draft)


Runoff Module
IP Modeling Tool
NEW
BMP Module
UPDATED
Pollutant Load Module

IP Modeling Tool Development

RUNOFF MODULE REVIEW

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Runoff Calcs: Simple Method

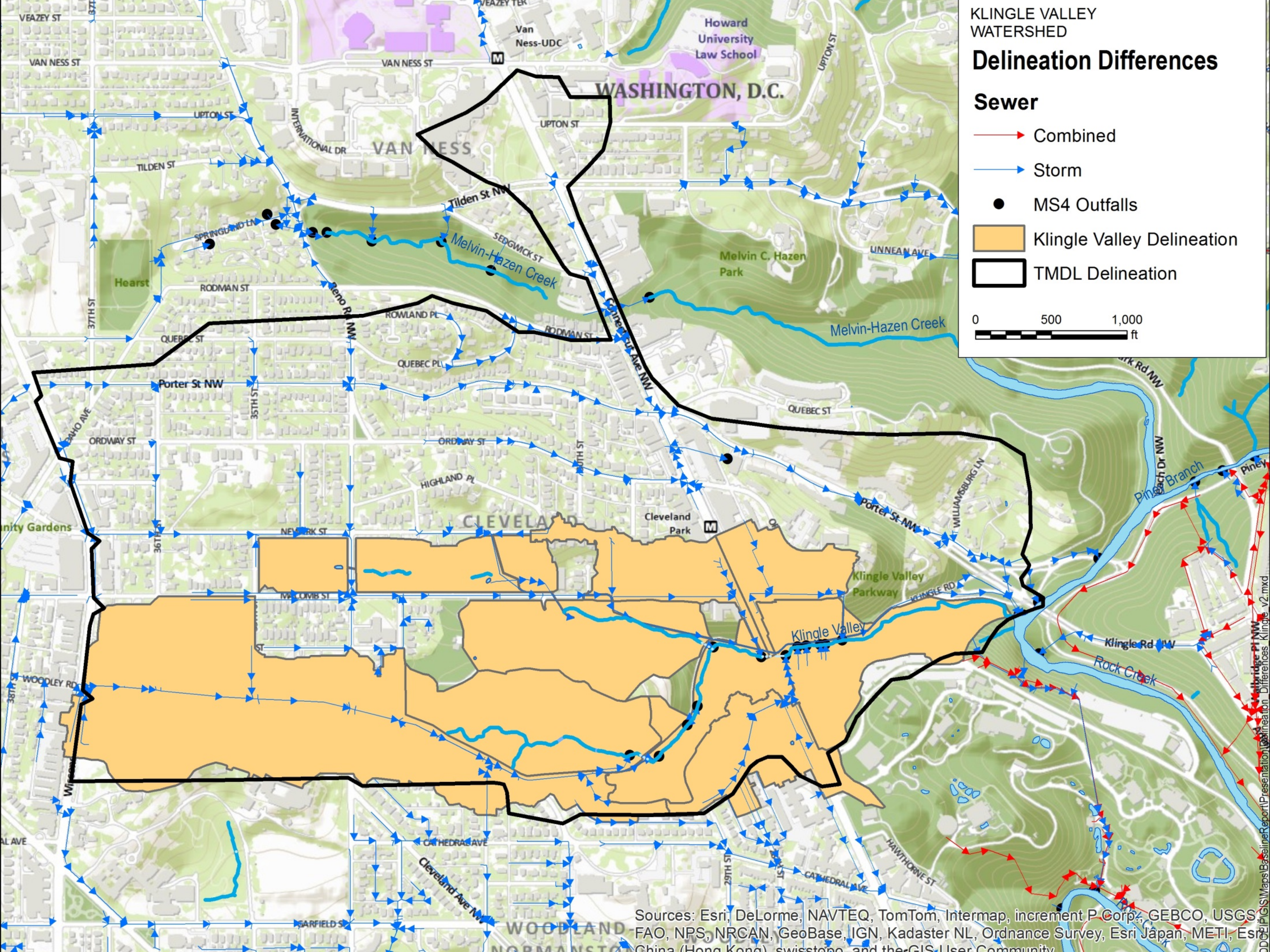
Appropriate as general planning tool at scale of development site, catchment, or subwatershed

$$R = 0.9 * P * Rv * A$$

- Precipitation (P)
- Runoff Coefficients (Rv, ~level of imperviousness)
- Drainage Areas (A)

Runoff Inputs

- Precipitation: average yearly or seasonal
- Rv: based on 2005 LULC and soils data
- Area: Delineated based on most up-to-date information
  - Some differences compared to TMDL areas


KLINGLE VALLEY WATERSHED
Delineation Differences
Sewer
Combined
Storm
MS4 Outfalls
Klingle Valley Delineation
TMDL Delineation
0
500
1,000
ft
WASHINGTON, D.C.
VAN NESS
CLEVELAND
Cleveland Park
Howard University Law School
Melvin C. Hazen Park
Melvin-Hazen Creek
Klingle Valley Parkway
Klingle Valley
Rock Creek
Piney Branch
Hearst
Van Ness-UDC
Connecticut Ave NW
Porter St NW
Tilden St NW
Klingle Rd NW
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

IP Modeling Tool Development

POLLUTANT LOAD MODULE REVIEW

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Load Calculation

- For TSS, TN, TP:
  - Load = land-based load + stream bank erosion load
- For all other pollutants except trash
  - Load = land-based load only, function of runoff and EMCs
- For trash:
  - Land-based loads only, function of landuse loading rates

Load Calculation Changes

- Refined EMC analysis
- Refined stream bank erosion methodology

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Methodology Updates

EMC

EMCs: Previous Recommendations

- Use EMCs from wet-weather monitoring if available. Otherwise use EMCs from original TMDLs.
  - Nutrients, sediments, most metals → monitoring
  - Hg, organics, toxics → TMDL
- ~~Apply one EMC per pollutant over entire MS4 area~~
  - Determine if watershed EMCs can be developed

Two-Step Process

1. Applied advanced statistics to address or eliminate uncertain data
2. Applied statistical test to determine potential differences exist between watershed EMCs

EMCs: Recommendations

- Watershed EMCs: TSS, BOD, O&G, Zn
- District-wide EMCs: TN, TP, FC, As, Cu, Pb
- TMDL EMCs: Hg and all toxics and organics

EMCs: Results

	TSS (mg/l)	TN (mg/l)	TP (mg/l)	Fecal Coliform Bacteria (MPN/ 100ml)	BOD (mg/l)	Oil and Grease (mg/l)	Copper (ug/l)	Lead (ug/l)	Zinc (ug/l)	Arsenic (ug/l)
EMCs used in TMDLs	35 60 80 94 227	3.7 2.0	0.50 0.27	28,265 17,300	27 43	3.6 10	78 57	36 29	183 173	1.4
EMCs used in IP Modeling Tool	60(RC) 73(ANA) 42(POT)	3.3	0.38	13,406	24(RC) 36(ANA) 28(POT)	4.2 (RC) 3.7(ANA) 3.4(POT)	53	16	102(RC) 121(ANA) 101(POT)	1.5

EMCs: Results

	Hg (ug/l)	Chlor-dane (ng/l)	DDD (ng/l)	DDE (ng/l)	DDT (ng/l)	Diel-drin (ng/l)	Hepta-chlor Epoxide (ng/l)	PAH1 (ug/l)	PAH2 (ug/l)	PAH3 (ug/l)	TPCB (ug/l)
EMCs used in TMDLs	0.19	9.83	3.0	13.3	34.2	0.29	0.96	0.66	4.16	2.68	0.08
EMCs used in Modeling Tool	0.19	9.83	3.0	13.3	34.2	0.29	0.96	0.66	4.16	2.68	0.08

Methodology Updates

STREAM BANK EROSION

Stream Bank Erosion

- Stream bank erosion contributes sediment and nutrients
- Contribution calculated as a function of overall watershed load, imperviousness, and stream condition

SBE methodology

- Further refinement to establish link between SBE and watershed imperviousness and stream erosion potential
  - Based on empirical relationship (MDE) and literature (CWP)

Stream Bank Erosion

Load from SBE can be reduced through stream restoration or by reducing the watershed imperviousness

Allocating SBE Loads

- For CB TMDL: Apply SBE load towards WLA
  - Reason: Approved and recommended by CBP
  - Note: Impact of SBE on total loads not very pronounced
- For local TMDL: Apply SBE load towards LA
  - Reasons:
    - Local TMDLs are inconsistent in allocating SBE
    - Local TMDLs do not calculate SBE for all tribs
    - Local TMDLs calculate much smaller SBE load compared to FWS studies
  - Note: Impact of SBE on total loads very pronounced in small tribs

SBE Implications

- Credit towards Bay TMDL is a big driver for stream restoration
- Stream restoration will also be used to meet local LAs
  - Mostly impacts Anacostia TSS TMDL since Watts Branch has already undergone some restoration

Methodology Updates

BMPs

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Incorporating BMPs

- “Finalized” current MS4 BMP inventory
  - Type, location, drainage area
- Finalized BMP efficiencies
  - Percent load reduction
  - BMP volume retention reduction
  - Other reductions (BMP specific)

MS4 BMP Inventory

- Collected BMP data
  - DDOE
  - DDOT
  - DCWater
  - GSA
- Consolidated into single database

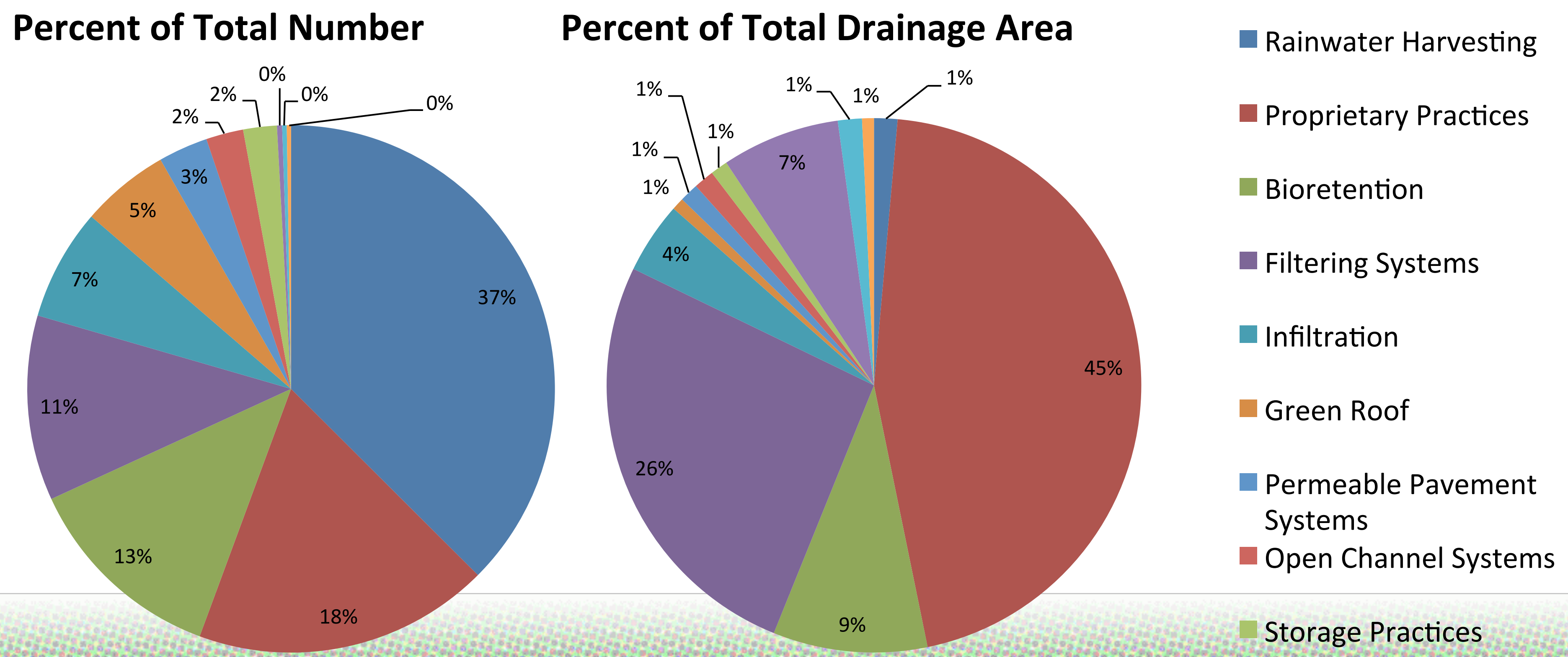
MS4 BMP Inventory

- Consolidate and standardize BMP data by:
  - Checking/removing duplicates
  - Assigning uniform nomenclature
  - Grouping into 12 BMP categories
  - Assigning spatial coordinates
  - Assigning missing drainage areas
- All assumptions err on the conservative side

MS4 BMP Inventory by numbers

Treated Drainage Area (sq.ft.)	15,883,953 (1.4% of MS4 Area)			
Number of MS4 BMPs Identified	3,193			
Number of BMPs retained	2,226			
% of Total BMP Count	70%			
BMP Category	**Treated Drainage Area**	**% of treated DA**	**Count**	**% of Count**
Bioretention	1,502,789	9%	353	16%
Filtering Systems	246,558	2%	55	2%
Green Roof	1,286,887	8%	75	3%
Impervious Surface Disconnect	21,087	0%	4	0%
Infiltration	1,089,177	7%	208	9%
Open Channel Systems	404,352	3%	47	2%
Permeable Pavement Systems	346,570	2%	53	2%
Ponds	4,245,328	27%	3	0%
Proprietary Practices	1,849,796	12%	214	10%
Rainwater Harvesting	547,959	3%	1,186	53%
Storage Practices	221,322	1%	17	1%
Wetland	4,122,128	26%	11	0%

Current MS4 BMPs



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Other BMPs

- IP Modeling Tool also includes:
  - stream restoration
  - trash removal strategies
  - street sweeping
- In the pipeline:
  - catch basin cleaning
  - pet waste removal
  - new tree planting

BMP Efficiencies

Three possible methods

1. If BMP runoff volume retention is known, calculate load reduction based on volume reduction efficiency curves
2. If BMP runoff volume retention is unknown, calculate load reduction based percent load reduction efficiency
3. "Other" reduction efficiency

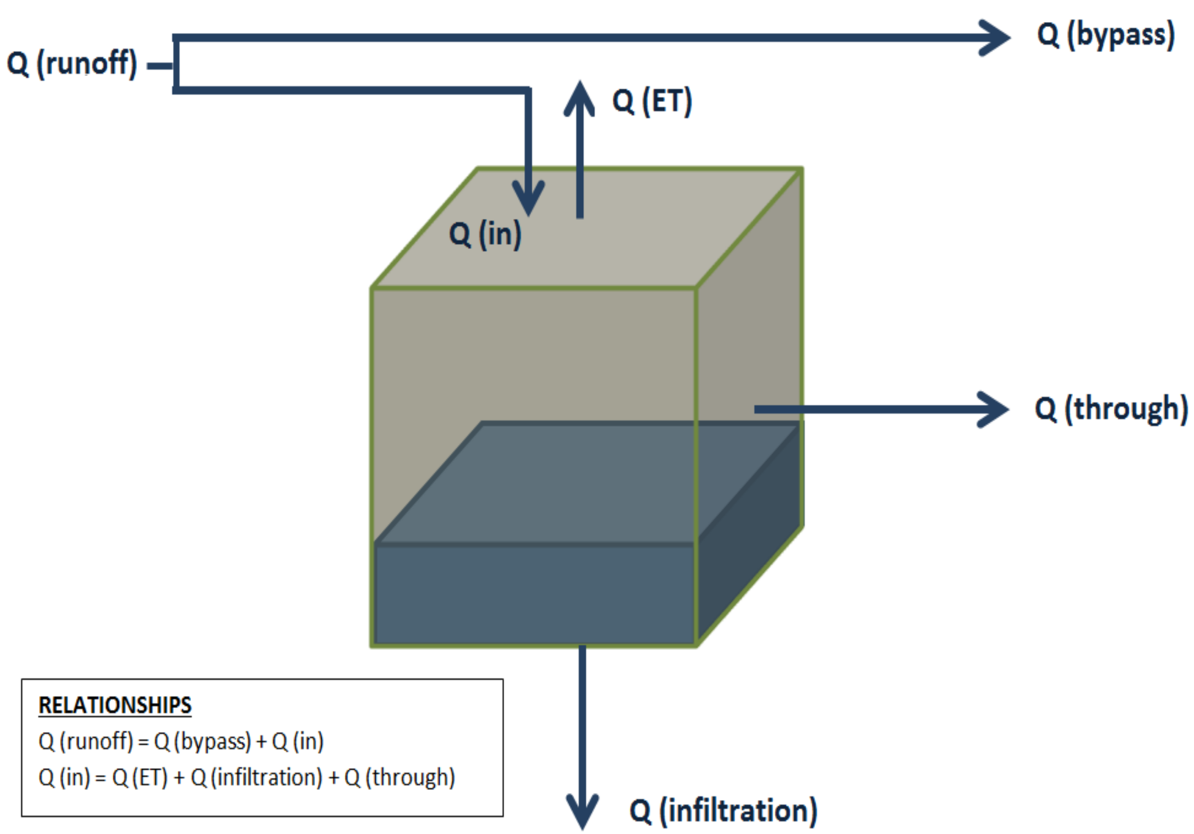
Needed to evaluate BMPs designed under new SW guidance

Needed to evaluate BMPs designed under old SW guidance

Needed for BMPs with prescribed load reductions

Percent Reduction

$(Load_{in}) \times \%Red = Load_{out}$



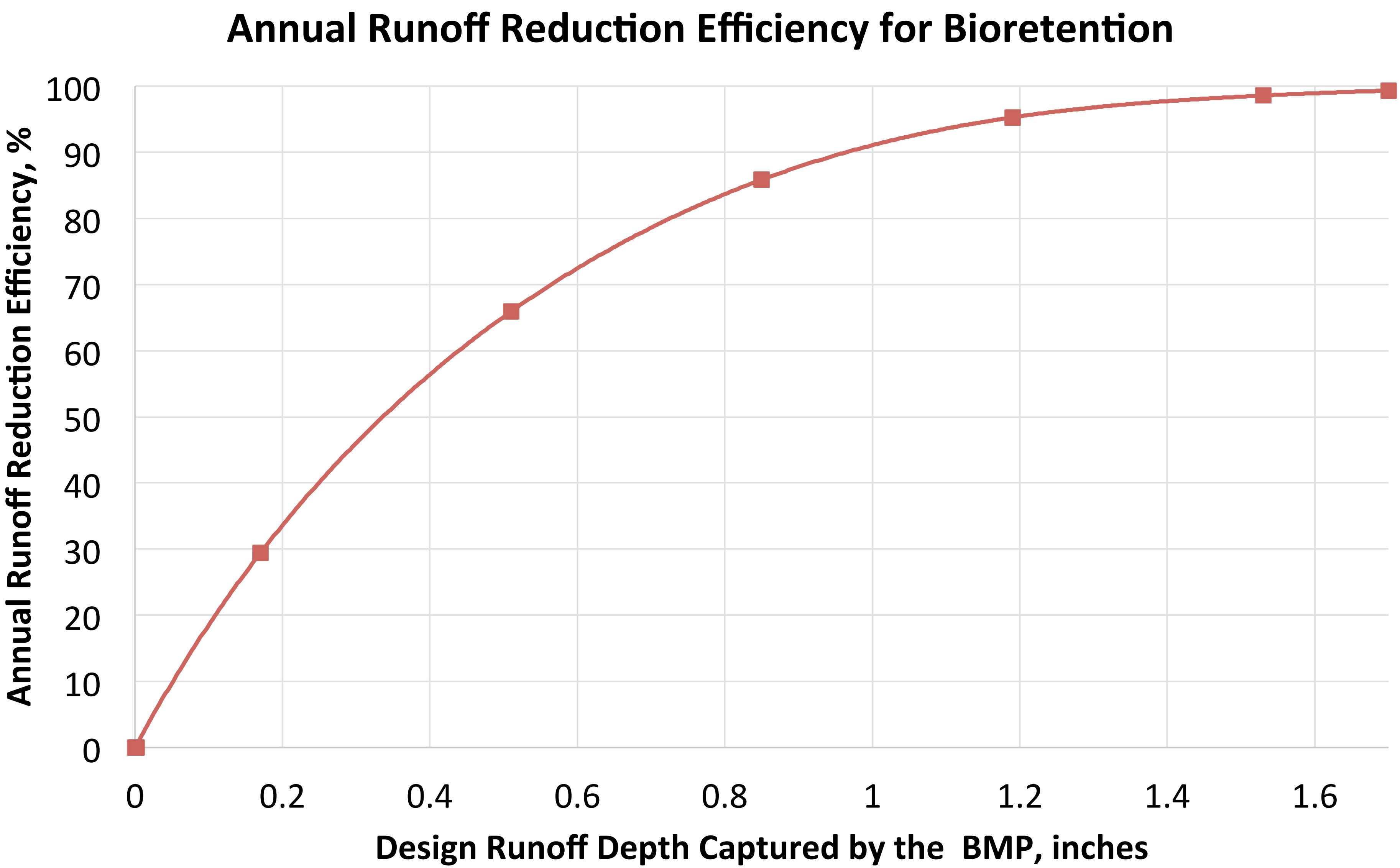
Volume Reduction

$(Q_{ET}+Q_{infiltration}) \times EMC = Load$ Reduced

Volume Reduction Efficiencies

- Efficiencies determined using SWMM model (continuous long term simulation)
- Conservative assumption that load reduction only occurs through volume reduction (no filtering)
- Follows CBP recommended method

Example Volume Reduction Curve



Percent Load Reduction Efficiencies

- For CBP BMPs, use CBP recommended efficiencies for TSS, TN, TP
- For non-CBP BMPs, use published literature efficiencies for TSS, TN, TP
- Apply partition coefficients to determine efficiencies for other pollutants

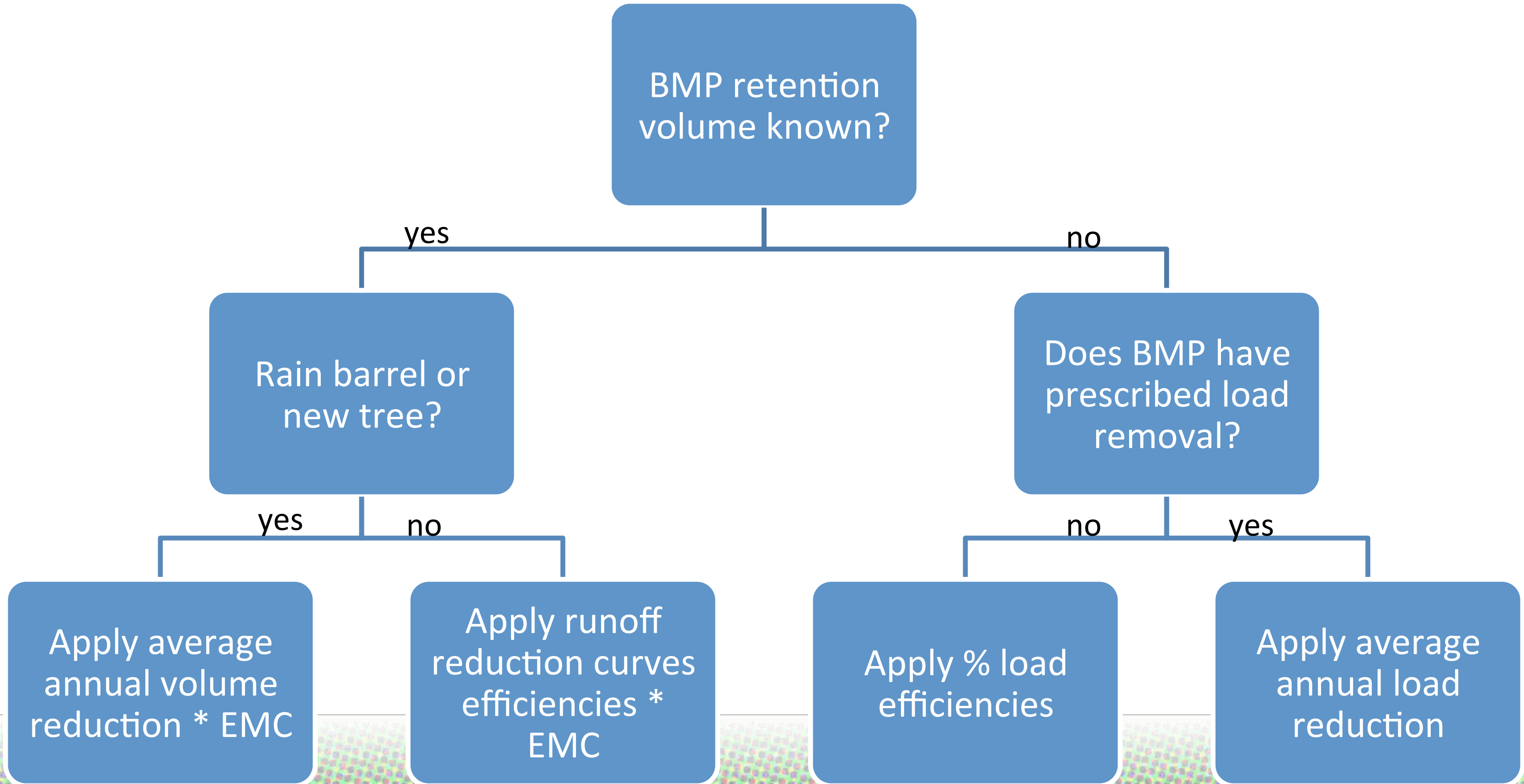
Percent Efficiencies

	Green Roof	Rainwater Harvesting	Impervious Surface Disconnect	Permeable Pavement Systems	Bioretention	Filtering Systems	Infiltration	Open Channel Systems	Ponds	Wetland	Storage Practices	Proprietary Practices	Tree Planting and Preservation
Arsenic	18	9	10	42	45	48	56	40	36	36	21	6	0
BOD	0	0	0	0	0	40	51	30	0	63	27	0	0
Chlordane	7	3	3	15	16	17	20	14	13	13	7	2	0
Copper	21	10	11	48	52	55	65	46	41	41	24	7	0
DDD	22	10	11	49	52	56	66	47	42	42	24	7	0
DDE	25	12	13	58	62	66	78	55	49	49	29	8	0
DDT	24	11	12	53	57	61	72	51	46	46	27	8	0
Dieldrin	0	0	0	0	0	0	1	0	0	0	0	0	0
Fecal Coliform Bacteria	24	12	13	55	59	63	75	53	47	47	27	8	0
Heptachlor Epoxide	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	27	13	14	62	66	70	84	59	53	53	31	9	0
Mercury	18	9	10	42	45	48	56	40	36	36	21	6	0
Oil and Grease	0	0	0	0	0	0	0	0	0	0	0	62	0
PAH1	1	0	0	2	2	2	2	2	1	1	1	0	0
PAH2	11	5	6	25	26	28	33	24	21	21	12	4	0
PAH3	30	14	15	67	72	77	91	64	57	57	33	10	0
TN	43	40	13	47	58	40	83	42	20	20	13	5	0
TP	45	40	13	50	68	60	85	43	45	45	15	10	0
TPCB	19	9	10	44	47	50	59	42	37	37	22	6	0
TSS	31	15	16	70	75	80	95	67	60	60	35	10	0
Zinc	24	12	13	55	59	63	75	53	47	47	27	8	0

"Other" Reduction Efficiencies

- Rain barrels and trees: pre-determined average annual retention (xx gallons/yr)
- Stream restoration: follows CBP interim rates
- Trash removal, street sweeping: pre-determined annual load removal

BMP Load Reduction Method Selection



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Modeling Tool Updates

MODELING TOOL UPDATES

Modeling Tool Updates

- Includes changes to EMCs, SBE
- Incorporates BMP inventory and efficiencies

Baseline Load Implications

- Baseline = loads without BMPs
- Modeled baseline loads will differ from TMDL baseline
  - ~1/3 less than TMDL baseline
  - ~2/3 greater than TMDL baseline

Reasons for Different Results

Differences in modeling approaches	Reason for differences	Effect of difference
Different runoff method	Needed consistent method to determine runoff volumes in MS4 and for BMPs	Significant effect. Simple method typically produces higher runoff volumes compared to gaged flow volumes
Different precipitation	Needed consistent value to apply across MS4 and BMPs	Minor effect
Different drainage areas	Better GIS data for delineations	Significant effect if new drainage area is very different. Could result in higher/ lower runoff volumes and pollutant loads.
Different MS4 characterization	Better GIS data to characterize MS4	Minor effect
Different stream bank erosion method	Understanding of SBE has evolved	Significant effect. Generally results in additional load from SBE.
Different EMC	Better/more data to draw from	Significant effect. Could result in higher/ lower pollutant loads

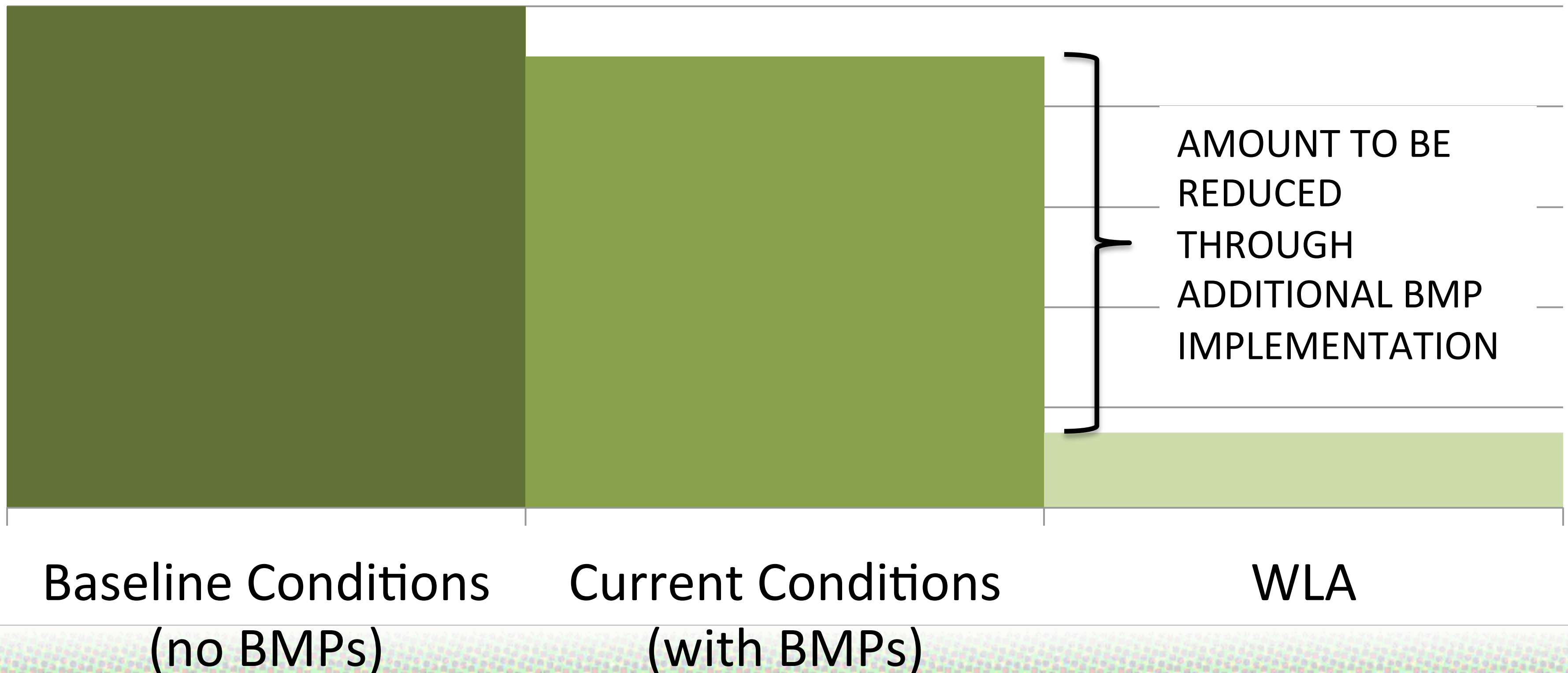
Analysis of Existing Conditions

- Existing conditions reflect load reductions from current BMPs
  - Existing load = baseline load – current BMP load removed
- Basis for gap analysis

Percent of Total Load Removed by Existing BMPs

Pollutant	Range of Reduction
Nutrients	0-22%
Sediment	0-8%
Bacteria	0-4%
Trash	60-70%
BOD, O&G	<1%
Metals	0-4%
Organics/Toxics	0-5%
PCB	Not modeled (source control)

Context/Purpose: Gap Analysis



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Gap Analysis – Example Results

Water Body	TMDL TN MS4 Baseline Load (lb/yr)	Model TN MS4 Baseline Load (lb/yr)	TMDL TN WLA (lb/yr)
POTTF_DC	42,000	127,800	39,400
POTTF_MD	18,300	15,700	15,000

NEXT STEPS

Future Scenario Modeling

- Incorporate new District stormwater regulations
  - Retention requirements for development and redevelopment
  - Utilize forecasts from multiple sources
- Review WIPs for anticipated IP actions
- Determine approach for closing gap

Upcoming Deliverables and Timing

End of June

- Comprehensive Baseline Documentation Submitted
- Also share with stakeholders on website

July 2014

- DDOE/Stakeholders review Report

Late Summer 2014

- Stakeholder meeting
- Present Comprehensive Baseline Results
- Approach to implementation scenario modeling

Fall 2014

- Scenario modeling
- Implementation Planning

Questions/ Comments?