Status of Work Orders

MIDS Work Group

October 19, 2012

Open Work Orders with Barr

- Swales (WO2)
- Permeable Pavement (WO3)
- Iron-Enhanced Filters (WO4)
- Turf (WO5)
- Redevelopment & Linear (WO6)
- Stormwater Reuse (WO7)
- Calculator (WO1)

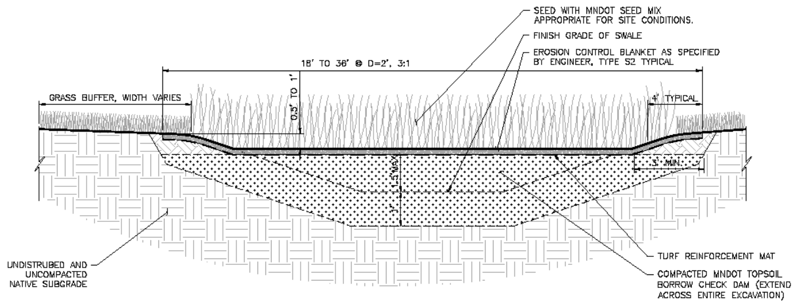
Photos: Ray Roemmich, Valley Branch Watershed District

Swales

Swales

Previous Work

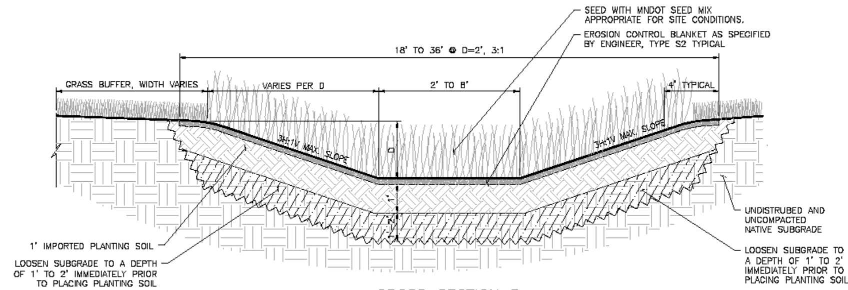
- Conducted basic review of 31 **research** documents
- Provided draft **drawings** of minimum standards
- Summarized **algorithms** for various swale options with spreadsheet calculator



CROSS SECTION A

NOT TO SCALE

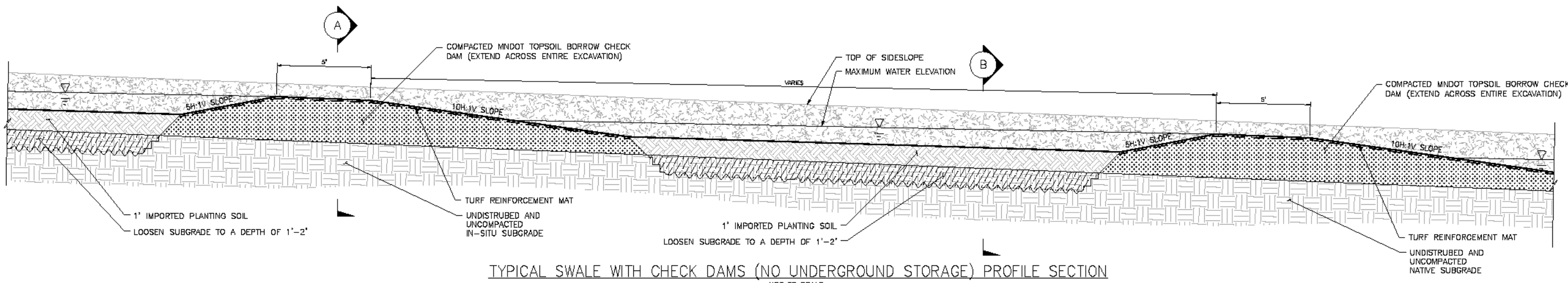
NOTE: NOT RECOMMENDED FOR TYPE D NATIVE SOILS



CROSS SECTION B

NOT TO SCALE

NOTE: NOT RECOMMENDED FOR TYPE D NATIVE SOILS



TYPICAL SWALE WITH CHECK DAMS (NO UNDERGROUND STORAGE) PROFILE SECTION

NOT TO SCALE

NOTE: NOT RECOMMENDED FOR TYPE D NATIVE SOILS

CONSTRUCTION SEQUENCING:

1. PERFORM CONTINUOUS INSPECTIONS OF EROSION CONTROL PRACTICES.
2. INSTALL SILT FENCE ALONG THE PERIMETER OF THE SITE TO PREVENT SEDIMENT FROM LEAVING THE SITE DURING THE CONSTRUCTION PROCESS.
3. ALL DOWNGRADIENT PERIMETER SEDIMENT-CONTROL BMPS MUST BE IN PLACE BEFORE ANY UP GRADIENT LAND-DISTURBING ACTIVITY BEGINS.
4. REMOVE TOPSOIL FROM THE SITE AND PLACE IN TEMPORARY STOCKPILE LOCATION. TEMPORARY SEED THE STOCKPILE WITH SAME SEED AS FINAL SEED MIX.
5. INSTALL UNDERGROUND UTILITIES (WATER, SANITARY SEWER, ELECTRIC AND PHONES) TAKING THE LOCATION AND FUNCTION OF STORM WATER BMPS INTO CONSIDERATION.
6. SEED AND MULCH DISTURBED AREAS ON SITE.
7. CONSTRUCT THE ROADS TAKING THE LOCATION AND FUNCTION OF STORM WATER BMPS INTO CONSIDERATION.
8. PERFORM ALL OTHER SITE IMPROVEMENTS TAKING THE LOCATION AND FUNCTION OF THE STORM WATER BMPS INTO CONSIDERATION.
9. FINAL GRADE THE SITE.
10. STABILIZE THE SITE BY IMPLEMENTING THE NATIVE SEEDING AND PLANTING PORTION OF THE LANDSCAPING PLAN.
11. INSTALL THE EROSION CONTROL BLANKET AND COIR ROLL/CHECK DAMS.
12. REMOVE THE SILT FENCE AFTER THE SITE IS STABILIZED PER PROJECT ENGINEER APPROVAL.

GENERAL NOTES:

1. INSTALL ALL TEMPORARY EROSION CONTROL MEASURES IN ACCORDANCE WITH MnDOT GENERAL CONDITIONS 2573, PRIOR TO THE START OF ANY CONSTRUCTION OPERATION THAT MAY CAUSE ANY SEDIMENTATION OR SILTATION AT THE SITE.
2. INSTALL STORM DRAIN INLET PROTECTION TO PREVENT CLOGGING OF THE STORM SEWER AND SEDIMENT LOADS TO DOWNSTREAM STORM WATER FACILITIES OR WATERBODIES.
3. GRADING OF THE SWALE SHALL BE ACCOMPLISHED USING LOW-IMPACT EARTH-MOVING EQUIPMENT TO PREVENT COMPACTION OF THE UNDERLYING SOILS. SMALL TRACKED DOZERS AND BOBCATS WITH RUNNER TRACKS ARE RECOMMENDED.
4. EXCAVATE THE SWALE TO THE SPECIFIED DEPTH (ELEVATION). IT IS RECOMMENDED THAT ALL SUB MATERIAL BELOW THE SPECIFIED ELEVATION SHALL BE LEFT UNDISTURBED, UNLESS SOIL LOOSENING IS INDICATED.
5. GRADE TO THE DEPTH (ELEVATION) SPECIFIED IN THE CONSTRUCTION DOCUMENTS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
6. IN THE EVENT THAT SEDIMENT IS INTRODUCED INTO THE BMP DURING OR IMMEDIATELY FOLLOWING EXCAVATION, THIS MATERIAL WILL NEED TO BE REMOVED FROM THE SWALE PRIOR TO INITIATING THE NEXT STEP IN THE CONSTRUCTION PROCESS. THIS IS ESPECIALLY IMPORTANT IF THE SWALE HAS BEEN DESIGNED TO INFILTRATE STORM WATER: SEDIMENT THAT HAS BEEN WASHED INTO THE SWALE DURING THE EXCAVATION PROCESS CAN SEAL THE PERMEABLE MATERIAL, SIGNIFICANTLY REDUCING THE INFILTRATION CAPACITY OF THE SOILS.
7. MATERIAL EXCAVATED FROM THE SWALE(S) SHALL BE DISPOSED OF ON-SITE AT LOCATIONS (STOCKPILE AREAS) DESIGNATED BY ENGINEER.
8. **NON-STANDARD COMPONENT:** CLEAN, WASHED 1.5 TO 3.5-INCH GRAVEL SHALL BE PLACED IN THE BOTTOM OF THE SWALE TO THE DEPTH SPECIFIED IN THE CONSTRUCTION DOCUMENTS. GRAVEL SHOULD BE PLACED IN LIFTS AND LIGHTLY COMPACTED WITH PLATE COMPACTORS.
9. **NON-STANDARD COMPONENT:** THE PERFORATED PIPE (UNDERDRAIN) SHALL BE LAID DIRECTLY ON THE GRAVEL BED. GRADE AND ALIGNMENT SHALL NOT VARY FROM THE PRESCRIBED GRADE BY MORE THAN 0.03 FEET (9 MM) AT ANY POINT. THE JOINTS BETWEEN SECTIONS OF PIPE SHALL BE CONNECTED IN A FASHION ACCEPTABLE TO ENGINEER. ONCE THE PIPE IS IN PLACE, IT SHALL BE COVERED IMMEDIATELY WITH GRANULAR MATERIAL AS SPECIFIED IN THE CONSTRUCTION DOCUMENTS. THE GRANULAR MATERIAL SHALL BE OF UNIFORM DEPTH ON BOTH SIDES OF THE PIPE. SPECIAL INLETS AND SPECIAL DEVICES AT THE OUTLET END OF THE PIPE SHALL BE CONSTRUCTED AS SHOWN IN THE PLANS.
10. SEEDING AND INSTALLATION OF EROSION CONTROL BLANKET SHALL BE COMPLETED WITHIN 48 HOURS OF FINAL GRADING.
11. MAXIMUM FLOW VELOCITY FOR SWALE BASE CHANNEL SHALL BE 1 FPS MAXIMUM FOR A 2 YR 24 HR DESIGN STORM.
12. MAXIMUM FLOW VELOCITY FOR SWALE SIDE SLOPES SHALL BE 4 FPS MAXIMUM FOR A 2 YR 24 HR DESIGN STORM.

NO. | REVISION DESCRIPTION | DATE | BY

I hereby certify that this plan was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota

Print Name:

Sign Name:

Date | License No.

Date | Designed By | Drawn By

Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155-4194
Phone: (651)-296-6300
TTY: (651)-282-5332
WEBSITE: www.pca.state.mn.us/

MIDS DRY SWALES TYPICAL DRAWINGS

TYPICAL SWALE WITH CHECK DAMS

Sheet No. 2 of 3 Sheets

			Parameters to be entered
			Parameters calculated

Total Volume Reduction

Total Annual Volume Reduction	74%
Total Event Volume Reduction (1.1 inch 15 minute duration storm)	14%

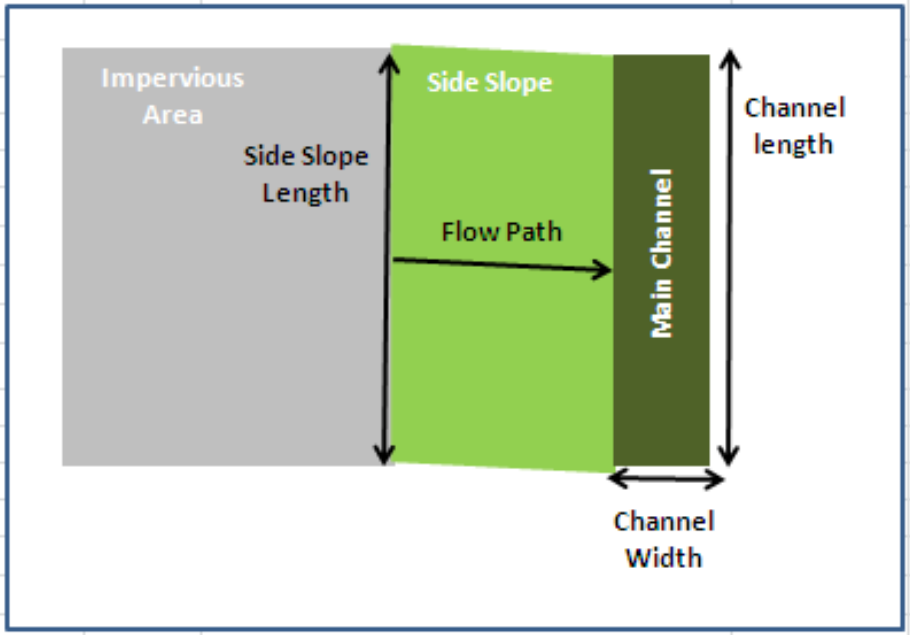
Impervious Area	1	acres
Annual	31	inches
Event	1.1	inches

Side Slope Parameters

Slope (%)	33
Infiltration Rate (in/hr)	0.8
Manning's n	0.35
Flow Path (ft)	10
Side Slope Length(ft)	1320
Annual Volume Reduction	5%
Event Volume Reduction	3%

Main Channel Base Parameters

Channel Length (ft)	1320
Channel Width (ft)	5
Slope (%)	1
Infiltration Rate (in/hr)	0.8
Manning's n	0.35
Annual Volume Reduction	72%
Event Volume Reduction	11%



Calculator | Side Slope Models | Base Channel Models

Swales

Previous Work

- Suspended additional work in hopes U of MN's work for LRRB would provide real-world, technically sound data to base volume and pollutant reductions

Swales

Current Work Plan

1) **Update draft drawings**

   Please get comments to MPCA to compile and get to Barr

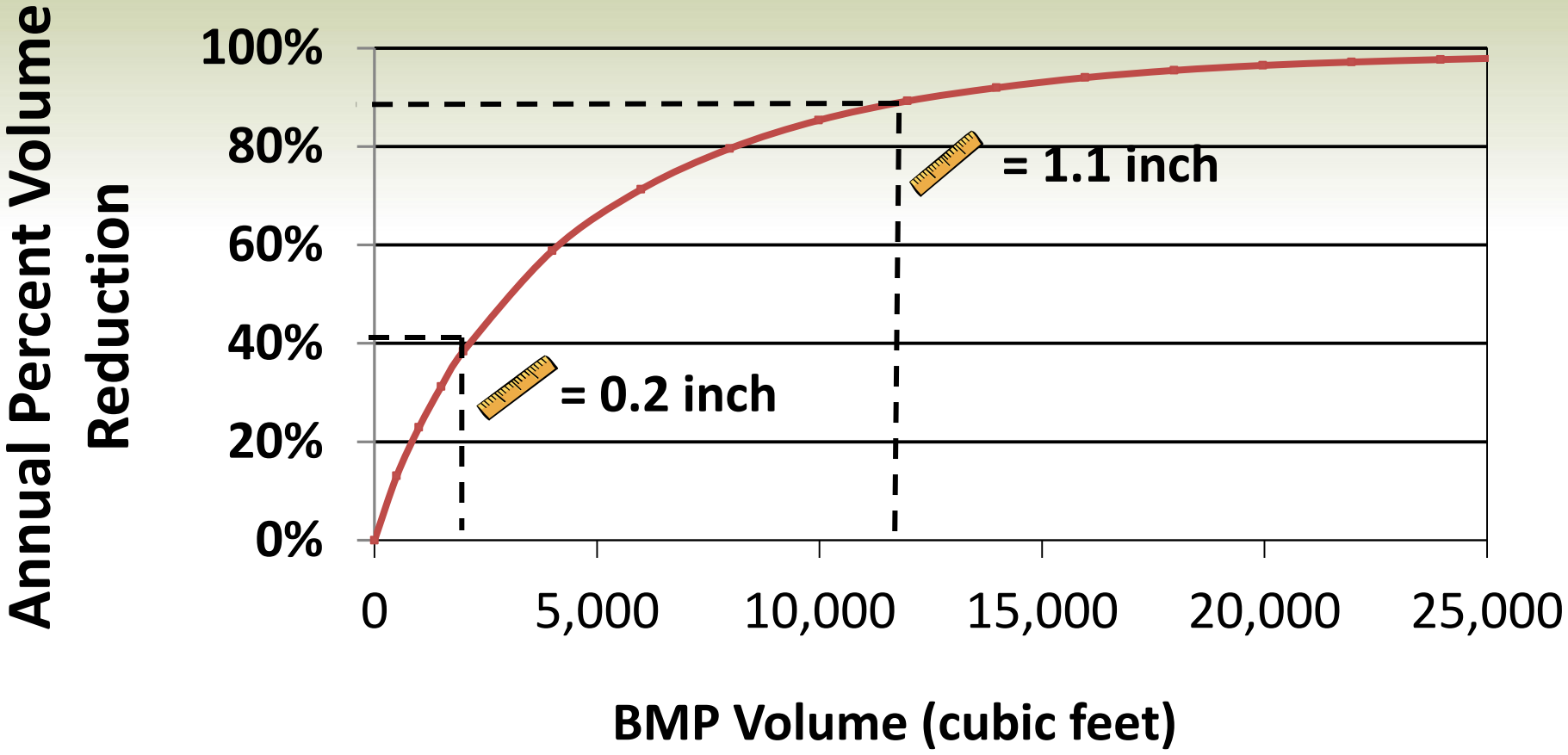
Current Work Plan

2) **Update algorithms for calculator**

If LRRB information not available by 11/30/2012:

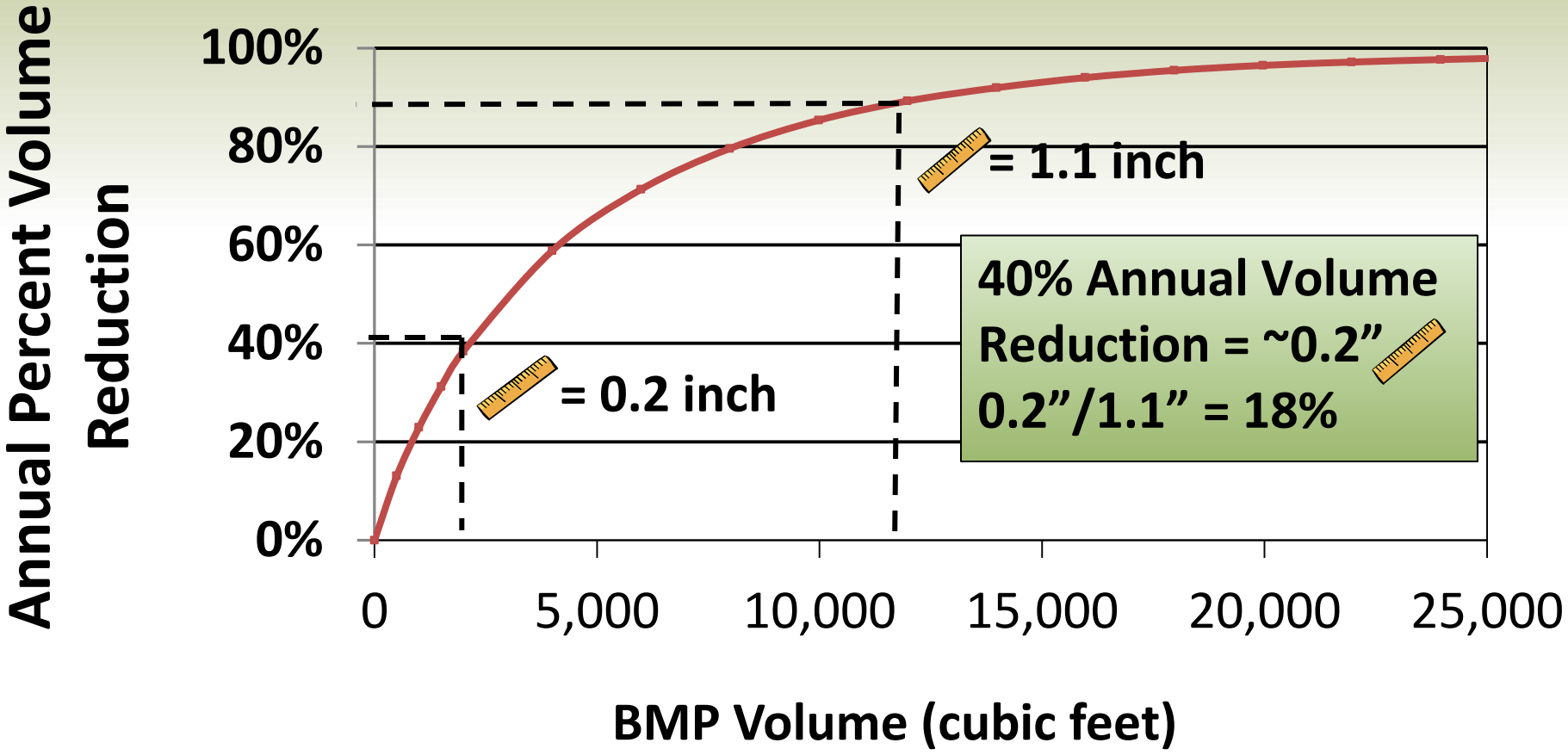
- Use previously developed algorithms and convert the volume reductions to percentage of the performance goal
- Develop algorithms for variations and TP, DP, and TSS removals

Annual vs. Performance Goal Volumes



Note: Performance curve is for a 10 acre site, 30% impervious

Annual vs. Performance Goal Volumes



Note: Performance curve is for a 10 acre site, 30% impervious

Swales

Current Work Plan

3) Meetings

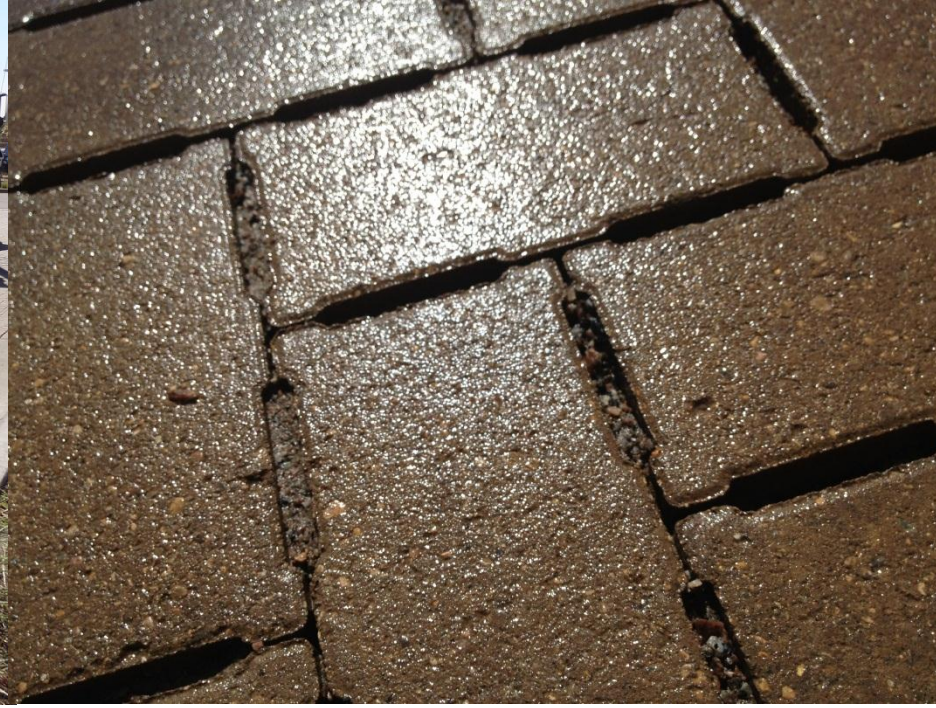
One 2-hour meeting with Dry Swale Squad

One MIDS Work Group meeting

Swales

Current Work Plan

- **Schedule:**
  - Waiting for comments on drawings
  - Waiting for LRRB results
  - Goal: Push hard in December and complete before February (plan goes until June 30)



Photos: Barr Engineering Company

Permeable Pavement

Permeable Pavement
Previous Work

- Technical team produced document
- MPCA reorganized

Permeable Pavement

Current Work Plan

1) Review and edit document

- Add sections on certification and credits

Current Work Plan

2) Update algorithms

- For compliance to volume control performance goal, volume reduction:
  - No drain tile: Void spaces
  - Elevated drain tile: Storage below tile
  - Bottom drain tile: No credit
- Determine *annual* TP, DP, and TSS removals

Permeable Pavement

Current Work Plan

3) Meetings

- One with permeable pavement team
- One with MIDS Work Group

Permeable Pavement
Current Work Plan

Schedule: Goal to complete by end of 2012

Photos: John Hanson

Photos: Barr Engineering Company

Iron-Enhanced Filters

Iron-Enhanced Filters

Previous Work

- U of MN presented at MIDS Work Group meeting and MPCA-organized meeting

Iron-Enhanced Filters

Current Work Plan

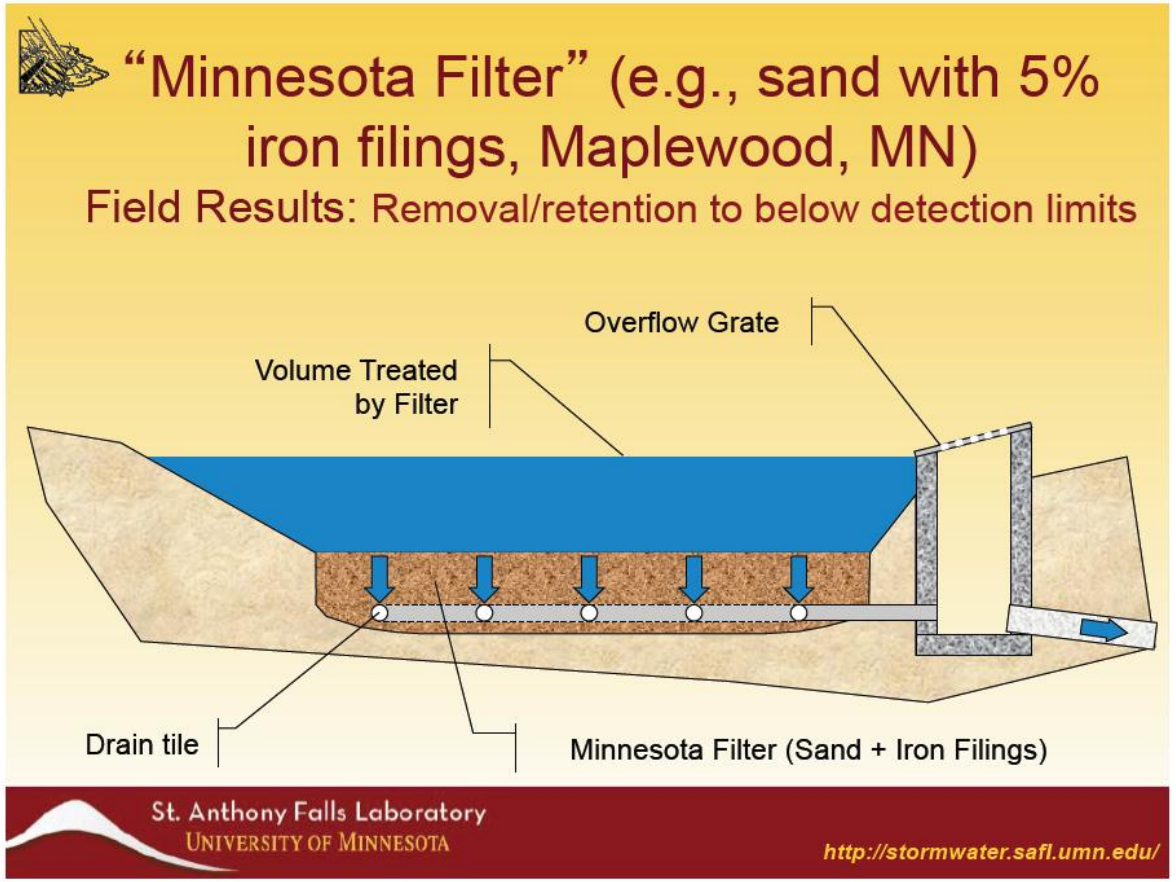
1) Prepare document

- Overview
- Variants
- Design (filters, benches at wet ponds, check dams)
- Construction
- Maintenance
- Performance
- Certification/Training
- Credits

Iron-Enhanced Filters
Current Work Plan

Design:

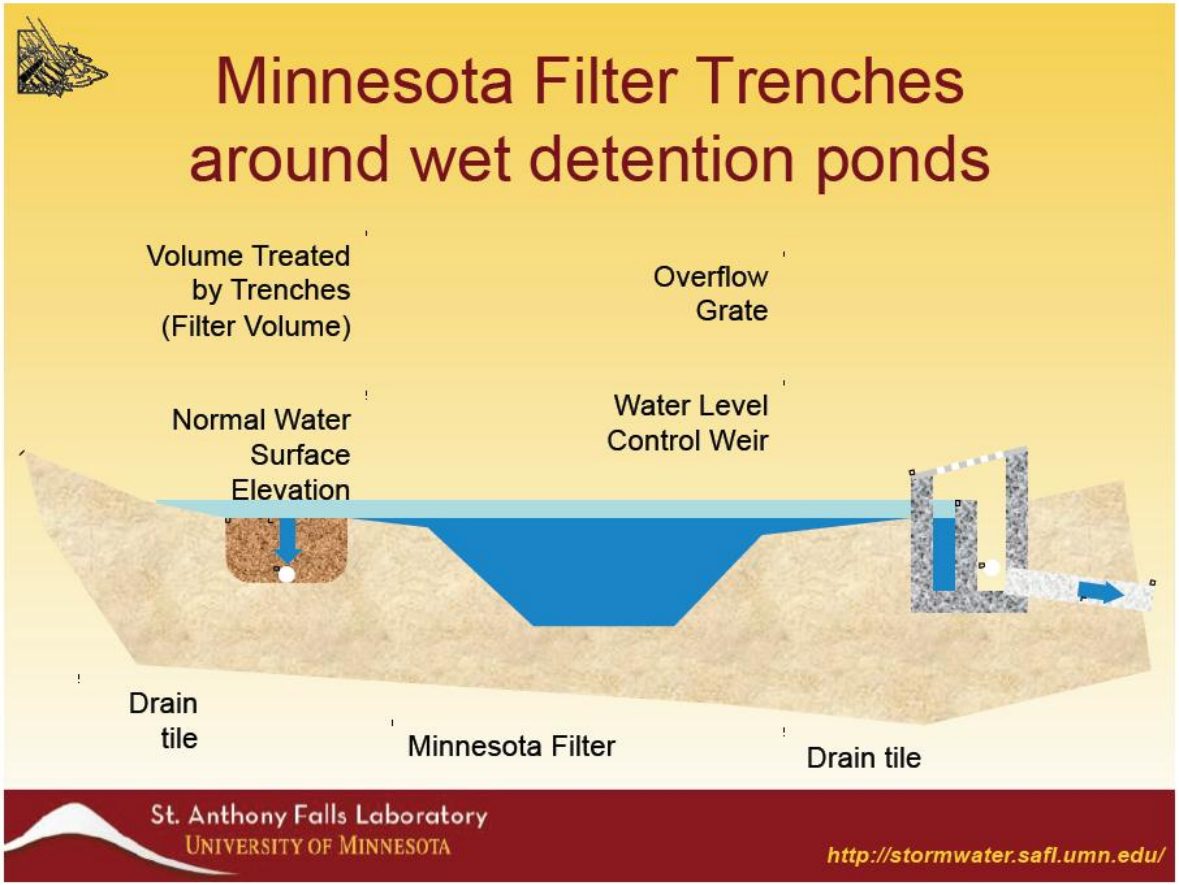
Filter



Iron-Enhanced Filters
Current Work Plan

Design:

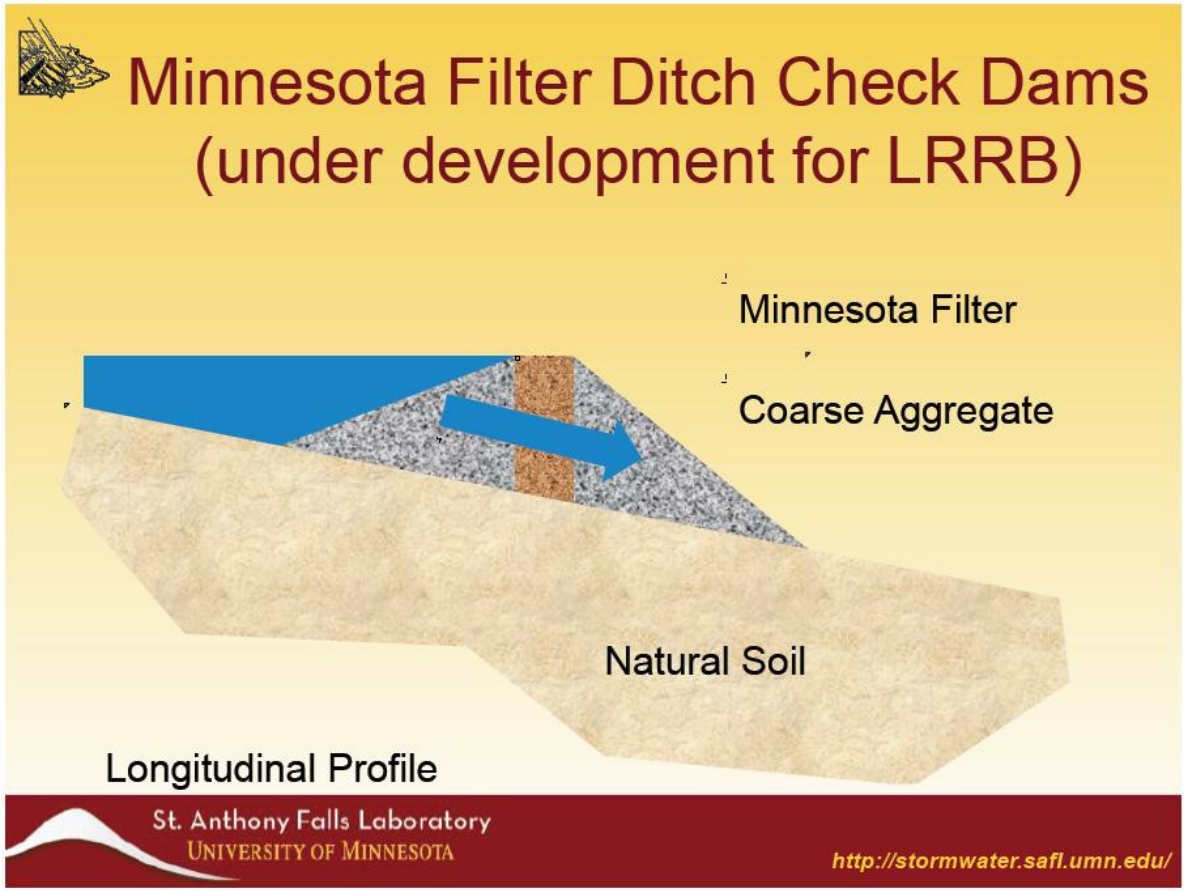
Bench at wet pond



Iron-Enhanced Filters
Current Work Plan

Design:

Check dam



Iron-Enhanced Filters

Current Work Plan

2) Update Calculator

- Annual TP, DP, & TSS reductions
- No additional volume reductions for adding iron

Iron-Enhanced Filters

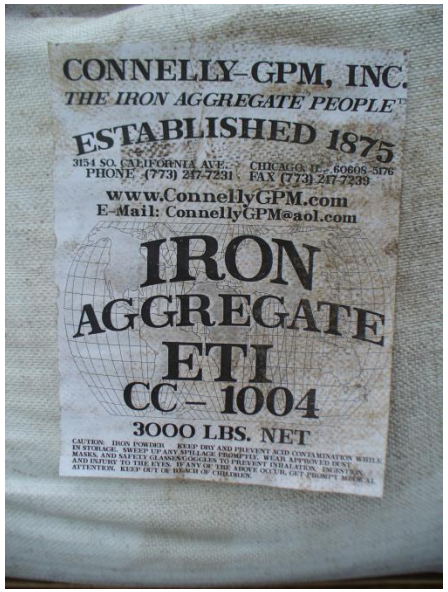
Current Work Plan

3) Meetings

- U of MN & MPCA after document drafted
- MIDS Work Group

Iron-Enhanced Filters
Current Work Plan

Schedule: Goal to complete by early January 2013, but contract goes until June 30, 2013



Photos: Barr Engineering Company

Photo: http://en.wikipedia.org/wiki/File:SeededfertilizedlawnJPG

Turf

Turf

Previous Work

- Wenck presented at MIDS Work Group meetings

Turf

Current Work Plan

1) Determine Credits

A. Turf that captures runoff from impervious surfaces (i.e., impervious surface disconnection)

B. Turf that does not capture runoff from impervious surfaces, but is installed and maintained to promote infiltration at a higher rate than assumed in the MIDS modeling used to develop the performance goal for new sites without restrictions (e.g., the soils are looser than those assumed in the modeling)

Current Work Plan

1) Determine Credits

For each of those turf groups, Barr will use the available data and models to determine the acceptable

- volume control credit
- annual TP removal percentage
- annual DP removal percentage
- annual TSS removal percentage

Turf

Current Work Plan

2) Memorandum

- Description of turf and its use as a BMP
- Performance of turf in regards to volume reduction and water quality benefit
- Suggestions for calculator revisions

Turf

Current Work Plan

3) Meetings

- Turf technical team (one 2-hour meeting)
- MIDS Work Group

Turf

Current Work Plan

Schedule: Goal to complete by early January 2013, but contract goes until June 30, 2013

Photo: http://www.reporthost.com/a1qual/sample1/

Photos: Barr Engineering Company

Redevelopment and Linear

Redevelopment and Linear
Current Work Plan

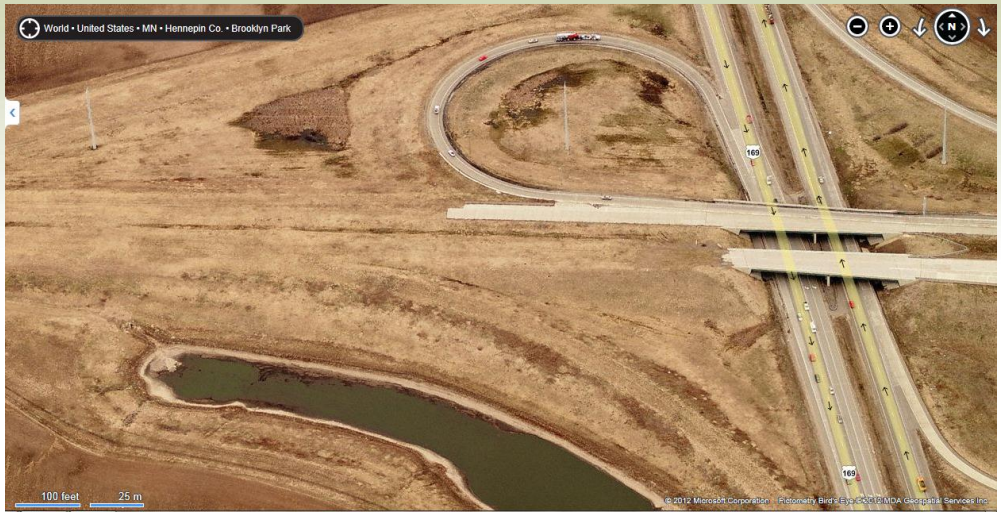
1) **"Convince Me" diagram**

   General flow chart(s) to help designers and regulators navigate the path to compliance and assist in determining treatment options based on site conditions

Redevelopment and Linear
Current Work Plan

2) Review and Summarize Real-World Examples

A. MNDOT Linear Example: TH 610 Phase II - SP 2771-38 in Brooklyn Park and Maple Grove (TH 169 to Elm Creek Blvd)



Source: Bing

Redevelopment and Linear
Current Work Plan

2) Review and Summarize TH 610 Phase II

- Run the models as the project was planned,
- Run the models with BMPs that will provide stormwater volume control equivalent to one half inch times the project impervious surfaces, which might require sizing conceptual BMPs, while maintaining the storm water rate control provided,
- Summarize the stormwater runoff volume and pollutant (TP, dissolved phosphorus, and TSS) reductions for both conditions.

Current Work Plan

2) Review and Summarize Real-World Examples

B. City Redevelopment, Non-Linear Example: Project to be Determined

Redevelopment and Linear
Current Work Plan

2) Review and Summarize City Redevelopment Example

- Run the models as the project was planned
- Run the models with BMPs that will provide stormwater volume control equivalent to 1.1, 0.8, and 0.4 inch times the project's impervious surfaces, which will require sizing conceptual BMPs (If it's not feasible to do volume control on a site, Barr will try to site and size a BMP(s) to provide 75% TP reduction)
- Summarize the stormwater runoff volume and pollutant (TP, DP, and TSS) reductions for all conditions

Redevelopment and Linear
Current Work Plan

3) Meetings

- Linear & Redevelopment technical team (one 3-hour meeting)
- Two MIDS Work Group meetings

Redevelopment and Linear
Current Work Plan

Schedule: Need case study information

Goal to complete by early January 2013, but contract goes until June 30, 2013

Photo: Barr Engineering Company

Photos: FRS Design Group, LLC at http://frsdesign.com/

Stormwater Reuse

Stormwater Reuse

Current Work Plan

1) **Memo Regarding Contamination and Treatment**
   - Typical uses and design considerations for using stormwater from stormwater ponds for irrigation
   - Range of contaminant treatments and standards for using storm water for irrigation
   - Pollutant treatment types and concentration criteria for Minnesota
   - Key plumbing code issues that limit stormwater reuse for irrigation

Current Work Plan

2) Develop Credits

- Range of *annual* volume, TP, DP, and TSS reductions for projects that collect and reuse stormwater for irrigation

Current Work Plan

3) Meetings

- Representatives from various state agencies (MPCA, MDH, and MDLI) and Barr
- Stormwater reuse/harvesting technical team and Barr
- Representatives from various state agencies and tech team and Barr
- MIDS Work Group

Stormwater Reuse

Current Work Plan

Schedule: Goal to complete by early January 2013, but contract goes until June 30, 2013

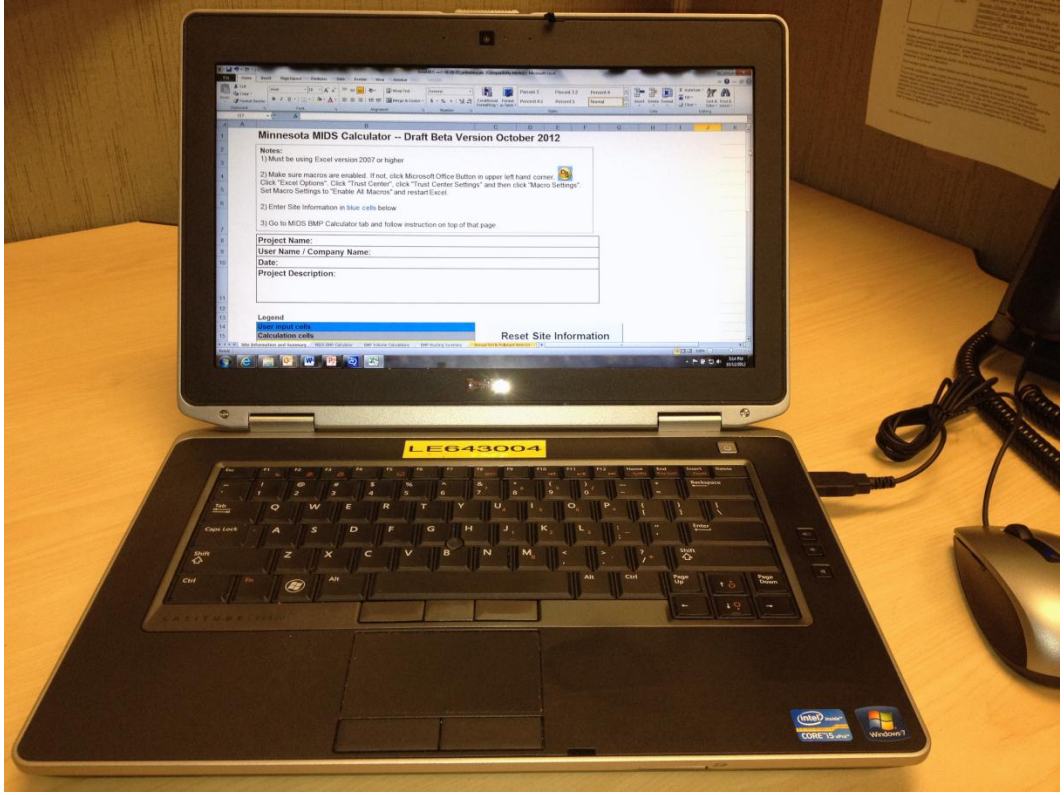


Photo: John Hanson

Calculator

Calculator
Previous Work

- Beta Version

Calculator
Current Work Plan

1) Update Beta Calculator

Calculator
Current Work Plan

Overall Items to Update:

- Investigate compatibility with Excel 2003
- Develop a calculator output summary sheet that lists the calculator parameters
- Divide TP into dissolved and particulate and track removals
- Create a button to clear all values and reset the worksheet
- Set a restriction so negative numbers cannot be entered
- Add a general link to the Stormwater Manual
- Update volume pollutant reduction amounts for various BMPs to be consistent

Calculator
Current Work Plan

BMP Volume Calculations Sheet Items to Update:

- Fix soil options
- Set maximum depth for infiltration basin
- Enable users to edit name of practice under other BMPs
- Include a user-defined infiltration rate with a predetermined upper threshold
- Display calculated drawdown time
- Add drainage calculation in bioretention basin to pervious pavement, infiltration basin, infiltration trench and dry swale
- Provide lookup table for media porosity
- Only allow impervious areas to be routed to green roof and pervious pavement
- Make correction to dry swale volume calculation

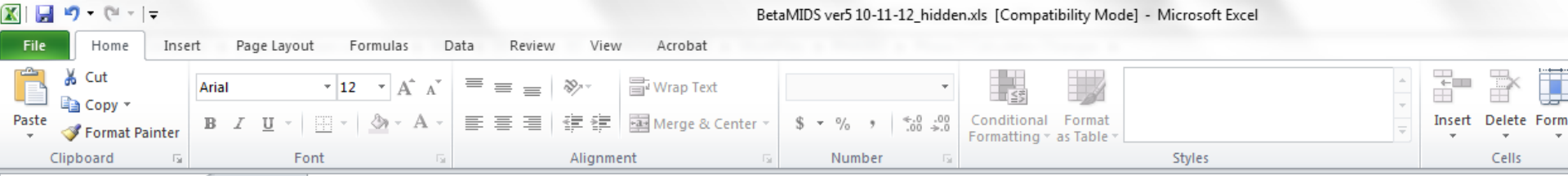
Calculator
Current Work Plan

MIDS BMP Calculator Sheet Items to Update

- Fix routing so BMPS cannot be routed back to themselves
- Incorporate a total line at the bottom of BMP Direct Drainage Area worksheet
- Make sure cells are in order based on when data should be entered
- Add wetlands to calculator

Calculator
Current Work Plan

Prepare Very Basic User's Manual

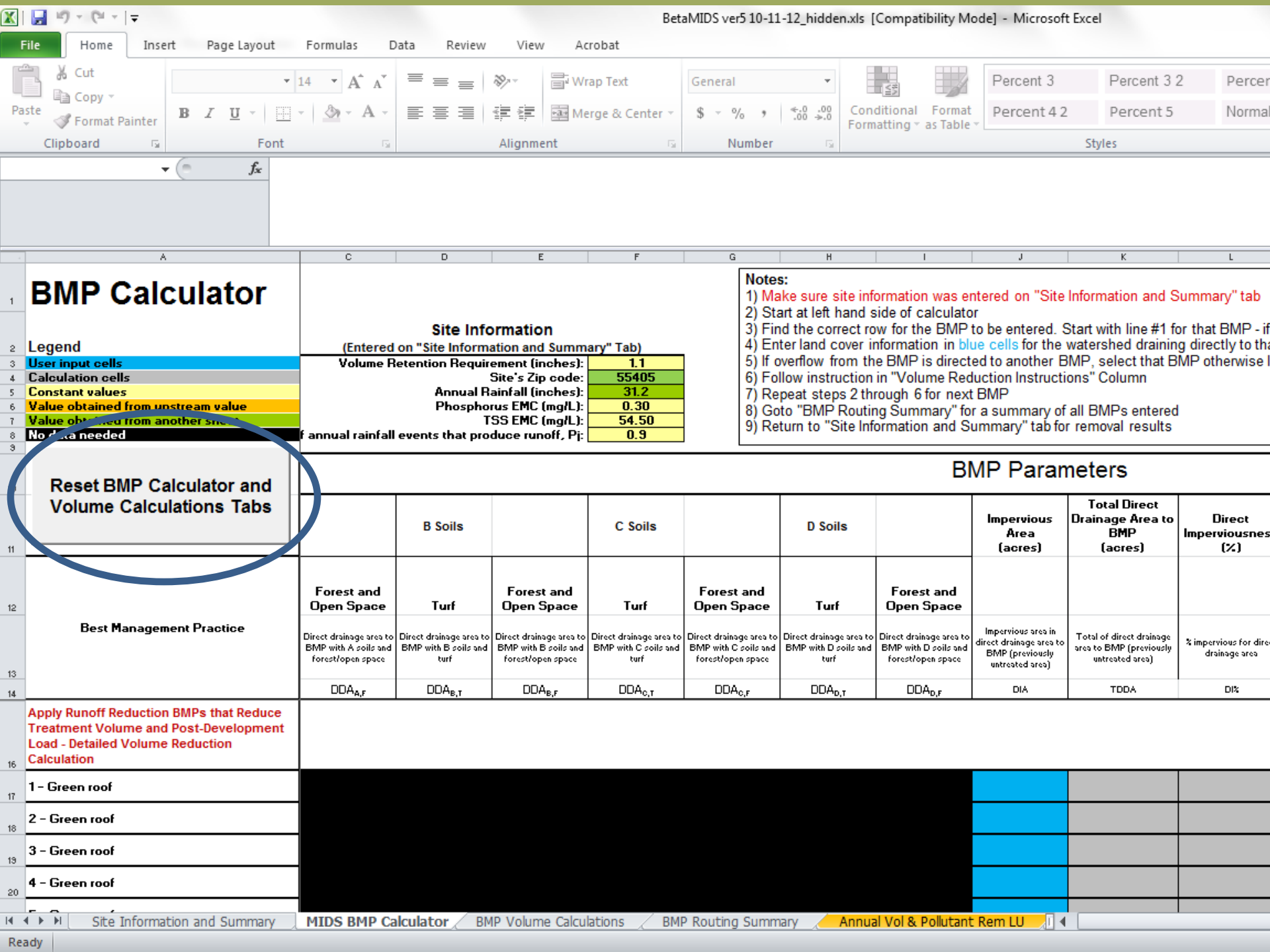


Summary Information

Total impervious cover (acres)	0.00
Total watershed area (acres)	0.00
Site runoff coefficient, Rv	
% Impervious	
Development volume retention requirement (cubic feet)	
Volume removed by BMPs (cubic feet)	
Additional volume removal needed to meet requirement (cubic feet)	
Percent volume removed	
Post-development annual Particulate P load (lb/yr)	
Annual Particulate load removed by BMPs (lb/yr)	
Post-development annual Dissolved P load (lb/yr)	
Annual Dissolved P load removed by BMPs (lb/yr)	
Percent annual TP removed	
Post-development annual TSS load (lb/yr)	
Annual TSS load removed by BMPs (lb/yr)	
Percent annual TSS removed	

Note:
Green cells will fill in when MIDS BMP Calculator tab is complete

Grey Cells are calculated using Site Information entered above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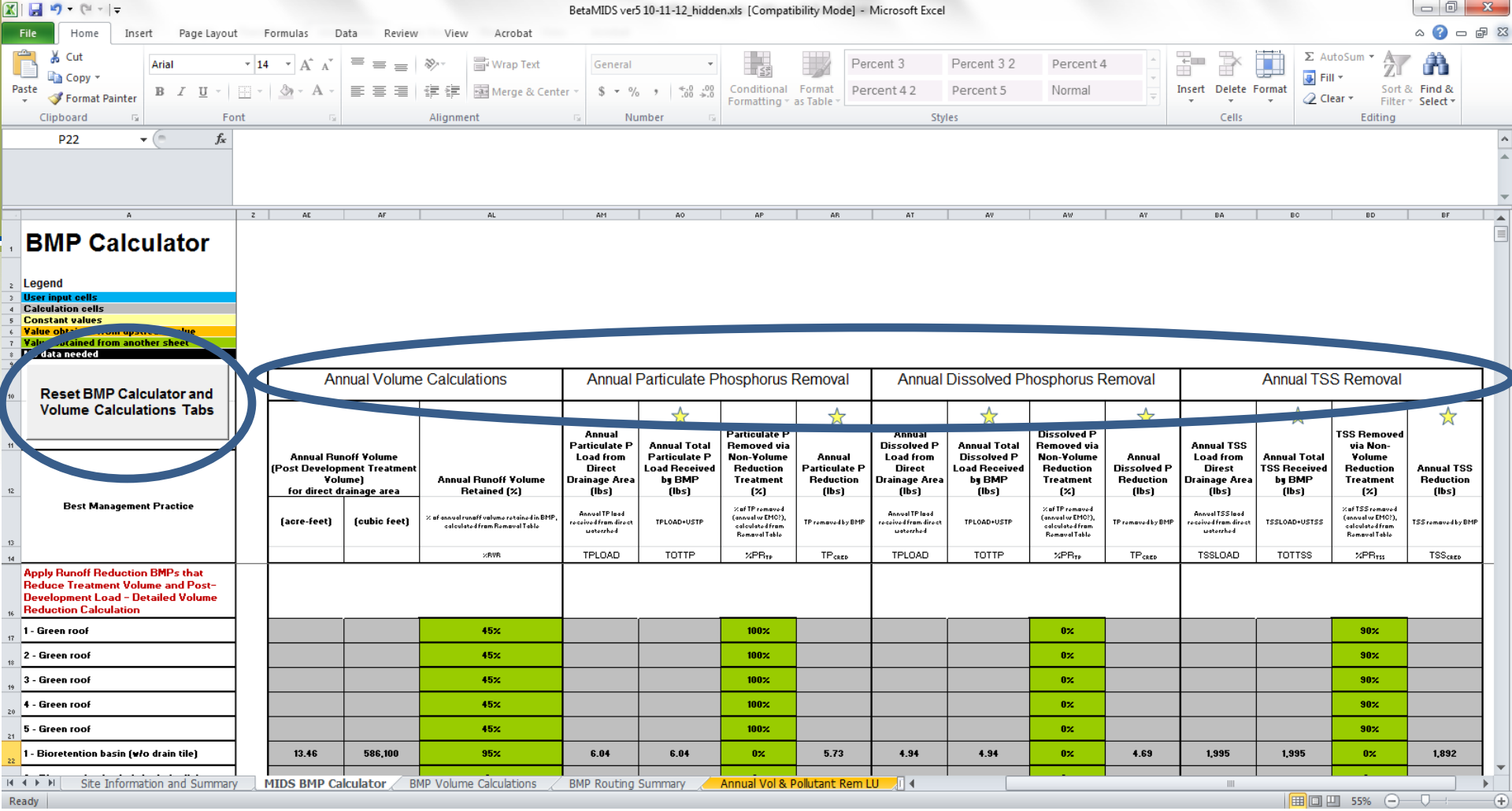
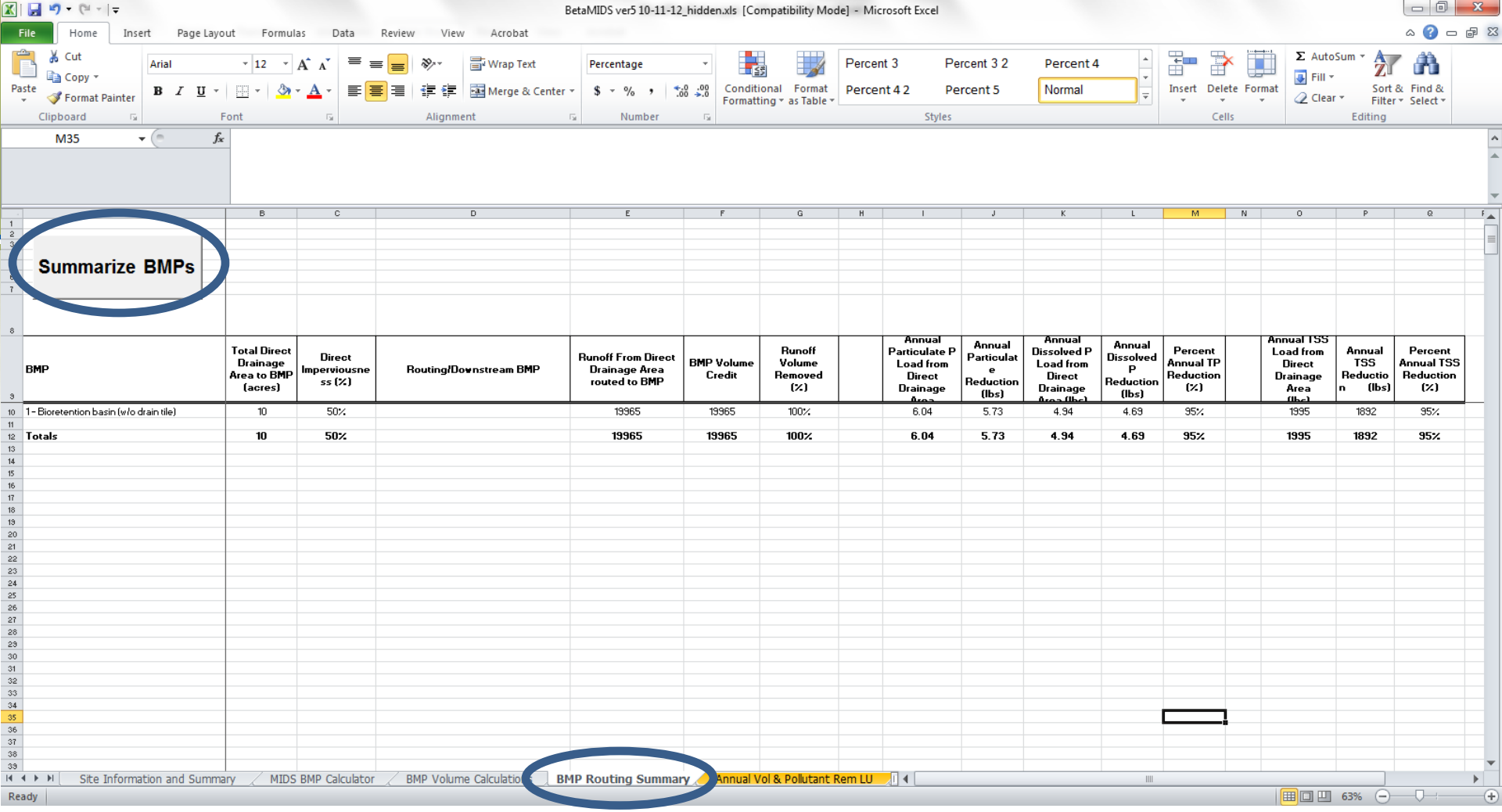
File
Home
Insert
Page Layout
Formulas
Data
Review
View
Acrobat
Cut
Copy
Format Painter
Paste
Clipboard
Font
Wrap Text
Merge & Center
Alignment
General
Number
Conditional Formatting
Format as Table
Percent 3
Percent 3 2
Percent 4 2
Percent 5
Styles
BMP Calculator
Legend
User input cells
Calculation cells
Constant values
Value obtained from upstream value
Value obtained from another sheet
No data needed
Site Information
(Entered on "Site Information and Summary" Tab)
Volume Retention Requirement (inches): 1.1
Site's Zip code: 55405
Annual Rainfall (inches): 31.2
Phosphorus EMC (mg/L): 0.30
TSS EMC (mg/L): 54.50
f annual rainfall events that produce runoff, Pj: 0.9
Notes:
1) Make sure site information was entered on "Site Information and Summary" tab
2) Start at left hand side of calculator
3) Find the correct row for the BMP to be entered. Start with line #1 for that BMP - if
4) Enter land cover information in blue cells for the watershed draining directly to tha
5) If overflow from the BMP is directed to another BMP, select that BMP otherwise l
6) Follow instruction in "Volume Reduction Instructions" Column
7) Repeat steps 2 through 6 for next BMP
8) Goto "BMP Routing Summary" for a summary of all BMPs entered
9) Return to "Site Information and Summary" tab for removal results
Reset BMP Calculator and Volume Calculations Tabs
BMP Parameters
B Soils
C Soils
D Soils
Impervious Area (acres)
Total Direct Drainage Area to BMP (acres)
Direct Imperviousnes (%)
Forest and Open Space
Turf
Forest and Open Space
Turf
Forest and Open Space
Turf
Forest and Open Space
Best Management Practice
Direct drainage area to BMP with A soils and forest/open space
Direct drainage area to BMP with B soils and turf
Direct drainage area to BMP with B soils and forest/open space
Direct drainage area to BMP with C soils and turf
Direct drainage area to BMP with C soils and forest/open space
Direct drainage area to BMP with D soils and turf
Direct drainage area to BMP with D soils and forest/open space
Impervious area in direct drainage area to BMP (previously untreated area)
Total of direct drainage area to BMP (previously untreated area)
% impervious for direc drainage area
DDA A,F
DDA B,T
DDA B,F
DDA C,T
DDA C,F
DDA D,T
DDA D,F
DIA
TDDA
DI%
Apply Runoff Reduction BMPs that Reduce Treatment Volume and Post-Development Load - Detailed Volume Reduction Calculation
1 - Green roof
2 - Green roof
3 - Green roof
4 - Green roof
Site Information and Summary
MIDS BMP Calculator
BMP Volume Calculations
BMP Routing Summary
Annual Vol & Pollutant Rem LU
Ready


BetaMIDS ver5 10-11-12_hidden.xls [Compatibility Mode] - Microsoft Excel
BMP Calculator
Legend
User input cells
Calculation cells
Constant values
data needed
Reset BMP Calculator and Volume Calculations Tabs
Best Management Practice
Annual Volume Calculations
Annual Particulate Phosphorus Removal
Annual Dissolved Phosphorus Removal
Annual TSS Removal
Annual Runoff Volume (Post Development Treatment Volume) for direct drainage area
(acre-feet)
(cubic feet)
Annual Runoff Volume Retained (%)
Annual Particulate P Load from Direct Drainage Area (lbs)
Annual Total Particulate P Load Received by BMP (lbs)
Particulate P Removed via Non-Volume Reduction Treatment (%)
Annual Particulate P Reduction (lbs)
Annual Dissolved P Load from Direct Drainage Area (lbs)
Annual Total Dissolved P Load Received by BMP (lbs)
Dissolved P Removed via Non-Volume Reduction Treatment (%)
Annual Dissolved P Reduction (lbs)
Annual TSS Load from Direst Drainage Area (lbs)
Annual Total TSS Received by BMP (lbs)
TSS Removed via Non-Volume Reduction Treatment (%)
Annual TSS Reduction (lbs)
%RVR
TPLOAD
TOTTP
%PRTP
TPCRED
TPLOAD
TOTTP
%PRTP
TPCRED
TSSLOAD
TOTTSS
%PRTSS
TSSCRED
Apply Runoff Reduction BMPs that Reduce Treatment Volume and Post-Development Load - Detailed Volume Reduction Calculation
1 - Green roof
2 - Green roof
3 - Green roof
4 - Green roof
5 - Green roof
1 - Bioretention basin (w/o drain tile)
13.46
586,100
95%
6.04
6.04
0%
5.73
4.94
4.94
0%
4.69
1,995
1,995
0%
1,892
Site Information and Summary
MIDS BMP Calculator
BMP Volume Calculations
BMP Routing Summary
Annual Vol & Pollutant Rem LU
Ready


BetaMIDS ver5 10-11-12_hidden.xls [Compatibility Mode] - Microsoft Excel
Summarize BMPs
BMP
Total Direct Drainage Area to BMP (acres)
Direct Imperviousness (%)
Routing/Downstream BMP
Runoff From Direct Drainage Area routed to BMP
BMP Volume Credit
Runoff Volume Removed (%)
Annual Particulate P Load from Direct Drainage Area
Annual Particulate Reduction (lbs)
Annual Dissolved P Load from Direct Drainage Area (lbs)
Annual Dissolved P Reduction (lbs)
Percent Annual TP Reduction (%)
Annual TSS Load from Direct Drainage Area (lbs)
Annual TSS Reduction (lbs)
Percent Annual TSS Reduction (%)
1 - Bioretention basin (w/o drain tile) 10 50% 19965 19965 100% 6.04 5.73 4.94 4.69 95% 1995 1892 95%
Totals 10 50% 19965 19965 100% 6.04 5.73 4.94 4.69 95% 1995 1892 95%
Site Information and Summary
MIDS BMP Calculator
BMP Volume Calculation
BMP Routing Summary
Annual Vol & Pollutant Rem LU
Ready

Calculator
Current Work Plan

3) Meetings

- One 2-Hour Meeting with Technical Team
- MIDS Work Group

Calculator
Current Work Plan

Schedule: Goal to complete by end of 2012