Advanced Design Workshops

1. Stormwater Basics: Quality vs. Quantity
2. Downstream Analysis
3. Post-Construction BMP Exclusions and Infeasibilities
4. Wet Detention Pond Design
5. GDOT Post-Construction Stormwater Report

More topics to come in 2017......
Post-Construction BMPs – Exclusions and Infeasibilities
Why Are We Here?

• What are GDOT’s permit requirements?

• What are exclusions and infeasibilities with regard to PCBMPs on GDOT projects?

• What documentation is required?
GDOT’s MS4 Permit

• 5 year permit term
  – Initial permit term was Jan 2012 – Jan 2017
  – Permit renewed on January 3, 2017
• Comply with a number of requirements or Best Management Practices (BMPs)
• Future permit cycles typically become more stringent
• Phases in requirements
• Annual report to Georgia EPD
MS4 Areas in 2012 Permit

One year to phase in the 2017 post-construction stormwater requirements

If the project has received concept approval (start of preliminary engineering) by January 3, 2018, you must comply with the post-construction stormwater requirements in the 2012 permit.
New MS4 Areas in 2017 Permit

One year to phase in the 2017 post-construction stormwater requirements

Project receives concept approval by January 3, 2018

EXEMPT
MS4 Permit Requirements

• Better site design with use of GI/LID
• Improve quality of stormwater runoff through 80% TSS removal from 1.2” rainfall
• 2017 permit introduces runoff reduction – retain up to the first inch of rainfall on the site
• Protect existing stream channels by controlling smaller events
• Reduce stream channel overbank flooding
• Consider downstream flood effects
• Inspect and maintain existing and new stormwater systems
MS4 Permit Requirements

How do we meet these requirements?

- GDOT MS4 permit requirements similar to other MS4s (cities and counties) in the state

- Implementing post-construction stormwater management on GDOT’s projects, however, is VERY different because of the linear highway environment
MS4 Permit Requirements
Linear Highway Environment

• Roadway drainage system main purpose is to quickly remove runoff for:
  - Protection of public safety
  - Maintenance of roadway’s structural integrity

• Roadway systems are “ribbons” of development often in tight corridors

• Linear footprint of roadway projects often inhibits use of land-intensive stormwater treatment practices

• A roadway system may include several drainage areas and convey significant off-site runoff

• Portions of roads within several watersheds may be subject to different stormwater regulations
MS4 Permit Requirements
Linear Highway Environment

GDOT’s MS4 permit provides a special set of tools intended to help meet these unique challenges.
Our Unique Tools

Three tiered screening process:

- Project Approach
- Project Level Exclusion
- Outfall Level Exclusion
- Infeasibility
Our Unique Tools

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Project Level Exclusions

• Removes all post-construction BMPs for the entire project.
• Does not remove the requirement for stormwater quantity assessment to check for adverse impacts downstream of the project.
5 Project Level Exclusions (PLE)

Project-Level Exclusions (PLE) remove post-construction BMP requirements for entire project and include:

1. Facility not GDOT-owned
2. Project not within MS4 boundaries
3. Environmental docs approved before 6/30/12
4. Small land disturbance (less than 1 acre) / addition of impervious area

*Important note:* PLE does not remove the requirement for stormwater quantity assessment to check for adverse impacts downstream of the project.
Example 1

Given:
- 2 lane 12 feet wide GDOT highway
- 2 shoulders 3 feet wide
- Project located in Rabun County (District 1)

Does a project level exclusion apply?
- Yes – not in an MS4 area
Example 2

Given:
• GDOT highway widening in Richmond County (District 2)
• Environmental documents approved July 6, 2013
• Total project area is 19 acres
• Impervious area is 41%

Does a project level exclusion apply?

No – Investigate further at the basin level
Example 3

Given:

- GDOT highway in Henry County (District 3)
- Sidewalk rebuilding project at intersection, disturbing 0.3 acres
- Environmental documents approved March 1, 2013

Does a project level exclusion apply?

Yes – safety or < 1 acre
Example 4

Given:

- 12 feet wide single lane road
- Total project area is 16 acres
- GDOT funded project on a Floyd County roadway

Does a project level exclusion apply?

Yes – not a GDOT facility
Example 5

Given:

- GDOT highway widening project in Madison County (District 1)
- Concept approved July 8, 2014
- AADT = 15,152
- Project area = 8.1 miles

Does a project level exclusion apply?

Yes – new MS4 area and concept approved prior to January 3, 2018
Projects in areas added to GDOT’s permit in 2017 that have been awarded or received concept approval within 365 days of the permit issuance date are exempt from complying with the 2017 permit post-construction stormwater management requirements.
Example 6

Given:

- GDOT intersection in Cobb County (District 7)
- Total area of land disturbance of entire project (and basin) is 0.90 acres
- Impervious area is 32%
- 750 feet of roadway

Does a project level exclusion apply?

Yes – less than 1 acre disturbed
Example 7

Given:
- GDOT Highway in Gwinnett County (District 1)
- Total project area is 12 acres
- Impervious area is 36%
- Environmental documents approved June 16, 2010

Does a project level exclusion apply?  

Yes – Env. docs before 6/30/2012
Example 8

Given:

- GDOT highway in Fayette County (District 3)
- 4 lane highway
- Shoulder rebuilding project in multiple locations, each disturbing 0.86 acres and providing 1,500 feet of shoulder for safety improvements

Does a project level exclusion apply?

Yes – safety or < 1 acre
Example 9

Given:
- GDOT highway widening project in Savannah (District 5)
- Environmental documents approved August 18, 2012
- AADT = 32,042
- Length of project = 6.5 miles

Does a project level exclusion apply?  

No – investigate further at the basin level
Example 10

Given:

- Road work on CR 54
- Environmental documents approved September 23, 2014
- Impervious area is 52%
- Project area is 8 acres.

Does a project level exclusion apply?

Yes- not a GDOT facility
At Concept, complete the top section of the MS4 Concept Report Summary.

### MS4 Concept Report Summary

Attach the following checklist information to the Concept Report Template:

- **Is there a Project Level Exclusion that applies to this project?**  
  - No  
  - Yes  
  - If yes, please indicate which of the following exclusions apply:
    - Roadways that are not owned or operated (maintained) by GDOT may not require post-construction BMPs. Coordinate with the appropriate local government or entity to determine stormwater management requirements.
    - The project location is not within a designated MS4 area.
    - Maintain storm and safety improvement projects whereby the sites are not connected and disturb less than one acre at each individual site. This includes projects such as repaving, shoulder building, fiber optic line installation, sign addition, and sound barrier installation.
    - Projects that have their environmental documents approved or right-of-way plans submitted for approval on or before June 30th, 2012.
    - Read projects that disturb less than 1 acre or for site development projects that add less than 5,000 ft² of impervious area.

If the project has a Project Level Exclusion nothing further is needed.

If the project does not have a Project Level Exclusion use the MS4 Concept Level Design Spreadsheet to estimate the treatment volumes and flow rates. Use the BMP’s, complete the tables below, and include as an attachment to the Concept Report. Add additional rows, if necessary. It is understood that this information will be approximate based on available data at the time of the concept.

In MS4 designated areas, water quantity requirements may be waived for drainage areas that flow directly into surface waters that have a drainage area greater than 5 square miles.

#### Drainage Area Summary

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<th>Outfall Area</th>
<th>Pre-Development</th>
<th>Post-Development</th>
<th>Water Quality Volume (Cubic Feet)</th>
<th>Channel Protection Volume (Cubic Feet)</th>
<th>Required Detention Volume (Cubic Feet)</th>
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#### BMP Selection and Feasibility Summary

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</table>

In addition to the above charts, attach the Drainage Area Map, drainage basin summary spreadsheets, and cost estimates (if required) to the Concept Report.
At Concept, complete the top section of the MS4 Concept Report Summary.

For PFPR, every GDOT project in an MS4 area requires completion of a MS4 Post-Construction Stormwater Report.
Our Unique Tools

Three tiered screening process:

- Project Approach
- Project Level Exclusion
- Outfall Level Exclusion
- Infeasibility
Our Unique Tools

Outfall Level Exclusions

• Removes post-construction BMPs for a specific outfall’s drainage area (i.e. a portion of the project is excluded from post-construction BMP design).

• Does not remove the requirement for stormwater quantity assessment to check for adverse impacts downstream of the project.
Our Unique Tools

• Outfall Level Exclusions are analyzed at the outfall level, for every outfall basin on the project.
• Each outfall basin area should not be confused with each receiving water’s drainage area.
Project Outfall: the point where concentrated flows from the highway drainage system leaves the right-of-way

– Does not include cross-drain structures or culverts installed under a road that function only to maintain the natural flow of surface waters and drainage
6 Outfall Level Exclusions (OLE)

Outfall-Level Exclusions (OLE) remove post-construction BMP requirements for a specific outfall’s drainage area and include:

1. Change in existing roadway alignment that creates safety concern due solely to installation of BMP
2. Installation of BMP solely causes realignment or piping of a stream
3. Installation of BMP solely impacts a stream buffer or wetland
4. Discharges exit R/W as sheet flow
5. Flows that originate offsite
6. Reduction (or negligible increase) in impervious area

OLE #6 Note: Numeric criteria does not exist for “negligible” or “minimal” increase condition; the designer must use engineering judgement to determine if a flow increase is negligible and creates no adverse impact. Adequate and appropriate documentation is particularly important when claiming this OLE.
Outfall Level Exclusions include the following:

1. Cases where the project would require an existing roadway alignment change solely to allow for BMPs. This exclusion applies only to existing roadway alignment changes that would create a safety concern. A written explanation of the safety concern(s) must be included with the post-construction stormwater report for all uses of this exclusion.

2. Instances where the installation of post-construction BMPs would require the re-alignment and/or piping of a stream.

3. When a project would impact existing vegetated stream buffers or wetlands solely for the purposes of installing BMPs. See state requirements for additional information on stream buffers.

4. Where stormwater discharges from the project site are designed to exit the right-of-way as sheet flow (non-point source discharges). Sheet flow should be designed in a manner to ensure that the flow will not cause instability, erosion, or flooding. The designer should determine if this is possible by visiting the site prior to design, and providing a written explanation with supporting evidence for this drainage area.

5. As stated in section 4.2.5.1 (a) of the GDOT MS4 permit, “Stormwater runoff that must be treated does not apply to flows that originate outside of GDOT’s right-of-way or diverted flows from undisturbed areas.” If feasible, direct all offsite stormwater around the project site to the cross drain or stream such that it does not combine with stormwater from the project’s impervious surfaces or conveyance systems. This redirection allows the BMPs to only treat or detain the stormwater that originates from GDOT’s right-of-way, and stormwater that originates off-site to pass through the right of way unimpeded.

6. As stated in section 4.2.5.1 (a) of the GDOT MS4 permit, for outfalls along linear roadway projects whereby the net impervious surface area within that outfall’s drainage area has been reduced or remains the same as pre-developed conditions, post-construction stormwater requirements will not apply. Special consideration from the Department may be given to those projects with a minimal increase in impervious area. In such cases, the designer will be required to provide supporting calculations showing that the increase in stormwater runoff and/or volume required to be treated for water quality is negligible with respect to the drainage area in question. Exclusions should be noted on Attachment B within the “Applicable MS4 Requirements” section. For simplicity, record the number from the list above corresponding to the exclusion being claimed.
Our Unique Tools

Three tiered screening process:

- Project Approach
  - Project Level Exclusion
  - Outfall Level Exclusion
  - Infeasibility
MS4 Permit Requires

– Stormwater runoff treatment to the maximum extent practicable.

– Infeasibility determined individually:
  • For each design requirement ($WQ_v$, $CP_v$, $Q_{p25}$, $Q_f$)
  • Per outfall basin within the project limits

– Does not remove the requirement for stormwater quality assessment to check for adverse impacts downstream of the project.
Our Unique Tools

- Filter Strip
- Grass Channel
- Enhanced Dry Swale
- Enhanced Wet Swale
- Infiltration Trench
- Bioslope
- Sand Filter
- Bioretention Basin
- Dry Detention Basin
- Wet Detention Pond
- Stormwater Wetland
- Open Graded Friction Course (OGFC)

Included in the designer’s “tool box” to meet MS4 and other stormwater requirements.
Infeasibility Criteria

Infeasibility criteria make compliance with post-construction requirements for a specific outfall’s drainage area infeasible and include:

1. Cost ($BMP cost \geq 10\% \text{ basin project cost}$)
2. Schedule delay (> 90 days, due to BMP specifically)
3. Impact to endangered/threatened species
4. Damage to cultural/community resource ($historical/ archeological sites, cemetery, park, wildlife refuge, nature trail, school$)
5. Residence or business displacement ($significant impact of business requiring closure must be caused by BMP installation – i.e. impacting a few parking spaces not sufficient to claim displacement$)
Infeasibility Criteria

Infeasibility criteria make compliance with post-construction requirements for a specific outfall’s drainage area infeasible and include:

6. Violation of a federal or state law or regulation
7. Shallow bedrock, contaminated soils, high groundwater, utilities/other underground facilities
8. Limited soil infiltration capacity
9. Site too small to infiltrate significant volume
10. Site does not allow for gravity flow to BMP
Infeasibility #1 (Cost) Determination

**Infeasibility Criteria #1**: BMP costs are $\geq 10\%$ of the project costs within a specific basin. The detailed comparison should include:

- Right-of-way cost (*include actual cost of acquisition in both or exclude altogether*)
- Roadway construction (*actual cost for specific project segment, cannot use cost per linear foot for overall project*)
- Utility relocation
- Additional right-of-way requirements (*specific to the BMP*)
- BMP construction and all related design elements
- Do not include ITS or toll related expenses
- Do not include maintenance costs
Approaching a Project

Now lets take a look at a few project scenarios and see how the OLEs and infeasibilities apply.
Example 11

Given:

- Drainage area is 1 acre
- Design would allow for sheet flow off the road (see top picture), as it did in the existing condition
- 4 lanes, 12 feet wide
- 2 shoulders, 3 feet wide

OLE, infeasible, or investigate further?

**OLE #4 – Sheet Flow**
Example 12

Given:

• Length of section is 2,800 feet
• Drainage area is 2.8 acres
• The conceptual design of any BMP will require the additional purchase of R/W from the adjacent property owner
  – Mill Creek Nature Center: wetland/wildlife preserve

OLE, infeasible, or BMP?

Infeasible – #4 Damage to cultural/community resource
Example 13

Given:

- Length of section is 5,300 feet
- Drainage area is 4.0 acres
- The infiltration trench required in this area can only be located on a former gas station site where aged underground storage tanks have been known to leak over the years. Remediation of this area is not planned as part of the project.

OLE, infeasible, or BMP?

Infeasible – #7 Contaminated Soils
Example 14

Given:
- Drainage area is 2.3 acres
- Existing impervious area is 0.65 acres
- Adding 0.20 acres of impervious area
- Available R/W = 10’ (EOP – RW)
- Available length // to roadway = 100’

OLE, infeasible, or BMP?

Investigate further...
Example 15

Given:

• Drainage area is 2.5 acres
• 4, 12 feet wide roadway lanes with shoulders, 3 feet wide
• 34% impervious
• Roadway alignment would introduce a new curve with limited sight distance if the BMP is installed

OLE, infeasible, or BMP?

OLE #1 – Alignment change causes safety concern
Example 16

Given:
- Drainage area is 4.6 acres
- Existing impervious area is 2.67 acres
- New impervious area is 3.68 acres
- Available length // to roadway = 175’

OLE, infeasible, or BMP?

Investigate further...
Example 17

Given:

- Length of section is 8,500 feet
- Drainage area is 6.1 acres
- The conceptual design of any BMP will require the additional purchase of R/W from the adjacent property consisting of street front townhomes in an old neighborhood development with 0’ setbacks

OLE, infeasible, or BMP?

*Infeasible – #5 Residence displacement*
Example 18

Given:

- Drainage area is 3.5 acres
- Existing impervious area is 0.75 acres
- New impervious area is 1.0 acres
- Available R/W = 45’ (EOP – RW)
- Available length // to roadway = 100’

OLE, infeasible, or BMP?

Investigate further...
Example 19

Given:
- Length of section is 1,000 feet
- Drainage area is 1.1 acres
- Based on the limited amount of grading that can be completed within this basin, it will be necessary to use a stormwater pump station to collect stormwater at the proposed BMP location

OLE, infeasible, or BMP?

**Infeasible – #10 No gravity flow**
Example 20

Given:

• New construction project
• Drainage area is 2.5 acres
• 38% impervious
• Stormwater discharge flows through a vegetated stream buffer

OLE, infeasible, or BMP?

OLE #3 – Stream buffer impact
Example 21

Given:
- Length of section is 3,000 feet
- Drainage area is 2.1 acres
- The construction of any BMP will require the removal of a portion of an adjacent stand of mature pines
- A designer is under the impression that this basin is feasible, and after her design of a BMP an environmental report discovered red-cockaded woodpecker in the area nesting in the mature pines

OLE, infeasible, or BMP?

Infeasible – #3 Endangered species impact
Example 22

Given:
• Drainage area is 1.0 acres
• Site Info:
  • Impervious Pre = 0.1 ac
  • Impervious Post = 0.6 ac
  • In a super section through a curve
  • 455’ available inside of curve parallel with roadway
  • No potential for environmental impacts, delay, or damage to any existing structure or protected land

OLE, infeasible, or BMP?

Investigate further...
Example 23

Given:
• Drainage basin area is 5.5 acres
• Stormwater can be designed to bypass the site.
• No increase in impervious area
• 2 lanes, 12 feet wide
• 2 shoulders, 3 feet wide

OLE, infeasible, or BMP?

OLE #6 – No increase in impervious area
Example 24

Given:
- Drainage area is 1.75 acres
- Installation of BMPs will require realignment of stream
- 26% impervious

OLE, infeasible, or BMP?

**OLE #2 – Stream re-alignment**
Example 25

Given:

- Length of section is 2,850 feet
- Drainage area is 2.4 acres
- Any outlet or discharge of stormwater from a BMP would cause the BMP to be determined infeasible due to the high cost of installation, so the designer is considering infiltration as a last option
- HSG “D” soils present

OLE, infeasible, or BMP?

Infeasible – #8 Limited soil infiltration
Example 26

Given:

• Length of section is 2,600 feet
• Drainage area is 1.8 acres
• This project requires no R/W acquisition
• Due to the design of post-construction BMPs, R/W will need to be acquired solely for the installation of the BMP. Estimate duration for R/W acquisition is 16 weeks.

OLE, infeasible, or BMP?

Infeasible – #2 Schedule Delay
Example 27

Given:

- Drainage area is 3.1 acres
- Existing impervious area is 0.8 acres
- New impervious area is 1.4 acres
- Receiving water = Paula’s Creek
- Paula’s Creek is impaired for phosphorus

OLE, infeasible, or BMP?

Investigate further…
Given:
- Drainage area is 3.1 acres
- Existing impervious area is 0.95 acres
- New impervious area is 1.65 acres
- Any outlet of stormwater from a BMP would cause the BMP to be determined infeasible due to the high cost of installation, so the designer is considering infiltration as a last option

OLE, infeasible, or BMP?

Investigate further...
Given:

- The conceptual design of any BMP will require the additional purchase of R/W from the adjacent property
- Drainage area is 3.1 acres
- Existing impervious area is 1.1 acres
- New impervious area is 1.8 acres
- Dense Bermuda grass
- Q_{25}=23.5 \text{ cfs}
- Q_{1}=1.5 \text{ cfs}

OLE, infeasible, or BMP?

Investigate further...

Note: CP_v is not required because Q_1 < 2.0 \text{ cfs}
Example 30

Given:

- Drainage area is 6.5 acres
- Existing impervious area is 1.5 acres
- New impervious area is 3.0 acres
- Receiving water = Paula’s Creek
- Paula’s Creek is impaired for phosphorus
- Available length // to roadway = 100’
- $P_1$ = 3.3 inches
- $P_{25}$ = 6.6 inches
- WQ being provided as part of a separate project

OLE, infeasible, or BMP?

Investigate further…
Example 31

Given:

- Existing impervious area is 1.54 acres
- Proposed impervious area is 1.48 acres
- Drainage area is 3 acres

OLE, infeasible, or BMP?

**OLE #6 – Reduction in impervious area**
Exclusions and Infeasibility

Three evaluation steps:

1. Evaluate for PLE
2. Delineate basins and evaluate for OLEs
3. Evaluate infeasibilities
   • Determine which BMPs are appropriate
   • Design appropriate BMP(s) where certain infeasibilities do not exist
   • Reevaluate infeasibilities based on the design

Each must be documented in some way!

Does not remove the requirement for stormwater quantity assessment to check for adverse impacts downstream of the project.
Stormwater Planning Information

• Documentation of stormwater planning/management is required at each milestone review:
  Concept → PFPR → FFPR

• For detailed information, see Chapter 3 and Chapter 10 of the GDOT Drainage Manual.
Why is planning documentation required?

- Allows GDOT and design team to identify deficiencies before project has advanced too far in design process

Poor planning can cause an increase in:

- Project cost
- Project schedule duration
Project Documentation

Why is planning documentation required?

– Proof of permit compliance
  • Required for the MS4 permit annual report
  • Reduce time spent on open record requests
  • Avoid lawsuits
How can we avoid these problems:

- Consider and plan for stormwater early in the project’s design
- Follow all GDOT policies, checklists, and milestone reviews
- Document stormwater design calculations and details (according to GDOT’s requirements at each review)

Complete the MS4 Concept Report Summary and for each basin, the Workbook (See GDOT R.O.A.D.S.)
Post-Construction Stormwater Report

See GDOT R.O.A.D.S. Website for PCS Report

Project Documentation

GDOT Infeasibility & Outfall Level Exclusion Report Template

• Instructions are included in red text
• Details the OLEs and infeasibilities, as well as the feasible BMP designs
• Can be found in the Post-Construction Stormwater Report as Attachment C
Documenting PLEs

If you have a project in an MS4 area with a Project Level Exclusion (PLE):

1. Complete Stormwater Report Cover Page ONLY
2. Document the PLE as appropriate
3. Review and (if required) revise at project milestone submittals
Documenting PLEs

PLE #1 – Not a GDOT facility

- Identify owner/operator of facility
- Provide location map with the beginning/end of project demonstrating project is not a state route

**Note:** The project must be designed to meet local MS4 stormwater management requirements
Documenting PLEs

PLE #2 – Not in an MS4 Area

• No MS4 documentation is required at PFPR for projects not located in an MS4 area

• PLE will be documented in the Concept Report
Documenting PLEs

PLE #3 – Maintenance and Improvement Project (disturbing less than 1 acre)

• Provide a brief narrative indicating the type of project and the proposed disturbed area

• Provide project plan sheets with disturbed area clearly delineated/hatched when applicable
Documenting PLEs

PLE #4 – Environmental documents or ROW plans submitted before June 30, 2012

- Provide environmental document or ROW plan submission date with GDOT acknowledgement of dated submission
Documenting PLEs

PLE #5 – Road project disturbing < 1 acre or facility project adding < 5,000 ft² impervious area

• Provide a brief narrative indicating the type of project and the proposed disturbed and impervious areas documented

• Provide project plan sheets with disturbed and impervious areas clearly highlighted
Documenting OLEs

If you have an Outfall-Level Exclusion (OLE):

• Complete Cover Page of Post-Construction Stormwater Report

• Complete Attachment A – LID/GI Checklist

• Complete for all basins:
  ✓ Attachment B – Post-Construction BMP Summary
  ✓ Attachment C – Post-Construction Stormwater BMP Documentation

• Complete Attachment D at milestone review
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<th>Receiving Water</th>
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<th>LID or GI?</th>
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</table>
Documenting OLEs

OLE #1 – BMP requires alignment change that creates safety concern

OLE #2 – BMP requires realignment or piping of a stream

• Provide a written explanation detailing the OLE and demonstrate how BMP necessitated the impact
• Provide roadway exhibit that clearly shows BMP causing OLE
OLE #3 – Existing stream buffers or wetlands would be impacted solely by BMP installation

• Provide submitted Ecology Resources Survey Report showing buffers and wetland areas

• Provide exhibit showing roadway alignment with topo that clearly shows BMP and resulting impacts to environmentally sensitive areas
Documenting OLEs

OLE #4 – Stormwater discharges leave project ROW as sheet flow

• Provide calculations and exhibit showing drainage basin delineation and roadway alignment showing all topo features demonstrating stormwater leaves ROW as sheet flow

• NOTE: designer must prove that sheet flow will not cause instability, erosion or flooding downstream of the project (Reference Volume 2 Section 5.4.3 of 2016 GSMM for velocity limitations of channel linings for justification. A separate analysis must be completed to prove no downstream flooding)
Documenting OLEs

OLE #5 – Stormwater flows that originate offsite

- Provide exhibit showing drainage basin delineation and roadway alignment clearly indicating that flows originate off project ROW
OLE #6 – Reduction or negligible increase in impervious area

• Provide pre- and post-development roadway plans showing project footprint with limits of impervious areas delineated and labeled

• If claiming “negligible increase”, designer must provide analysis comparing pre- and post-developed % increases in discharge, velocity and depth. No numeric standards exist for “negligible”; therefore engineering judgement must be used to determine if it is applicable based on the analysis.

(Note: GDOT will issue determination of acceptability based on the submitted analysis)
Documenting OLEs

OLE #6 – Reduction or negligible increase in impervious area

<table>
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<tr>
<th>Physical Parameters of Drainage Area 10B</th>
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<tr>
<td>Drainage Area 10B (Pre)</td>
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<td>Impervious</td>
</tr>
<tr>
<td>Fair Condition Grass (Soil Group B)</td>
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<tr>
<td>Total</td>
</tr>
</tbody>
</table>

| Drainage Area 10B (Post)                 | Area (Acres) | CN  |
| Impervious                               | 1.45         | 98  |
| Fair Condition Grass (Soil Group B)      | 0.53         | 61  |
| Total                                    | 1.98         | 88  |

There is an increase of 413 sf of impervious surface. However, because the increase is 0.48% of the overall drainage area, the increase for additional calculations. Therefore, Outfall Level Exclusion #6 within this basin.

Basin 10B Existing

- Existing Impervious Area = 1.44 Ac
- Overall Area within ROW = 1.98 Ac
- Existing % Impervious = 72.73%
- Existing Rv = 0.70

Basin 10B Proposed

- Proposed Impervious Area = 1.45 Ac
- Overall Area within ROW = 1.98 Ac
- Proposed % Impervious = 73.23%
- Proposed Rv = 0.71

Add 413 sf impervious surface, less 1% of overall drainage basin and no increase in curve number. Therefore, negligible increase and no BMP required.

CN Pre = 88
CN Post = 88

% Increase of Impervious Surface = 0.48%
Documenting Infeasibility

If you have a BMP that is Infeasible:

• Complete Cover Page of Post-Construction Stormwater Report
• Complete Attachment A – LID/GI Checklist
• Complete for all basins:
  ✓ Attachment B – Post-Construction BMP Summary
  ✓ Attachment C – MS4 Infeasibility and OLE Report
• Complete Attachment D at milestone review

Note: Infeasible AND feasible BMPs should be included in Attachment B and C of the PCSR
Documenting Infeasibility

Infeasibility #1 – BMP cost exceeds 10% of total project cost within the basin

• Use GDOT pay item index or Cost Estimating System (CES) to prepare comparison of proposed roadway costs to additional BMP cost of the basin

• If BMP cost is slightly above 10% of roadway cost, consider cost saving measures to lower BMP cost to under 10% (e.g. use of retaining walls in areas with high ROW cost)

Note: cost per linear foot estimates are not acceptable; must be actual cost of project within the associated basin
### Documenting Infeasibility

#### Final Roadway Estimate By Cost Category

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<tr>
<th>Item</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Quantity</th>
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<td>$299,295.47</td>
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**Roadway Cost Total** $2,198,573.44
### Documenting Infeasibility

**Detailed Estimates used to Populate Category Costs**

(using GDOT pay items, CES, etc.)

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## Documenting Infeasibility

### Detailed Estimates used to Populate Category Costs
(using GDOT pay items, CES, etc.)

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<td>$2,501.06</td>
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<tr>
<td>Catch Basin, GP 2, Addl Depth</td>
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<td>Storm Sewer Manhole, TP 1</td>
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<tr>
<td>Storm Sewer Manhole, TP 1, Addl Depth, CL</td>
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<td>$159.17</td>
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<td>Storm Sewer Manhole, TP 1, Addl Depth, CL</td>
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<tr>
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<td>Storm Sewer Manhole, TP 2, Addl Depth, CL</td>
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<td>Storm Sewer Manhole, TP 2, Addl Depth, CL</td>
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<td>Storm Sewer Manhole, TP 2, Addl Depth, CL</td>
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<td>$211.00</td>
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<tr>
<td>Flared End Section 15&quot;, Stormdran</td>
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<td>$433.46</td>
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<tr>
<td>Flared End Section 18&quot;, Stormdran</td>
<td>ea</td>
<td>$573.76</td>
<td></td>
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<tr>
<td>Flared End Section 24&quot;, Stormdran</td>
<td>ea</td>
<td>$643.08</td>
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<tr>
<td>Flared End Section 30&quot;, Stormdran</td>
<td>ea</td>
<td>$715.56</td>
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<tr>
<td>Plain Conc. Ditch Paving, 4 In</td>
<td>sy</td>
<td>$25.49</td>
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<tr>
<td>Remove Pipe</td>
<td>if</td>
<td>$4.80</td>
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</tr>
<tr>
<td>Safety End Section 36&quot;</td>
<td>ea</td>
<td>$1,060.10</td>
<td></td>
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<tr>
<td>Safety End Section 42&quot;</td>
<td>ea</td>
<td>$1,757.17</td>
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<tr>
<td>Storm Drain Pipe, 15&quot;, H 1-10</td>
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<td>$32.95</td>
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<td>Storm Drain Pipe, 18&quot;, H 1-10</td>
<td>if</td>
<td>$29.58</td>
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<td>Storm Drain Pipe, 24&quot;, H 1-10</td>
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<td>$37.25</td>
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<td>Storm Drain Pipe, 30&quot;, H 1-10</td>
<td>if</td>
<td>$47.57</td>
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<tr>
<td>Storm Drain Pipe, 36&quot;, H 1-10</td>
<td>if</td>
<td>$57.55</td>
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<tr>
<td>Storm Drain Pipe, 42&quot;, H 1-10</td>
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<td>$71.56</td>
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</table>
## Documenting Infeasibility

### Cost Comparison - Enhanced Dry Swale

<table>
<thead>
<tr>
<th>Item</th>
<th>Roadway Cost</th>
<th>Additional Cost due to BMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paving/Roadwork</td>
<td>$945,685.15</td>
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</tr>
<tr>
<td>Earthwork/Misc</td>
<td>$414,692.83</td>
<td>$3,750.00</td>
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<tr>
<td>Striping/Marking</td>
<td>$33,610.41</td>
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</tr>
<tr>
<td>Drainage</td>
<td>$109,333.71</td>
<td></td>
</tr>
<tr>
<td>Concrete/Walls/Barriers</td>
<td>$461,765.01</td>
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</tr>
<tr>
<td>Guardrail</td>
<td>$63,738.00</td>
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<tr>
<td>Bridge</td>
<td>$105,712.20</td>
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</tr>
<tr>
<td>Utilities</td>
<td>$64,036.12</td>
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</tr>
<tr>
<td>Right of Way</td>
<td>$0.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>Outlet Control Structure</td>
<td>$0.00</td>
<td>$4,000.00</td>
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<tr>
<td>Engineered Media</td>
<td>$0.00</td>
<td>$6,300.00</td>
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<tr>
<td>Check Dams</td>
<td>$0.00</td>
<td>$600.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$2,198,573.44</strong></td>
<td><strong>$14,650.00</strong></td>
</tr>
</tbody>
</table>

**Percent of Roadway Cost**: 0.67%

Sum detailed estimate into a summary table (to include in the post-construction stormwater report)
## Documenting Infeasibility

### Post-Construction BMP Cost Evaluation for Infeasibility

**02/05/16**

Drainage Area 8 (Project/on-site Area = 6.82 Ac.)

To New Water Quality/Wet Detention Pond:

<table>
<thead>
<tr>
<th></th>
<th>Proposed Project Cost</th>
<th>Additional Cost due to Installation of Water Quality BMPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthwork</td>
<td>$474,155</td>
<td>$16,223</td>
</tr>
<tr>
<td>Erosion Control</td>
<td>$136,281</td>
<td>$12,020</td>
</tr>
<tr>
<td>Signing and Marking</td>
<td>$42,951</td>
<td>$0</td>
</tr>
<tr>
<td>Roadway Items</td>
<td>$1,258,287</td>
<td>$0</td>
</tr>
<tr>
<td>Right of Way</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Bypass Structure (OCS)</td>
<td>$0</td>
<td>$500 (For WQ Only)</td>
</tr>
<tr>
<td>Retaining Walls</td>
<td>$0</td>
<td>$144,950 (Wall 2)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,911,674.00</strong></td>
<td><strong>$173,593.00</strong></td>
</tr>
<tr>
<td><strong>Total Increase</strong></td>
<td><strong>$173,593.00 (9.08%)</strong></td>
<td></td>
</tr>
</tbody>
</table>
Infeasibility #2 – BMP implementation would cause delays in schedule in excess of 90 days

- Describe how the inclusion of the BMP would increase the schedule
- Clearly indicate the delay is solely due to the BMP

Note: this does not apply to design delays, only exceptional impacts or new ROW phases
Documenting Infeasibility

Infeasibility #3 – BMP implementation would cause loss of habitat of endangered or threatened species

Infeasibility #4 – BMP implementation would cause cultural or community resource damage (historical and archaeological sites, cemeteries, parks, etc.)

• Provide applicable sections of reports showing habitat/resource locations (Protected Species Survey Report, Historical and Archeological Resources Survey Report)

• When available, provide Environmental Resource Impact Table (ERIT)

• Provide basin exhibit or plan sheets showing roadway alignment and habitat/resource delineations demonstrating how any BMP would impact these areas. Label the areas.
Impacts must be caused by **BMP installation only** - not other project elements.
Documenting Infeasibility

Infeasibility #5 – BMP implementation would cause residence or business displacement

• Provide exhibit showing roadway alignment and home/business locations demonstrating that any BMP would impact these locations

• Include cross sections and construction limits from the construction of the BMP

NOTE: Resource impacts must be from the BMP only and not the other project elements
Documenting Infeasibility

Infeasibility #6 – BMP implementation would cause a violation of federal or state law or regulation

• Provide documentation of statute or regulation that would be violated in order to construct a BMP
Documenting Infeasibility

Infeasibility #7 – Shallow bedrock, contaminated soils, high groundwater, potential utility conflicts or other underground facilities would prevent BMP installation

• Utilize the Web Soil Survey website to give approximate data for bedrock and groundwater depths at the concept level phase

• Provide applicable sections of geotechnical report to show bedrock and groundwater table data

• Provide Soil Quality and Contaminant Survey Report to establish quality of soils to determine BMP feasibility

• Provide aboveground utility location survey data on roadway plans as part of BMP infeasibility exhibit

• Use GPR or other subsurface utility surveys to locate underground facilities to determine BMP infeasibility

• Provide the cost to relocate utilities and the estimated cost of the BMP
Documenting Infeasibility

Infeasibility #7 – Shallow bedrock, contaminated soils, high groundwater, potential utility conflicts or other underground facilities would prevent BMP installation

Only the documentation relevant to the specific site limitation is needed

and groundwater table data

- Provide Soil Quality and Contaminant Survey Report to establish quality of soils to determine BMP feasibility

- Provide aboveground utility location survey data on roadway plans as part of BMP infeasibility exhibit

- Use GPR or other subsurface utility surveys to located underground facilities to determine BMP infeasibility

- Provide the cost to relocate utilities and the estimated cost of the BMP
Documenting Infeasibility

Infeasibility #8 – Soil infiltration capacity is limited

Infeasibility #9 – Site is too small to infiltrate significant volume

- Provide calculations and exhibits showing roadway alignment and surveyed features along with alternatives analysis demonstrating that only infiltrating BMPs would be feasible for this basin

- Can utilize Web Soil Survey at concept level to determine soil data and infiltration BMP feasibility

- Provide applicable sections of geotechnical report to show bedrock, soils, and groundwater depth data

Refer to Appendix J of the GDOT Drainage Manual for guidance on infiltration testing
Documenting Infeasibility

Infeasibility #8 – Soil infiltration capacity is limited

Infeasibility #9 – Site is too small to infiltrate significant volume

Refer to Appendix J of the GDOT Drainage Manual for guidance on infiltration testing
Documenting Infeasibility

Infeasibility #10 – Site does not allow for gravity flow for the BMP

- Provide exhibit showing roadway alignment, survey features and contours demonstrating that topography does not provide adequate fall for flow into or out of BMP
At the concept level, it is better to be conservative and assume a BMP will need to be installed rather than claiming an infeasibility that may end up being feasible after more site information is determined.
Questions

Brad McManus, PE
MS4 Program Manager
Office of Design Policy and Support
bmcmanus@dot.ga.gov

ANY QUESTIONS?