Wet Weather Team Project Meeting Materials

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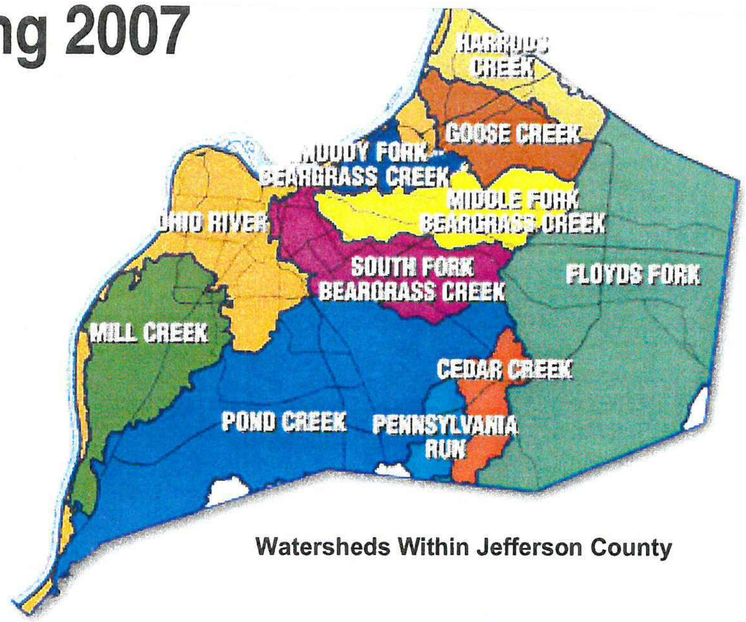
WWT Stakeholders Meeting # 7 3/15/2007

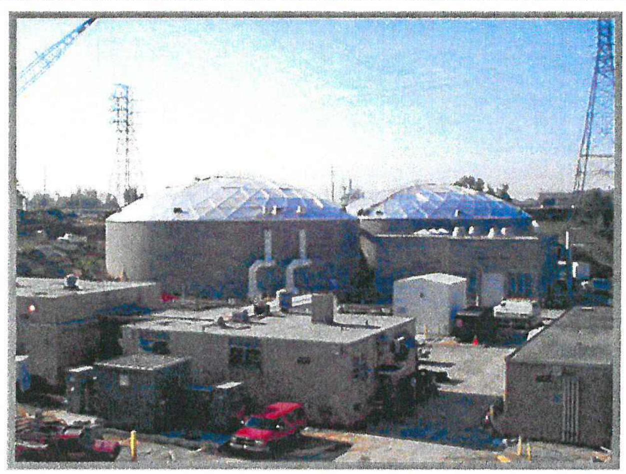
Summer 2006–Spring 2007

MSD

Louisville and Jefferson County Metropolitan Sewer District



Watersheds Within Jefferson County



Agenda

Draft Agenda
Louisville and Jefferson County Metropolitan Sewer District (MSD)
Wet Weather Team Meeting #7
Thursday, March 15, 2007, 4:20-8:00 PM
MSD Main Office, Board Room
700 West Liberty St., Louisville

Meeting Objectives:

- Learn about wet-weather wastewater and stormwater management problems in the Beargrass Creek watershed, and discuss potential high-level strategies to address those problems.
- Discuss an example of how benefit-cost information will be developed based on the performance measures for the regulatory compliance value.
- Review draft performance measures for the asset protection and eco-friendly solutions values. (Performance measures for other values will be discussed at future meetings.)
- Discuss and provide feedback on MSD's current plans for public participation efforts during the development of the Wet Weather Program, including public meetings as well as ongoing education, outreach, and public relations activities.
- Identify next steps and expectations for the next meeting of the Wet Weather Team.

4:20 PM **Participants Arrive and Get Settled**

4:30 PM **Review Agenda and Ground Rules (5 minutes)**

- Review meeting objectives and ground rules.

4:35 PM **Wet Weather Project Updates (10 minutes)**

- Updates on MSD wet weather activities and follow-up items from the last Wet Weather Team meeting.

4:45 PM **Discussion of Watershed-Specific Problems and High-Level Response Strategies— Beargrass Creek Watershed (50 minutes)**

- Review wastewater and stormwater management problems the Beargrass Creek watershed, their causes, and the results of past efforts to address the problems.
- Discuss potential high-level strategies to address the problems in the watershed.

5:35 PM **Dinner with Update on Approach to Weighting Values (25 minutes)**

Dinner will be provided for Wet Weather Team members.

- During dinner, the facilitation team will provide an update on the development of an approach for weighting the Wet Weather Team's values, based on the results of the straw poll voting exercise conducted at the last meeting.

6:00 PM **Discussion of Draft Performance Measures (70 minutes)**

- Discuss an example of how benefit-cost information will be developed based on the performance measures for the regulatory compliance value.
- Introduce the draft performance measure tables for the asset protection and eco-friendly solutions values. (Performance measures and an evaluation framework for other values will be discussed at future meetings.)

7:10 PM **Discussion of Planned Public Participation Efforts (30 minutes)**

- Review and provide feedback on MSD's strategy and plans for public participation efforts during the development of the Wet Weather Program, including public meetings and ongoing education, outreach, and public relations efforts.

7:40 PM **Opportunity for Observer Comments (10 minutes)**

7:50 PM **Wrap Up and Next Steps (10 minutes)**

- Review plans and expectations for the April 19, 2007 Wet Weather Team meeting.

8:00 PM **Adjourn**

Meeting Summary

Final Meeting Summary
Wet Weather Team Meeting #7
Thursday, March 15, 2007
MSD Main Office, Louisville

The Wet Weather Team (WWT), chartered by the Louisville and Jefferson County Metropolitan Sewer District (MSD), met on March 15, 2007 at MSD's main office in Louisville. The objectives of the meeting were to:

- Learn about wet-weather wastewater and stormwater management problems in the Beargrass Creek watershed, and discuss potential high-level strategies to address those problems;
- Discuss an example of how benefit-cost information will be developed based on the performance measures for the regulatory compliance value;
- Review draft performance measures for the asset protection and eco-friendly solutions values; and
- Discuss and provide feedback on MSD's current plans for public participation efforts during the development of the Wet Weather Program, including public meetings as well as ongoing education, outreach, and public relations activities.

Wet Weather Project Updates

MSD Executive Director Bud Schardein mentioned that he had participated in almost 150 community meetings related to MSD's Consent Decree, noting the importance of the Consent Decree and that it will require investments from the community. Mr. Schardein also provided an update on a potential upcoming rate increase that MSD is considering, for funding interim action projects such as addressing the "Big 4" sanitary sewer overflows (SSOs). He said that despite the anticipated rate increases, MSD's rate would likely continue to fall in the lower third of rates for municipalities across the country. Mr. Schardein also described some ideas MSD was considering for calibrating the new wastewater charges based on the contribution that individual users had on the overall load (e.g., based on the size of the pipe connection).

Brian Bingham of MSD said that the upcoming rate increases are not related to funding the long-term plans for control of combined sewer overflows (CSOs) and SSOs, but they will help support some of the interim actions required by the Consent Decree. Mr. Bingham also described MSD's response to a recent storm event, and noted that MSD's real time control program had kept about 620 million gallons of overflows from leaving the sewer systems.

Beargrass Creek Presentation and Discussion

Brian Bingham gave a presentation on CSO and water quality problems in the Beargrass Creek watershed and options to address those problems using non-point source and site-specific CSO controls. The presentation covered: (a) water quality problems in Beargrass Creek; (b) the sources of pollution loads; and (c) water quality improvement options, including source control (requiring education to change behavior), stormwater best management practices (BMPs), and point source controls for CSOs. He noted that it will be important to implement both point source and non-point source controls to meet water quality standards in Beargrass Creek.

Participants asked a variety of clarifying questions about the presentation, including questions about specific control options (e.g., low-impact development techniques, maintenance requirements for pervious pavement, etc.). In addition, WWT members discussed a range of potential strategies to consider for the Beargrass Creek watershed. Highlights of this discussion are as follows.

- Some participants commented on the water quality data presented, noting that upper reaches of the Middle and Muddy Forks of Beargrass Creek do not have dissolved oxygen (DO) problems. This implies that aquatic health may be an issue in some, but not all, of the stream reaches. In response to the comment, MSD stated that it is reviewing and calibrating the DO data, and that there may have been fewer water quality exceedances than previously reported to the public.
- A few participants suggested that MSD could consider leveraging and coordinating the Wet Weather Program efforts with MSD's MS4 stormwater management permitting responsibilities.
- Several participants mentioned the interest in the development community in cost-effective, eco-friendly solutions, and suggested that it would be helpful for MSD to develop specific design parameters or standards for low-impact development techniques and other stormwater BMPs (such as porous pavement, vegetated swales, etc.). In addition, WWT members mentioned that it could be helpful to have incentives to encourage developers to adopt those practices.
  - MSD and the technical team said that other communities have developed design manuals that could be useful, and that MSD is also considering developing its own stormwater BMP manual that would reflect site-specific considerations. WWT participants noted that MSD could develop a design manual that would support implementation of MSD's MS4 stormwater management responsibilities as well as the Wet Weather Program.
  - Regarding incentives, a few participants asked whether the use of eco-friendly source prevention techniques could qualify a property owner for reduced wastewater rates. MSD could also start instituting a surcharge on illegal sump pump connections, as part of the implementation of the Consent Decree.
- While several participants expressed support for strategies that rely on source prevention (e.g., rain gardens), participants also raised questions about what effects they'd have over the long term and whether it would be more difficult to convince regulators about their effectiveness.
  - One option mentioned would be to conduct a demonstration project in a small area, and compare the changes in pollutant loading and stormwater flows to those of other areas.
  - Participants suggested including installation of pervious pavement (e.g., across some or all of the residential streets) as well as other stormwater management BMPs as specific project alternatives in the analysis the technical team will conduct. The technical team confirmed that those types of projects would be included in the cost-benefit analysis. MSD staff also mentioned and drew upon their experience with existing permeable pavement pilot efforts, including some pavement directly outside the MSD main office.
  - Some WWT stakeholders commented that the short, educational newsletters that the Louisville Gas & Electric Company (LG&E) sends with utility bills could be effective at changing people's behavior; however, it is unlikely that LG&E follows up to determine how many people read the newsletters and take actions based upon them.
- A few participants noted that most of the Beargrass Creek watershed consists of residential and commercial land uses, with little open space, so it could be important to influence homeowner behavior to improve stormwater management in those areas.
- WWT members discussed the possibility of looking at solutions that could meet the objectives of multiple agencies (e.g., water quality and flood control improvements) and receive funding from multiple sources. MSD participants said that MSD would embrace opportunities to work with other agencies, but will also need to meet the tight schedule required by the Consent Decree.

- WWT stakeholders suggested that it could be helpful to initiate a dialog with neighborhoods, potentially including door-to-door outreach, to better understand local water quality problems and to solicit local input on potential solutions.

Participants were encouraged to send the facilitation team additional, specific ideas for options to address wastewater and stormwater management issues in the Beargrass Creek watershed, or other areas.

Update on Approach to Weighting the Wet Weather Team's Values

During the dinner break, Jennifer Tice of Ross & Associates gave an overview of a handout that outlined the results and potential implications of the straw poll voting exercise that was conducted during and following the February 13th WWT meeting. The straw poll was designed to get an initial sense of WWT stakeholder preferences regarding the relative importance of the WWT's values for choosing between Wet Weather Program alternatives. The handout summarized the point scores that each value received in the voting exercise and described the difference between values that will be evaluated at the project-level and values that will be evaluated programmatically (i.e., across all projects). The four values proposed for programmatic evaluation are: (1) economic vitality; (2) education; (3) environmental justice and equity; and (4) financial equity.

The facilitation team also walked through some of the potential implications of the straw poll results, if the results were used to determine a relative weighting of the values. For example, public health and environmental enhancement scored very highly in the straw poll, so projects that achieve results in those areas would be considered higher priorities for the Wet Weather Program than projects that deliver benefits for lower-scoring values such asset protection and customer satisfaction, all else being equal (e.g., cost). Projects that score well across all values would come out top; however, the values weighting would influence the end results of the cost-benefit analysis when there are projects that affect the values differently (e.g., provide benefits in some, but not other areas). The implications outlined in the handout for both the project-level analysis of alternatives and the programmatic analysis represent only one possible interpretation of the voting results. The handout was intended to be a "thought piece" to stimulate thinking among WWT stakeholders about potential weights for the values; it is not necessarily representative of how the WWT will choose to weight the values.

WWT stakeholders were encouraged to review the handout before the next WWT meeting, when there would be time for the group to discuss relative weights for the values. Although there was not much time for discussion at this meeting, participants made the following comments.

- A few participants noted that it was surprising that three values—customer satisfaction, financial equity, and economic vitality—ended up at the bottom of the list of values, implying that WWT stakeholders found those values to be the least important for deciding between alternatives.
- WWT stakeholders also suggested that it would be helpful to have examples of how the weighting would affect the outcomes of projects selected, especially for the environmental justice and equity value, which cuts across many of the other values identified by WWT stakeholders.

Performance Measures Discussion

Gary Swanson of CH2M HILL reviewed a step-by-step example of how the performance measures for the regulatory compliance value would be used to develop benefit-cost information for project alternatives. The steps in the development of benefit-cost information include:

1. Define the problem;
2. Identify appropriate performance scales;

3. Define the alternatives and outcomes (predictive models);
4. Develop present-worth costs;
5. Quantify base case (current condition);
6. Quantify each alternative's performance improvement (problem reduction) using performance matrix scales;
7. Calculate benefit/cost ratios; and
8. Interpret results.

During this session, Mr. Swanson also introduced two new draft performance matrices, for the asset protection and eco-friendly solutions values. The draft eco-friendly solutions performance matrix uses a different format than the performance matrices developed for other values. Instead of including both a frequency scale and an impact/severity scale, the eco-friendly solutions table contains five categories representing different levels of "eco-friendliness." Participants were asked to review the performance matrices (draft matrices for asset protection and eco-friendly solutions; and revised draft matrices for public health and environmental enhancement) before the next WWT meeting on April 19, 2007.

Highlights from the WWT discussion about performance measures and the benefit-cost example include the following points.

- Defining the alternatives will be a critical step in designing the Wet Weather Program. Behavior change actions should be considered along with other alternatives.
- Participants noted that it can be more difficult to quantify and sustain the benefits of voluntary strategies.
    - Continued education and monitoring of the effectiveness of these strategies will, therefore, be very important.
    - These strategies may score lower on the regulatory compliance value (e.g., because of the uncertainty about long-term effectiveness), but higher on other values, such as eco-friendly solutions.
- A few participants suggested that it may be useful to consider enforcement approaches and changes to local regulations, along with voluntary actions. Others commented on the importance of education to overall program effectiveness (e.g., letting people know about the implications of illegal sump pump connections), and that enforcement alone is likely to be insufficient.

Public Participation Plans

Marla Hill of CH2M HILL, who works on Atlanta's "Clean Water Atlanta" program, gave a presentation on MSD's current thinking for public education and outreach efforts associated with the development of MSD's Wet Weather Program. MSD worked with the technical team to develop and refine a draft plan for public participation efforts based in large part on suggestions from Wet Weather Team stakeholders. Components of the draft plan include target audiences (general public, specific groups, and schools), key objectives, proposed messages associated with each key objective, use of multiple communication media, and plans for initial public meetings in April 2007. The draft plan includes activities relevant to the current Wet Weather Program development period (through 2008) and an initial proposal for components of the overall long-term education program (after 2008). The five objectives for the general public are:

- Value clean water;
- Protect public health;
- Support investment needs;
- Maintain positive MSD image; and

- Provide Wet Weather Plan input.

WWT participants were generally supportive of the outline of the draft public participation plan presented. Specific comments and suggestions made by WWT members included the following points.

- It is best to bring people in from the beginning, rather than wait until everything is "set in stone."
- It could be helpful to work with other building inspectors to raise awareness of wet weather issues during inspections.
- A targeted direct-mail approach could be useful to help address local, site-specific problems (e.g., highlighting a specific neighborhood CSO).
- The Courier-Journal newspaper could be a venue for generating awareness of MSD's key messages. The press can help foster increased understanding and acceptance in the community through news coverage they provide and/or editorial page commentary.
- A few participants expressed concern about the likely attendance at the public meetings, and suggested that a 6-hour time span for meetings might be too long.
- Participants noted that none of the public meetings were planned for locations in the Beargrass Creek watershed.

Participants were asked to send any additional suggestions for the format, content/messages, and/or locations of public meeting #1 to the facilitation team for MSD's consideration.

Observer Comments

There were no comments from observers at this meeting.

Wrap Up and Next Steps

- MSD will work with the technical team to schedule, design, and conduct a series of open-house style public meetings in April at different locations across Jefferson County. The facilitation team will distribute information about the times and locations of the meetings to the WWT once they are set.
    - WWT stakeholders were encouraged to attend at least one of the public meetings to listen to feedback from community members firsthand.
- The technical team will develop draft performance measures for the environmental enhancement values as well as an approach for the programmatic evaluation of Wet Weather Program alternatives.
- The next WWT meeting will be on Thursday, April 19, 2007, at MSD's main office in downtown Louisville. Potential meeting topics include:
    - Discussion of potential weights for the Wet Weather Team's community values in the cost-benefit analysis of alternatives for MSD's Wet Weather Program;
    - Discussion of a proposed approach for the programmatic evaluation of Wet Weather Program alternatives;
    - Review and provide feedback on the draft performance matrices for values evaluated at the project level (asset protection, eco-friendly solutions, environmental enhancement, public health enhancement, and regulatory compliance); and
    - Update on MSD's public education and outreach efforts, including the April public meetings.

Meeting Participants

Wet Weather Team Stakeholders

Susan Barto, Mayor of Lyndon
Charles Cash, City of Louisville, Planning & Design Services Department
Allan Dittmer, University of Louisville
Faye Ellerkamp, City of Windy Hills
Jeff Frank, Vanguard Sales
Arnita Gadson, West Jefferson County Community Task Force
Mike Heitz, City of Louisville, Metro Parks
Tom Herman, Zeon Chemicals
Rick Johnstone, Deputy Mayor, Mayor's Office
Bob Marrett, CMB Development Company
Kurt Mason, Jefferson County Soil and Water Conservation District
Judy Nielsen, Louisville Metro Health Department
Lisa Santos, Irish Hill Neighborhood Association
Bruce Scott, Kentucky Waterways Alliance
David Wicks, Jefferson County Public Schools

MSD Personnel

Brian Bingham, MSD Regulatory Management Services Director
Derek Guthrie, MSD Director of Engineering/Operations & Chief Engineer
Bud Schardein, MSD Executive Director

Facilitation and Technical Support

Rob Greenwood, Ross & Associates Environmental Consulting
Marla Hill, CH2M HILL
Gary Swanson, CH2M HILL
Jennifer Tice, Ross & Associates Environmental Consulting

Meeting Observers

Vicki Coombs, MSD
Phillis Croce, MSD
Henry Cubero, The Cubero Group
David Hackworth, CH2M HILL
Martin Hoehler, MSD
Tim Kraus, O'Brien & Gere
Teri Pifine, MSD
Wesley Sydnor, O'Brien & Gere
Rob Thomas, Redwing Ecological Services, Inc.

Meeting Materials

- March 15, 2007 Meeting Agenda
- Summary of the 2/13/07 Wet Weather Team Meeting
- Beargrass Creek CSO Presentation
- Stormwater Best Management Practices Brochure
- Update on Approach to Weighting the Wet Weather Team's Values
- Benefit/Cost Development Instructions
- Draft Performance Measure Table for Asset Protection
- Draft Performance Measure Table for Eco-Friendly Solutions
- Revised Draft Performance Measure Table for Public Health Enhancement
- Revised Draft Performance Measure Table for Regulatory Compliance
- Public Participation Plan Presentation

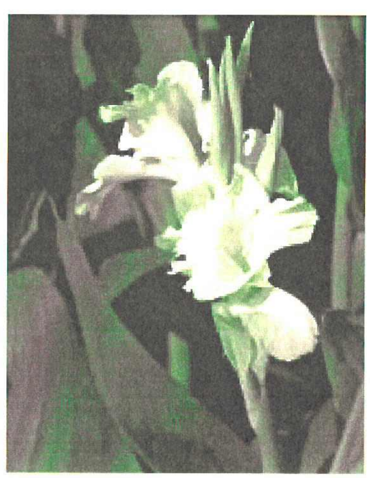
Handouts

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

STORMWATER
Best Management Practices

EVERGLADES STORMWATER PROGRAM






South Florida's urbanization began with the building of the Flagler East Coast Railroad in the 1890s. Since then, the population growth rate has mushroomed. As an area urbanizes, natural land is converted to uses that support human activities. Buildings, homes, streets, and parking lots seemingly rise overnight.

Along with urban sprawl comes a disturbance of the natural water flow. After storms, water runoff becomes accelerated as much of the land has been made impervious by man-made structures. The amount of rain that normally would infiltrate into the ground is reduced. The increased volume of water can overload drainage systems, and the accelerated speed of the runoff created by the rain causes soil and sediment erosion.

Today, greater emphasis is being placed on developing comprehensive Stormwater Management Plans to mitigate the adverse effects of increased runoff. These plans provide for:

- Surface drainage and flood protection
- Erosion and sediment control
- Aesthetic enhancement and recreational opportunities
- Reuse of water resources
- Reduction of pollutants

Best Management Practices, or BMPs, help address the water quality impacts of stormwater runoff by preventing, treating and/or controlling the amount of pollution in urban runoff. Identifying and implementing best practices to suit a specific watershed is an overriding goal in managing stormwater.

While no one Best Management Practice can be the cure-all for a particular plan, a system of practices can pull together as the cars in a train. Henry Flagler's train has evolved into what may be thought of as the BMP treatment train…a linked system for effectively transporting runoff from the urbanized areas of south Florida.

Stormwater Best Management Practices

BMPs help control the volume and speed of runoff before it enters receiving waters and promote the seepage of rainwater into groundwater storage areas. The two general types of BMPs that can be used in combination to manage urban runoff are structural and non-structural.

Non-Structural BMPs include prevention practices designed to improve water quality by reducing the accumulation and generation of potential pollutants at or near their source. They do not require construction of a facility, but instead provide for the development of pollution control programs that include, but are not limited to prevention, education, and regulation. These programs may consist of the following elements:

- Planning and regulatory tools
- Conservation, recycling, and source controls
- Maintenance and operational procedures
- Educational and outreach programs

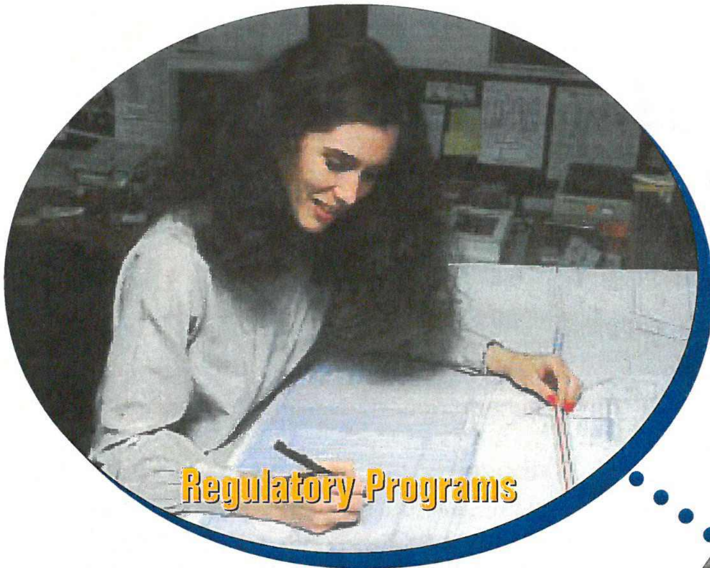
Structural BMPs involve building an engineered "facility" to treat water at either the point of generation or point of discharge to either the storm sewer system or to receiving waters. Most require some level of routine maintenance. Structural BMPs can be categorized as follows:

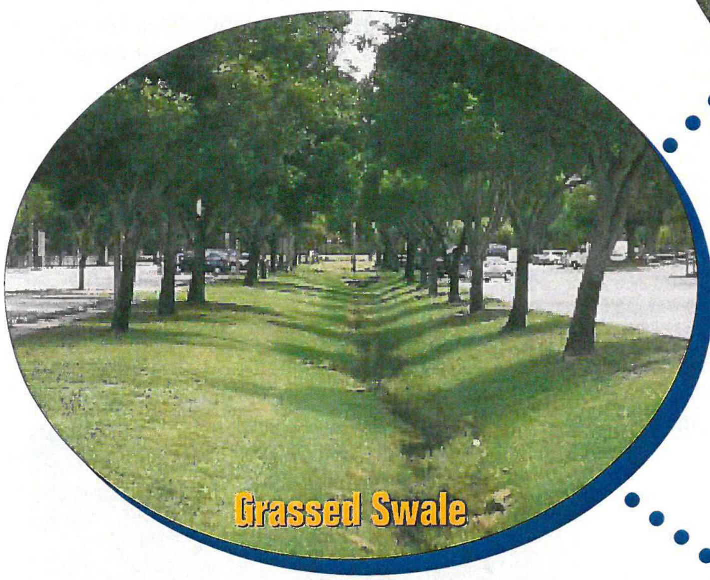
- Retention systems
- Detention systems
- Other systems

The S-9 pumping station, located in Broward County, is the primary discharge structure for the C-11 West Basin, one of the urban tributary basins discharging stormwater runoff into the Everglades Protection Area.

Non-Structural and Structural BMPs

are used in conjunction to create an effective stormwater management plan.





The first strategy of a management plan should be to prevent and reduce pollutants using non-structural BMPs. Structural BMPs are a secondary measure meant to remove additional pollutants from a watershed.

Pollutants Commonly Found in Stormwater Runoff

Pollutants in stormwater runoff are generated from nine major sources: street pavement, motor vehicles, atmospheric deposition, vegetation, erosion, litter, chemicals, construction and agricultural activities, and wastewater.

Each pollutant has a specific adverse impact on the health of our waterways and environment. Common pollutants and their impacts are summarized as follows:

Sediments

These constitute the largest mass of pollutant and consist of solid materials originating from crumbling rocks, eroded soil, or organic material from the land. Sediments clog waterways, smother bottom dwelling organisms, increase turbidity, and degrade aesthetic value.

Nutrients

Nitrogen and phosphorus are generated from landscape runoff (fertilizers, detergents, plant debris), atmospheric deposition, animal wastes and defective septic systems. In excess, these nutrients increase biological productivity and may cause uncontrolled growth of algae and undesirable aquatic weeds.

Heavy Metals

Lead, cadmium, chromium, copper, and zinc originate from motor vehicle operation, direct fallout, industrial facilities, and degradation of highway materials. They disrupt fish and shellfish reproduction and accumulate in fish tissue, thereby posing a threat to humans.

Oxygen Demanding Substances

These substances include decaying organic matter. They consume oxygen in the water and create an oxygen deficit that can kill fish and other aquatic life forms.

Petroleum Hydrocarbons

Petroleum hydrocarbons are generated from leaking storage tanks, vehicle emissions, and improper disposal of waste oil. They can collect in bottom sediments of water bodies where they may harm bottom dwelling organisms.

Pathogens

The primary sources of pathogens such as coliform bacteria and viruses are animal wastes, defective septic systems, illicit sewage connections, and boats and marinas. Contamination prevents swimming in water bodies, drinking from certain water sources, and harvesting fish.

Toxic Materials

Manufactured compounds such as pesticides, solvents, and household and industrial chemicals have been found in at least 10 percent of urban runoff samples.

Other Impacts

Changes in water temperature can also have an impact on water quality. Water holds less oxygen as it becomes warmer resulting in less oxygen available for aquatic organisms. This increases the metabolism, respiration, and oxygen demand of fish and other aquatic life.

Everyday activities provide many opportunities for water conservation and water quality improvement.

Quantifying Pollutants in Stormwater Runoff

Water pollutants can be quantified in terms of concentration or load. Concentration is the amount of pollutant per unit volume of water sampled at a particular time. This may vary considerably with each storm and from site to site. The accepted practice is to determine a single value by analyzing a series of samples taken at points throughout the runoff event and combining them in proportion to the flow rate at the time of sampling. The value is known as the event-mean concentration, or EMC, and is usually expressed as mg/L. It provides a method for comparing different storm events and relating one site with another.

Load is the mass of pollutant delivered to a receiving water body during a period of time. It provides further insight to the values obtained from concentration based data. Loading rates help provide an understanding of the pollutant attenuation capabilities of stormwater management practices. Load is expressed on an annual basis as kg/year or tons/year.

Feasibility Screening for BMP Selection

Selecting a Best Management Practice is a complex process and is most effective when implemented as part of a comprehensive stormwater management program. Management practices should provide for the following: 1) prevention or reduction of the amount of pollutants entering surface or ground-waters and 2) regulation of the total amount of runoff from rainfall.

Construction of facilities and implementation of practices according to approved plans and applicable permits are essential in the management process. Institutional ordinances and programs must be in place to provide the fiscal resources, review and approve plans, inspect operation, and enforce regulations. A comprehensive program should include a combination of components that are properly selected, designed, implemented, inspected, and regularly maintained. BMP options should be evaluated through feasibility screening for the following factors:

- Physical and technical limitations
- Pollutant reduction capabilities
- Cost considerations
- Supplemental benefits/side effects
- Public acceptance

The area to be managed should be assessed according to the size of the region contributing to stormwater runoff, area required for the BMP option, land and soil characteristics, and intended land use. Rainfall characteristics such as average frequency, duration, and intensity must also be reviewed. These will directly affect the volume of water that needs to be detained, infiltrated, or reused; the time needed to recover the treatment volume; and the process used to capture, filter, or assimilate pollutants. Increasing water residence time and promoting low turbulence help achieve stormwater treatment objectives by allowing for effective settling of sedimentation.

Pollutant type and load will need to be determined, since some BMP methods are more effective than others for removing particular types of pollutant. Treatment goals must be established to determine a minimum treatment performance standard. These standards are usually best achieved through the use of combined BMP practices as part of an overall management plan.

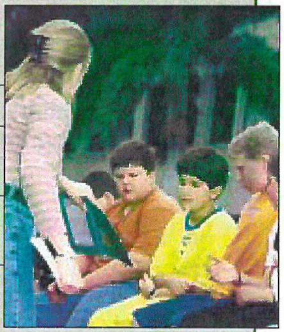
Any proposed BMP should be constructible in a selected location with reasonable effort and expense. Costs to be considered are capital costs for design and construction; permit fees; expenses involved in operation, inspection and maintenance; and unit costs for pollutant removal.

The more publicly accepted the BMP, the better chance it has for success. Structural BMPs require a long-term commitment; therefore, the owner/operator must be comfortable with project requirements before construction begins. Non-structural BMPs need active community support, and participation can be encouraged by defining problems clearly and outlining measures to solve them. Prevention is more cost effective and efficient than treatment of runoff.

NON-STRUCTURAL BMP OPTIONS

P = Planning and Regulatory Tools
C = Conservation, Recycling and Source Control
M = Maintenance and Operational Procedures
E = Educational and Outreach Programs

Option	Description/Components
Ordinances and Regulatory Programs **(P)**	• Defined objectives/purposes • Definitions • Permitting requirements • Variances • Performance/design standards • Enforcement policies
Low Impact Development **(P)**	• Use of small, cost-effective, multi-functional landscape features • Source control concept • Include hydrologic functions such as filtration, frequency and volume of discharges, groundwater recharge
Conservation Plan **(C)**	• Appropriate lawn irrigation • Xeriscape landscape component • Low volume plumbing fixtures • Conservation oriented rate structures by utilities • Leak detection programs • Public education for conservation
Using Reclaimed Water **(C)**	• Treating and disinfecting wastewater and using it for a new beneficial use such as irrigation, groundwater recharge, manufacturing processes, wetlands, fire protection, dust control
Source Control Measures **(C)**	• Address management, storage and/or disposal practices of contaminants such as erosion and sediment, animal, yard and solid waste, toxic materials, fertilizers, pesticides, herbicides and household products
Turfgrass Management **(M)**	• Irrigation practices • Mowing practices • Fertilization practices • Targeted pest management • Aerification and/or dethatching • Composting
Street Cleaning **(M)**	• Removal of accumulated deposition of solids
Catch Basin Cleaning **(M)**	• Removal of accumulated sediment and trash from catch basins
Road Maintenance **(M)**	• Repair of road surfaces to minimize roadway debris and potholes
Canal/Ditch Maintenance **(M)**	• Removal of excessive vegetation or built up sediments at bottom of canals • Routine maintenance of degraded or blocked flow ways
Modification of Structural **(M)** Operations	• Diversion from critical habitat areas • Increased detention times • Water storage for future use • Groundwater recharge options
Storm Drain Stenciling **(E)**	• Labeling storm drains to prevent dumping
Hazardous Waste Education Campaign **(E)**	• Informing the public how to meet hazardous waste regulations
School Programs **(E)**	• Producing displays and exhibits or making presentations to all levels of school children
Erosion Control Campaign **(E)**	• Distribution of seedlings for erosion control • Training sessions for construction personnel in private and public sectors
Volunteer Opportunities **(E)**	• Creating opportunities for community involvement such as water quality monitoring
Neighborhood Projects **(E)**	• Select and promote neighborhood projects and conduct award ceremonies



STRUCTURAL BMP OPTIONS

R = Retention
D = Detention
O = Other

Option	Description/Components
Dry Retention Basin **(R)**	• Storage impoundment • Should drain within 72 hours • Runoff pretreated to remove course sediment • May flow through sediment trap or vegetated filter strip
Exfiltration Trench **(R)**	• Shallow, excavated ditch backfilled with stone • Runoff infiltrates subsoil, then groundwater • Pretreatment of runoff generally necessary • Suited for areas of less than 5 to 10 acres • Most effective when used in combination with other BMPs
Concrete Grid Pavements **(R)**	• Porous layer diverts runoff into reservoir. • Filtrates into underlying soil • Reduces runoff and traps vehicle-generated pollutants • High failure rates without upkeep
Vegetated Filter Strip **(R)**	• Land with vegetative cover • Effective for overland sheet flow • Sloping areas distribute runoff uniformly. • Pesticides, fertilizers should be avoided.
Grassed Swale **(R)**	• Shallow, vegetated, man-made ditch • Located above water table to allow runoff to infiltrate groundwater • Provides pretreatment before discharge of runoff to treatment systems • Mow at least twice annually to height of 3 to 4 inches.
Sand Filter **(R)**	• Self-contained bed of sand • Particulate filtered out from first flush of runoff • Filtered water collected in pipes and returned to water body
Dry Detention Pond **(D)**	• Pond to detain runoff for up to 24 hours to allow for pollutant settling • Normally dry between storm events • Minimum 1 foot required from control elevation to bottom of pond
Wet Detention Pond **(D)**	• Permanent pool to store and release water at a controlled rate • May include forebay to trap and remove sediment • May establish wetland fringe around pond perimeter
Constructed Wetland **(D)**	• Simulates water quality functions of natural system • Does not replicate all ecological functions of wetland • Located where impact to surrounding areas is minimal • May include forebay, microtopography, and pondscaping
Water Quality Inlet **(O)**	• Settling by gravity to remove pollutants • Designed to trap floatable trash and debris • Requires extensive maintenance • Recommended for small drainage areas • Most effective when used in combination with other BMPs
Sediment Separation **(O)**	• Devices such as sumps, baffle boxes capture sediments, debris. • Efficient only within specific ranges of volume and discharge rates • Collected sediment transported or pumped to waste facility
Chemical Treatment **(O)**	• Chemical use to coagulate and separate pollutants • Coagulated compounds need disposal and possible dewatering.

Non-Structural BMP Options

Non-structural options consist of establishing practices that serve as pollutant control measures and setting policies that promote changes in human behavior to reduce activities that create pollution. These options can be used to complement structural BMPs in developing areas but may be the only alternative in existing urbanized locations.

To ensure the proper operation of a BMP system, periodic maintenance and upkeep of system components is necessary. Maintenance activities may include proper management of turfgrass, street cleaning and road maintenance, canal and ditch maintenance, and catch basin cleaning.

Regulatory measures should be developed to address such issues as hazardous materials codes, land development and use regulations, water shortage and conservation policies, and controls on types of flow allowed to drain into sanitary municipal storm sewer systems. Local governments are responsible for establishing these programs, and they must comply with state and federal mandates.

Plans for implementing non-structural BMPs in existing developed areas should incorporate the following actions:

- Identification of priority pollutant reduction opportunities
- Protection of natural areas that help control runoff
- Ecological restoration to clean up degraded water bodies

Citizens should be educated about the relationship they have with the watershed in their area and how their actions can affect the health of local waterways. The public can help prioritize clean-up strategies and volunteer to help with water restoration and protection activities.

Structural BMP Options

Structural mechanisms for controlling stormwater runoff in developing areas fall into three categories: 1) retention systems, 2) detention systems, and 3) other systems.

Retention systems include dry retention basins, exfiltration trenches, concrete grid pavements, vegetated filter strips, grassed swales, and sand filters. These rely on settling with soil infiltration/filtration to remove potential contaminants. As water passes through filtration media, it can then be routed into other water bodies, evaporated, or percolated into the groundwater. At construction sites, control mechanisms should be installed only after soils have been permanently stabilized to prevent clogging from sediments generated during construction. Restrictions may apply to systems located where groundwater requires protection.

Detention systems such as dry detention ponds, wet detention ponds, and constructed wetlands rely primarily on settling for pollutant control. These BMPs require silt removal along with periodic removal of accumulated trash and debris to prevent clogging of control devices. Constructed wetlands are designed to simulate the water quality improvement functions of natural wetlands. Many of these systems are currently being designed to include vegetated buffers and deep-water areas to provide wildlife habitat and aesthetic enhancements.

Other systems that can be incorporated into BMP practices are water quality inlets, sediment separation procedures, and chemical treatment processes. Water quality inlets in their simplest form are catch basins that allow for pollutant settling. Proper disposal of coarse-grained sediments and hydrocarbons is required, and

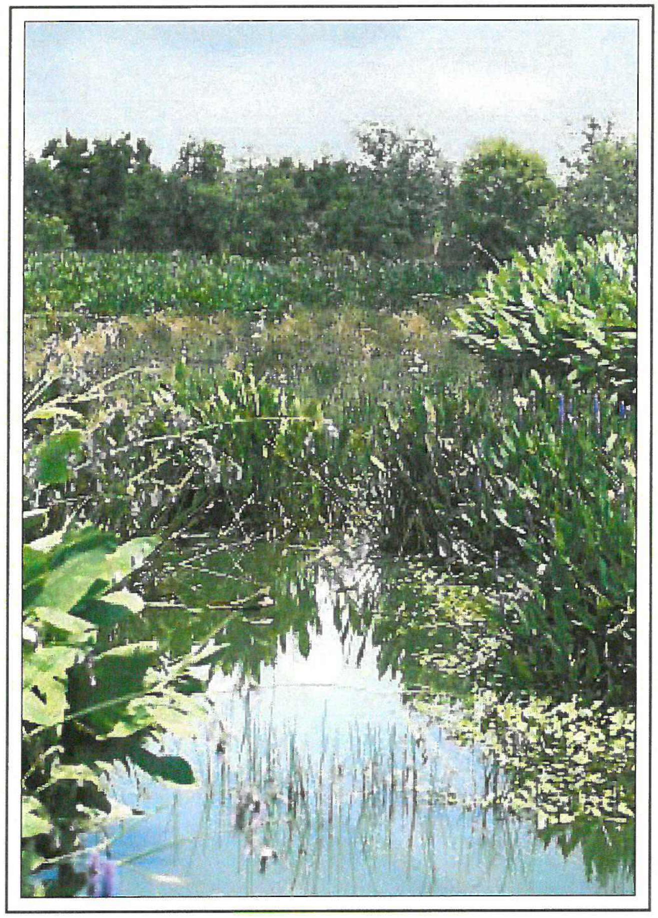
clean-out costs may be significant. Sediment separation practices use sumps, baffle boxes, oil/grit separators, and sediment basins to capture trash, sediments, and floating debris. They are efficient only within specific ranges of volume and discharge rates. Chemical processes include coagulation and separation of solids to remove pollutants. Although land requirements are small for chemical treatment practices, operations and maintenance costs can be high.

Opportunities for BMP Implementation

New Development. Before development occurs, land in a watershed is available for a number of pollution prevention and treatment options such as setbacks, buffers, open spaces, and wet ponds or constructed wetlands. Siting requirements and land use ordinances are more easily implemented during this period. Options available during the beginning stages of development generally are not practicable or cost effective after an area is developed.

Retrofitting. Retrofitting water management systems in developed areas can be difficult and costly; therefore, targeting existing runoff control projects for better efficiency and economy may be a feasible option. Pollution reduction opportunities should be identified and protective measures that help control runoff into natural areas should be put into place. Then ecological restoration and retrofit activities to clean up water bodies can begin.

Site Construction. During construction phases, BMPs can be implemented to control pollutants resulting from the erosion of disturbed soils. These focus on controlling the amount of soil lost during high winds, rainfall and runoff thereby minimizing subsequent adverse impacts of downstream sedimentation. These practices may consist of seeding and mulching exposed soils, constructing sediment basins, or using bales of hay as runoff barriers.



Conclusion

The population of the 16-county area served by the South Florida Water Management District has increased by approximately 25 percent over the last ten years. This kind of rapid urbanization impacts natural waterflow systems that affect water quality and quantity. Effective water management practices need to be implemented at every level, from homeowners associations and local drainage districts, to cities and counties, and all the way to the regional water management level.

One hundred years ago, south Florida was still a wilderness. Today our highly populated area needs solutions to problems perpetuated by rapid urbanization. The harmful effects of excess stormwater runoff can be reduced through the development of Best Management Practices. The implementation of linked water management systems will provide needed controls to manage runoff and reduce pollution in our waterways.

sfwmd.gov

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, Florida 33406
561-686-8800 • FL WATS 1-800-432-2045

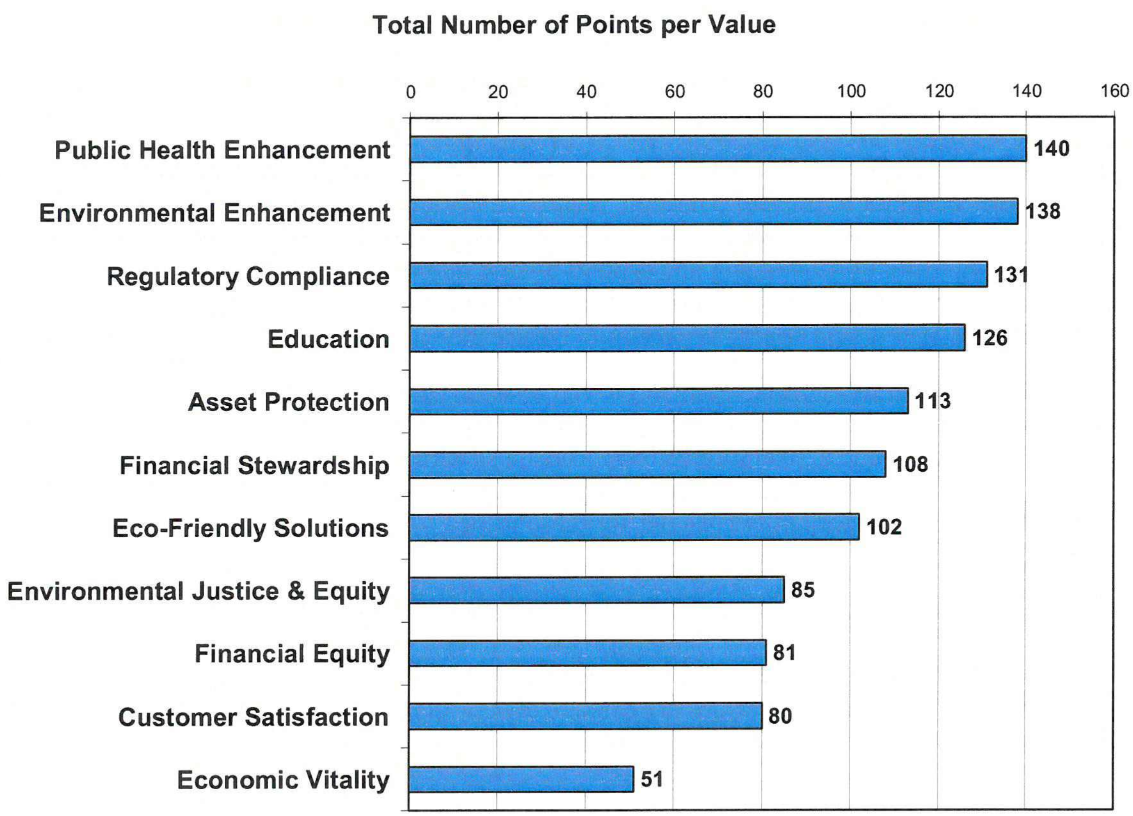
www.sfwmd.gov
MAILING ADDRESS: P.O. Box 24680
West Palm Beach, FL 33416-4680

Update on Approach to Weighting the Wet Weather Team's Community Values
Discussion Draft Prepared for Wet Weather Team Meeting #7, March 15, 2007

This document summarizes the results from the straw poll voting exercise conducted during and after the Wet Weather Team (WWT) stakeholder meeting on February 13, 2007, outlines a potential distinction between values that could be evaluated at the programmatic level rather than at the project level, and describes potential implications of the results of the straw poll voting exercise for weighting the values.

I. Results from the Straw Poll Values Weighting Exercise (Updated 3/20/07)

At the WWT meeting on February 13, 2007, stakeholders on the Wet Weather Team were asked to complete a "straw poll" ballot soliciting their thoughts on the relative importance of the WWT values for deciding between alternatives for MSD's Wet Weather Program. (Input from WWT stakeholders who missed the meeting was also collected.) The ballots asked individuals to assign 55 points across the 11 values, with higher point values representing greater importance for evaluating program alternatives. The voting exercise was intended to provide a snapshot of the group's preferences, as a starting point for further discussions. The results from the voting exercise are shown in the chart below.



In the straw poll voting exercise there was a high degree of divergence in the voting for two of the top tier values (education and regulatory compliance). Discussions following the exercise suggested that the wide divergence in voting on regulatory compliance was due to many stakeholders not voting for the value because they assumed that it was "given." The discussions indicated strong support among the stakeholder group for placing high value on regulatory compliance as a value.

II. Values Used in Programmatic and Project Level Evaluations

In the values-based decision-making model the Wet Weather Team is using, alternatives for the Wet Weather Program will be evaluated at two levels:

(1) Project level—measuring the benefits and costs of alternatives to address site-specific problems (e.g., a specific CSO location); and
(2) Programmatic level—evaluating the characteristics of the Wet Weather Program as a whole, including all site-specific projects as well as watershed or community-wide solutions.

Certain values are relevant in the context of evaluating alternatives to address site-specific problems, while other values appear better evaluated and served when used at the programmatic level for the Wet Weather Program as a whole. The values proposed for programmatic evaluation include:

- Economic Vitality
- Education
- Environmental Justice and Equity
- Financial Equity

The rationales for considering these values at the programmatic level are as follows.

- Economic vitality addresses the total cost burden for the community as well as wastewater service rates and development fees; these aspects relate to the Wet Weather Program as a whole.
- Education is an important component of all projects. Some strategies, such as efforts to change homeowner behavior to prevent pollution, require education in order to be effective. Other strategies, such as structural changes to MSD's sewer systems, depend at least indirectly on education, to foster understanding and support among ratepayers for MSD's investments to address sewer overflow and water quality issues. Because of the cross-cutting nature of the education value, it would appear important to ensure the value is examined programmatically.
- The environmental justice and equity value and the financial equity value relate to the overall distribution of positive and negative impacts among different racial and socioeconomic groups in the community. While a given project may affect a specific socioeconomic population more than others, it is the balance in the distribution of benefits and costs of the Wet Weather Program as a whole that is most important to consider for these values.

III. Implications of the Straw Poll Voting Exercise for Weighting the Values

Examples of the potential implications of the results of the straw poll voting exercise for the weighting of the Wet Weather Team's community values are listed below. The facilitation team will work with the technical team to develop proposed weights for the community values.

Project-Specific Analysis of Alternatives

- Wet Weather Team (WWT) stakeholders appear strongly supportive of projects that will deliver public health and environmental enhancement benefits.
    - All other factors being equal (e.g., project cost), WWT stakeholders will want to favor projects that enhance the environment and public health more than projects that provide, for example, benefits for asset protection and eco-friendly solutions.

- Environmental enhancement and public health enhancement also have scored higher than financial stewardship, implying that stakeholders may accept some degree of diminishing cost effectiveness when the result is improvements to the environment and/or public health.
- WWT stakeholders will want to favor projects that provide asset protection and eco-friendly solution benefits more than projects that provide customer satisfaction benefits.
- Thus, a project alternative that scores high on customer satisfaction improvement, but low on environmental enhancement and public health enhancement, will likely be ranked lower compared to other alternatives.

- WWT stakeholders also know that MSD's Wet Weather Program needs to be highly attentive to regulatory compliance.

Programmatic Analysis of Alternatives

- Financial Values: The relatively low weighting of the economic vitality value implies that WWT stakeholders are willing to take on a substantial cost burden in order to gain real benefits for the community, especially in the areas of public health and environmental enhancement.
  - However, considering the high weighting of the financial stewardship value, WWT stakeholders feel strongly that resources should be used wisely, on solutions that are cost effective.
- Education: About a third of the WWT stakeholder group sees education as critically important to the success of the Wet Weather Program. Most of the rest of the group believes that education is, at a minimum, a key building block for the program.
  - This implies that the Wet Weather Program should explore and invest in all cost-effective educational opportunities that contribute to benefits such as environmental enhancement, regulatory compliance, and public health enhancement.
- Environmental Justice and Equity: This value indicates a strong interest on the part of WWT stakeholders to ensure the Wet Weather Program examines opportunities to increase balance in the distribution of costs and benefits among different racial and socio-economic populations in the community.
  - The relative straw poll score for the environmental justice and equity value suggests that opportunities to improve the balance would be undertaken as long as, in particular, they do not adversely affect environmental and/or public health benefits, or create strongly negative impacts to regulatory compliance, asset protection, financial stewardship, and/or eco-friendly solutions.

LOUISVILLE & JEFFERSON COUNTY METROPOLITAN SEWER DISTRICT WET WEATHER PLAN DEVELOPMENT

BENEFIT/COST DEVELOPMENT INSTRUCTIONS

Introduction

The Louisville & Jefferson County MSD is developing a comprehensive Wet Weather Plan to address water quality and regulatory impacts of combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs). This Wet Weather Plan will incorporate and integrate both a CSO Long-Term Control Plan (LTCP) and a Sanitary Sewer Discharge Abatement Plan (SSDP).

To assist in decision-making, MSD is using a rigorous benefit/cost analysis approach. Benefits are quantified in relation to a set of community values defined by a Wet Weather Team that includes a Stakeholder Group made up of community opinion leaders from a broad cross section of community interests.

The Wet Weather Team has identified the following values to be considered in developing the Wet Weather Plan:

- Asset Protection
- Customer Satisfaction
- Eco-Friendly Solutions
- Public Education
- Environmental Enhancement
- Environmental Justice and Equity
- Public Health Enhancement
- Regulatory Compliance
- Economic Vitality
- Financial Equity
- Financial Stewardship

The purpose of this document is to provide an example of how the performance measures associated with each value will be used to develop benefit/cost relationships. The example focuses on the Regulatory Compliance value and analyzes project alternatives for addressing the problem of wastewater treatment plant peak flow permit exceedances.

For this value, specific performance measures were developed based on guidance from the stakeholder group. The performance measures explain how the value is numerically quantified and enable the benefits of differing project alternatives to be compared. The performance measures for this value incorporate a two-dimensional matrix consideration of both the probability of an event (e.g., a CSO discharge) happening and the severity of the impact when the event occurs. This two-dimensional step is a sequence step of what is commonly referred to as a "risk management" approach. (Note that certain of the values we will consider will not lend themselves to a probability/impact approach, and the performance measures will be one-dimensional, but may have multiple considerations within that one-dimensional scale.)

An important distinction to keep in mind when reviewing this example is that certain events (e.g., CSOs) that cause problems are allowed by regulations but require mitigation measures to reduce the undesirable impacts. Other events that cause problems are not authorized under any regulation (e.g., SSOs or effluent discharge permit exceedance). For CSOs, the benefit/cost evaluation will be used to select and prioritize control measures that reduce the impacts of these discharges. For the unauthorized events, the benefit/cost evaluation will be used to establish the design condition (e.g., a system designed to handle the predicted flow from a two-year storm) appropriate for elimination of these events up to an agreeable frequency level risk, and to prioritize the order that corrective measures will be taken. Note that the term "design condition" is similar to the term "design storm" commonly used in flood protection considerations, but "design condition" recognizes that factors other than precipitation (such as soil moisture, groundwater levels, storage basin capacity available, etc.) impact the recurrence interval of flows and loads in sewerage systems. Both design condition and design storm are described in terms of the recurrence interval (5-year recurrence interval, 5-year storm).

Example - Project Alternatives with Design Condition Recurrence Interval Considerations

This example relates to a wastewater treatment plant (WWTP) capacity problem. For the purpose of illustration, benefits will be developed for only one of the values (Regulatory Compliance). Other examples will be developed in the future to illustrate the different approaches to developing benefits for CSO control measures, and for other values that do not use the two-dimensional risk management analytical framework.

Step 1 - Define the Problem

The problem to be considered in Example 1 is a WWTP that experiences high wet weather flow peak events that result in frequent effluent discharge permit violations (the problem). The plant has an annual average flow design capacity of 4 million gallons per day (mgd), and a peak flow design capacity of 10 mgd. During wet weather events the peak flow capacity of the plant is exceeded several times per year. Flow modeling of the collection system is used to predict peak flow rates for a series of design conditions with different recurrence intervals. The peak flows for each recurrence interval are shown below, along with a comparison of the predicted peak flow to the peak flow capacity of the treatment plant.

Recurrence Interval	Peak Flow, mgd	% Over Capacity
2 month recurrence	12	20%
1 year recurrence	14	40%
2 year recurrence	15.5	55%
5 year recurrence	19	90%
10 year recurrence	28	180%

Step 2 - Identify Appropriate Performance Scales

In this example, the Regulatory Compliance value will be used for evaluation. This value has three different sets of aspects that can be considered: SSO discharge, CSO discharge, and WWTP discharge permit limit exceedance (expressed through the surrogate peak capacity exceedance). These three aspects are expressed by performance measures and linked to performance scales, as illustrated in Figure 1.

Since this example deals only with WWTP discharge, the CSO and SSOs aspects can be ignored, resulting in the performance scale matrix in Figure 2.

Value:	Regulatory Compliance		Performance Measure			Impact					
			WWTP Peak Flows		Peak flow delivered to WWTP versus rated peak hour capacity of plant	Peak flow exceeds rated capacity by more than 50%	Peak flow exceeds rated capacity by 30 - 50%	Peak flow exceeds rated capacity by 20 - 30%	Peak flow exceeds rated capacity by 10 - 20%	Peak flow exceeds rated capacity by less than 10%	Peak flow is within rated capacity
			BGC CSOs		Discharge flow rate % of receiving stream flow	Discharge > 5%	Discharge 1 - 5%	Discharge 1 - 0.2%	Discharge 0.1 - 0.2%	Discharge <0.1%	No discharge
			CSOs in Ohio River		Annual Average Overflow Volume (AAOV)	100 MG+ AAOV	20 - 100 MG AAOV	2 - 20 MG AAOV	1 - 2 MG AAOV	<1.0 MG AAOV	No discharge
Performance Measure	WWTP Peak Flows	CSOs	SSOs		Release point	< 1 year recurrenace interval	1-2 yr recurrence interval	2-5 yr recurrence interval	5-10 yr recurrence interval	>10 yr storm return	No discharge
	Event Recurence Interval	Frequency per location	Event Recurence Interval	↓	→	Most Severe Impact				Least Impact	No Impact
						5	4	3	2	1	0
Frequency	6-10 per year	>10 per year	< 1 year recurrence interval	Most Likely	5	25	20	15	10	5	0
	1-6 per year	4-10 per year	1-2 yr recurrence interval		4	20	16	12	8	4	0
	1-2 year recurrence interval	1-4 per year	2-5 yr recurrence interval		3	15	12	9	6	3	0
	2-5 year recurrence interval	1-2 year recurrence interval	5-10 yr recurrence interval		2	10	8	6	4	2	0
	>5 year recurrence interval	>2 year recurrence interval	>10 yr storm return	Least Likely	1	5	4	3	2	1	0
	Not possible	Not possible	Not Possible	Not Possible	0	0	0	0	0	0	0

Figure 1: Full Performance Measurement Table for Regulatory Compliance

Value:	Regulatory Compliance	Performance Measure		Impact					
Performance Measure	WWTP Peak Flows	Peak flow delivered to WWTP versus rated peak hour capacity of plant		Peak flow exceeds rated capacity by more than 50%	Peak flow exceeds rated capacity by 30 - 50%	Peak flow exceeds rated capacity by 20 - 30%	Peak flow exceeds rated capacity by 10 - 20%	Peak flow exceeds rated capacity by less than 10%	Peak flow is within rated capacity
	Event Recurence Interval	→ ↓		Most Severe Impact				Least Impact	No Impact
				5	4	3	2	1	0
Frequency	6-10 per year	Most Likely	5	25	20	15	10	5	0
	1-6 per year		4	20	16	12	8	4	0
	1-2 year recurrence interval		3	15	12	9	6	3	0
	2-5 year recurrence interval		2	10	8	6	4	2	0
	>5 year recurrence interval	Least Likely	1	5	4	3	2	1	0
	Not possible	Not Possible	0	0	0	0	0	0	0

Figure 2: Scale Selection: Wastewater Treatment Plant Portion of the Regulatory Compliance Performance Measurement Table

Step 3 – Define the Alternatives and Outcomes (Predictive Models)

For this example, three Alternatives have been developed that address the aspect of WWTP discharge permit exceedance as predicted by peak flows exceeding the treatment plant peak capacity. Alternative 1 expands the WWTP by 50% resulting in a peak flow capacity of 15 mgd. No change in the sewer system is involved, so the peak flows at the plant remain the same for each recurrence interval. Since the peak flows are the same, but the peak flow capacity has been increased, peak flows are within plant capacity for larger design conditions with longer recurrence intervals as shown below:

Alternative 1	**No Change in Plant Flows, 50% Plant Expansion, Peak Capacity = 15 mgd**	
Recurrence Interval	***Peak Flow***	***% Over Capacity***
2 month recurrence	12	0%
1 year recurrence	14	0%
2 year recurrence	15.5	3%
5 year recurrence	19	27%
10 year recurrence	28	87%

Alternative 2 expands the WWTP by 100%, resulting in a peak flow capacity of 20 mgd. Again, no change in the sewer system is involved, so the peak flows remain the same for each recurrence interval. With an expansion of the peak flow capacity at the plant, this expansion results in a capacity that can accommodate peak flows out to the 10-year recurrence interval.

Alternative 2	**No Change in Plant Flows, 100% Plant Expansion, Peak Capacity = 20 mgd**	
Recurrence Interval	***Peak Flow***	***% Over Capacity***
2 month recurrence	12	0%
1 year recurrence	14	0%
2 year recurrence	15.5	0%
5 year recurrence	19	0%
10 year recurrence	28	40%

Alternative 3 takes a different approach. In this alternative, a portion of the sewershed is removed from the plant service area and redirected to another service area for treatment. This reduces overall loads and flow peaks for each recurrence interval by 33%. There is no change in the plant capacity. The impact on peak flows and the resulting over-capacity values at each recurrence interval is as shown below:

Alternative 3	**Reduced Plant Flows 1/3, No Plant Expansion, Peak Capacity = 10 mgd**	
Recurrence Interval	***Peak Flow***	***% Over Capacity***
2 month recurrence	7.9	0%
1 year recurrence	9.2	0%
2 year recurrence	10.2	2%
5 year recurrence	12.5	25%
10 year recurrence	18.5	85%

The summary of the three alternative approaches is noted in the table below:

Alternative	Alt 1 – 50% Plant Expansion		Alt 2 – 100% Plant Expansion		Alt 3 – 1/3 Flow Reduction	
	15 mgd		20 mgd		10 mgd	
Recurrence Interval	***Peak Flow***	***% Over Capacity***	***Peak Flow***	***% Over Capacity***	***Peak Flow***	***% Over Capacity***
2 month recurrence	12	0%	12	0%	7.9	0%
1 year recurrence	14	0%	14	0%	9.2	0%
2 year recurrence	15.5	3%	15.5	0%	10.2	2%
5 year recurrence	19	27%	19	0%	12.5	25%
10 year recurrence	28	87%	28	40%	18.5	85%

Step 4 – Develop Present-Worth Costs

The development of present-worth costs will follow conventional engineering practice. Construction costs, non-construction costs, and operating and maintenance costs will be developed and converted to a total present worth cost. The costs developed for this illustrative example are shown below:

Alternative	Alt 1 – 50% Plant Expansion	Alt 2 – 100% Plant Expansion	Alt 3 – 1/3 Flow Reduction
Total Present Worth	$8 million	$14 million	$7 million

Step 5 – Quantify Base Case (current condition)

In this step, the current treatment plant's peak flow performance status is determined for each listed wet weather recurrence interval and is called the "Base Case." In Figure 3, peak flows for the listed recurrence intervals are compared to plant capacity and plotted on the performance matrix according to the predicted performance impact. The symbol "B" indicates current conditions at each recurrence interval.

Step 6 – Quantify Each Alternative's Performance Improvement (problem reduction) using Performance Matrix Scales

In this step, the predicted outcome of implementing each alternative is plotted on the graph by comparing any resulting performance scale change against the Base Case. Any improvement will be indicated by horizontal arrows for each recurrence interval. The subtraction in the right hand column indicates the point value of this improvement. The larger the numerical value, the more the alterative improved the Base Case for that particular wet weather recurrence interval.

In the lower right corner of Figures 4–6, the average of the improvement over the entire range of recurrence intervals is shown. This average represents the alternative's benefit score.

Value:	Regulatory Compliance	Performance Measure		Impact					
Performance Measure	WWTP Peak Flows	Peak flow delivered to WWTP versus rated peak hour capacity of plant		Peak flow exceeds rated capacity by more than 50%	Peak flow exceeds rated capacity by 30 - 50%	Peak flow exceeds rated capacity by 20 - 30%	Peak flow exceeds rated capacity by 10 - 20%	Peak flow exceeds rated capacity by less than 10%	Peak flow is within rated capacity
	Event Recurence Interval	→ ↓		Most Severe Impact				Least Impact	No Impact
				5	4	3	2	1	0
Frequency	6-10 per year	Most Likely	5	25	20	15 B	10	5	0
	1-6 per year		4	20	16 B	12	8	4	0
	1-2 year recurrence interval		3	15 B	12	9	6	3	0
	2-5 year recurrence interval		2	10 B	8	6	4	2	0
	>5 year recurrence interval	Least Likely	1	5 B	4	3	2	1	0
	Not possible	Not Possible	0	0	0	0	0	0	0

Figure 3: Base Case Conditions for Each Wet Weather Event Recurrence Interval

Value:	Regulatory Compliance	Performance Measure		Impact						
Performance Measure	WWTP Peak Flows	Peak flow delivered to WWTP versus rated peak hour capacity of plant		Peak flow exceeds rated capacity by more than 50%	Peak flow exceeds rated capacity by 30 - 50%	Peak flow exceeds rated capacity by 20 - 30%	Peak flow exceeds rated capacity by 10 - 20%	Peak flow exceeds rated capacity by less than 10%	Peak flow is within rated capacity	Scoring
	Event Recurence Interval	→ ↓		Most Severe Impact				Least Impact	No Impact	
				5	4	3	2	1	0	
Frequency	6-10 per year	Most Likely	5	25	20	15 B	10	5	0 A1	15 - 0 = 15
	1-6 per year		4	20	16 B	12	8	4	0 A1	16 - 0 = 16
	1-2 year recurrence interval		3	15 B	12	9	6	3 A1	0	15 - 3 = 12
	2-5 year recurrence interval		2	10 B	8	6 A1	4	2	0	10 - 6 = 4
	>5 year recurrence interval	Least Likely	1	5 B A1	4	3	2	1	0	5 - 5 = 0
	Not possible	Not Possible	0	0	0	0	0	0	0	Avg Points = 9.4

Figure 4: Development of Benefit Score for Alternative 1

Value:	Regulatory Compliance	Performance Measure		Impact						
Performance Measure	WWTP Peak Flows	Peak flow delivered to WWTP versus rated peak hour capacity of plant		Peak flow exceeds rated capacity by more than 50%	Peak flow exceeds rated capacity by 30 - 50%	Peak flow exceeds rated capacity by 20 - 30%	Peak flow exceeds rated capacity by 10 - 20%	Peak flow exceeds rated capacity by less than 10%	Peak flow is within rated capacity	Scoring
	Event Recurence Interval	→ ↓		Most Severe Impact				Least Impact	No Impact	
				5	4	3	2	1	0	
Frequency	6-10 per year	Most Likely	5	25	20	15 B	10	5	0 A2	15 - 0 = 15
	1-6 per year		4	20	16 B	12	8	4	0 A2	16 - 0 = 16
	1-2 year recurrence interval		3	15 B	12	9	6	3	0 A2	15 - 0 = 15
	2-5 year recurrence interval		2	10 B	8	6	4	2	0 A2	10 - 0 = 10
	>5 year recurrence interval	Least Likely	1	5 B	4 A2	3	2	1	0	5 - 4 = 1
	Not possible	Not Possible	0	0	0	0	0	0	0	Avg Points = 11.4

Figure 5: Development of Benefit Score for Alternative 2

Value:	Regulatory Compliance	Performance Measure		Impact						
Performance Measure	WWTP Peak Flows	Peak flow delivered to WWTP versus rated peak hour capacity of plant		Peak flow exceeds rated capacity by more than 50%	Peak flow exceeds rated capacity by 30 - 50%	Peak flow exceeds rated capacity by 20 - 30%	Peak flow exceeds rated capacity by 10 - 20%	Peak flow exceeds rated capacity by less than 10%	Peak flow is within rated capacity	Scoring
	Event Recurence Interval			Most Severe Impact				Least Impact	No Impact	
				5	4	3	2	1	0	
Frequency	6-10 per year	Most Likely	5	25	20	15 B	10	5	0 A3	15 - 0 = 15
	1-6 per year		4	20	16 B	12	8	4	0 A3	16 - 0 = 16
	1-2 year recurrence interval		3	15 B	12	9	6	3 A3	0	15 - 3 = 12
	2-5 year recurrence interval		2	10 B	8 A3	6	4	2	0	10 - 8 = 2
	>5 year recurrence interval	Least Likely	1	5 B A3	4	3	2	1	0	5 - 5 = 0
	Not possible	Not Possible	0	0	0	0	0	0	0	Avg Points = 9.0

Figure 6: Development of Benefit Score for Alternative 3

Step 7 - Calculate Benefit/Cost Ratios

In this step, the benefit/cost ratio is calculated for all alternatives using the benefit scores and the total present worth. Note that for this example only one stakeholder value is illustrated, but in practice, the benefit scores from all the stakeholder values will be summed to determine the overall benefit/cost ratio.

Alternative	Alt 1 – 50% Plant Expansion		Alt 2 – 100% Plant Expansion		Alt 3 – 1/3 Flow Reduction	
Total Present Worth	$8 million		$14 million		$7 million	
Benefit/Cost Ratio	Benefit Score	**Benefit/ Cost**	Benefit Score	**Benefit/ Cost**	Benefit Score	**Benefit/ Cost**
	9.4	**1.18**	11.4	**0.81**	9	**1.29**

Step 8 – Interpret Results

In this example, Alternative 3 has the best benefit cost ratio, despite having the lowest benefit score. The benefit/cost ratio is only one factor to consider in determining which alternative to select for any given problem. After the benefit/cost information is available, the alternatives must still be reviewed relative to overall program values and objectives to determine which alternative best fits the overall needs of the communities. While the benefit/cost ratio is a powerful tool to guide decisions, the tool alone does not make the decision.

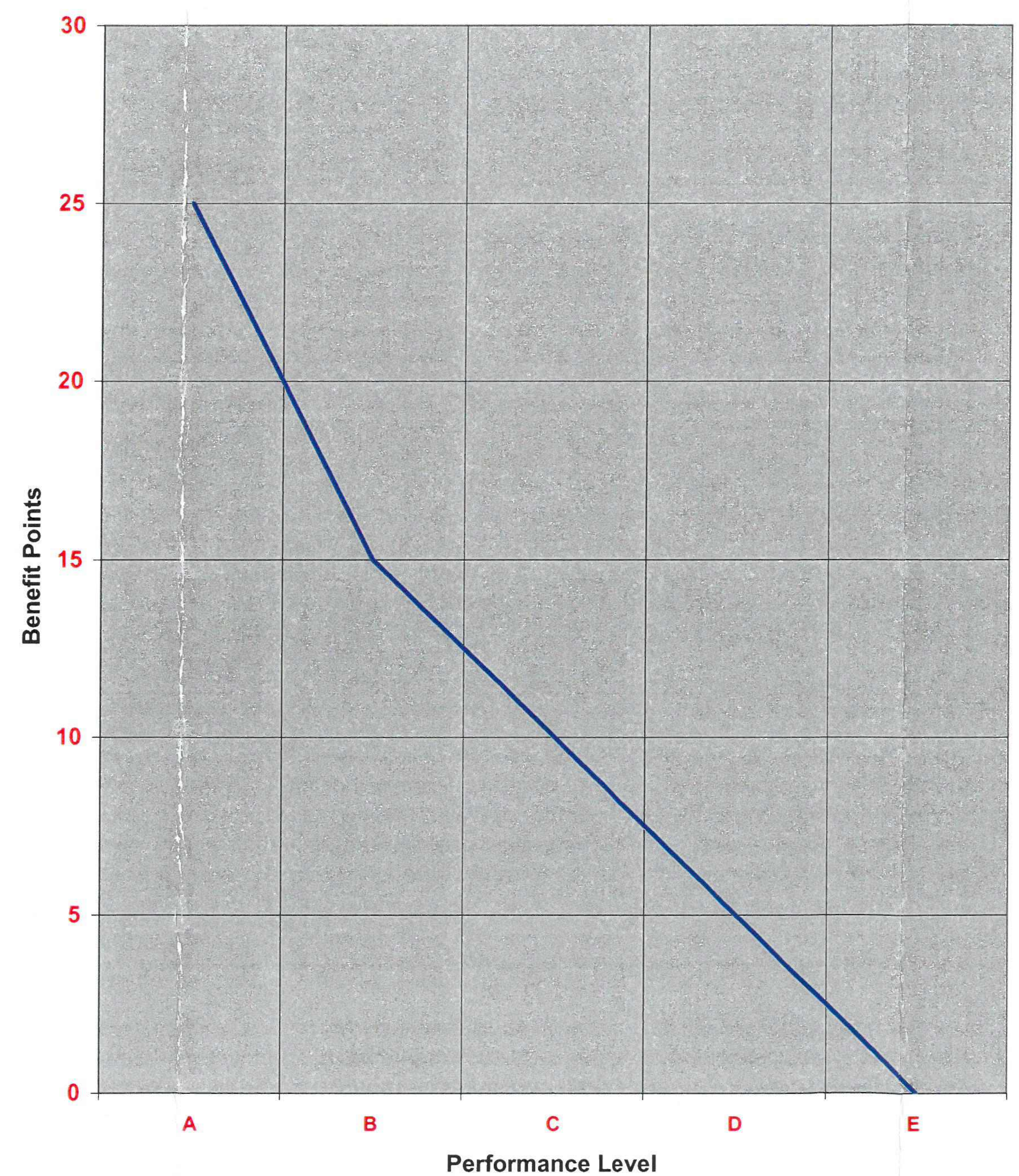
Value:	Asset Protection	Impact						Rationale	Measurement Method
Performance Measures	Flood Damage	Homes or businesses are subject to severe structural damage	Homes or businesses are subject to minor to moderate structural damage	Flooding limits access to homes or businesses	Flooding limits access to recreational areas	Standing water on property, but access not affected and no damage expected	No standing water	Storm water BMPs can reduce stormwater peaks and reduce extent of flooded areas, while sewer separation may increase localized stormwater peak flows and increase the flooding impacts of storms.	Drainage models where available, or historic observations of flood-prone areas combined with the expected relative impacts of sewer system modifications on storm water flows
	Basement Back-ups	Sewer surcharging within 6 feet of ground surface for more than 20% of manholes	Sewer surcharging within 6 feet of ground surface for 10 - 20% of manholes	Sewer surcharging within 6 feet of ground surface for 5 - 10% of manholes	Sewer surcharging within 6 feet of ground surface for 1 - 5% of manholes	Sewer surcharging within 6 feet of ground surface for 0 - 1% of manholes	No surcharging within 6 feet of ground surface	First floor levels are typically 1 - 2 feet above ground surface, and basement floors are typically 8 - 10 feet below the first floor. A sewer surcharge of 6 feet below ground surface is highly likely to cause back-ups in homes with basement service.	Measurement methods will be via hydraulic models to quantify the hydraulic grade lines compared to ground surface elevations at manholes.

Frequency	Event Recurrence Interval ↓ / Impact →			Most Severe Impact				Least Impact	No Impact
				5	4	3	2	1	0
	6-10 per year	Most Likely	5	25	20	15	10	5	0
	1-6 per year		4	20	16	12	8	4	0
	1-2 year recurrence interval		3	15	12	9	6	3	0
	2-5 year recurrence interval		2	10	8	6	4	2	0
	>5 year recurrence interval	Least Likely	1	5	4	3	2	1	0
	Not Possible	Not Possible	0	0	0	0	0	0	0

Acronyms
BMP = Best management practice

Value:	Eco-Friendly Solutions	
Performance Measure Description	**Performance Level**	**Benefit Points (25 is best, 0 is worst)**
Natural systems are the basis of project function. Non-point source control is critical to project success. Project provides multiple-use benefits for recreation and habitat expansion. Construction is non-obtrusive. Final configuration is significant improvement over existing conditions. Existing barren or non-productive areas are converted into grassed or vegetated plots. Impermeable surfaces are reduced.	A	25
Natural systems provide the majority of the project function. Active non-point source controls are part of project. Finished project requires no energy except for cleaning and maintenance. Construction is largely non-obtrusive.	B	15
Natural systems play a minor role in the solution. Active non-point source efforts are integral to solution. Green space and terrestrial habitat are significantly enhanced. Finished project consumes less than 10% of the energy required for secondary treatment. Construction causes minor, localized traffic disruption.	C	10
Natural systems are not a functioning part of the solution, but green space or terrestrial habitat is enhanced. Non-point source control not integral to project, but addressed in green space enhancement. Finished project consumes less than half the energy of secondary treatment. Construction causes local traffic disruption.	D	5
Natural systems are not part of solution. Non-point or homeowner source control is not part of solutions. Project consumes energy similar to secondary treatment. Finished project results in the potential for nuisance conditions in local neighborhood. Construction causes regional public traffic disruption. Impermeable surfaces are increased.	E	0

Benefit Scale: Eco-Friendly Solutions



Value: Public Health Enhancement	Performance Measures	Impact						Rationale	Measurement Method
WWTP Peak Flows	Peak flow delivered to WWTP versus rated peak hour capacity of disinfection system	Peak flow exceeds rated capacity by more than 100%	Peak flow exceeds rated capacity by 50 - 100%	Peak flow exceeds rated capacity by 25 - 50%	Peak flow exceeds rated capacity by 10 - 25%	Peak flow exceeds rated capacity by less than 10%	Peak flow is within rated capacity	WWTP disinfection systems have ability to adjust dose rates to handle small short term peaks without exceeding discharge standards. Significant peaks will result in inadequate disinfection that exceeds discharge permit limits. In extreme cases the peak exceedances may be significant.	Measurement will be from analyzing plant influent flows against pre-determined plant stress-test results and operating criteria.
CSOs and SSOs	Release point	Discharge where volume is > 0.04% of stream's flow	Discharge to water or ground in high public use or access area	Discharge to water in low public use or access area. Basement back-up	Discharge to ground in low public use or access area, discharge contained and cleaned up.	De minimus quantity	No discharge	Not all discharges violate the Clean Water Act. Discharges vary in the impact to public health and the environment. Therefore, EPA developed guidance on how to set priorities based on the risk to the public's health and the environment under their Enforcement Management System in Chapter X, titled "Setting Priorities for Addressing Discharges from Separate Sanitary Sewers." The assigned consequences follow the intent of the principles and priorities presented in the chapter. SSO Event Mean Concentration for Fecal Coliform estimated at 500,000/100ml. Dilution factor 0.04% required to not exceed 200 FC/100 ml Water Quality Standard.	Measurement methods will be via hydraulic models to quantify the SSO discharge and the GIS to establish relative distance from designated locations or objects.

Performance Measures / **Frequency**

WWTP Peak Flows: Design Event Recurrence Interval	CSOs: Frequency per location	CSOs and SSOs: Event Recurrence Interval			Most Severe Impact 5	4	3	2	Least Impact 1	No Impact 0
6-10 per year	>10 per year	< 1 year recurrence interval	Most Likely	5	25	20	15	10	5	0
1-6 per year	4-10 per year	1-2 yr recurrence interval		4	20	16	12	8	4	0
1-2 year recurrence interval	1-4 per year	2-5 yr recurrence interval		3	15	12	9	6	3	0
2-5 year recurrence interval	1-2 year recurrence interval	5-10 yr recurrence interval		2	10	8	6	4	2	0
>5 year recurrence interval	>2 year recurrence interval	>10 yr storm return	Least Likely	1	5	4	3	2	1	0
Not Possible	Not Possible	Not Possible	Not Possible	0	0	0	0	0	0	0

Acronyms

CSO = Combined sewer overflow
FC = Fecal coliform
GIS = Geographic information system
SSO = Sanitary sewer overflow
WWTP = Wastewater treatment plant

Value: Regulatory Compliance	Performance Measure	Impact: 5	Impact: 4	Impact: 3	Impact: 2	Impact: 1	Impact: 0	Rationale	Measurement Method
WWTP Peak Flows	Peak flow delivered to WWTP versus rated peak hour capacity of plant	Peak flow exceeds rated capacity by more than 50%	Peak flow exceeds rated capacity by 30 - 50%	Peak flow exceeds rated capacity by 20 - 30%	Peak flow exceeds rated capacity by 10 - 20%	Peak flow exceeds rated capacity by less than 10%	Peak flow is within rated capacity	WWTPs have ability to handle small short term peaks without exceeding discharge standards, but significant peaks may result in process washout and associated failure of discharge permit limits	Measurement will be from analyzing plant influent flows against pre-determined plant stress-test results and operating criteria.
CSOs: Beargrass Creek CSOs	Discharge flow rate % of receiving stream flow	Discharge > 5%	Discharge 1 - 5%	Discharge 1 - 0.2%	Discharge 0.1 - 0.2%	Discharge <0.1%	No discharge	CSO Event Mean Concentration for Fecal Coliform in overflows estimated at 250,000/ 100 ml. Dilution factor 0.08% required to not exceed 200 FC/100 ml Water Quality Standard	Measurement method will be via hydraulic model to quantify the CSO. Spreadsheet calculation to determine mix concentration.
CSOs: CSOs in Ohio River	Average Annual Overflow Volume (AAOV)	100 MG+ AAOV	20 - 100 MG AAOV	2 - 20 MG AAOV	1 - 2 MG AAOV	<1.0 MG AAOV	No discharge	100 MG AAOV (10 events) dilution factor in average Ohio River flow is 0.04%. 1.0 MG AAOV (1 event) dilution factor is 0.06%. Cumulative impact of multiple overflow locations may become significant for WQS exceedance.	Measurement methods will be via hydraulic models to quantify the CSO discharge. Spreadsheet calculation to mix concentration.
SSOs	Release point	< 1 year recurrence interval	1-2 yr recurrence interval	2-5 yr recurrence interval	5-10 yr recurrence interval	>10 yr storm return	No discharge	Regulations do not distinguish between potential impact of SSOs, therefore frequency and impact are the same for Regulatory Compliance value.	Measurement methods will be via hydraulic models to quantify the SSO discharge

Frequency: WWTP Peak Flows – Event Recurrence Interval	CSOs – Frequency per location	SSOs – Event Recurrence Interval			Most Severe Impact 5	4	3	2	Least Impact 1	No Impact 0
6-10 per year	>10 per year	< 1 year recurrence interval	Most Likely	5	25	20	15	10	5	0
1-6 per year	4-10 per year	1-2 yr recurrence interval		4	20	16	12	8	4	0
1-2 year recurrence interval	1-4 per year	2-5 yr recurrence interval		3	15	12	9	6	3	0
2-5 year recurrence interval	1-2 year recurrence interval	5-10 yr recurrence interval		2	10	8	6	4	2	0
>5 year recurrence interval	>2 year recurrence interval	>10 yr storm return	Least Likely	1	5	4	3	2	1	0
Not possible	Not possible	Not Possible	Not Possible	0	0	0	0	0	0	0

Acronyms
AAOV = Average annual overflow volume
CSO = Combined sewer overflow
MG = Million gallons
SSO = Sanitary sewer overflow
WQS = Water quality standards
WWTP = Wastewater treatment plant

Presentations

Beargrass Creek Combined Sewer Overflows

Wet Weather Team
Stakeholder Group
March 15, 2007

MSD

Louisville & Jefferson County Metropolitan Sewer District

Presentation Outline

Beargrass Creek Watershed Case Study

- Problem Definition
- CSO Control Alternatives
- Nonpoint Source Control Alternatives
- Site-Specific CSO Abatement Options Considered to date
- Discussion (strategies and values)

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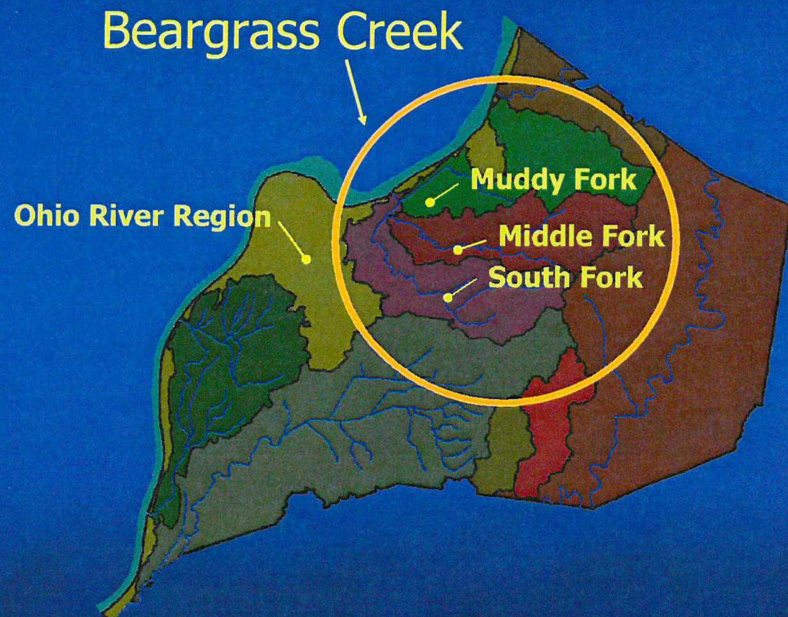
Combined Sewer Overflow Watershed Delineations



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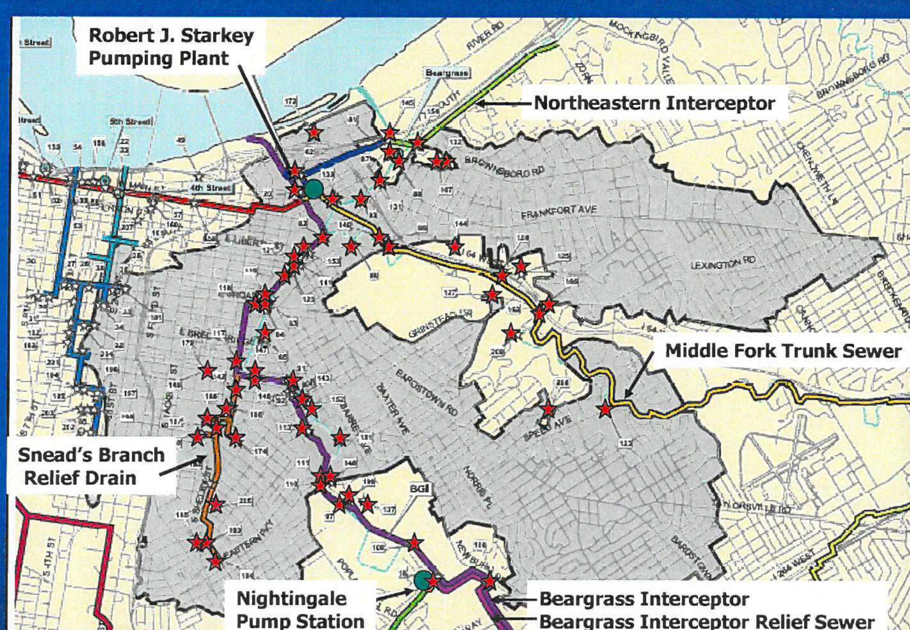
54 CSOs Discharge into Beargrass Creek



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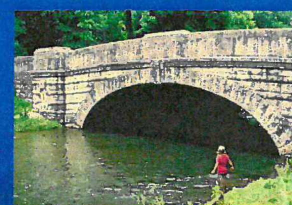
Problem Definition

CSO and SSO Point Sources Contribute Much of the Watershed Loads

	BOD Load		TSS Load		Fecal Coliform Load	
Stream Segment	Point Source	Non-point Source	Point Source	Non-point Source	Point Source	Non-point Source
Muddy Fork	<1%	99%	<1%	99%	<1%	99%
Middle Fork	30%	70%	13%	87%	56%	44%
South Fork	55%	45%	27%	73%	77%	23%
Total Loads	42%	58%	20%	80%	68%	32%



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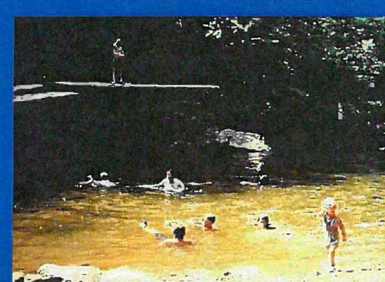
Problem Definition

The Beargrass Creek Watershed has significant water quality problems

Sub-watershed Name	Percent exceedances 200 cfu/100 ml geo mean	Percent exceedances 400 cfu/100 ml max sample
Muddy Fork	63%	36%
Middle Fork	79%	53%
South Fork	69%	49%



Low levels of Dissolved Oxygen (DO) are also a problem

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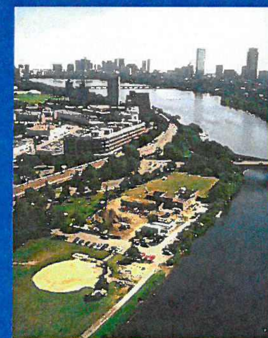
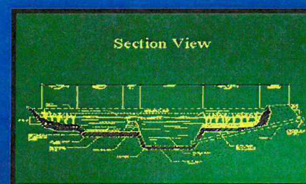
Water Quality Improvement Options

- Source Control
- Stormwater Best Management Practices (BMPs)
- Point Source Control (CSO and SSO)



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7

Water Quality Improvement Options

Source Control Keeps Pollutants Out of the Sewers

- Landscaping practices
- Lawn Chemical Management
- Pet Waste Management
- Septic Tank removal
- Street Sweeping
- Construction Site Erosion Controls
- Low Impact Development

These programs rely on Public Education to modify people's behavior.
Results are difficult to quantify except through long-term monitoring.

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8

Water Quality Improvement Options

Stormwater BMPs can Reduce Flow Peaks and Remove Pollutants

- Detention Basins – wet and dry
- Constructed Wetlands
- Perimeter Filter Drains
- Bioretention and Enhanced Swales
- Pervious Paving
- Filter Strips
- Riparian Forest Buffer




Effectiveness can be modeled and measured. Long term maintenance required to maintain efficiency.

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Stormwater BMP Control Reduction Efficiencies for Fecal Coliform[1]

General Structural Controls	Fecal Coliform Reduction (%)
Wet Pond	70 (with no waterfowl)
Wetland Pond System	50 (with no waterfowl)
Surface Sand Filter	40
Perimeter Sand Filter	40
Infiltration Trench with Filter Strip	60
Manufacturered Treatment Catchbasins	95

1 Cited from New Jersey Department of Environmental Protection "A Cleaner Whippany River Watershed – Nonpoint Source Pollution Control Guidance Manual."

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Stormwater BMP Control Reduction Efficiencies for Other Pollutants[1]

General Structural Controls	TSS Removal (%)	BOD Removal (%)	TP Removal (%)
Stormwater Pond	80	50	50
Stormwater Wetland	80	50	40
Bioretention Area	80	50	60
Sand Filter	80	60	50
Infiltration Trench	80	80	60
Enhanced Swales	80	50	50

1 Cited from Georgia Stormwater Management Manual

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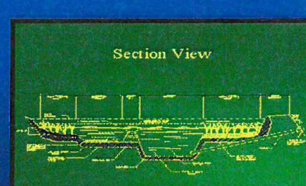
Water Quality Improvement Options
CSO Controls Will Be a Vital Part of BGC Solution

- **Sewer Separation**
  - Partial separation reduces volume and frequency
  - Complete separation eliminates CSO
- **Storage –**
  - In-sewer storage (RTC) least expensive ($.10/gal)
  - Retention Basins (open or covered) medium costs ($.50-2.00/gal)
  - Tunnels represent most costly storage option ($3+/gal)



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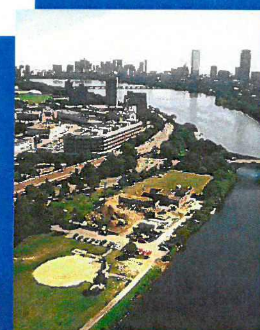
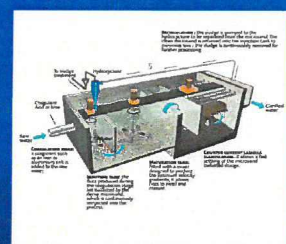
Water Quality Improvement Options
CSO Controls Will Be a Vital Part of BGC Solution

- **Relief Sewers move the problem downstream**
- **Remote Treatment –**
  - Screening and separation
  - Sedimentation,
  - High Rate Physical/Chemical
  - Disinfection
- **Receiving Water Improvement**
  - Aeration and flow augmentation





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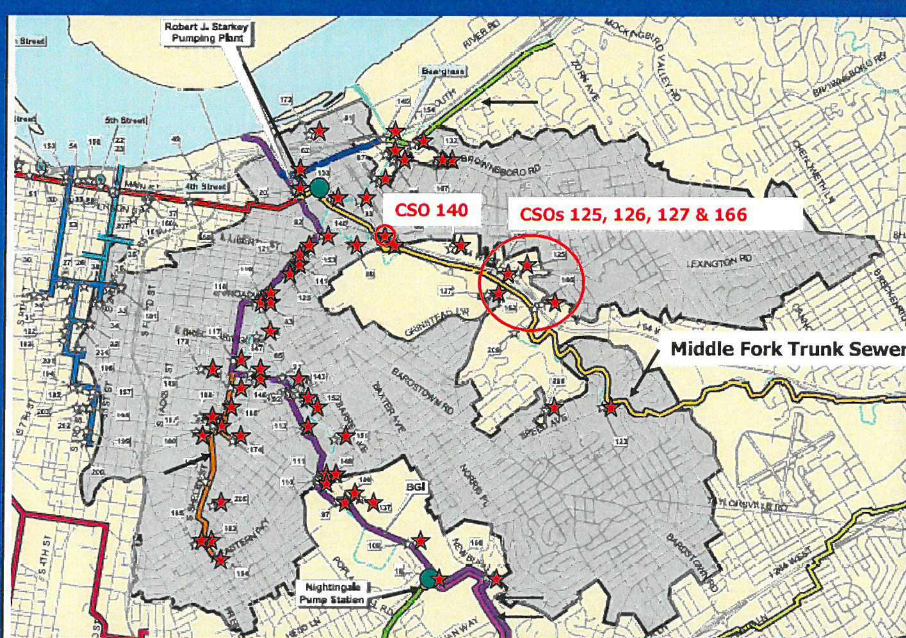
CSO Abatement Example



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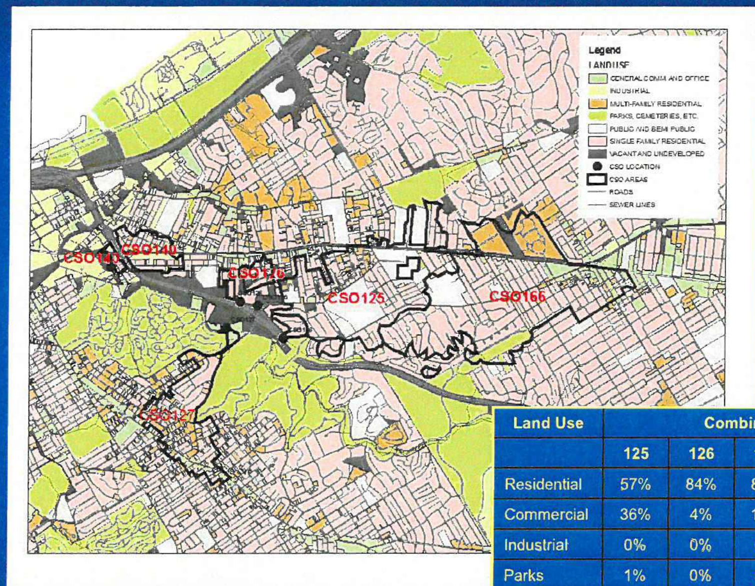
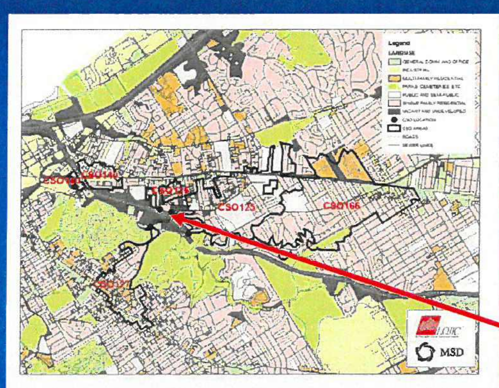
Land Use



Land Use	Combined Sewer Overflow					
	125	126	127	140	166	Total
Residential	57%	84%	82%	61%	77%	71%
Commercial	36%	4%	13%	6%	15%	20%
Industrial	0%	0%	0%	21%	0%	1%
Parks	1%	0%	5%	1%	5%	3%
Vacant	5%	12%	0%	11%	3%	4%
Acres	391	35	192	76	697	1391

CSO 125



Avg. Vol.: 18.4 MG/YR
Avg. Freq.: 30 events/YR
Avg. Dur.: 7.2 Hours

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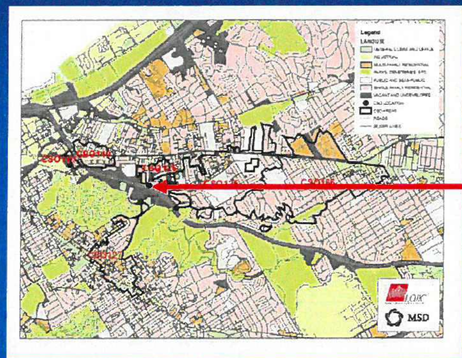
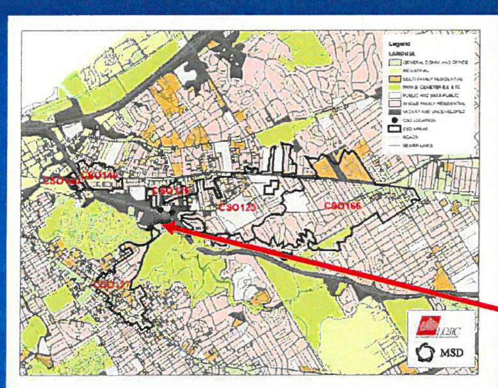
CSO 126

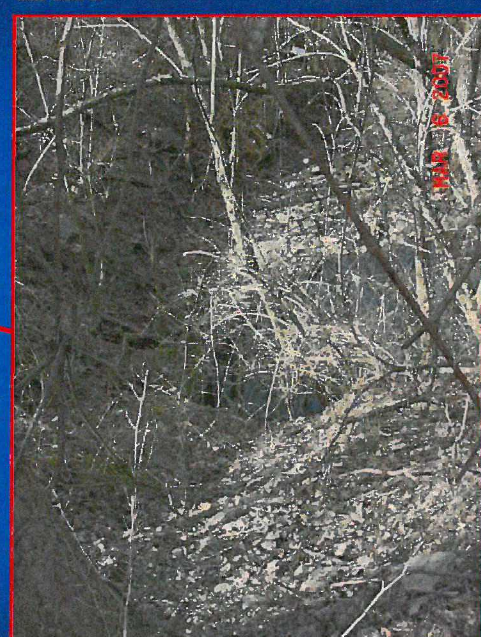


Avg. Vol.: 0.3 MG/YR
Avg. Freq.: 6 events/YR
Avg. Dur.: 1.2 Hours

MSD

CSO 127

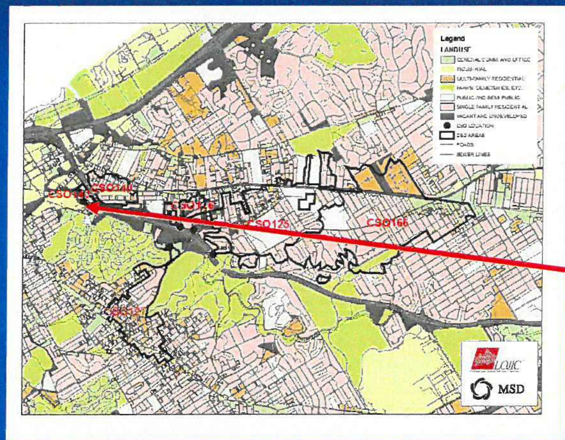




Avg. Vol.: 13.3 MG/YR
Avg. Freq.: 29 events/YR
Avg. Dur.: 1.9 Hours

MSD

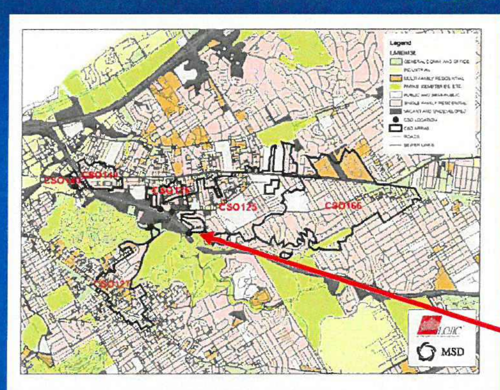
CSO 140



Avg. Vol.: 5.1 MG/YR
Avg. Freq.: 28 events/YR
Avg. Dur.: 1.9 Hours

MSD

CSO 166



Avg. Vol.: 16.3 MG/YR
Avg. Freq.: 31 events/YR
Avg. Dur.: 1.8 Hours

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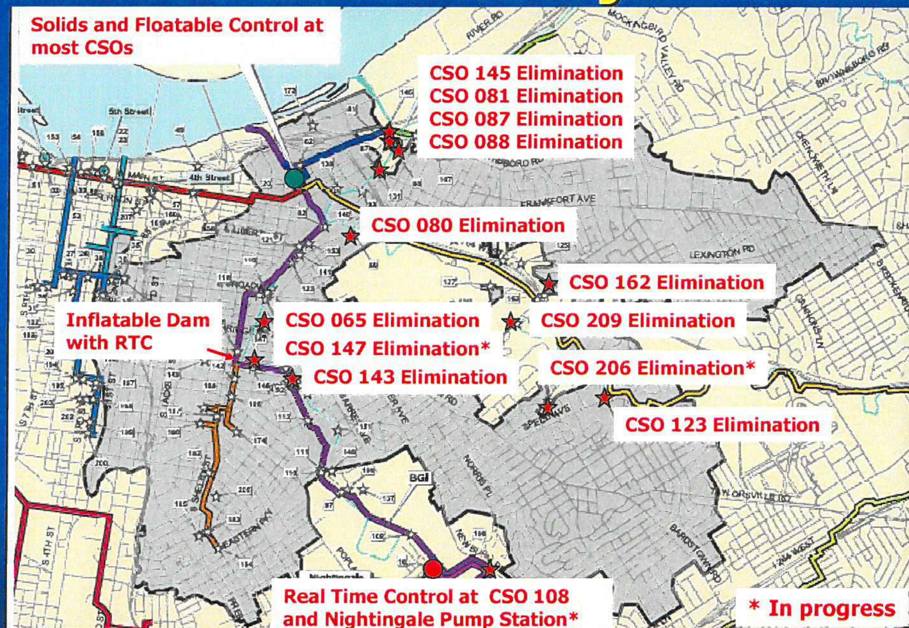
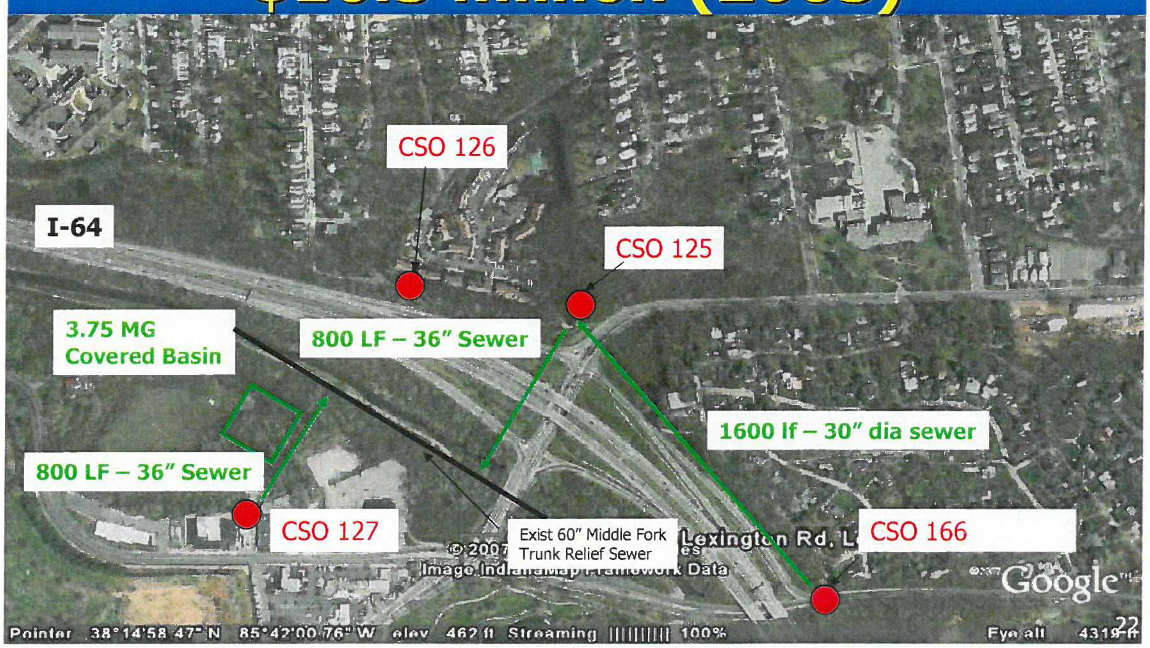
Current and Completed Abatement Projects

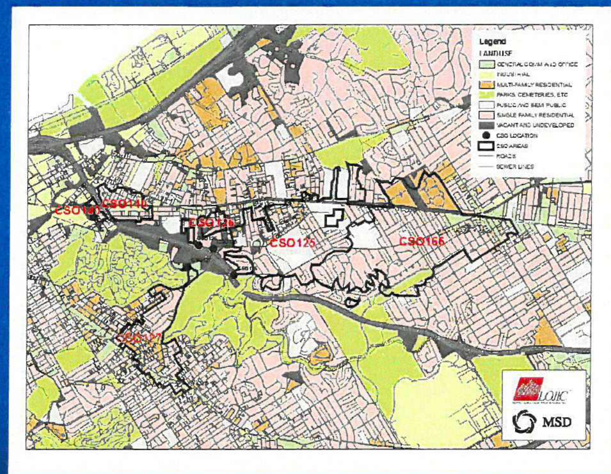


Preliminary Alternative Conveyance, Storage & RTC $10.3 million (2003)



What Other Actions Could Improve BGC Water Quality in This Area?

- Source Control?
- Stormwater BMPs?
- Other Point Source Control?



END

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Storage
Open Retention Basins

Example:

Brady Lake and Executive Inn Basins

Characteristics
15 million gallons
Stormwater and CSO
Real Time Control (RTC)

Purpose
Remote Flow equalization
CSOs 15 and 191
Reduce AAOV by 50 MG/YR

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Storage
Open Retention Basins

Example:

Indianapolis, IN
Service Population: 1 million

Characteristics
38 million gallons
$15.3 million

Purpose
Flow equalization at treatment plant

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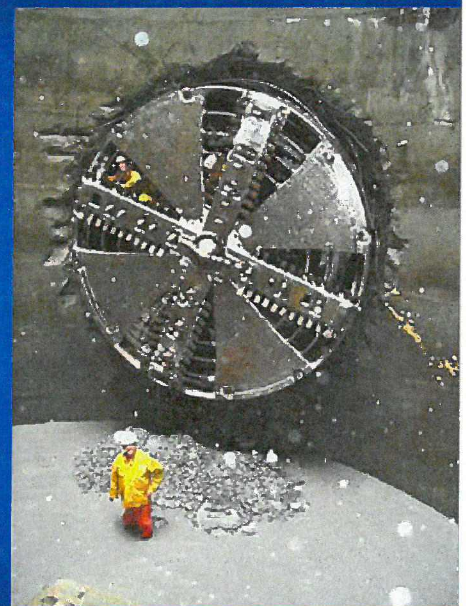
Storage and Conveyance Tunnels

Example:

King County (Seattle, WA)
Service Population: 1.4 million

Features
30 – 109 feet deep
14’-8” Diameter
$77 million

Purpose
Store: 4 million gallons
Convey: 3,100-foot-long
Treat: During extreme storms, the tunnel will provide disinfection, screening and dechlorination



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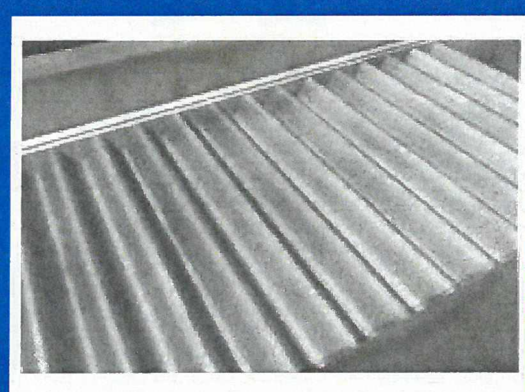
Remote Treatment - Screening

Example:
Crosswave Screen by CDS International

Characteristics:
- 6mm (1/4-inch) opening
- Installed horizontally at 90 degrees to the overflow weir with upward flow through the screen.
- Cleaned after every storm event



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Remote Treatment - Screening

Example:

Cyclone Screen by CDS International

Characteristics:

- 6mm (1/4-inch) opening
- Self Powered

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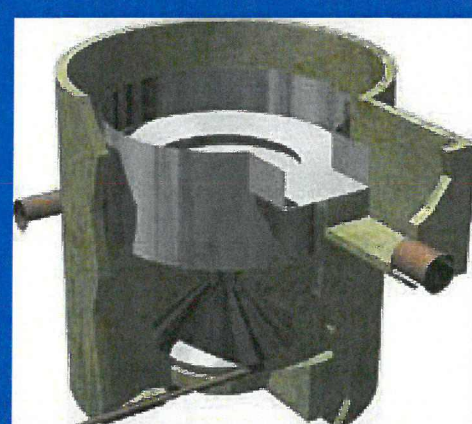
Remote Treatment - Vortex Separator

Example:

Storm King by Hydro International

Features

- Removes floatables and settleable solids.
- Small Footprint
- Low O&M Requirements
- Moderate removal efficiency
- Can be used as a contact chamber for chemical disinfection and chemically assisted sedimentation or floatation



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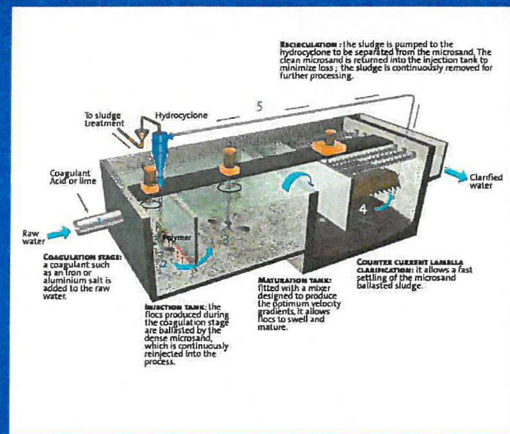
Remote Treatment - High Rate Sedimentation

Example:

Actiflo by Kruger



Features

- Removes settleable solids
- High removal efficiency
- High O&M requirements
- Small footprint

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CSO Disinfection Alternatives

Research Study:

US EPA (Office of Research and Development)

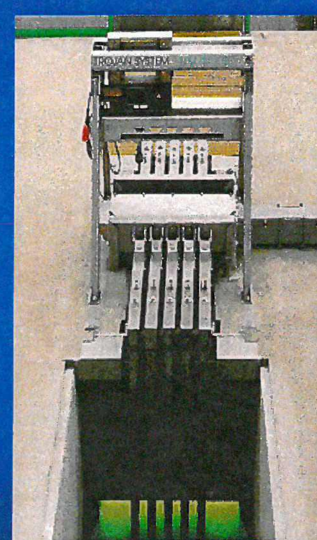
November 2003

Pilot test in New York City

- Chlorine/Dechlor
- Ozone
- Ultraviolet Light
- Chlorine Dioxide

Findings

- Chlorine/Dechlor recommended option
- Chlorine Dioxide is effective but not readily available
- UV/Ozone has high capital cost with low utilization



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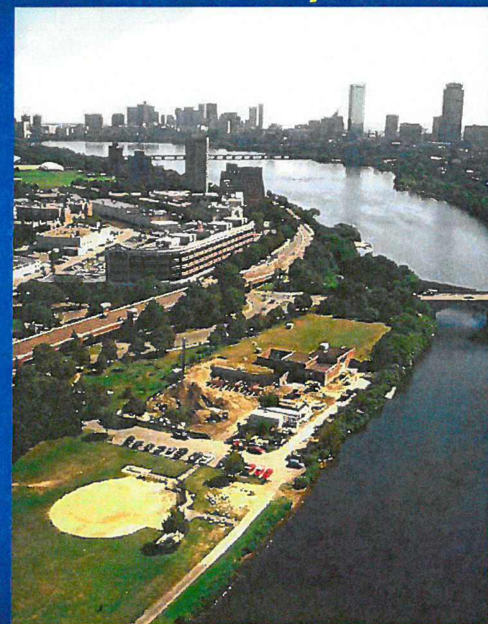
Remote Treatment Facility

Example:

Massachusetts Water Resources Authority (Boston, MA)
Service Population: 2.5 million

Cottage Farm CSO Facility
Pumping
Storage
Screening
Disinfection



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Land Use

Land Use	Combined Sewer Overflow					
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Parks	1%	0%	5%	1%	5%	3%
Vacant	5%	12%	0%	11%	3%	4%
Acres	391	35	192	76	697	1391

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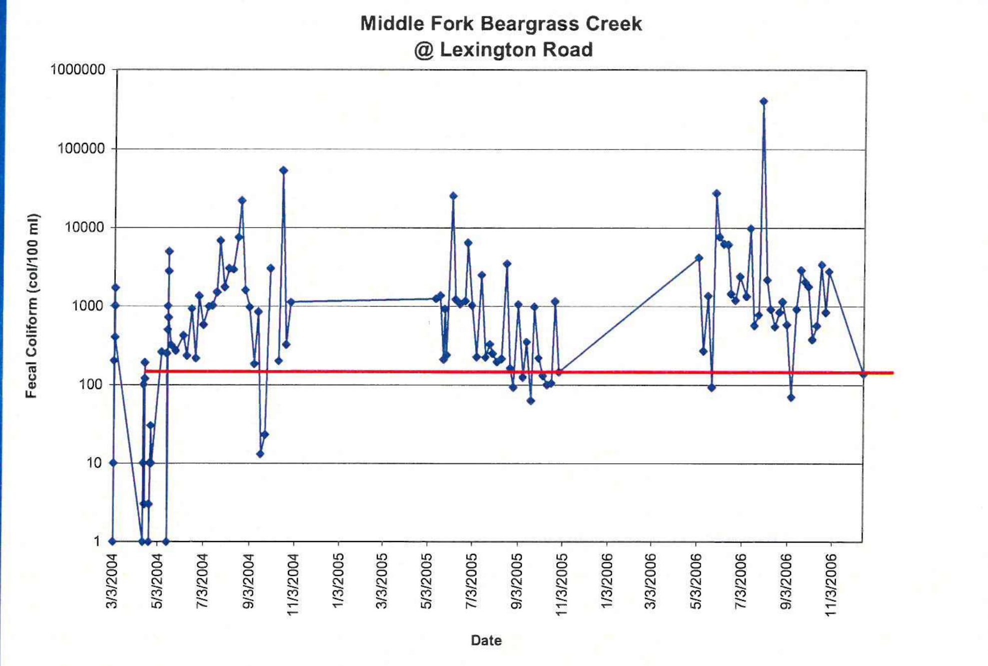
Downstream Water Quality
Fecal Coliform Concentrations



Public Participation Plan

Wet Weather Team
Stakeholder Group Meeting
March 15, 2007

MSD Louisville & Jefferson County Metropolitan Sewer District

Presentation Outline

- Public Participation Plan
  - Audiences
  - Objectives
  - Approaches
  - Messages
- Public Meeting No. 1
  - Format
  - Locations
  - Times

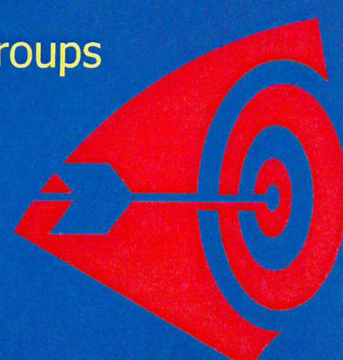
Public Participation Plan Development Background

The draft plan is based upon…

- Experience with similar education and outreach efforts in other communities
- Wet Weather Team stakeholder suggestions
- Wet Weather Consent Decree requirements
- MSD's previous efforts and experience

Target Audiences

- Audience 1 - General Public
- Audience 2 - Specific Groups
  - Property Owners
  - Advocacy Groups
  - Builders
  - Restaurants/Industries
- Audience 3 - Schools

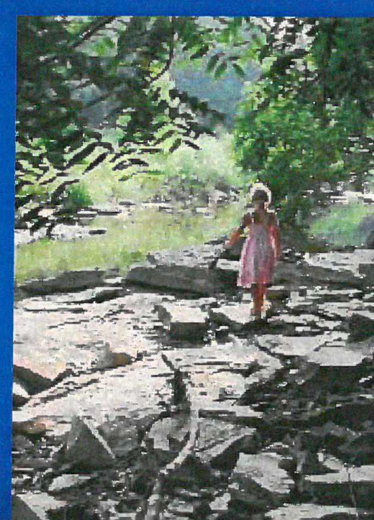


Five Key Objectives for General Public

- Value Clean Water
- Protect Public Health
- Support Investment Needs
- Maintain Positive MSD Image
- Provide Wet Weather Plan Input

Value Clean Water Message

Clean water benefits us all in many ways. We all have a stake in protecting and enhancing the quality of our water resources.

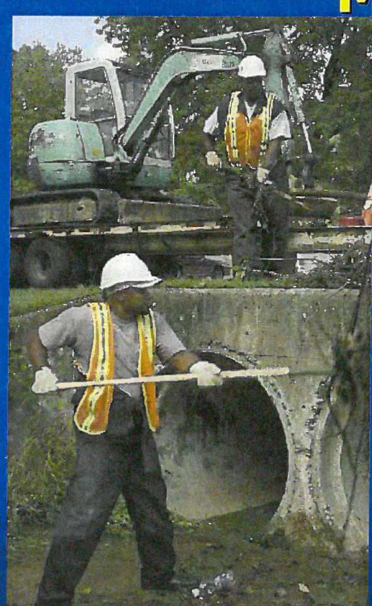


Investment Needs Message

Our community needs to take steps to improve water quality. It is both a benefit to the community and a regulatory requirement. This is a big job, requiring significant investment by our rate payers. We request your understanding and support for the rate increases necessary to complete this important undertaking.

7

Positive MSD Image Message

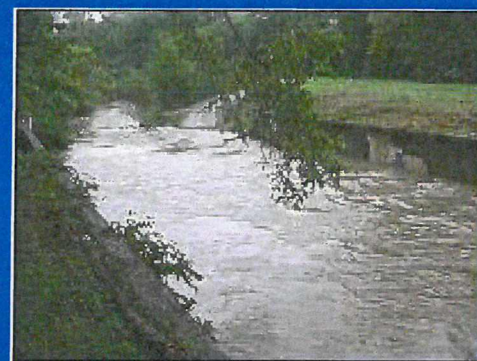


MSD is working hard, behind the scenes, to provide clean water.

8

Protect Public Health Message

Our streams are not safe to go in during, and immediately after, wet weather events due to high bacterial levels. We are working to correct this condition, but it's a big job and will take us all working together to achieve it.



Wet Weather Plan Input Message

MSD is interested in the community's input into its long term plan.

Communication Media

OBJECTIVE	TV Ads	Public Service (TV and Radio)	Print Ads	Editorials	Public TV Video	Speakers Bureau	Community Events	Newsletter	Website	Direct Mail and Phone Surveys	Signage at Overflows	Email
Value Clean Water	✔		✔	✔	✔	✔	✔	✔	✔			
Investment Needs			✔	✔		✔		✔	✔			
Positive MSD Image	✔		✔	✔	✔	✔	✔	✔	✔			
Protect Public Health		✔			✔				✔		✔	✔
Wet Weather Plan Input			✔	✔		✔			✔	✔		

Key Objectives for Specific Groups

- **Property Owners**

  Behavior modification (rain barrels, rain gardens, illegal connections, broken laterals, pet waste, landscaping, pesticides and fertilizers)

- **Advocacy Groups**

  Partnership on items of mutual interest

- **Builders**

  Erosion Prevention and Sediment Control Compliance

  Low Impact Development

- **Restaurants & Industries**

  Grease and industrial pretreatment compliance with existing ordinances

Property Owners Message

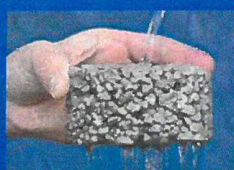
MSD cannot do it alone. Individual property owners, working together, can have a huge impact on water quality. To accomplish our goals and keep costs down, everyone needs to participate.

Advocacy Group Message

We all want a healthy environment and a vibrant community. Let's work together on items of mutual interest for the benefit of us all.

Builders Message

Low impact development features improve property values, and help in our joint effort to enhance our environment. We all need to find ways to minimize impacts due to development. In the long run, we all realize the benefits or pay the price.



Restaurants and Industry Message

Grease and industrial waste can cause problems in the system. Prevention is not merely a regulation, it is important to our environment and public health.

Key Objectives and Messages for Schools

- **Value Clean Water**

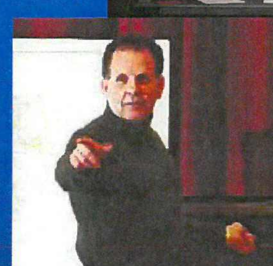
  We need to take care of the environment so that it can take care of us.

- **Behavior Modification**

  In order to accomplish our goals, everyone needs to participate.

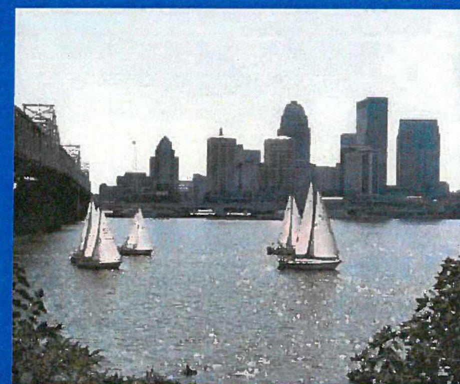
Public Meeting No. 1 Format

- Open House style scheduled from 3 – 9 pm
- Dedicate more than half of meeting time for listening to community concerns and obtaining feedback
- 30 minute presentations repeated at different times
- Information booths with visual displays manned by MSD representatives



Public Meeting No. 1 Messages

- Positive value of Clean Water
- History of the Consent Decree
- Wet Weather Planning Process (includes discussion of investment needed, tied to future rate increases)
- We Need Your Input

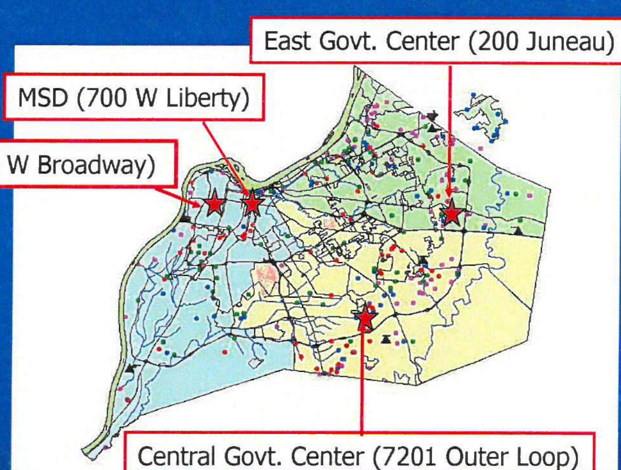


19

Public Meeting No. 1

Times and Locations

- April 2007
- 3 pm to 9 pm
(presentations at 3:30, 5:30 and 7:30)
- Multiple Locations
(downtown, west, south and east)
- Alternative Locations?
(churches, schools, firehouse)



20