



# Lessons Learned on How to Develop Guidance and Implement LID

MAFSM 2009 Conference  
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**Baker**

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# Outline

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- Why develop a LID program
- How to develop LID guidance
- Implementation
- Summary of key lessons learned

# Why Develop a LID Program

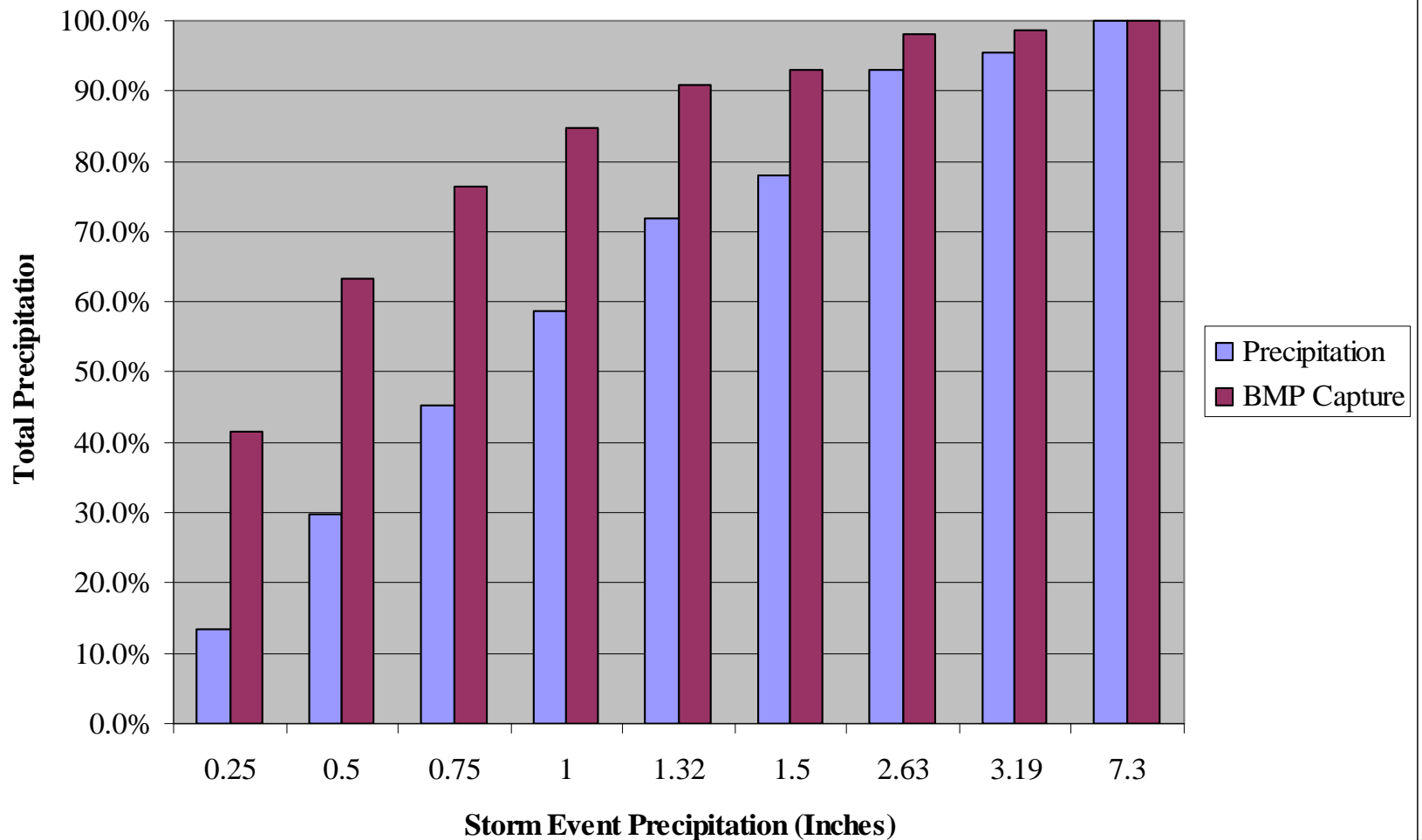
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- Conventional stormwater practices are not effective at managing more frequent precipitation events
- Evaluate infrequent large volume flood events separately from more frequent smaller storm events
- Frequent events carry majority of pollutants and annual precipitation volume
- Managing 90 to 95% of annual average precipitation can be done by capturing up to the initial 1.3 to 1.7 inches of precipitation from each storm event

# Precipitation Frequency & BMP Capture Volumes

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**Summary of Storm Event Data For Reagan National Airport  
Period of Record is 5/1/1948 through 2/1/2006**



# Virginia, Maryland and DC are revising stormwater management requirements

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- MS4 permits incorporate TMDLs, LID and monitoring
- New stricter state stormwater legislation and guidance
- New federal construction effluent guidelines for erosion and sediment control by December 2009
- New federal post development effluent guidelines before the end of the next MS4 permit cycle
- Chesapeake Bay TMDL
- Low Impact Development is a key component

# Lessons Learned on How to Develop Guidance

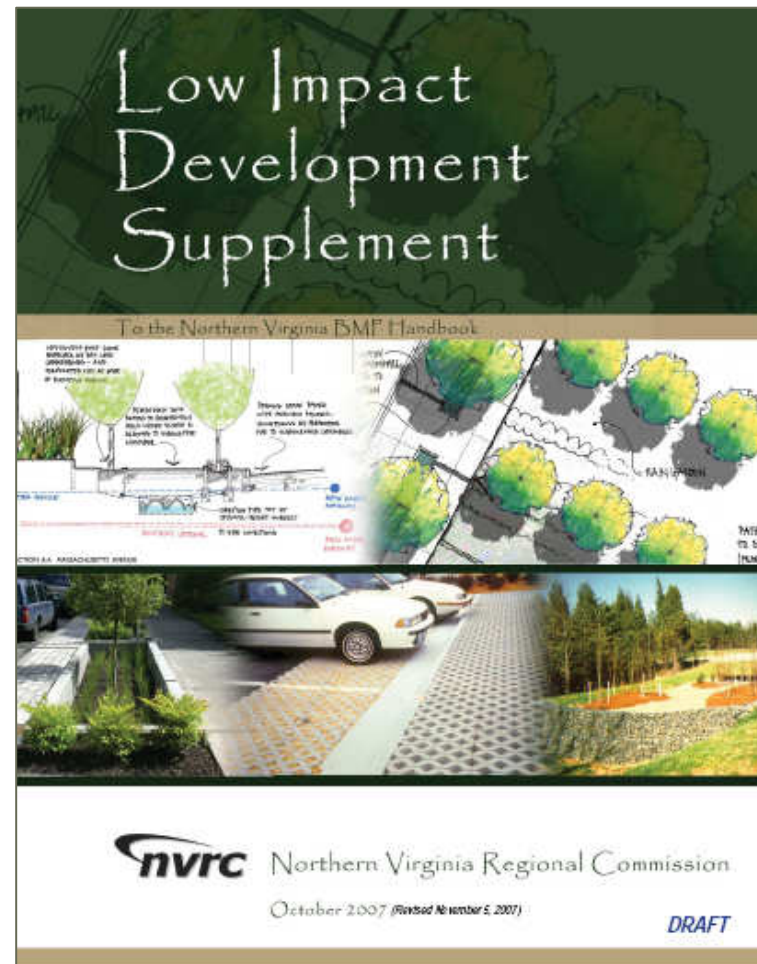
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- Provide a consistent and defensible process that is accepted by approving authorities
- Developers want the process to be clear and reasonable and to not delay to development
- Approving agencies want to know that the system will work as designed and can be reasonably maintained

# NVRC Developed a LID Supplement to the Northern Virginia BMP Handbook

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- Standardizes process so design engineers and permit authorities agree on application requirements and methods
- LID under utilized until this is resolved
- LID sizing approach is now volumetric
- LID practice descriptions
  - BMP selection
  - Design and specifications
  - Life cycle costs
  - Construction and maintenance
  - As-built approval



# 12 LID Practices in the First Edition

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Northern Virginia's LID Supplement

- Pervious pavements
- Reforestation
- Vegetated roofs
- Bioretention cells
- Vegetated swales
- Vegetative box filters
- Filtration devices
- Pocket wetlands
- Non-structural sand filters
- Level spreaders
- Dry wells
- Rain catchment systems





# LID is Not Understood by all

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- A select team of diverse representatives should form a standing committee for the duration of guidance development and preferably on into implementation
- This process can take a year or more
- Many developers and approving agency staff misunderstand the full extent of LID
- Thus education is necessary for at least the initial meetings
- Stakeholders must stay the duration

# Everyone Will Not Agree

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- Differing agencies prefer different design practices
- This holds across a different municipalities and sometimes within various agencies of one municipality
- For this reason, the final guidance could be:
  - consensus of the preferred approach
  - Description of the basic approach with a collection of alternatives (a municipality may select one or more alternatives but not necessarily all alternatives)

# Guidance Must Cover More Than Design

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- Looking forward to maintenance, some agencies will not allow LID structures to be built on private property because of the added expense of inspection and possible enforcement if maintenance is not performed by the owner
- Guidance must include design, construction and maintenance

# Implementation

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- Public outreach and education are critical
  - Property owners need to know what they have on their land (especially if they recently purchased the land)
  - Developers need to understand how LID works so they don't subvert the LID intent during construction
  - Adequate maintenance will not occur without continuous education and outreach – in which case structural LID elements can fail

# Northern Pennsylvania Bioretention that was “Redesigned”

Baker



# Northern Pennsylvania Bioretention that was “Redesigned”

Baker

- The site should have:
  - sloped parking lot
  - Curb stops next to bioretention area
- Instead the “redesign” had:
  - Flat lot
  - Complete curbing around bioretention areas
  - Curb cuts were added as an afterthought



# Residential Development in Maryland Next to the District of Columbia

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- Developer was prodded by County to use full LID for stormwater management
- Site was relatively flat and used natural contours as one LID technique
- Curbless roads, grass swales and onsite bioretention also were used
- Designs were thoroughly reviewed and approved
- Construction received proper oversight

# Maryland LID Development – Worked as Planned

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- Part of the large site was developed and residential properties were sold
- Stormwater worked fine for smaller storms
- A very large storm occurred soon after properties were predominately sold out
- The LID worked as planned



# Maryland LID Development – Not What Resident's Expected

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- Water was retained in swales onsite
- The overflows worked as designed and no homes or driveways were flooded
- The water took two days to drain
- Resident's were very unhappy about ponded water in their yards for so long
- The developer had another parcel to build and sell
- Rather than take a risk on public education that might fail, the developer spent over \$1M to remove swales and install sewers

# Key Lessons

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- You need the right people at the table to develop guidance
- Design, construction and maintenance are all critical
- Designers and developers must be educated
- Public education and outreach are necessary – stormwater does not have to be whisked away ASAP
- Agency resources need to be increased for maintenance and education of LID structures

# Questions and Answers



**Thank You**

**Baker**

# Contact information

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# LID Practices (No Limit!)

*“Creative Techniques to Use, Store, Detain and Recharge”*

## Baker

- Bioretention / Rain Gardens
- Strategic Grading
- Site Finger Printing
- Resource Conservation
- Flatter Wider Bio Swales
- Flatter Slopes
- Long Flow Paths
- Tree / Shrub Depression
- Turf Depression
- Landscape Islands Storage
- Rooftop Detention /Retention
- Roof Leader Disconnection
- Parking Lot / Street Storage
- Smaller Culverts, Pipes & Inlets
- Alternative Surfaces
- Reduce Impervious Surface
- Surface Roughness Technology
- Rain Barrels / Cisterns / Water Use
- Catch Basins / Seepage Pits
- Sidewalk Storage
- Vegetative Swales, Buffers & Strips
- Infiltration Swales & Trenches
- Eliminate Curb and Gutter
- Shoulder Vegetation
- Maximize Sheet flow
- Maintain Drainage Patterns
- Reforestation
- Pollution Prevention.....



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# THANK YOU

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