Wet Weather Team Project Meeting Materials

Summer 2007–Spring 2008

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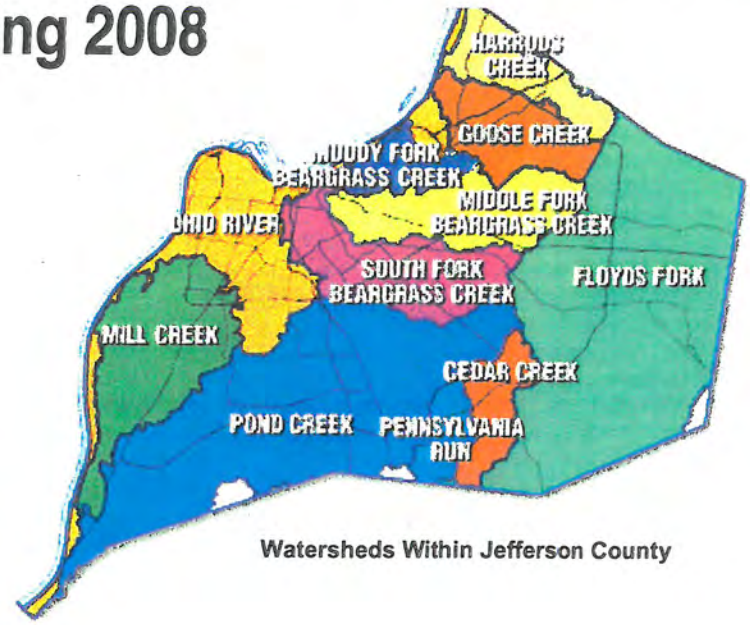
WWT Stakeholders Meeting # 12 9/20/2007

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 #12
Thursday, September 20, 2007, 4:20-8:30PM
MSD Main Office, Board Room
700 West Liberty St., Louisville

Meeting Objectives:

- Discuss potential components of long-term monitoring and evaluation efforts for MSD's Wet Weather Program.
- Review and discuss high-level sanitary sewer overflow (SSO) control strategies and preliminary project concepts being considered for the Sanitary Sewer Discharge Plan.
- Review and discuss the approach for soliciting community input on preliminary project concepts at the October and November 2007 public meetings.
- 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 **Introductions, Review Agenda and Ground Rules (10 minutes)**

- Review meeting objectives and ground rules.

4:40 PM **Wet Weather Project Updates and Observations (25 minutes)**

- Updates on issues related to the Wet Weather Team Project and follow-up items from the last Wet Weather Team meeting.
    - Update on developing the Wet Weather Program public education and outreach plan.
- WWT stakeholder updates and announcements.

5:05 PM **Presentation on Long-Term Monitoring and Evaluation Efforts (35 minutes)**

- Review and discuss potential components of a post-construction monitoring and evaluation plan for the Wet Weather Program, including plans to track changes in water quality and the effectiveness of the education/outreach efforts.

5:40 PM **Dinner Break (25 minutes)**

Dinner will be provided for Wet Weather Team members.

6:05 PM **SSO Control Strategy Discussion (90 minutes)**

- Review and discuss high-level SSO control strategies and preliminary project concepts being considered for the Sanitary Sewer Discharge Plan.

7:35 PM **Preview Project Concepts and Approach for the Fall Public Meetings (40 minutes)**

- Review approach for soliciting community input on preliminary project concepts during the October and November 2007 public meetings.
- Provide input on the locations, structure, and content of the public meetings (see the homework assignment on public meetings for specific information).

8:15 PM **Opportunity for Observer Comments (10 minutes)**

8:25 PM **Wrap Up and Next Steps (5 minutes)**

- Review plans and expectations for the October 18, 2007 Wet Weather Team meeting.

8:30 PM **Adjourn**

Final Meeting Summary
Wet Weather Team Meeting #12
Thursday, September 20, 2007
MSD Main Office, Louisville

The Wet Weather Team (WWT), chartered by the Louisville and Jefferson County Metropolitan Sewer District (MSD), met on September 20, 2007, at MSD's main office in Louisville. The objectives of the meeting were to:

- Discuss potential components of long-term monitoring and evaluation efforts for MSD's Wet Weather Program.
- Review and discuss high-level sanitary sewer overflow (SSO) control strategies and preliminary project concepts being considered for the Sanitary Sewer Discharge Plan.
- Review and discuss the approach for soliciting community input on preliminary project concepts at the Wet Weather Program public meetings planned for October and November 2007.

Wet Weather Project Updates and Announcements

Jennifer Tice of Ross & Associates noted that starting with this meeting, the "Wet Weather Project Updates" section of meeting agendas would include an opportunity for WWT stakeholders to make announcements or provide observations, in addition to MSD's announcements. WWT stakeholders suggested this change. Announcements and observations at this meeting included the following:

- Capacity Management: Derek Guthrie of MSD gave an update on MSD's Capacity, Management, Operations, and Maintenance (CMOM) plan, which MSD needs to finalize by February 2008. As part of that plan, MSD certifies the capacity of its treatment plants. In MSD's review of potential capacity impacts of development plans, MSD provides one of three responses: (1) "no"—the project is not approved; (2) "yes"—the project is approved; and "yes, but"—the project is approved, as long as certain conditions are met (e.g., any new wet weather flows from the project should be offset by an equivalent amount). The majority of projects fall into this third category.
- Development: A WWT stakeholder noted a concern that MSD consider economic development interests during the design and implementation of MSD's Wet Weather Program.
    - New development should be allowed to occur while the community is meeting its consent decree requirements. As an example, Atlanta is well into the implementation of its consent decree, but it is also first in the nation with regard to housing starts.
    - There should be consistency in MSD's approach to reviewing and approving construction and development projects, regardless of whether projects are in the combined sewer area or in suburbs served by the sanitary sewer system. Infiltration and inflow (I&I) are issues for existing developed areas as well as new developments.
- Education/Outreach Plan Efforts: Angela Akridge of MSD gave an update on MSD's progress developing an education and outreach program for the Wet Weather Program. MSD has reviewed the feedback and suggestions from WWT members and incorporated them into planning for the Project WIN (Waterway Improvements Now) program. Ms. Akridge noted three updates:
    1. Project WIN is incorporating a positive message about the area's water resources, as suggested by WWT members.
    2. MSD will start using the phrase "Be part of the winning team" to encourage people to help reduce wet weather sewer overflow and water quality problems.

3. MSD is developing a seasonal calendar for public outreach, with outreach messages tailored to the season (e.g., outreach during the winter holiday season might include a message asking people not to dispose of fats, oils, and grease down the drain). In general, it takes about three months to prepare for a three-month outreach campaign.

- Technical Team Updates: Gary Swanson of CH2M HILL mentioned that members of the technical team had met with Jefferson County Public Schools (JCPS) to discuss a concept plan for green infrastructure projects at several school sites. He also noted that MSD had a meeting with the Louisville Metro Parks Department and the Kentucky Transportation Cabinet to discuss a stormwater control project. Finally, he asked whether WWT stakeholders would be interested in attending an optional "open house" meeting where WWT stakeholders could learn more about the project alternatives being considered for MSD's Wet Weather Program.
- JCPS Tour of Beargrass Creek: A WWT stakeholder mentioned that MSD helped give about 90 JCPS principals a tour of Beargrass Creek watershed, including combined sewer overflow (CSO) locations and the outdoor classrooms MSD helped develop.

In a follow-up discussion related to the development issues, WWT stakeholders asked MSD questions about the relationship between I&I and capacity management. Brian Bingham and Derek Guthrie of MSD noted that treatment plants are sized to allow for build out; however, the sanitary sewer system has leaks that cause sanitary sewer overflows during wet weather. It is unlikely that there are any treatment plants where capacity is the only issue, not also I&I from the collection system.

Rob Greenwood of Ross & Associates observed that this discussion highlighted an example of a key need and interest among the stakeholder group (related to how the sewer systems accommodate new flows from development in the short-term and long-term). He noted that the facilitation team at Ross & Associates would work to ensure that there is an equal weighting of stakeholder interests in products from the Wet Weather Team. In addition, Mr. Greenwood reminded participants that the stakeholder subgroup of the WWT is a "consensus seeking" body, and that each stakeholder participates as an individual, rather than representing the organizational policy of any organization affiliated with that individual.

Post-Construction Monitoring Presentation and Discussion

Gary Swanson of CH2M HILL gave a presentation on initial plans for monitoring and evaluation efforts associated with MSD's Wet Weather Program. He described the following four main components of monitoring and evaluation efforts:

1. Construction project monitoring—short-term monitoring to verify/demonstrate the performance of individual projects;
2. Water quality monitoring—long-term monitoring of water quality conditions in the Ohio River and Jefferson County streams, including flow levels, bacteria, metals, chemical pollutants, and biological and habitat indicators;
3. Green infrastructure effectiveness—monitoring of the effectiveness and sustainability of green infrastructure projects, tailored to the type and scale of each project; and
4. Behavior change effectiveness—measuring the effectiveness and sustainability of behavior-change efforts relative to value protection (e.g., measurable improvements in water quality attributable to behavior changes).

Mr. Swanson noted that EPA's CSO policy encourages adaptive management, so if MSD is able to demonstrate that non-traditional approaches provide lasting effects, this could provide opportunities to change future implementation efforts (e.g., reducing future construction of marginal projects).

In response to this presentation, WWT members asked several clarifying questions and made a number of comments, including the following:

Water Quality Monitoring

- A WWT stakeholder suggested that MSD consider involving the research community (e.g., students at the University of Louisville's School of Public Health) in water quality monitoring and data analysis.
- A WWT stakeholder commented that water-quality science, not regulations, should drive the water quality monitoring plan. Progress should be measured against performance goals. The WWT member also noted that currently there is a research gap in water quality science.
- WWT members commented that quality control (QC) is an important consideration for the water quality monitoring, and suggested that MSD consider whether to use EPA's QC protocols.
- A WWT stakeholder observed that biological monitoring is more difficult for people to understand, so it presents a challenge from a public education standpoint.

Behavior Change and Green Infrastructure Effectiveness Monitoring

- Several WWT members asked for information on how other communities have monitored the effectiveness of behavior-change efforts related to water quality and the results they have seen.
    - Mr. Swanson said that there is a body of knowledge about changing household behavior related to water quality. (For example, there was research on Minnesota's efforts to encourage people to use detergents that did not contain phosphates.)
    - A WWT member also mentioned efforts in the Southwest to conserve water (e.g., by using low-flow toilets, showers, and dishwashers), which used a regulatory process.
    - Regarding how other consent decree communities have relied on behavior change efforts, Brian Bingham of MSD noted that most CSO and SSO consent decrees in the country do not contain the flexibility that MSD's wet weather consent decree contains.
    - Mr. Bingham added that education must be part of MSD's Wet Weather Program, but MSD is looking for input from the Wet Weather Team on how extensive the education efforts should be.
- A few WWT members asked about the effectiveness of green infrastructure solutions such as rain barrels. Mr. Swanson said that if every MSD customer had four rain barrels, it could remove an estimated 10 million gallons of stormwater from entering the combined sewer system.
- WWT members encouraged the technical team to do additional analysis of the potential effects of behavior change and green infrastructure strategies at reducing flows into MSD's sewer systems.
- A WWT stakeholder noted that it could be helpful to conduct separate research and data analysis to supplement any data collected through surveys about people's behaviors. (For example, in research about smoking, self-reported data can be compared to data on cigarette purchases.)

Other Comments

- Several WWT members discussed opportunities to encourage property owners to disconnect downspouts. One idea mentioned was to incorporate inspections into the property-transfer process (e.g., as another inspection with the sale of existing homes). For example, MSD could deputize the state plumbing inspector, which has the authority to go into private property, to conduct inspections of downspouts and foundation drains, and then MSD could pay on a per building basis for those inspections.
- A few stakeholders raised the issue of development and growth, making comments that sustainable development is challenging, that development responds to rather than creates growth, and that cities die without growth.

SSO Control Strategies Presentation and Discussion

Presentation Summary

In the first part of this session, Dave Servis of Tetra Tech gave a presentation on the range of remediation technologies available to control overflows from the sanitary sewer system, including (a) flow-reduction techniques, (b) transport and diversion techniques, and (c) storage techniques. He described examples of each control type, along with the advantages and disadvantages of different approaches. Mr. Servis also described ways in which water can enter the sanitary sewer system from infiltration and inflow (I&I), including manholes and sewers under MSD's control, and private property sources such as building laterals, downspouts, sump pumps, and foundation drains. He said that six sump pumps connected to the sewer system could consume the capacity of an eight-inch diameter pipe.

Gary Swanson of CH2M HILL provided some background information on the history of problems with the sanitary sewer system. Mr. Swanson said that the sanitary sewer system met the required standards at the time it was built; however, building codes and practices have changed since then. In addition, the materials and construction practices that were used were prone to damage and deterioration, and the system has degraded over time. Jim Huiting of Tetra Tech added that Jefferson County is an ideal location for SSOs, because the climate and soil conditions make it very likely that water will enter the sanitary sewer system.

The final segment of the presentation consisted of a review of some of the potential project concepts for control of SSOs that the technical team will be evaluating as alternatives for MSD's Wet Weather Program. Dave Servis reviewed background information on the reasons for SSO problems in the Middle Fork Beargrass Creek watershed, including undersized pump stations and sewer pipes, illegal roof drain and sump pump connections, and high groundwater levels. He then described the SSO locations, annual overflow levels, and potential SSO control solutions for three representative watersheds within the Middle Fork—Anchor Estates Pump Station, Goose Creek Pump Station, and Weicher Creek.

Discussion Summary

WWT members asked a number of clarifying questions about the SSO presentations, commented on the specific control options presented by the technical team for the Middle Fork Beargrass Creek watershed, and offered several suggestions for additional control options and solutions that could be considered. During this discussion, MSD and the technical team clarified the differences between the problems in the combined sewer system (which accepts stormwater flows) and in the sanitary sewer system (which is designed to be a tight system), and the implications those differences have for potential solutions. (For example, a stormwater detention or retention basin is much more likely to be accepted by the community than a concrete-lined open storage basin to hold SSOs.)

Highlights from the WWT's discussion of SSO control strategies include the following:

Flow-Reduction Control Techniques

- WWT members asked for information on the effectiveness of flow-reduction control techniques, including the level of I&I reduction that could be attained through source control. The technical team responded that I&I reduction efforts are generally able to reduce about 20 percent of the flows into the system; however, the range of effectiveness is +/- 20 percent (i.e., 0 to 40%).
- In response to questions, the technical team also described an example of a flow-reduction effort MSD did in Woodland Hills. MSD invested about $1 million in flow-reduction controls such as

manhole covers and cured-in-place piping for about 80 percent of the sewer system in the Woodland Hills area. These efforts, however, were not successful in eliminating the SSOs.

- Several WWT members commented on the fact that the technical team had not presented many options for using flow-reduction techniques to address SSOs in the Middle Fork watersheds.
    - A few WWT participants suggested that flow-reduction techniques should not be ruled out for any watershed.
    - WWT members also encouraged MSD and the technical team to look at opportunities to reduce flows of water into the sewer system (e.g., from housing units) in tandem with other types of solutions.

Addressing Private Sources of Infiltration and Inflow

- A few WWT members suggested that more should be done to address private sources of infiltration and inflow, since much of the problem is caused by issues on private properties. It is important for MSD to address the primary causes of the problem.
- WWT members suggested that MSD consider non-traditional approaches to addressing SSO problems. For example, MSD could involve community organizers and work with the Metro Council and neighborhood groups to address the root causes of the problem and make community members a part of the solution.
- One solution mentioned by the group would be to develop an ordinance that would allow MSD or a plumbing inspector to enter homes to identify sources of I&I (e.g., broken foundation drains). An amnesty period could be provided to help with the transition to the new requirements. In addition, MSD could subsidize or help pay for the costs of the inspections.
- WWT members suggested crafting messages related to the reasons for the problem and people's personal responsibility for addressing it.
- A stakeholder commented that the Wet Weather Team's discussion was reminiscent of historical discussions about community policing, in which there was a lot of resistance to considering new practices and roles for police in solving problems.

Comments Related to Specific Sites

- Anchor Estates Pump Station: A WWT member questioned why the potential location for a storage solution in the Anchor Estate Pump Station watershed was so far downstream of the SSO problem, and suggested that a solution closer to the problem could be preferable.
- Goose Creek Pump Station: A WWT stakeholder noted that there was road construction occurring in the Goose Creek Pump Station area, and suggested that MSD consider linking Wet Weather Program construction projects to the road construction efforts. Derek Guthrie of MSD responded that MSD does try to coordinate with other construction projects where possible.

Other Comments and Suggestions

- Park Sites: A few WWT stakeholders commented that parks should not be considered as potential locations for open storage facilities. Covered storage facilities with parks on top, however, do not raise the same concerns.
    - Another opportunity would be to consider converting a utility-owned site into a recreational area, rather than looking at parks as potential sites for wastewater facilities.
- Parking Lots: WWT members suggested looking at large parking lots as potential sites for wastewater storage facilities. Organizations might be willing to have a covered storage facility built below a ground-level parking lot. In addition, there could be opportunities to add value for the property owner, by building a parking garage as a replacement and/or by providing credit for any non-point source pollution reduction associated with the project.

- Combining Strategies: Several WWT participants encouraged MSD and the technical team to look at combining different types of control options. For example, combining storage and flow-reduction approaches could make it possible to use a smaller-sized storage facility (e.g., a 2-acre site instead of a 3-acre site).
- Phasing in Solutions: A few WWT members noted that it could be useful to phase in different types of solutions over time.
- WWT Information Requests: Commenting on the technical team's presentations, WWT members said that it would be helpful to have additional information to inform WWT discussions. In particular, it would be useful to increase the WWT's understanding of the benefits and challenges of different control approaches (e.g., why a storage solution might be preferable to a transport solution for a particular area), and to be able to communicate that to others outside the group.

The facilitation team wrapped up the discussion by proposing that there be a follow-up discussion on SSO controls at the next WWT meeting and by suggesting that it could be helpful for the technical team to develop an example illustrating the rationale behind favoring certain types of SSO control alternatives over others. In particular, it would be helpful for the group to gain a better understanding of the role of source-control solutions in addressing SSOs.

Approach to Fall Wet Weather Program Public Meetings

Gary Swanson of CH2M HILL reviewed the purpose and proposed structure of the next series of public meetings about MSD's Wet Weather Program. These meetings, which are planned for October and November 2007, are intended to solicit early feedback from the public on potential project ideas. The meetings will include a short overview presentation, and then an open session in which participants can go to tables organized by geographic areas to learn more and share their interests. A "homework assignment" with additional background information about the meetings and a list of questions for WWT consideration was distributed in advance of this meeting.

There was limited time to discuss the approach for these meetings, so the facilitation team requested feedback from WWT members following the meeting. Comments made at the meeting included:

- Bud Schardein of MSD suggested several locations for holding these public meetings, including the NIA Center, Shawnee High School, Fischer Packing Company facility, the East Government Center, the Fern Creek Community Center (or Fairdale High School), and the Southwest Government Center. A few WWT members indicated their support for these locations.
- Another suggestion from the Wet Weather Team was that MSD and the technical team avoid using acronyms in presentations and discussions with community members.

Observer Comments

John Wilson of SWL, Inc. suggested that the technical team might have relied too much on the results from MSD's experience with flow-reduction efforts in the Woodland Hills area in making conclusions about the effectiveness of flow-reduction control strategies. He made his point by raising two questions:

1. Mr. Wilson asked whether MSD's flow-reduction effort in Woodland Hills included actions to reduce inflow and infiltration from private properties. Members of the technical team said that there had been some work to disconnect roof leaders and do plumbing modifications; however, it had not involved an extensive effort at private properties.
2. Mr. Wilson also asked whether case studies were available nationwide about flow-reduction efforts that show improvements based on work on private properties.

Finally, Mr. Wilson commented that the age of the sanitary sewer system (and its degradation over time) is not the only issue causing the SSO problems that the Louisville and Jefferson County community faces.

Rob Greenwood of Ross & Associates noted that the agendas for future Wet Weather Team meetings may include additional opportunities for observers to comment (e.g., at the end of each WWT discussion session), so that observers need not wait until the end of the meeting to comment on WWT discussions.

Wrap Up and Next Steps

- WWT members are encouraged to provide feedback and suggestions on the technical team's proposed approach to the fall Project WIN public meetings. Please send suggestions to Jennifer Tice of the facilitation team (jennifer.tice@ross-assoc.com) by September 26, 2007.
- Based on the interest and availability of WWT members, the technical team will schedule and hold an open house style meeting in which WWT members can talk with the technical team about potential project concepts and alternatives being considered for MSD's Wet Weather Program.
- The next WWT meeting will be on Thursday, October 18, 2007, at MSD's main office. Potential meeting topics include:
    - Update on the fall Project WIN public meetings;
    - Follow-up discussion on source-control issues related to control of SSOs;
    - Introductory discussion of potential components of a financing plan for MSD's Wet Weather Program; and
    - Review of a draft outline for MSD's Wet Weather Plan for long-term control of CSOs and SSOs.

Meeting Participants

Wet Weather Team Stakeholders

Steve Barger, Labor
Susan Barto, Mayor of Lyndon
Stuart Benson, Louisville Metro Council, District 20
Charles Cash, Louisville Metro Planning & Design Services Department
Allan Dittmer, University of Louisville
Faye Ellerkamp, City of Windy Hills
Arnita Gadson, University of Louisville/West Jefferson County Community Task Force
Mike Heitz, Louisville Metro Parks Department
Tom Herman, Zeon Chemicals
Rick Johnstone, Deputy Mayor, Louisville Metro 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 Tollerud, University of Louisville, School of Public Health & Information Sciences
Tina Ward-Pugh, Louisville Metro Council, District 9
David Wicks, Jefferson County Public Schools

MSD Personnel

Angela Akridge, MSD Regulatory Policy Manager
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
Gary Swanson, CH2M HILL
Jennifer Tice, Ross & Associates Environmental Consulting

Meeting Observers

Kristen Crumpton, Tetra Tech
Henry Cubero, The Cubero Group
Marion Gee, MSD
Sue Green, MSD
Christine Horn, The Cubero Group
Jim Huiting, Tetra Tech
Clay Kelly, Strand Associates
Tim Kraus, O'Brien & Gere
Tom Luking, Tetra Tech
John Lyons, Strand Associates
Teri Pifine, MSD
Dave Servis, Tetra Tech
John Wilson, Sabak, Wilson & Lingo (SWL), Inc.

Meeting Materials

- Agenda for the 9/20/07 WWT Meeting
- WWT Contacts List (updated September 2007)
- Summary of the 8/2/07 WWT Meeting
- Solution Ideas List (August/September Update)
- Education and Outreach Ideas List (August/September Update)
- Data and Monitoring Requests Tracking List (August/September Update)
- Post-Construction Compliance Monitoring Presentation
- SSO Control Strategies Presentation, Part I: Remediation Techniques
- SSO Control Strategies Presentation, Part II: Potential Solutions
- WWT Homework Assignment on Approach for Fall 2007 Public Meetings
- Maps of Proposed Cluster Areas for October/November 2007 Wet Weather Program Public Meetings

Wet Weather Team Membership and Contact Information
September 2007

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Wet Weather Team Solution Ideas
Working Draft – September 13, 2007

The following is a list of potential "solution ideas" identified by Wet Weather Team (WWT) members that will be considered in the design of the Wet Weather Program. The list will act as a resource for the technical team as they consider project and program alternatives. These ideas were identified both at WWT meetings and through individual communications with WWT members (e.g., via e-mail). This list will remain "live" throughout the remainder of the WWT effort to capture ideas as they are shared. WWT members are encouraged to send additional ideas to the facilitation team for inclusion in this list.

New ideas will be listed under a "What's New" section at the beginning of the document for easy reference, as well as under the appropriate section later in the document. After the "What's New" list, this document is organized into three sections:

- Section I, "Project Alternatives," is organized into five sub-categories: Stormwater Best Management Practices (Non-Structural), Stormwater Best Management Practices (Structural), CSO and SSO Point Source Controls, General/Other Solutions, and Site-Specific Solutions.
- Section II, "Funding Ideas and Incentives," is organized into three sub-categories: Cost Allocation Strategies, Financial Incentives, and Funding Sources/Options.
- Section III, "Ideas Partly or Completely Outside the Scope of MSD's Wet Weather Consent Decree," includes municipal government actions that are only partly within MSD's control, MSD actions that are not related to sewer overflow issues, and green infrastructure ideas that are not directly related to sewer overflow issues.

What's New (August/September 2007)

A large number of new solution ideas have been added in all three sections of this document. As such, specific ideas are italicized in those sections instead of being referenced here. Please note that we have added several new sub-categories this month; as such, some older ideas may be in different places and/or be assigned different numbers. No solution ideas have been taken off of this list.

I. Project Alternatives

A. Stormwater Best Management Practices (Non-Structural)

1. Influence behavior of residential and commercial landowners through education.
    a. Promote water conservation practices: rain gardens, rain barrels, and responsible alternatives for sump pumps and downspout connections.
    b. Encourage stewardship: removing invasive vegetation from riparian zones, planting wetlands, litter cleanups, etc.
    c. *Conduct education on environmentally sustainable ways of using fertilizer and weed killer, and other stormwater best management practices to neighborhood groups.*
    d. *Discourage chemical treatment of and mowing near waterways to help keep debris from waterways.*
2. Regularly distribute billing inserts (like LG&E's) to MSD customers with facts and tips to encourage certain behaviors (e.g., lawn chemical management, pet waste management, landscaping practices).

3. Conduct a baseline survey and follow-up surveys of residents to determine whether education and outreach efforts are effective in changing behavior and perceptions on issues related to the Wet Weather Program
4. Hold "CSO Action Days" during or right after a hard rain to promote behavior change (e.g., don't use your dishwasher, wait to do your laundry, etc.).
5. Develop a pledge for customers that clearly lays out behaviors that will help MSD meet Consent Decree requirements. For an example, see http://www.watershedpledge.org (see also II-B-4).
6. Encourage the use of best management practices for chemical use in lawn management practices.
    a. Inform greenskeepers about best management practices (BMPs), since non-point source runoff is made worse by golf course chemicals.

B. Stormwater Best Management Practices (Structural, including Green Infrastructure Solutions)

1. Use landscaped areas to control stormwater runoff.
2. Encourage homeowners to construct rain gardens and use rain barrels.
3. Install French drains along roads to accept stormwater runoff (see also detailed suggestions listed for Beechwood Village below).
4. Develop specific design parameters or standards for stormwater best management practices and low impact development techniques and include these in an MSD Design Manual. The Design Manual should provide guidance for approaches including, but not limited to, the following:
    a. Pervious pavement
    b. Level spreaders
    c. Riparian buffers
    d. Vegetated swales
    e. Wet ponds
    f. Wet ponds with forebays (small basins that settle out incoming sediment before it is delivered to a stormwater BMP)
    g. Wetlands
5. Consider incorporating aspects of the LEED green building standards into MSD design manuals for structural BMPs.
6. Increase tree canopy.
    a. Ensure that urban CSO areas have at least a 30 percent tree canopy.
    b. *Initiate a tree-planting program with a goal to increase tree canopy in neighborhoods.*
7. Work with the community group "Women of Vision" to create a meditation garden in the West End that could also act as a rain garden or roof runoff demonstration.
8. Conduct demonstration projects (Note: Overlaps with demonstration projects in Education and Outreach Ideas List). Specific ideas for projects include:
    a. Create a demonstration area in each Jefferson County watershed to demonstrate and interpret healthy stream habitats and what MSD is doing to study and protect them.
    b. Create some sustainable lawns as pilot projects
    c. Develop a green infrastructure best management practice site similar to SD1 (Sanitation District Number 1 of Northern Kentucky).
    d. Add green demonstration/education facilities to old urban schools.
    e. Use the Butchertown Greenway Pump Station that is offline for an education and demonstration facility.

9. *Plant native plants with deep root systems.*
10. *Maintain existing detention/retention basins – many may not function properly due to lack of maintenance.*
11. *Design structural stormwater best management practices to be multiple- use and eco-friendly.*
    a. *Design detention ponds and stream buffers for recreational use.*
    b. *Make use of detention facilities as sports fields*
    c. *Incorporate trails along streams to provide recreational opportunities.*

C. CSO and SSO Point Source Controls

1. Disconnect downspouts and/or sump pumps (e.g., by developing educational initiatives aimed at landowners).
    a. *One potential target for a downspout disconnection program could be school buildings.*
    b. *Yard signs similar to those used in Portland's residential Downspout Disconnection Program could be useful for education and outreach about MSD's Wet Weather Program [Note: This idea overlaps with the Education Ideas List]. Specific ideas for signs include:*
        i. *Messages such as "I disconnected my downspout" and/or "I have a rain barrel."*
        ii. *The bottom of the sign could invite readers to "ask me" for more information.*
2. Increase enforcement and inspections of downspout and sump pump connections.

D. General/Other Solutions

1. Leverage and coordinate the Wet Weather Program efforts with MSD's MS4 stormwater management permitting responsibilities.
2. Conduct green infrastructure demonstration projects with monitoring components built in, to help demonstrate the overall effectiveness of green infrastructure solutions.
    a. Start with small, visible projects ("quick wins" – e.g., in a particular neighborhood, near a Rubbertown plant).
3. *Preserve rural character where possible.*
4. *Create a localized resource database to support green infrastructure development efforts (e.g., provide information on contractors that install pervious pavements). Specific ideas include:*
    a. *Develop a list of environmentally approved chemicals for use in lawn/landscape management.*
    b. *Landscape architects could provide green options for projects and developments.*

E. Site-Specific Solutions (Considered in Addition to the Solutions Listed Above)

Beechwood Village

1. Construct a park-like wet detention area in the wooded area of St. Matthews Park.
2. Install new sanitary lines and laterals to homes, and pumps for basement facilities when requested by the homeowner.
3. Install French drains on either side of roadways to accept stormwater runoff. The drains would be continuous trenches filled with gravel and covered by turf. The drains could also accept discharges from sump pumps and downspouts.

4. Install perforated pipe in the French drains so they can discharge more freely when they flood. The piped drain system would need to be a combination of gravity and pump depending on the topography and discharge point(s).
5. If a solid pipe system is used, the system could discharge to constructed wetlands designed to treat stormwater. Possible sites for constructed wetlands are the forest north of the Community Park and the detention pond for the bank on Shelbyville Road at the Beechwood Village entrance.
6. Restore natural stream banks for the Sinking Fork north of Shelbyville Road where the big pump now sits.

Beargrass Creek – Middle Fork

1. Restore the Middle Fork between Grinstead crossing and confluence.
    a. Restore wetlands and improve aquatic health in the following areas:
        i. The isolated quarry areas to the north of the interstate between Grinstead and Payne (which receives a small CSO discharge). One specific idea is to remove sediments from these areas.
        ii. The old meander into which CSO 127 discharges and the wet meadow in its bend.
    b. Work with the City of Louisville, the Parks, and the private sector to turn this area into a greenway that connects the waterfront with Cherokee and Seneca Parks, and eventually with parks in Saint Matthews, with a bikeway from Saint Matthews to downtown.
    c. Close CSOs in this area using projects that reduce flooding and improve water quality.
2. *CSOs 125, 126, 127, 144, and 166; and CSOs 86 and 140 could potentially be treated at one facility (some pumping would be required). This could be a visible project that could help link areas in the community.*
3. *Potentially develop the River Metals property (a brownfield near the Girl Scouts Building) as a storage or wetlands treatment area.*
4. *Establish wetlands at Seneca Park and Old Cannons Lane.*

Beargrass Creek – South Fork

1. Restore the South Fork between I-264 and Eastern Parkway.
    a. Restore the stream channel, along with the wet meadows and woods in the floodplain.
    b. Coordinate with landowners (e.g., the City of Louisville and Bellarmine College) on the restoration of the stream segment, which is part of a "nature education" corridor and is subject to MSD conservation easements.
    c. Potentially make this area into a bikeway as part of the solution.

Beargrass Creek – Muddy Fork

1. Restore Eva Bandman Park.
    a. Convert the park into restored wetlands with a boardwalk for visitors.
    b. Include the park as part of the solution for the CSOs that discharge at the confluence by having it receive their stormwater.
2. *Tie the impaired section of Beargrass Creek to newly created wetlands, near Eva Bandman Park.*
3. *Incorporate green infrastructure into the Arts Center.*
4. *Turn the MSD pump station into an interpretive center.*

5. *For CSOs 132, 154, and 167:*
    a. *Conduct a concentrated effort to disconnect downspouts in this area.*
    b. *Use incentives to get people to help solve the problem in this area. In particular, educate people about ways to reduce non-point source pollution.*
    c. *Acquire properties in flood-prone areas by paying more than fair market value for the homes (as compensation to homeowners for having to move). These areas could then be used to create detention or retention basins, or other facilities/structures to reduce wet-weather sewer overflows. (Note: Purchasing properties in flood-prone areas is also listed under Section III).*

Floyds Fork Watershed

1. *Look for opportunities for green infrastructure in the Floyds Fork watershed, as it is the last undeveloped area in Jefferson County.*
2. *Protect Floyds Fork with riparian buffers and other preservation efforts.*

Other Watershed and Site-Specific Solutions

1. *Create an 800-acre lake in the southwest portion of Jefferson County. Use a dam/flood wall to build it and include marshes around it.*
2. *Examine other sites for green infrastructure opportunities, such as:*
    a. *Pond Creek Lake and the southwest pump stations (this area has been studied already by the Corp of Engineers)*
    b. *The Bradley Property*

II. Funding Ideas and Incentives

A. Cost Allocation Strategies

1. Equitably assign costs (focus areas for the financial equity value):
    a. Consider the burden on fixed income and low-income populations
    b. Rates and fees that are linked to the cost to serve (i.e., the level of impact)
2. Charge residences differently depending on the area of impervious surfaces on properties (and therefore the amount of stormwater runoff that would be generated).
3. Require lower development fees for areas that already have sewer capacity (e.g., urban areas in need of re-investment).
4. Bill based on increased water usage—the more you use, the higher the rate.
5. *Develop an equitable plan for joint funding for permeable pavement efforts.*

B. Funding Sources/Options

1. Consider using volunteers to reduce costs.
2. Consider solutions that could meet the objectives of multiple agencies (e.g., water quality and flood control improvements) and therefore could potentially receive funding from multiple sources.

C. Incentives

1. Provide incentives for "preferred" behaviors.
2. Offer incentives for developers to use cost-effective, eco-friendly solutions (e.g., low impact development techniques, stormwater best management practices).
3. Charge reduced wastewater rates to property owners that use eco-friendly techniques to reduce stormwater runoff.
4. Reduce fees for families or businesses who sign a pledge that clearly lays out behaviors that will help MSD meet Consent Decree requirements (see also I-A-5).
    a. In critical CSO neighborhoods, provide free rain barrels to people who sign the pledge.
5. *Develop compensation credits to help alleviate financial burden to developers and property owners.*

III. Ideas Partly or Completely Outside the Scope of MSD's Wet Weather Consent Decree

A. *Municipal Government Actions (Only Partly within MSD's Control)*

Requirements Related to Planning and Zoning

1. Improve the development review process for new subdivisions. Deny permits for subdivisions or any new homes if the plant in the area is above capacity.
2. *Require that regional detention ponds in post-developed areas provide filtration for storms that occur every two years or less.*
3. *Require post-development runoff to be equal to pre-development runoff.*
4. *Develop mandatory or alternative green solutions for development projects (e.g., by changing development codes).*

Opportunities to Encourage/Use Green Infrastructure in Development Projects

1. *Utilize very large basins or lakes in new development areas and in rural areas. For new developments, create larger detention/retention basins.*
2. *Preserve existing natural systems, vegetation, and trees during development, rather than removing and rebuilding them. Take advantage of existing assets in development opportunities.*
3. *Look at green parking opportunities along business corridors.*
4. *Look at opportunities to develop more upward and infill already developed areas (i.e., increase density).*
5. *Develop a "complete streets" program policy to encourage "parkway-like" streets and reduce stormwater run-off.*
6. *Form partnerships with housing developers to minimize impervious surfaces.*
7. *The parking lot on Frankfort Avenue could utilize porous pavement for public parking.*
8. *Develop a recognition program for those who use green infrastructure.*
9. *Opportunities in schools:*
    a. *Incorporate green elements into the three new research facilities being planned at the University of Louisville.*
    b. *Turn school grounds into "ecological playgrounds" for neighborhoods.*

Opportunities to Link MSD Efforts to Existing Partnerships and Programs

1. Develop a "comprehensive solution" for local environmental improvement and education efforts.
    a. Fund and staff a collaborative planning effort to link the environmental education programs of multiple local agencies (MSD, Louisville Water Company, Metro government departments, Mayor's Office, TARC, etc.) together, develop specific goals and assessment systems, and then hold agencies accountable to those goals.'
2. Encourage local government agencies (e.g., Jefferson County Public Schools, Metro Parks) to adopt preventative practices to decrease stormwater runoff and wastewater volumes (e.g., low-flow toilets, pervious pavement, additional tree coverage, etc.).
3. *Integrate green projects into planning efforts underway.*
4. *Work with the Green City Partnership (an initiative involving the Louisville Metro Government, Jefferson County Public Schools, and the University of Louisville) on green infrastructure efforts. The Metro Green Initiative should be a leader for the community's Green City Partnership.*
5. *Consider green infrastructure in the context of healthy activity improvement projects and projects that promote greater walk-ability in neighborhoods.*
6. *Make use of neighborhood plans. There could be opportunities to incorporate green infrastructure into the 14 neighborhood plans and 6 neighborhood assessments that are being developed, as well as in neighborhood plans that well be developed in the future.*

Opportunities for MSD to Collaborate with Other Entities

1. *Coordinate with planning and zoning departments and other governmental entities around the value of green infrastructure.*
2. *Partner with schools to relate students' community service efforts with green projects.*
3. *Coordinate with other regional entities to build a major treatment plant near the Salt River.*

B. *MSD Actions Not Related to Sewer Overflow Issues*

1. Purchase properties within the floodplain.
    a. Buy land that is flooded on a regular basis and turn it into parks.
    b. When building a detention basin, buy properties in the floodplain that are most impacted.
2. Improve implementation and enforcement of the Sediment Control Act.
3. *Partner with local lawn care companies to promote Louisville Green (MSD's organic fertilizer)*

C. Green Infrastructure Ideas Not Related to Wet Weather Issues

1. *Heine Brothers Coffee is looking for five acres for an urban farm to grow produce and sell to local restaurants.*
2. *The "86-64" community effort to remove portions of I-64 could be an opportunity to reclaim the waterfront and promote public transportation such as light rail.*
3. *Utilitize the open space in parks for green infrastructure.*
4. *Develop and educate residents about urban farming opportunities.*
5. *Teach and promote sensible/responsible development.*
6. *Require parking lots to provide shaded areas.*
7. *Establish a tree ordinance to protect specific trees (identified based on species, age, etc.) and require mitigation if the protect trees are damaged or removed.*

8. *Protect or improve water quality and flood control for developments.*

Wet Weather Team Education and Outreach Idea List
Working Draft – September 13, 2007

The following is a list of education and outreach ideas identified by Wet Weather Team (WWT) members for consideration for the Wet Weather Program. The list will act as a resource for MSD and the technical team as they develop and refine the draft education and outreach plan for MSD's Wet Weather Program. (The focus of this list is on long-term education, outreach, and public engagement efforts, rather than near-term activities such as public meetings occurring during the WWT process.) These ideas were identified both at WWT meetings and through individual communications with WWT members (e.g., via e-mail). This list will remain "live" throughout the remainder of the WWT effort, and WWT members are encouraged to send additional ideas for this list to the facilitation team.

New ideas will be listed under a "What's New" section at the beginning of the document for easy reference, as well as under the appropriate section later in the document. The remainder of the document is organized into two main sections, Section I, which focuses on MSD Wet Weather Program education and outreach efforts, and Section 2, which covers efforts that are only partly within MSD's control.

What's New (August/September 2007)

1. (1-B-5-e through 1-B-5-g) Message ideas:
   - Help people understand how they are connected to the problem.
   - Help change the perception people have of streams to a positive one (people think that streams are "dead").
   - Help people understand that green infrastructure can be incorporated into urban areas, since urban areas can be redeveloped.
2. (1-B-7) – Develop education programs for schools that allow children to take information home.
3. (1-C-5-b through 1-C-5-g) Demonstration projects:
   - Strategically place demonstration projects (e.g., porous pavement) near neighborhoods.
   - Create some sustainable lawns as pilot projects.
   - Develop a green infrastructure best management practice site similar to SD1 (Sanitation District Number 1 of Northern Kentucky).
   - Add green demonstration/education facilities to old urban schools.
   - The Clifton neighborhood is motivated, so would be a good demonstration area to show the effects of behavior change.
   - Use the Butchertown Greenway Pump Station that is offline for an education and demonstration facility.
4. (1-C-14) – Yard signs similar to those used in Portland's residential Downspout Disconnection Program could be useful for education and outreach about MSD's Wet Weather Program. Specific ideas for signs include:
   a. Messages such as "I disconnected my downspout" and/or "I have a rain barrel."
   b. The bottom of the sign could invite readers to "ask me" for more information.
5. (1-D-1-c through 1-D-1-f) Education to support behavior change:
   - Conduct education regarding fertilizer, weed killer, and other stormwater best management practices to neighborhood groups.
   - Develop and educate residents about urban farming opportunities.
   - Teach and promote sensible/responsible development.

- Discourage chemical treatment and mowing near waterways to keep debris from waterways.

6. (1-D-6) Provide technical assistance to support behavior change.
    - Develop a program in which residents could pay a small fee for MSD or another agency to conduct a water/wastewater audit on a house similar to the energy audits offered by LG&E.

I. MSD Wet Weather Program Education and Outreach Efforts

A. Education/Outreach Program Characteristics

1. MSD should expand upon its existing education and outreach efforts, including Project WIN and other MSD programs such as Living Lands and Waters.
2. Education efforts should be comprehensive, adequately resourced, and human scale to encourage behavior changes (e.g., stewardship practices).
3. To be successful, public involvement efforts should include:
    a. A corporate or programmatic identity: logo, leader, advisory board, budget, mission, goals, website, etc.
    b. Communications: announcements, fliers, newsletters, radio/TV appearances, etc.
    c. Stewardship: removing invasive vegetation from riparian zones, planting wetlands, [and yes] litter cleanups
    d. Education: stream science, water quality monitoring
    e. Conservation: promoting rain gardens, rain barrels, and responsible alternatives for sump pumps and downspout connections.
    f. Coordination: linking the public involvement activity with MSD and the wet weather team
    g. Celebration: festivals, canoe floats, and other events that call positive attention to the area's waterways.
4. Outreach efforts should show people that there is an open and transparent process within which MSD is making decisions on behalf of the community.

B. Audiences, Objectives, and Messages

1. Target education efforts in "critical CSO neighborhoods" and schools in those areas.
    a. Use a targeted direct-mail approach to help address local, site-specific problems.
2. Involve commercial and industrial customers and solutions through PR and planning, not just residential customers.
3. Make a presentation to the full Metro Council.
4. Work with schools (in conjunction with Earth Day and river/creek cleanups) to involve both students and parents.
5. Message ideas:
    a. Develop positive educational messages about the value of clean water to supplement other education and outreach messages. (CSO warning signs, river sweeps, and other elements of MSD's outreach activities send a negative message about the community's water resources.)
    b. Can the "water is dirty, stay away from it" signs that EPA designated include a promise that the public can change the situation?
    c. Translate Consent Decree activities into dollar impacts for residents.

d. Communicate that we have no choice but must comply with the requirements of the consent decree in a timely manner.
e. Help people understand how they are connected to the problem.
f. Help change the perception people have of streams to a positive one (people think that streams are "dead").
g. Help people understand that green infrastructure can be incorporated into urban areas, since urban areas can be redeveloped.

6. Involve neighborhoods in identifying potential green infrastructure solutions (e.g., by having a neighborhood competition to get grassroots ideas for potential solutions).
7. Develop education programs for schools that allow children to take information home.

C. General Outreach and Education Strategies and Techniques

1. Use a variety of communication media to inform Louisville residents about issues, opportunities, and activities related to the Wet Weather Program and the Consent Decree. Examples include:
   a. feature articles and/or advertisements in the Courier Journal
   b. direct mail
   c. public service announcements on television
   d. radio (WLOU/WLLV 1350 and 101.3 FM for the west)
   e. e-mail lists ("UofL announcements" to University of Louisville employees, e-mail lists for Metro Council members)
   f. website(s) (provide information, as well as solicit input and questions)
   g. community meetings ("piggy back" on other events/meetings such as the Mayor's Night Out, community association meetings, Metro Council meetings, etc.)
   h. media "groundbreaking" events
   i. 5-minute DVD video (highlight the central issues and indicate the short and long-term consequences)
   j. Hold a "creek concert" to raise awareness of stream issues to young people
   k. Develop/use a Kentucky State Fair Exhibit (permanent or traveling)
2. Develop/use posters and visual displays to illustrate concepts to the public and provide context to Wet Weather Program activities. Specific suggestions include:
   a. Schematic of a combined sewer overflow
   a. Schematic of sump pumps and downspouts connected to sanitary sewers
   b. Map of the combined sewer area and outfalls against blue line streams and landmarks (road system would do)
   c. Map of SSO outfalls including the sewersheds of the "big four," as above
   d. Water Quality maps from the Beargrass Creek report card, also water quality info about Ohio River related to CSO outfalls
   e. Comparison of city sewer rates indicating which cities have consent decrees
   f. Time frames for the major deliverables in the Consent Decree
   g. Create visible representations of the solution, since they can be helpful for explaining project concepts to the public. Use these visual representations when soliciting community input.
3. 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.

4. Develop a speakers bureau to attend chamber/business association meetings and other groups that use speakers.
5. Conduct demonstration projects (Note: Overlaps with demonstration projects in Solution Ideas List). Specific ideas include:
    a. Create a demonstration area in each Jefferson County watershed to demonstrate and interpret healthy stream habitats and what MSD is doing to study and protect them.
    b. Strategically place demonstration projects (e.g., porous pavement) near neighborhoods.
    c. Create some sustainable lawns as pilot projects
    d. Develop a green infrastructure best management practice site similar to SD1 (Sanitation District Number 1 of Northern Kentucky).
    e. Add green demonstration/education facilities to old urban schools.
    f. The Clifton neighborhood is motivated, so would be a good demonstration area to show the effects of behavior change.
    g. Use the Butchertown Greenway Pump Station that is offline for an education and demonstration facility.
6. Present "Where is your CSO or SSO?" information on-line: On the MSD or LOGIC website, have the ability to type in your address and have it call up the location of the CSO or SSO that the property owner's waste goes to. The website could describe the watershed that contributes water and runoff to that individual CSO or SSO.
7. Support the identification of public watershed advocates for each Jefferson County watershed. Each watershed needs a public advocate. It could be connected with a nature center, or be an independent citizen advocacy group.
8. Make MSD facilities visitor friendly. For example, add educational exhibits around the flood wall, the history of flooding, etc. to the Beargrass Creek Pump Station and near the flood detention basins at the Fairgrounds.
9. Have MSD employees be educational ambassadors, as a way of making Louisville environmentally literate.
10. Public meeting ideas:
    a. To increase attendance, consider latching onto other meetings.
    b. Advertise public meetings at churches.
    c. Start public meeting presentations with information on rates to get people's attention.
    d. At public meetings, consider the fact that people need time to digest information from presentations and written materials.
11. Add a portal to MSD's website where people can submit comments on Project WIN; run a public service announcement to inform people about the issues and the website address for submitting comments.
12. Develop and run an information booth at selected festivals in the community (similar to the booth used for Project XL).
13. Use the potential disruption along Hikes Lane (part of the Big Four SSO plan) as an opportunity for broader education of the public about wet weather sewer overflow issues.
14. Yard signs similar to those used in Portland's residential Downspout Disconnection Program could be useful for education and outreach about MSD's Wet Weather Program. (Note: Overlaps with CSO and SSO Point Source Controls in Solution Ideas List). Specific ideas for signs include:
    a. Messages such as "I disconnected my downspout" and/or "I have a rain barrel."

b. The bottom of the sign could invite readers to "ask me" for more information.

D. Education to Change Behavior [Overlaps with Behavior Change Strategies in Solution Ideas List]

1. Influence behavior of residential and commercial landowners through education.
    a. Promote water conservation practices: rain gardens, rain barrels, and responsible alternatives for sump pumps and downspout connections.
    b. Encourage stewardship: removing invasive vegetation from riparian zones, planting wetlands, litter cleanups, etc.
    c. Conduct education regarding fertilizer, weed killer, and other stormwater best management practices to neighborhood groups.
    d. Develop and educate residents about urban farming opportunities
    e. Teach and promote sensible/responsible development.
    f. Discourage chemical treatment and mowing near waterways to help keep debris from waterways.
2. Regularly distribute billing inserts (like LG&E's) to MSD customers with facts and tips to encourage certain behaviors (e.g., lawn chemical management, pet waste management, landscaping practices).
3. Hold "CSO Action Days" (like Ozone Action Days) during or right after a hard rain to raise awareness and promote behavior change (e.g., don't use your dishwasher or clothes washer, wait to drain your bathtub, etc.).
4. Develop a pledge for customers that clearly lays out behaviors that will help MSD meet Consent Decree requirements. For an example, see http://www.watershedpledge.org
5. Encourage the use of best management practices for chemical use in lawn management practices.
    a. Inform greenskeepers about best management practices (BMPs), since non-point source runoff is made worse by golf course chemicals.
6. Provide technical assistance to support behavior-change efforts.
    a. Develop a program in which residents could pay a small fee for MSD or another agency to conduct a water/wastewater audit on a house similar to the energy audits offered by LG&E.

E. Monitoring, Evaluation, and Accountability

1. Conduct a baseline survey and follow-up surveys of residents to determine whether education and outreach efforts are effective in raising awareness and in changing behavior and perceptions on issues related to the Wet Weather Program. [Note: This is also included in the Solution Ideas List.]
    a. Develop a survey instrument (potentially with a coalition of cities) and use it every year.
2. Collect baseline data, monitor performance, and ensure "high stakes accountability" for all of the education and outreach objectives of the Wet Weather Program.
    a. Evaluate the extent to which citizens value clean water, support MSD, understand best management practices for homes and businesses, and have a basic understanding of ecological conditions and processes.
3. Consider creating/supporting an evaluation center to evaluate and document the effectiveness of education and outreach programs.
4. Develop a "report card" for MSD's Wet Weather Program to post on MSD's Project WIN website and publish it in print format regularly (e.g., annually). This report card would report on

performance measures related to the goals of MSD's Wet Weather Program and implementation of the consent decree.

II. Ideas Partly or Completely Outside the Scope of MSD's Wet Weather Consent Decree

A. *Municipal Government Actions (Only Partly within MSD's Control)*

1. Develop a "comprehensive solution" for local environmental improvement and education efforts.
    a. Fund and staff a collaborative planning effort to link the environmental education programs of multiple local agencies (MSD, Louisville Water Company, Metro government departments, Mayor's Office, TARC, etc.) together, develop specific goals and assessment systems, and then hold agencies accountable to those goals.

       [Note: This is also included in the Solution Ideas List.]
2. Transform governmental facilities to be role models and learning laboratories—demonstrate how to do the right thing.
    a. Encourage local government agencies (e.g., Jefferson County Public Schools, Metro Parks) to adopt preventative practices to decrease stormwater runoff and wastewater volumes (e.g., low-flow toilets, pervious pavement, additional tree coverage, etc.).

       [Note: This is also included in the Solution Ideas List.]
3. Work with other building inspectors to raise awareness of wet weather issues during inspections.

Wet Weather Team Data and Monitoring Request Tracking List
Working Draft – September 13, 2007

The following is a list of data and monitoring requests made by Wet Weather Team (WWT) members for consideration for the Wet Weather Program. These ideas were identified both at WWT meetings and through individual communications with WWT members (e.g., via e-mail). This list will remain "live" throughout the remainder of the WWT effort, and WWT members are encouraged to send additional requests to the facilitation team. Requests will be taken off the list when they have been responded to.

New ideas will be listed under a "What's New" section at the beginning of the document for easy reference, as well as under the appropriate section later in the document.

Note: For monitoring and evaluation suggestions related to the public education and outreach plan, please see the Wet Weather Team Education and Outreach Idea List

What's New (August/September 2007)

1. (F-3) – Conduct assessments of different watersheds to find the best opportunities for green infrastructure.
2. (F-4) – Determine impervious surface limits for individual watersheds.
3. (F-5) – Pick a CSO area and study the effects of rain barrels and rain gardens.
4. (G-1) – Information on the "root causes" of wet weather CSO and SSO problems (e.g., the CSO volume attributable to residential downspouts) to assist with Wet Weather Program decision making.

A. Effectiveness of Potential Solutions / Control Options

1. Information on the long-term effectiveness of strategies that rely on source prevention (e.g., rain gardens).
2. Quantitative information on the benefits and/or effectiveness of eco-friendly solutions currently used by MSD.
3. Build monitoring components into green infrastructure projects to help demonstrate the overall effectiveness of green infrastructure solutions.

B. Asset Protection Information

1. Specific information on the percentage of backups that are the result of MSD's activities as opposed to private property issues.

C. Customer Satisfaction Information

1. Monitor customer satisfaction data (e.g., number of hits on MSD's website, number of requests for information, customer satisfaction surveys).

D. Water Quality and Environmental Information

1. Data on how fecal coliform levels change with flow volumes.

2. Where water quality sampling is currently done in relation to recreational areas.
3. Current data MSD has on water quality in stream reaches (as aquatic health is an issue in some, but not all, stream reaches).
4. Environmental performance data such as biological indexes of aquatic health (fish counts, macro-invertebrate sampling, etc.), nutrient sampling, downstream pollutant load, and tree cover or other measures of habitat restoration efforts.
5. Consider monitoring water quality and flow at additional locations, based upon the Wet Weather Program's objectives and the performance measures developed for the program. Potential new monitoring locations to consider include:
    a. Intensely used public access sites within Beargrass Creek
    b. Stream segments MSD does not monitor currently, such as Buechel Branch and upper South Fork of Beargrass Creek
    c. Additional locations within the Floyds Fork watershed

E. Economic and Financial Information

1. How MSD's development fees compare to development fees in other places.
2. Cincinnati's rates before the community started to respond to its consent decree.

F. Research Requests

1. In order to gain information on the long-term effectiveness of strategies that rely on source prevention, conduct a demonstration project in a small area, and compare the changes in pollutant loading and stormwater flows to those of other areas.
2. Data on the public health impacts of polluted water (collected by the School of Public Health or the Health Department and included in an annual report).
3. Conduct assessments of different watersheds to find the best opportunities for green infrastructure.
4. Determine impervious surface limits for individual watersheds.
5. Pick a CSO catchment area and study the effects of rain barrels and rain gardens.

G. Other Data Requests

1. Information on the "root causes" of wet weather CSO and SSO problems (e.g., the CSO volume attributable to residential downspouts) to assist with Wet Weather Program decision making.

Wet Weather Team Homework Assignment: Approach for the Fall 2007 Public Meetings

For Discussion at the September 20, 2007 Wet Weather Team Meeting

This document describes a homework assignment to prepare for a discussion about the fall 2007 public meetings at the September 20, 2007 Wet Weather Team meeting. The document includes background information on this set of public meetings, instructions for the homework assignment, a description of five proposed areas in which to hold the public meetings, and a set of questions to answer. Please consider these questions in preparation for the September meeting.

I. Background on Current Plans for the Fall 2007 Public Meetings

MSD is currently planning to hold the next set of public meetings to solicit input on MSD's Wet Weather Program in October and November of 2007. The purpose of these meetings is to get early feedback from residents on specific problems and potential opportunities for projects in different geographic areas within Jefferson County. This opportunity for listening to community interests and getting feedback on potential project concepts is occurring much earlier in the process than originally planned, since WWT Team members pointed out that this kind of input would be highly valuable.

Current plans are to begin each meeting with a short presentation that provides an overview of MSD's Consent Decree, CSO and SSO problems, and control technologies. MSD staff and members of the technical team are then planning to be available for the remainder of the meeting to talk with residents about problems and potential projects in specific geographic areas. During this portion of the meeting, individual tables would be set up for a number of small geographic areas. Each table would have a blown-up map of the area, and MSD and technical team staff would answer questions and get input from interested residents on potential project concepts being considered in the area.

MSD and the technical team have incorporated a number of ideas suggested by WWT members into the initial planning of this set of public meetings. For example, MSD is planning on using short, focused presentations during the meetings, while providing a significant amount of time for members of the public to ask questions and provide input. MSD is also planning on providing visual displays (e.g., large, blown-up maps) at the meetings.

MSD is hoping to maximize participation and the quality of feedback received at these public meetings, but MSD is also operating under a number of constraints. To stay on schedule, this round of public meetings should be completed by the middle of November. In addition, since the staff who will be conducting the meetings are also key leaders of the alternative development and evaluation, five to six meetings are the most that can be accommodated in the available time. Please consider these constraints when thinking about the questions in Section IV, in the interest of having a realistic discussion at the WWT meeting. Please also note, however, that MSD is open to hearing that one or more of these constraints needs to be reconsidered, if WWT members believe the constraint would significantly limit participation and/or the quality of feedback.

II. Instructions for the Homework Assignment

As described above, MSD is planning on holding five to six public meetings this fall. In the attached maps, you will see the county divided into a proposed set of five regional "clusters," which are defined by interactivity among CSO and SSO problems and potential solutions. Each

cluster could potentially be the site of a public meeting. Please take a look at the maps, read the cluster descriptions below, and then consider the discussion questions in Section IV. We do not expect you to answer the questions for all five clusters; rather, we ask that you focus on one to two clusters with which you are most familiar. Also, we don't need you to write your answers down in advance – we just ask that you are prepared to share your ideas at the meeting.

III. Cluster Descriptions

Cluster A – Ohio River Combined Sewer Area

This highly urbanized area includes the downtown central business district, highly industrial areas such as Rubbertown, and the residential areas in the central and west end of the city. Despite the land use diversity, this area is uniformly characterized by large sewers leading to Ohio River CSOs, with localized SSOs in some neighborhoods.

CSO solutions in this area will likely include:

- Large scale regional storage or treatment facilities near the river;
- Regional storage and treatment; and
- System-wide source control measures (which will apply to this entire area).

SSO solutions in this area will likely include:

- Source control and
- Relief sewers, with little opportunity for surface storage due to the lack of suitable sites.

The previous public meeting in this area was held at the Nia Center.

Cluster B - Beargrass Creek Combined Sewer Area

This area encompasses all three branches of Beargrass Creek, including some of the tributary separate sewer area. This area has a large number of relatively small CSOs, and a scattering of localized SSO and other unauthorized discharges. The Middle Fork is the backbone of an extensive system of parks and open space. The other forks and the I-64 corridor provide additional open space opportunities.

In addition to county-wide source control measures, the small CSO basins in this area lend themselves to more focused source control initiatives, including a wide variety of green infrastructure opportunities. As such, CSO solutions in this area will likely include:

- County-wide source control measures and
- The full range of storage, conveyance, treatment, and green infrastructure solutions.

The previous public meeting in this area was held at the Girl Scouts headquarters.

Cluster C – East End

This area is separately sewered, but part of the area drains through the combined sewer area. The rest of the area goes to regional or small treatment plants. This area has a relatively low housing density with significant undeveloped land in the east and south sides. Development pressures in this area are significant and need to be considered as part of planning.

SSOs are scattered across this area, often related to the poor condition of developer-constructed systems that MSD acquired as part of regionalization. SSO solutions in this area will likely include:

- A broad range of storage, conveyance, source control, and treatment solutions;
- Disconnection of illicit connections; and
- Private property rehabilitation.

The previous public meeting in this area was held at the Southeast Government Center in Middletown.

Cluster D – Southeast

In many respects, this region is similar to Cluster C, with the exception of the Jeffersontown (JTown) service area. The JTown service area is currently under a building moratorium dictated by KDOW.

Solutions to the JTown problems may include:

- A broad range of storage options;
- Disconnection of illicit connections;
- Private property rehabilitation;
- Extensive rehabilitation or reconstruction (and relocation) of sewers;
- In-line or surface storage of wet weather flows; and
- Inter-basin transfers of load.

Elimination of the JTown treatment plant has also been discussed, potentially in conjunction with a new discharge location on the Salt River.

The previous public meeting in this area was held at the Central Government Center (7201 Outer Loop).

Cluster E – Southwest

This area is low-lying with shallow groundwater, resulting in high wet weather flows in areas with older sewers. The area drains to the West County Wastewater Treatment Plant through two very large interceptors. SSOs in this area are mainly due to limitations in the local collector sewers, since the plant and interceptors are currently operating well below capacity despite the high wet weather peaks.

Solutions in this area will likely include:

- Receiving inter-basin transfers of flow from other watersheds, requiring the addition of major diversion sewers, storage, and wet weather treatment expansion at the West County plant;
- Localized storage, conveyance, and source control projects;
- Disconnection of illicit connections; and
- Private property rehabilitation.

The previous public meeting in this area was held at the Southwest Government Center on Dixie Highway.

IV. Questions to Consider for the September 20, 2007 Wet Weather Team Meeting

A. Questions for Each of the Five Proposed Clusters

1. Do you think this is a logical way to form a cluster? If not, what suggestions do you have for making it more logical?

2. Where in this cluster should MSD hold the meeting?

    a. For Cluster A (Ohio River Combined Sewer Area), is a single meeting adequate, or do we need more than one meeting to address the different conditions in the central business district and the rest of the area?

3. What ideas do you have on how to get people to attend this meeting?

4. How would you divide this cluster into approximately five smaller geographic areas on which to collect specific feedback (e.g., are there logical neighborhood groupings?)?

5. Do you think the dialog we would get at this level (i.e., of the five or so smaller areas) would be useful?

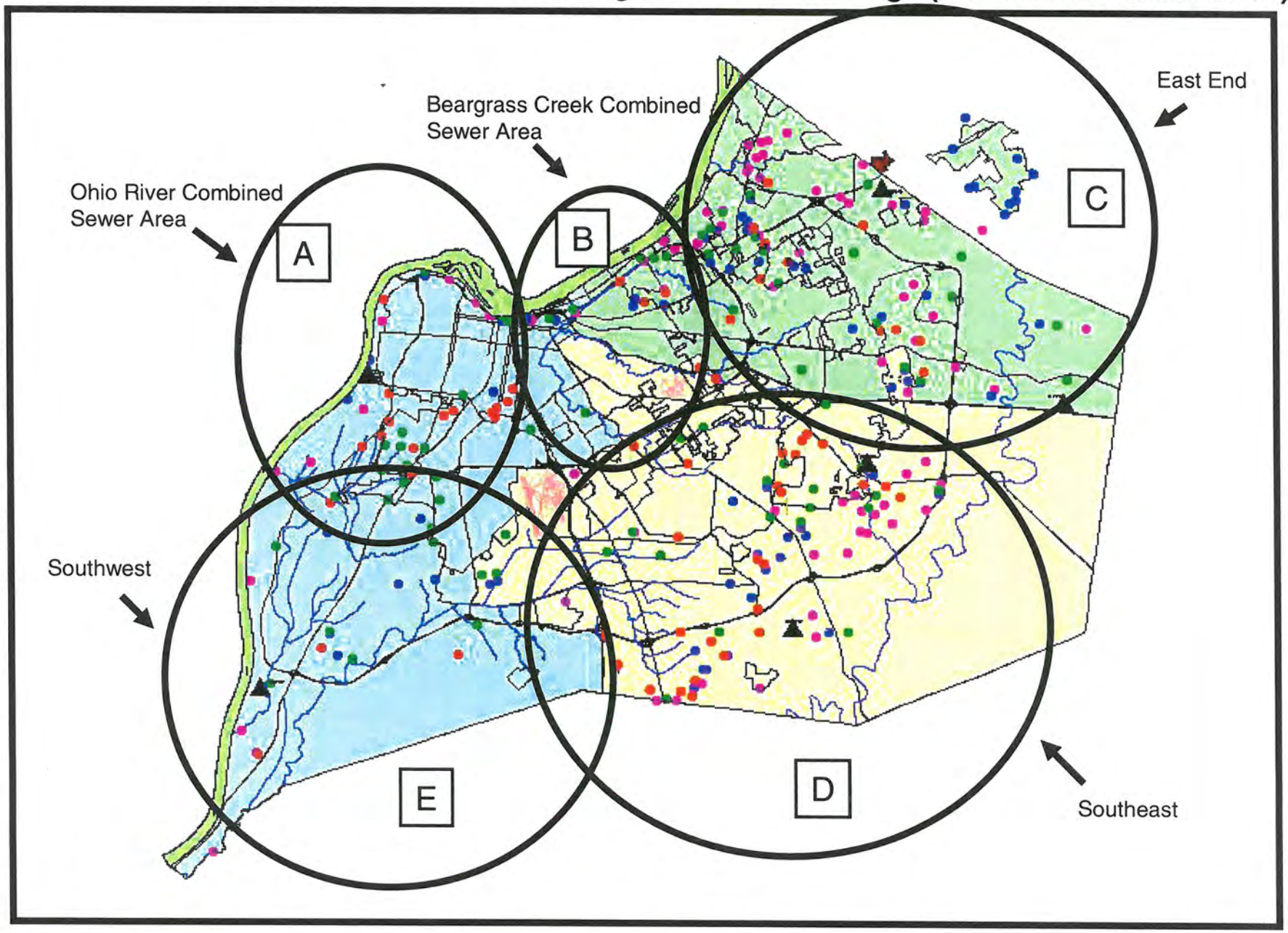
B. Overarching Questions on the Public Meetings

1. What general ideas do you have for getting people to attend the public meetings?

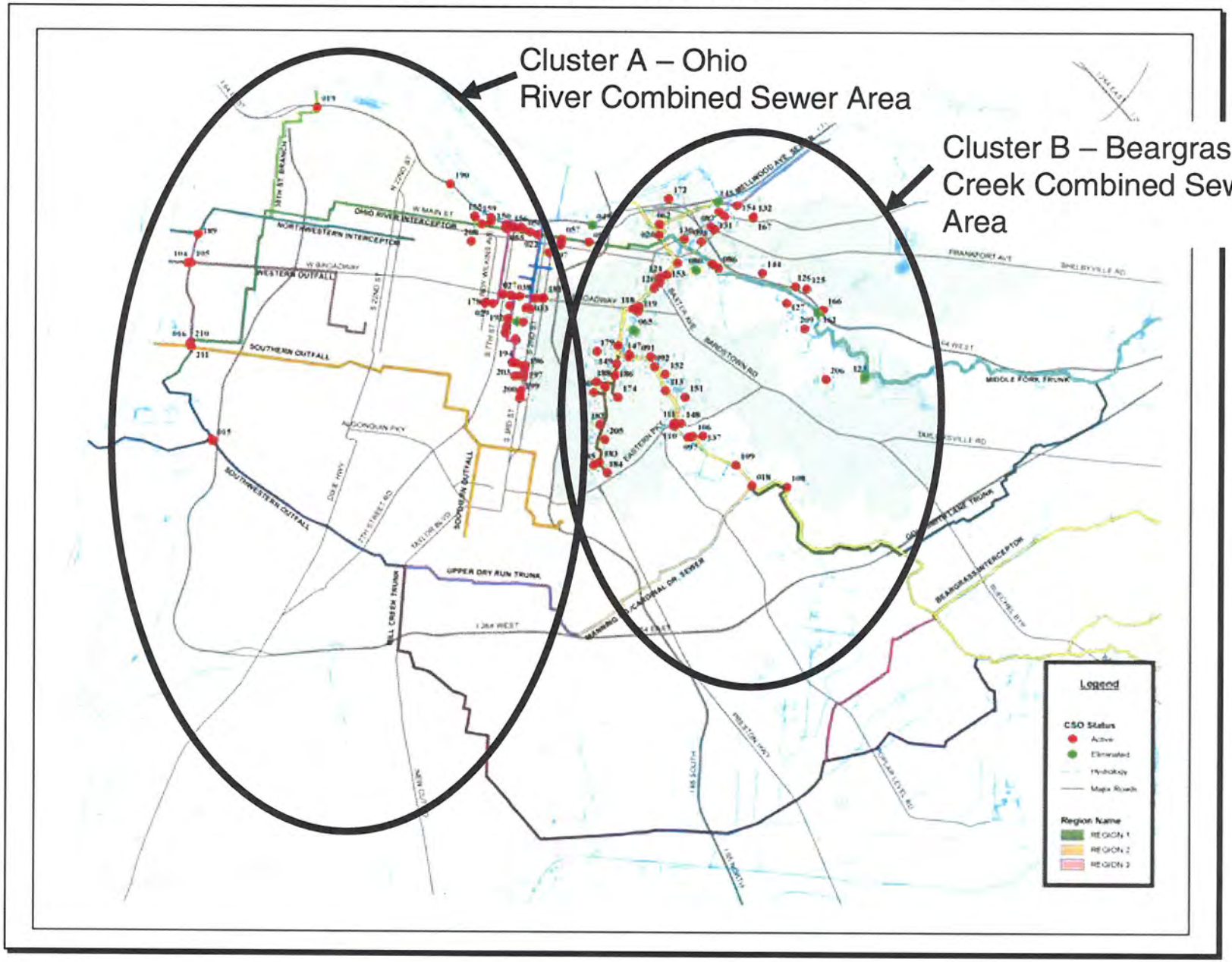
2. What, if any, changes would you suggest to the proposed format and structure of these public meetings (i.e., an overview presentation, followed by an opportunity for residents to provide feedback at tables organized by geographic area)?

3. Do you have other comments or recommendations for these public meetings?

Proposed Cluster Areas for Wet Weather Program Public Meetings (October/November 2007)



Close-Up of Cluster Areas A and B



Post-Construction Compliance Monitoring

Wet Weather Team
Stakeholder Group Meeting No. 12
September 20, 2007

Louisville & Jefferson County
Metropolitan Sewer District

Presentation Outline

- Preliminary Discussion of Compliance Monitoring Framework
- Regulatory Guidance and Requirements
- Opportunities for Enhanced System Performance
- Compliance Monitoring Components
  - Construction projects
  - Water Quality Improvements
  - Green Infrastructure Effectiveness
  - Behavior Change Effectiveness
    - Sustainability of changes
    - Effectiveness of changes

Final Compliance Monitoring Program Shaped by the Wet Weather Plan

- Monitoring sites may be adjusted to better measure performance
- Frequency of monitoring and monitored parameters will be reviewed
  - Regulatory requirements and guidance
  - Stakeholder values
- Specific quality assurance measures will guard against historical data quality issues (drift due to probe fouling, etc.)
- Measurement of behavior modification effectiveness will involve specialists engaged as part of the education activities

Intent of Post-Construction Compliance Monitoring

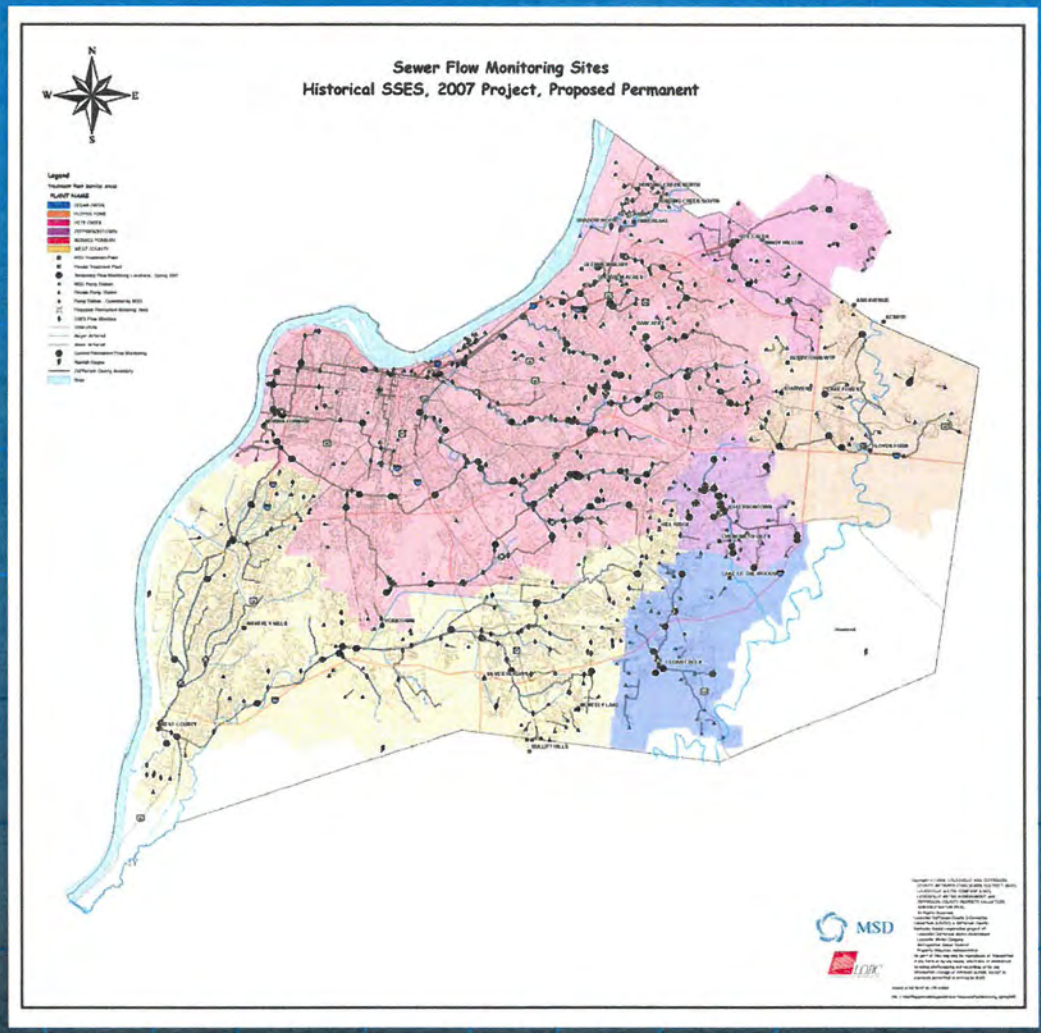
- Principles outlined in CSO Policy
  - Verify compliance with Water Quality Standards, protection of beneficial uses, and effectiveness of CSO controls
  - Evaluate if additional controls are required to achieve objectives
- LTCP Guidance Manual provides suggested approaches
- Consent Decree requires documentation of compliance with all components of the Wet Weather Plan, including CMOM and SSDP

Long-term Monitoring Offers MSD Opportunities for Plan Enhancement

- Confirm the effectiveness of MSD-owned and operated green infrastructure
- Document the extent of inter-agency cooperative projects and resulting water quality benefits
- Measure the extent, effectiveness, and sustainability of incentives, outreach, education, advertising, etc. on behavior changes that improve water quality
- Early successes can allow modifications in program direction in later years
  - "Adaptive management" is encouraged
  - Periodic re-evaluation is required (KPDES permit cycle is 5 years)
  - Proof of non-traditional approaches can eliminate or redirect projects of marginal value

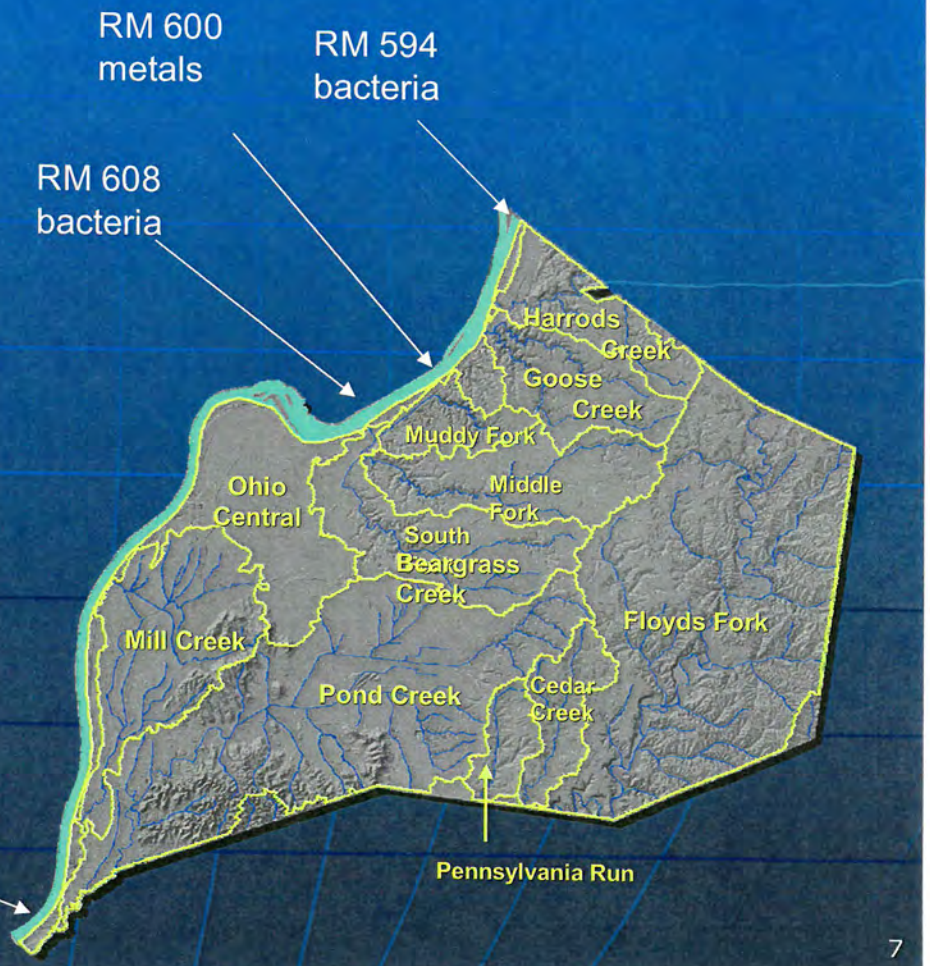
Multi-Faceted Compliance Monitoring Approach Maximizes Value to MSD

- Construction Project Monitoring
  - Schedule Milestones
  - Performance Testing
  - Project Effectiveness
    - Flow monitoring
    - Discharge sampling
    - Event recording
- Project effectiveness tied back to "average year" or target recurrence intervals
- Project monitoring short-term, only to demonstrate individual project performance



Water Quality Improvements Are Key Measures of Long-Term Effectiveness

- ORSANCO sampling represents long-term data base of Ohio River Conditions
  - Metals, nutrients & other specific chemicals bi-monthly
  - Bacteria 5/mo during contact recreation season
  - Fish populations annually
  - Fish tissue annually
  - Dioxon 3x annually
  - Future parameters and frequency to be discussed with ORSANCO as monitoring plan developed
- River flows available from USGS



MSD's Water Quality Monitoring Program Provides Continuous Measurement of Key Parameters

- Long Term Monitoring Network (LTMN)
- 28 Sites in and around Jefferson County
- Permanently installed monitors (sondes) measure DO, pH, temp, conductivity every 15 minutes year round
- Permanently installed USGS stream flow gauges
- Data available live on USGS web site

Regular Sampling Provides Baseline Conditions for Bacterial and Chemical Pollutants

- 28 LTMN Sites
- Laboratory Data
  - Recreational Contact sampling: 5 Fecal Coliform samples per month May through October
  - Quarterly samples for conventional pollutants, nutrients, and metals
- Future sites and analyses reviewed during Wet Weather Plan development

Biological and Habitat Monitoring Address Key Stakeholder Value

- 28 LTMN Sites
- Biological Data
  - Fish surveys produce Index of Biotic Integrity (IBI)
  - Macroinvertebrate surveys produce similar Index of Biotic Integrity (IBI)
  - Habitat Assessment performed as part of the macroinvertebrate surveys
  - Algae surveys produce Diatom Bioassessment Index (DBI)
  - Improvement of data accessibility a current MSD initiative
- Site location and analyses subject to review during plan development

HABITAT ASSESSMENT FIELD DATA SHEET – HIGH GRADIENT STREAMS (FRONT)

STREAM NAME		LOCATION	
STATION #	RIVERMILE	COUNTY	STATE
LAT	LONG	RIVER BASIN	
CLIENT		PROJECT NO.	
INVESTIGATORS/CREW			
FORM COMPLETED BY	DATE____ TIME ____ AM PM	REASON FOR SURVEY	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.	40-70% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16			
2. Embeddedness	Gravel, cobble, and boulder particles are 0-			

Green Infrastructure Requires Tailored Monitoring Approach

- Approach will differ by scale
  - Regional
  - Watershed
  - Neighborhood
  - Parcel
- Approach will differ by type
  - Constructed facility (MSD owned or not)
  - Incentivized cooperation
  - Education, advertising, etc.
- Approach may require different skills and approaches
  - Horticulture
  - Marketing
- Monitoring must show effectiveness and sustainability to justify impact on later phases of Consent Decree implementation
- Monitoring will be integral to development of each Green Infrastructure project

Behavior Change Monitoring For Effectiveness and Sustainability

- Measures of activity will not justify future modifications to plan implementation – results relative to value protection is what really counts
- Effectiveness measures may be derived from advertising industry
  - How many people did we reach?
  - How many people remember the message?
  - How many people changed their behavior?
  - What measurable benefits can we attribute to this behavior change?
- Effectiveness measures may be highly specific (number of rain barrels in service) or more general (understanding of water quality issues, support for MSD's actions, etc.)
- Sustainability measures drive future education programs and support consideration of behavior change benefits in reducing future program construction of marginal projects

Stakeholder Input Desired

- What did we forget? What are the gaps in our monitoring concepts?
- What additional information would be useful to you in the future?
- Who are the local experts we should consult with, especially related to measuring effectiveness and sustainability of education and behavior-change efforts?

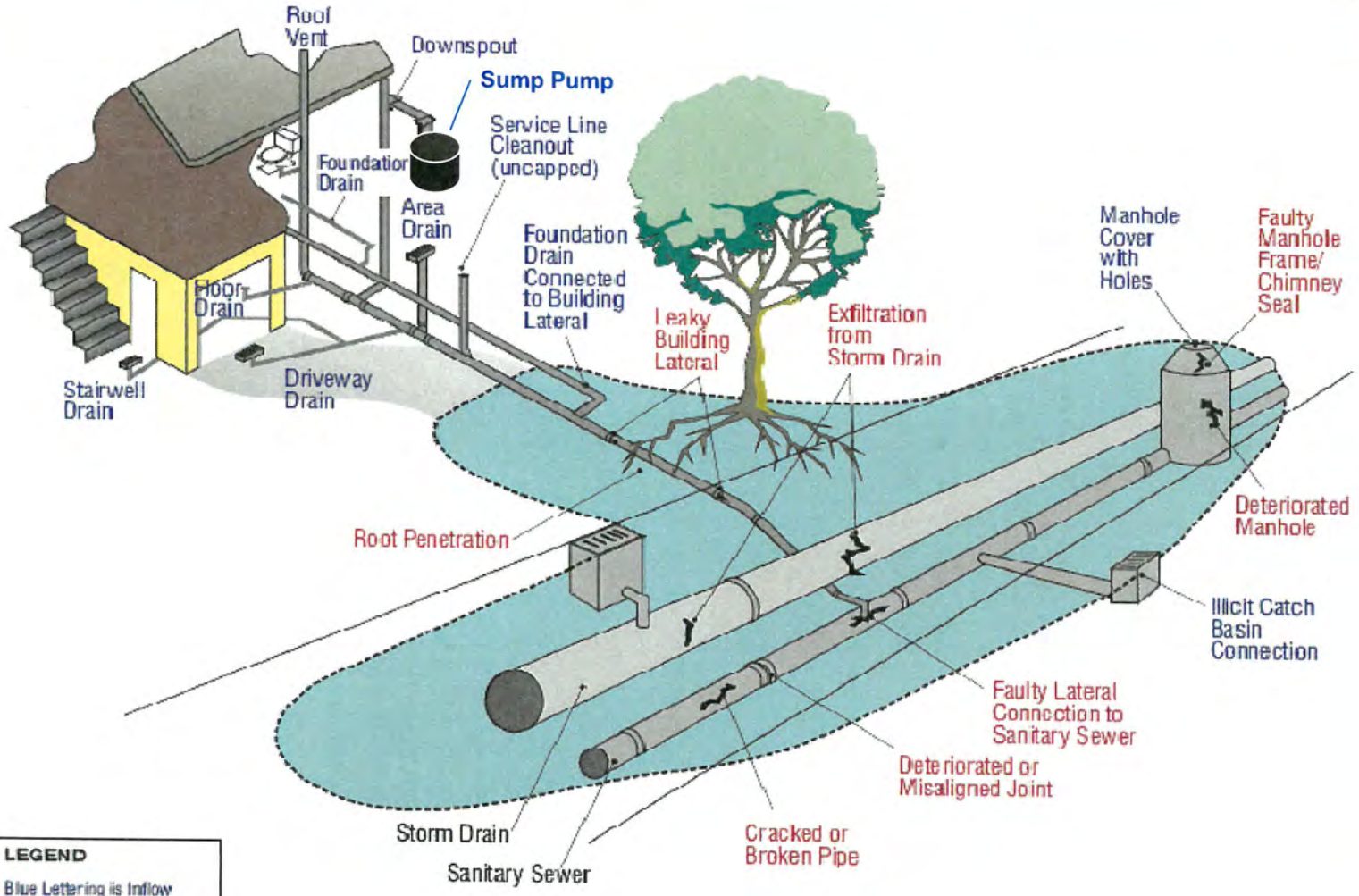
Discussion
Summary
Wrap-up

SSO Control Strategies
Part 1: Remediation Techniques

Wet Weather Team
Stakeholder Group Meeting No. 12
September 20, 2007

Louisville & Jefferson County
Metropolitan Sewer District

Sanitary Sewer Overflow - SSOs



From City Of Chino, CA

Typical Sources of Infiltration and Inflow

Overview

- PART 1: Remediation Techniques
  - Flow Reduction
  - Transport and Diversion
  - Storage
- PART 2: Potential Solutions
  - Overview of MSD Service Area
  - By Watershed
    - Specific to Middle Fork
    - General for Other Watersheds

Remediation Techniques

- Flow-Reduction
- Transport and Diversion
- Storage

Flow-reduction Solutions involve eliminating SSOs by reducing inflow and infiltration the first place.

Transport or Diversion Solutions involve eliminating SSOs by increasing downstream capacity. *They are presented together since the techniques are similar.*

Storage Solutions involve eliminating SSOs by temporarily storing waste water.

Treatment Solutions (except for new wastewater treatment plants) are generally not viable for SSOs: the SSO is to be eliminated not treated.

Remediation Techniques
Flow reduction

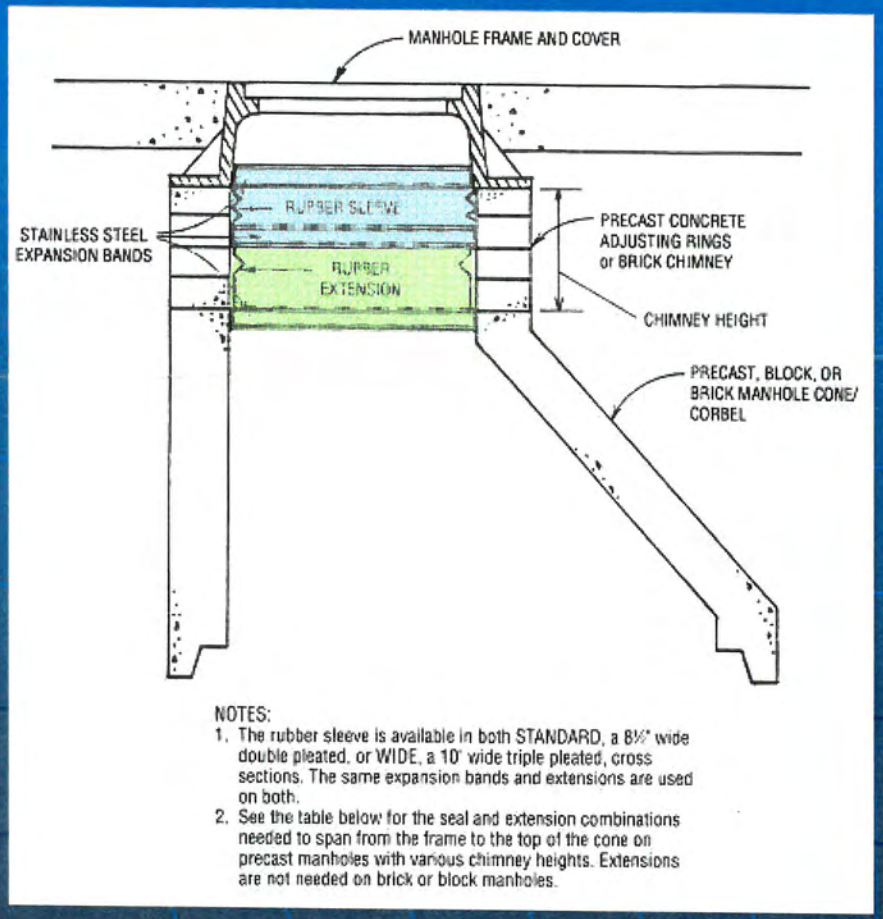
- Typical In-situ Remediation
- Private Property
- Pluses and Minuses

Flow-reduction Solutions involve eliminating SSOs by reducing inflow and infiltration the first place.

This could involve tightening up existing piping and manholes, re-routing private and illicit connections and flood proofing.

These solutions often decrease treatment requirements. But such solutions must be comprehensive to be effective.

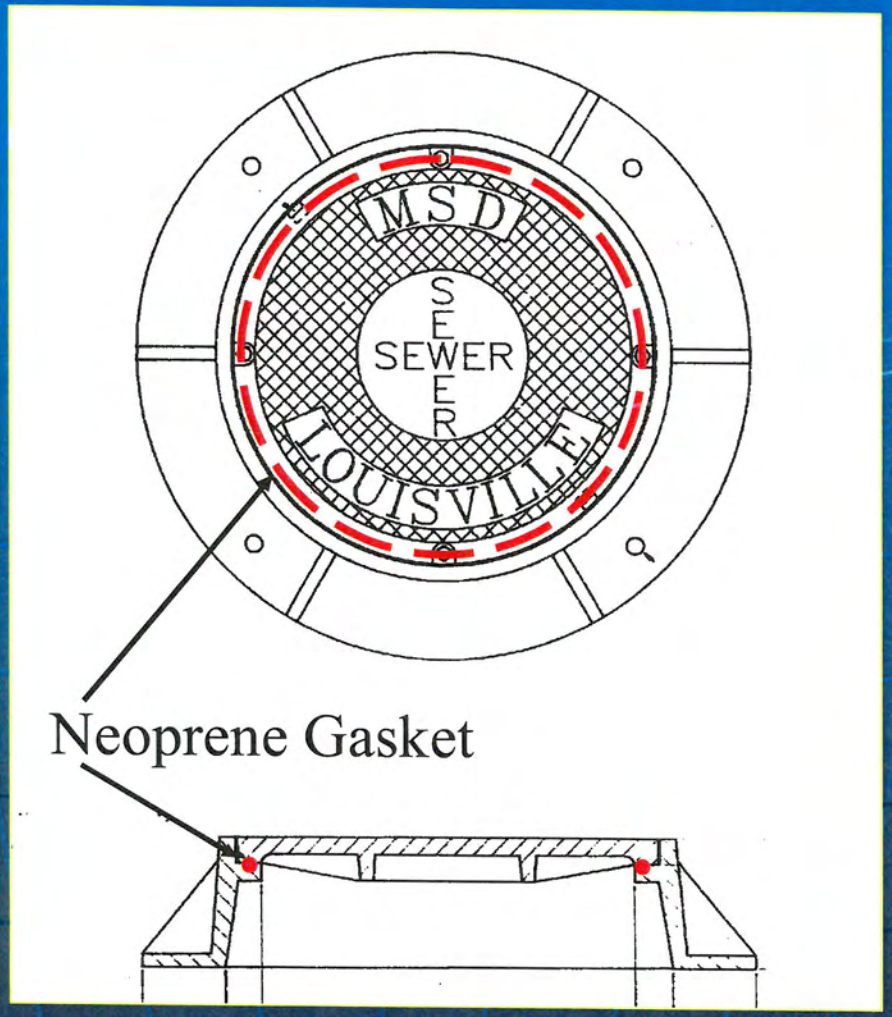
Chimney Seals



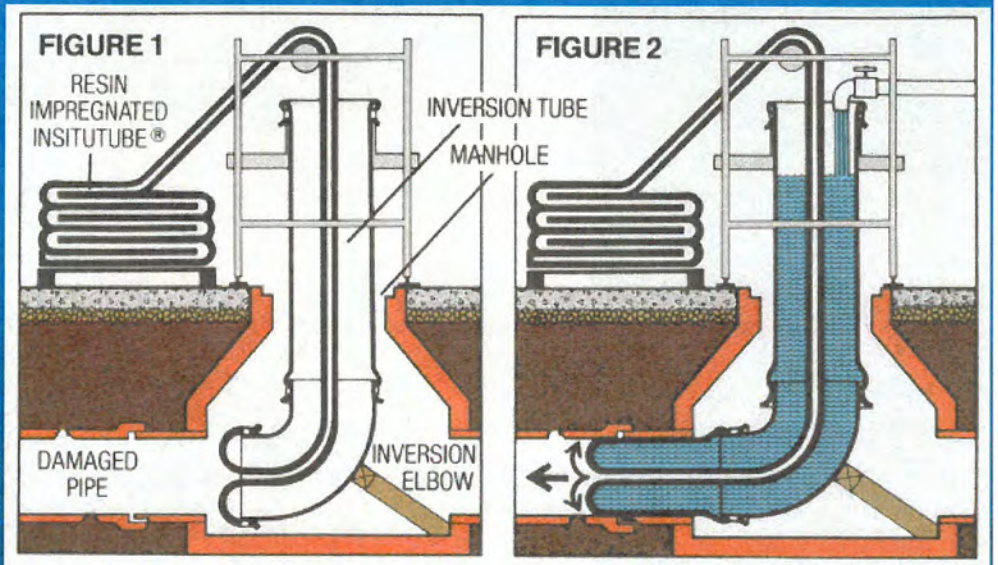
NOTES:
1. The rubber sleeve is available in both STANDARD, a 8½" wide double pleated, or WIDE, a 10" wide triple pleated, cross sections. The same expansion bands and extensions are used on both.
2. See the table below for the seal and extension combinations needed to span from the frame to the top of the cone on precast manholes with various chimney heights. Extensions are not needed on brick or block manholes.

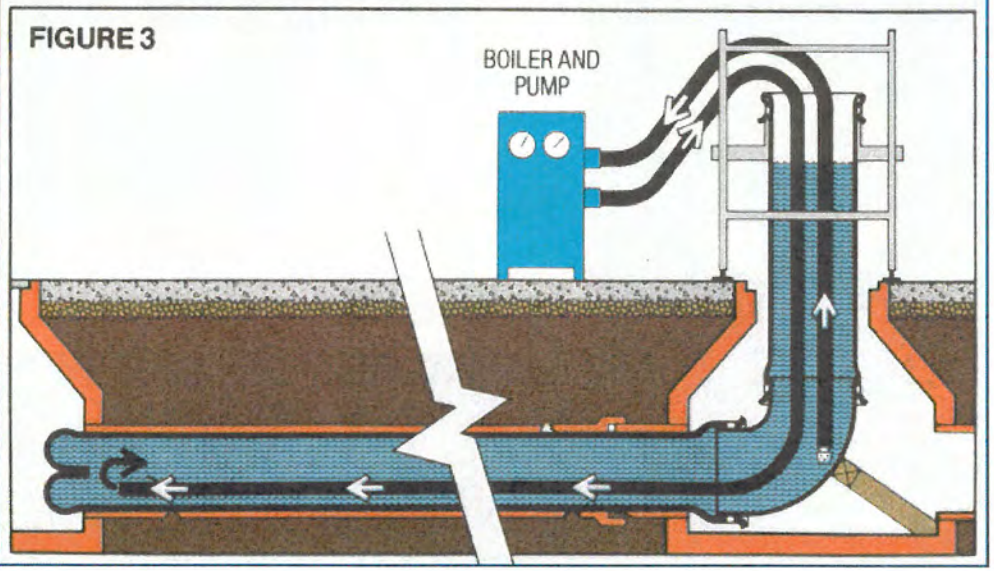
Manhole Repair

Water Tight Lid in Flood Prone areas



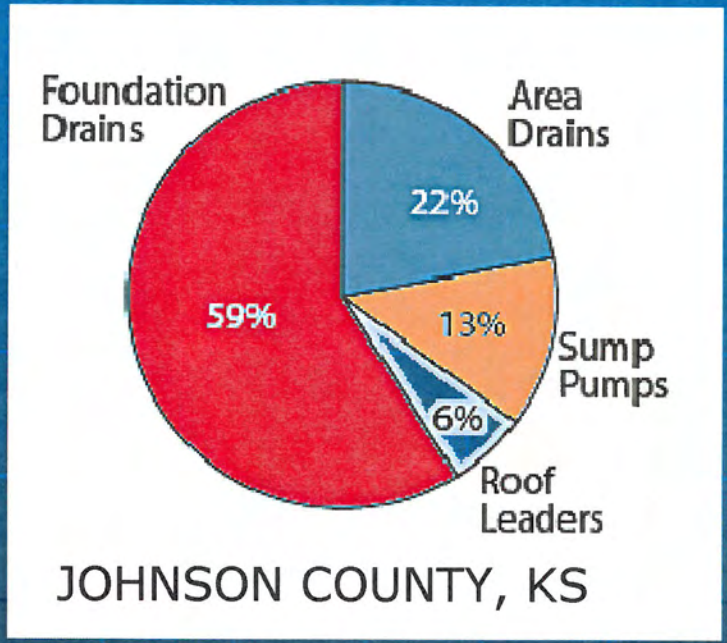
Installation of Cured-in-place Pipe





Property Service Connections Repair

Private Property



- Reroute
  - Sump Pumps
  - Area Drains
  - Foundation Drains
  - Roof Leaders
- In general, reroute clean water not purchased from Louisville Water Co

Flow-reduction Solutions

- Pluses
  - Relatively Inexpensive
  - Generally within existing Right of Way
  - Lower Long-term Operation & Maintenance (O&M) costs relative to other solutions
  - Reduces flow, treatment requirements and is applied near the problem
- Minuses
  - Effectiveness is debatable: unless comprehensive on both public and private side, water will find another way into the system
  - Must be maintained by private side
  - May not directly benefit homeowner

Remediation Techniques
Transport and Diversion

- Open Cut
- Horizontal Directional Drilling (HDD)
- Pipe Bursting
- Pump Stations
- Pluses and Minuses

Transport or Diversion Solutions involve eliminating SSOs by increasing downstream capacity.

This could involve increasing existing pipe sizes, increasing pumping capacity, building new pipes and pumps or diverting peak flow to systems with excess capacity.

These solutions often increase treatment requirements and must be evaluated for downstream impacts.

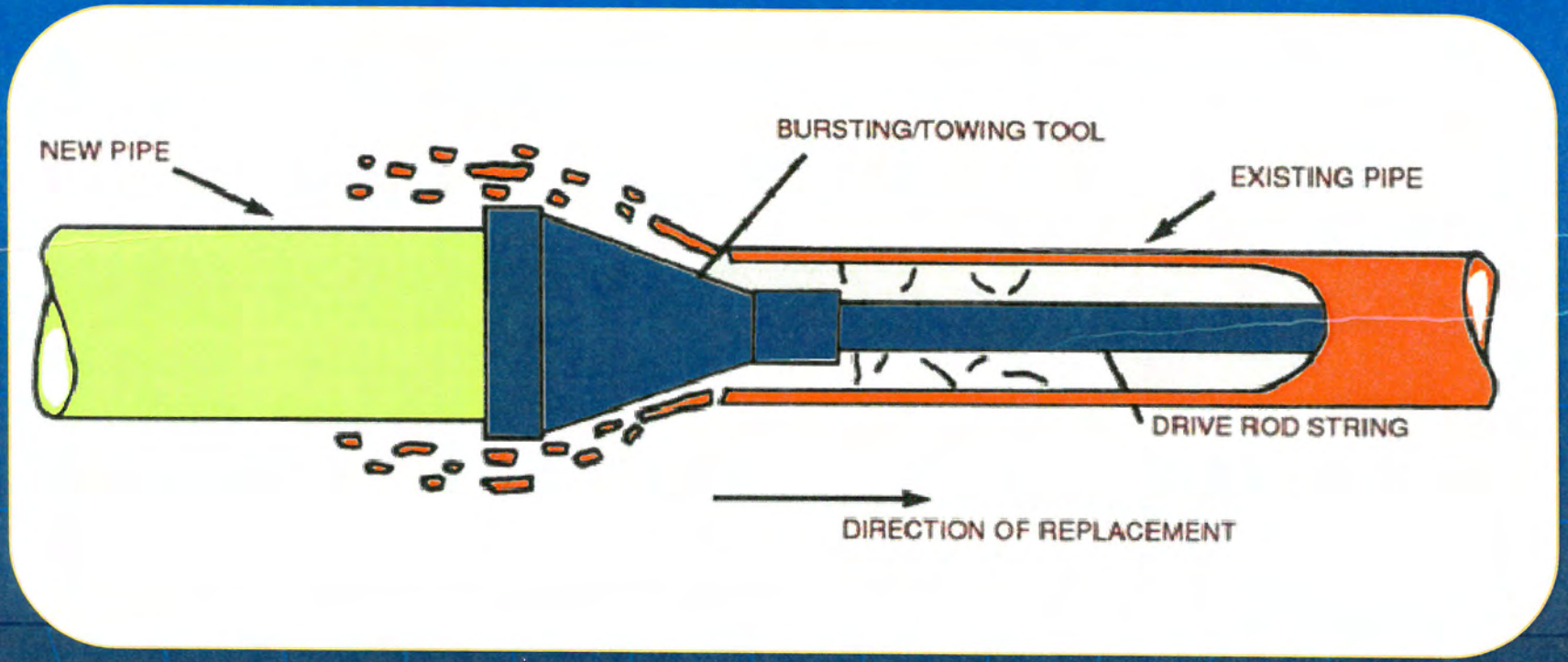
Traditional Method of Sewer Line Replacement

Horizontal Directional Drilling (HDD)

Above Left: A pulling head is attached to a fused length of PVC pipe.
Below: PVC pipe joints are fused together as part of this HDD installation.
Right: One method of creating a restrained PVC pipe joint.
Below Left: Drilling Machine

undergroundconstructiononline.com
September 2005
Baker Hughes Drilling Fluids ®

Pipe Bursting



Pump Stations

Louisville & Jefferson County
Metropolitan Sewer District

Transport Solutions

- Pluses
  - Generally within existing Right of Way
  - No additional odors and debris
  - Lower Long-term Operation and Maintenance (O&M) costs relative to Storage
- Minuses
  - Increases downstream flow
  - Increases treatment requirement
  - Impacts on traffic

Diversion Solutions

- Pluses
  - Take advantage of Capacity in nearby systems
  - Generally within existing Right of Way
  - Excellent Real-time control opportunities
  - Lower Long-term O&M costs relative to Storage
- Minuses
  - Few good opportunities
  - Increases downstream flow
  - Increases treatment requirement
  - Pump Station usually required
  - Impacts on Traffic

Remediation Techniques
Storage

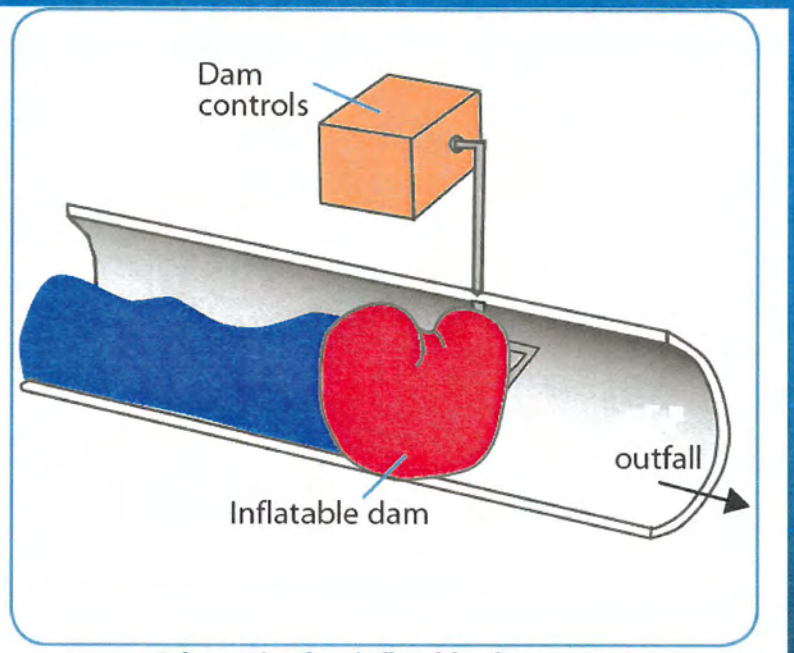
- In-line
- Off Line
- Open
- Covered
- Pluses and Minuses

Storage Solutions involve eliminating SSOs by temporarily storing waste water.

This usually involves storage basins with ancillary piping and pumping. The system fills during wet weather and is drained back as either treatment or sewer become available.

These solutions do not increase treatment requirements. They can have benefits downstream as well.

In-Line Storage (Just one example)



Schematic of an inflatable dam system.

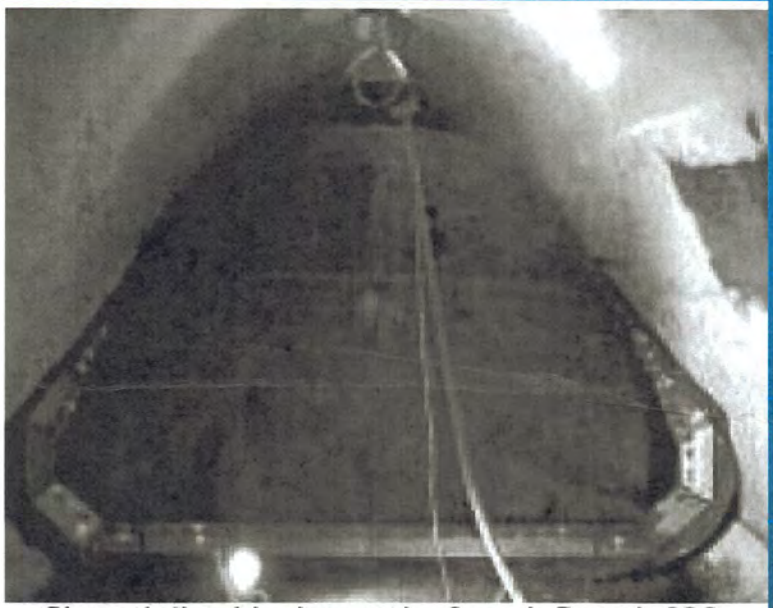


Photo: Inflatable dam at the Sneads Branch CSO.
Courtesy of LJCMSD

Sneads Branch

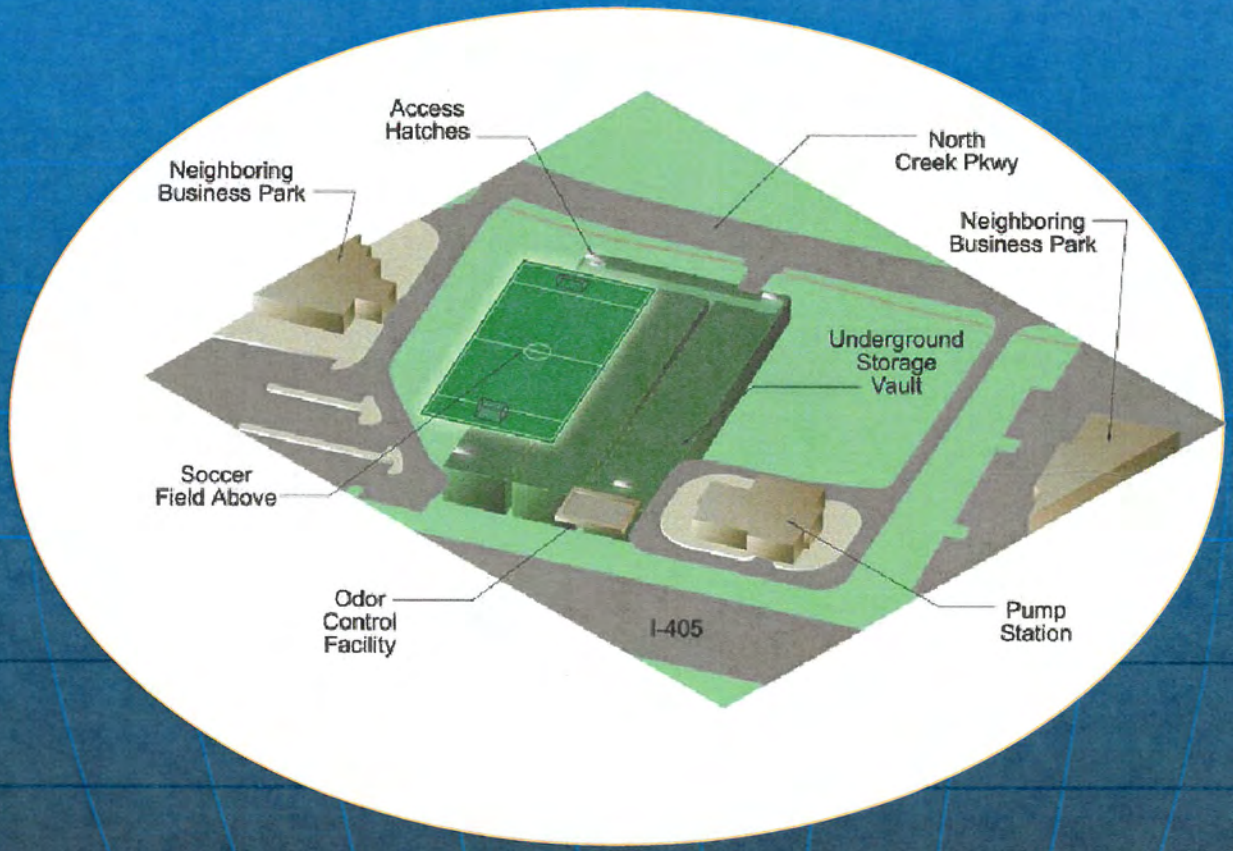
Off-line Open Storage

- 15.4 Million Gallon (MG) Basin at Brady Lake Site
- 11.8 MG Basin at Executive Inn Site
- 1,922 LF of New 60" Pipe to Executive Inn Basin
- Reduces Average Annual Overflow Volume by 92 MG/YR
- Capital Cost = $8.4 Million

Upper Dry Run Trunk Storage Facility

Off-line Covered Storage Layout

North Shore Storage facility
WA State



Covered Storage During and After Construction

North Shore Storage facility
WA State

Louisville & Jefferson County
Metropolitan Sewer District

Another example
Covered Storage

Dearborn Storage Basin
Wayne County, MI
Combined Sewer Overflow
Demonstration Project

Storage Solutions

- Pluses
  - No increase in downstream flow
  - Can store until treatment or sewer capacity is available
  - Real-time control opportunities
  - Can be less costly than transport
- Minuses
  - Large Footprint
  - Pumping often required
  - Odors and debris
  - Long-term O&M costs relative to transport
  - Costly, especially if covered

Summary

- Inflow and Infiltration
  - Manholes
  - Sewers
  - Private Property: drains, sump pumps roofs
- Remediation Techniques
  - Flow Reduction
  - Transport and Diversion
  - Storage
- Flow Reduction Techniques
  - Chimney Seals
  - Manhole Repair
  - Water-tight lid
  - Installation of Cured-in-place Pipe
  - Property Service Connections Repair
  - Private Property
- Transport and Diversion Techniques
  - Traditional Method of Sewer Line Replacement
  - Horizontal Directional Drilling HDD
  - Pipe Bursting
  - Pump Stations
- Storage Techniques
  - In-line
  - Off Line
    - Open
    - Covered
- Part 2: Potential Solutions
  - Overview of MSD Service Area
  - Possible Downstream Transport routes
  - Possible Storage Sites
    - Upstream surcharge areas
    - Open areas
  - Solutions Specific to Middle Fork
  - General for Other Watersheds

SSO Control Strategies
Part 2: Potential Solutions

Wet Weather Team
Stakeholder Group Meeting No. 12
September 20, 2007

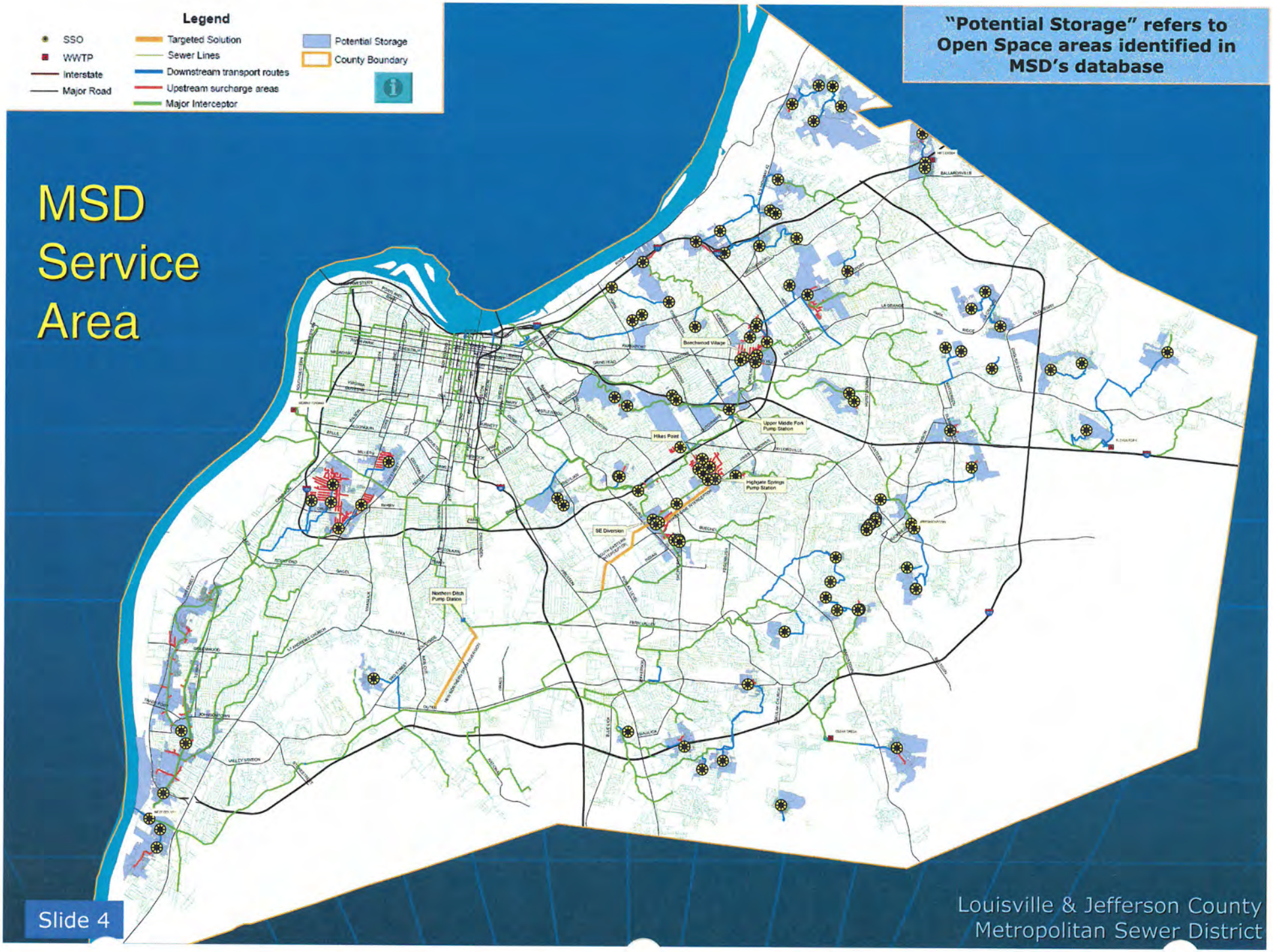
Louisville & Jefferson County
Metropolitan Sewer District

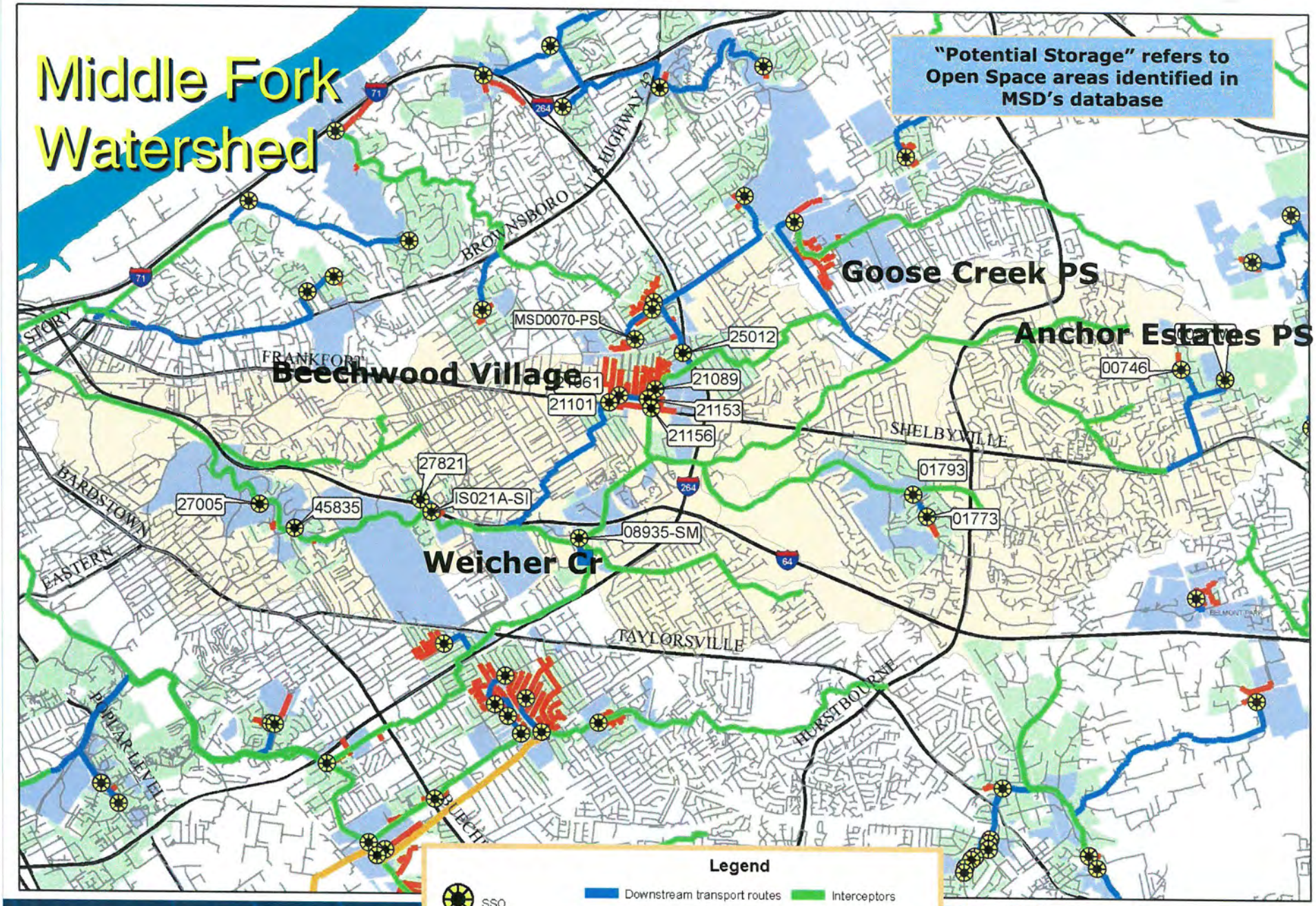
Part 2: Potential Solutions

- Entire MSD Service Area
- Each watershed
  - **Aerial photography where scale provides meaningful resolution**
  - Possible Downstream Transport routes
  - Upstream surcharge areas
  - Open areas
  - Various features
- For Middle Fork will show 7 potential solutions
- For Other watershed reference Middle Fork

Helpful Guidance for Potential Solutions

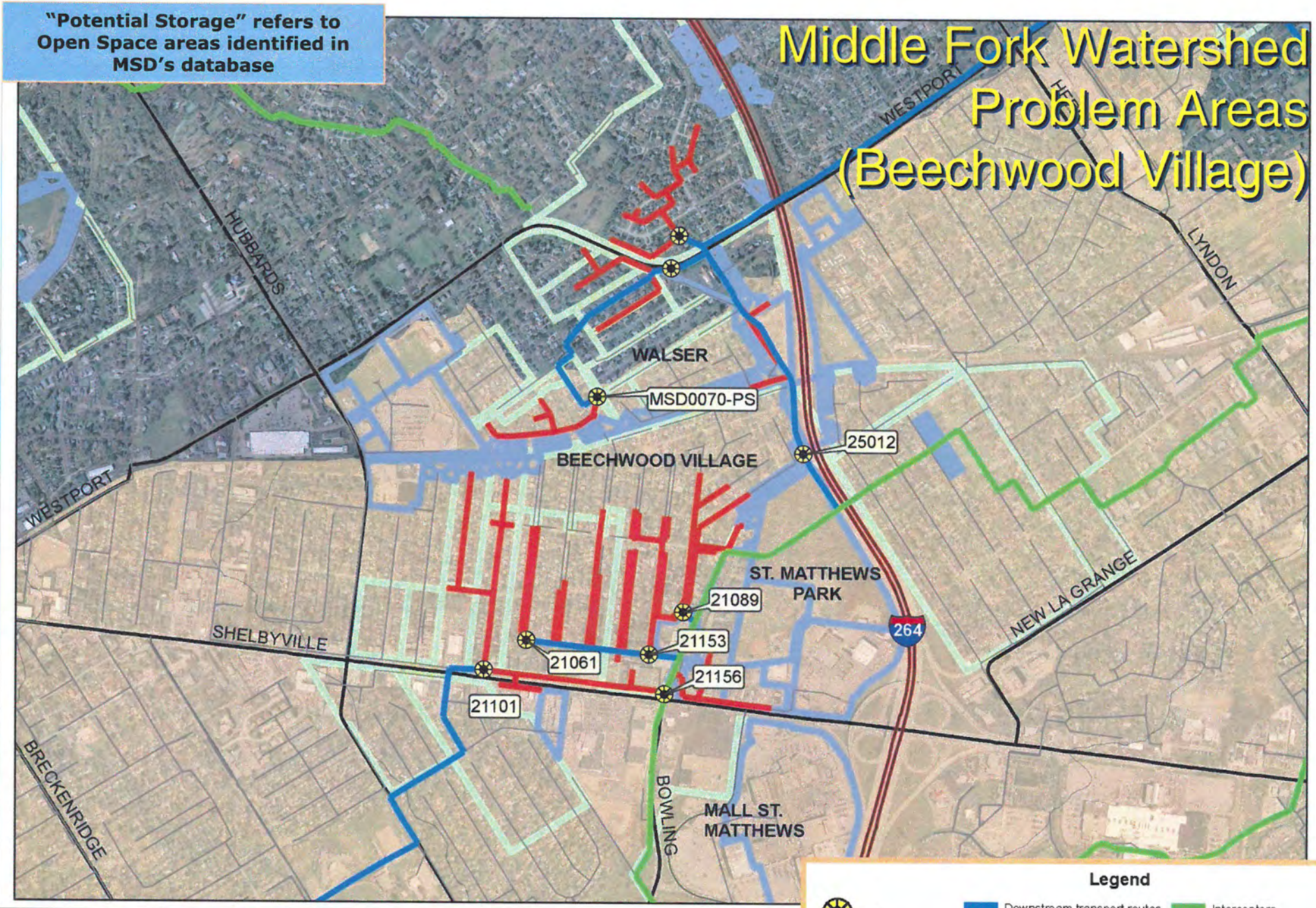
- When providing Comments and asking Questions, please:
  - Bring up any additional opportunities and key concerns.
  - Consider costs: nothing is free.
  - Consider Multi-use (e.g. recreation, industrial, PARK and TARC, bike trails).
  - Consider new additions (e.g. soccer fields where there are none).
- Please think outside the box. Everything is up for consideration. And nothing is foolish.


Legend
SSO
WWTP
Interstate
Major Road
Targeted Solution
Sewer Lines
Downstream transport routes
Upstream surcharge areas
Major Interceptor
Potential Storage
County Boundary
"Potential Storage" refers to Open Space areas identified in MSD's database
MSD Service Area
Bonchenwood Village
Hikes Point
Upper Middle Fork Pump Station
Highgate Springs Pump Station
SE Diversion
Northern Ditch Pump Station
Louisville & Jefferson County Metropolitan Sewer District
Slide 4


Middle Fork Watershed
"Potential Storage" refers to Open Space areas identified in MSD's database
Goose Creek PS
Anchor Estates PS
Beechwood Village
Weicher Cr
MSD0070-PS
25012
21089
21101
21153
21156
27821
IS021A-SI
27005
45835
08935-SM
00746
01793
01773
BROWNSBORO
HIGHWAY 42
FRANKFORT
STORY
SHELBYVILLE
BARDSTOWN
EASTERN
TAYLORSVILLE
HURSTBOURNE
POPLAR LEVEL
Legend
SSO
Downstream transport routes
Upstream surcharge areas
Interstate
Sewer Lines
Interceptors
Potential Storage
Subdivision
Watershed

"Potential Storage" refers to Open Space areas identified in MSD's database

Middle Fork Watershed Problem Areas (Beechwood Village)



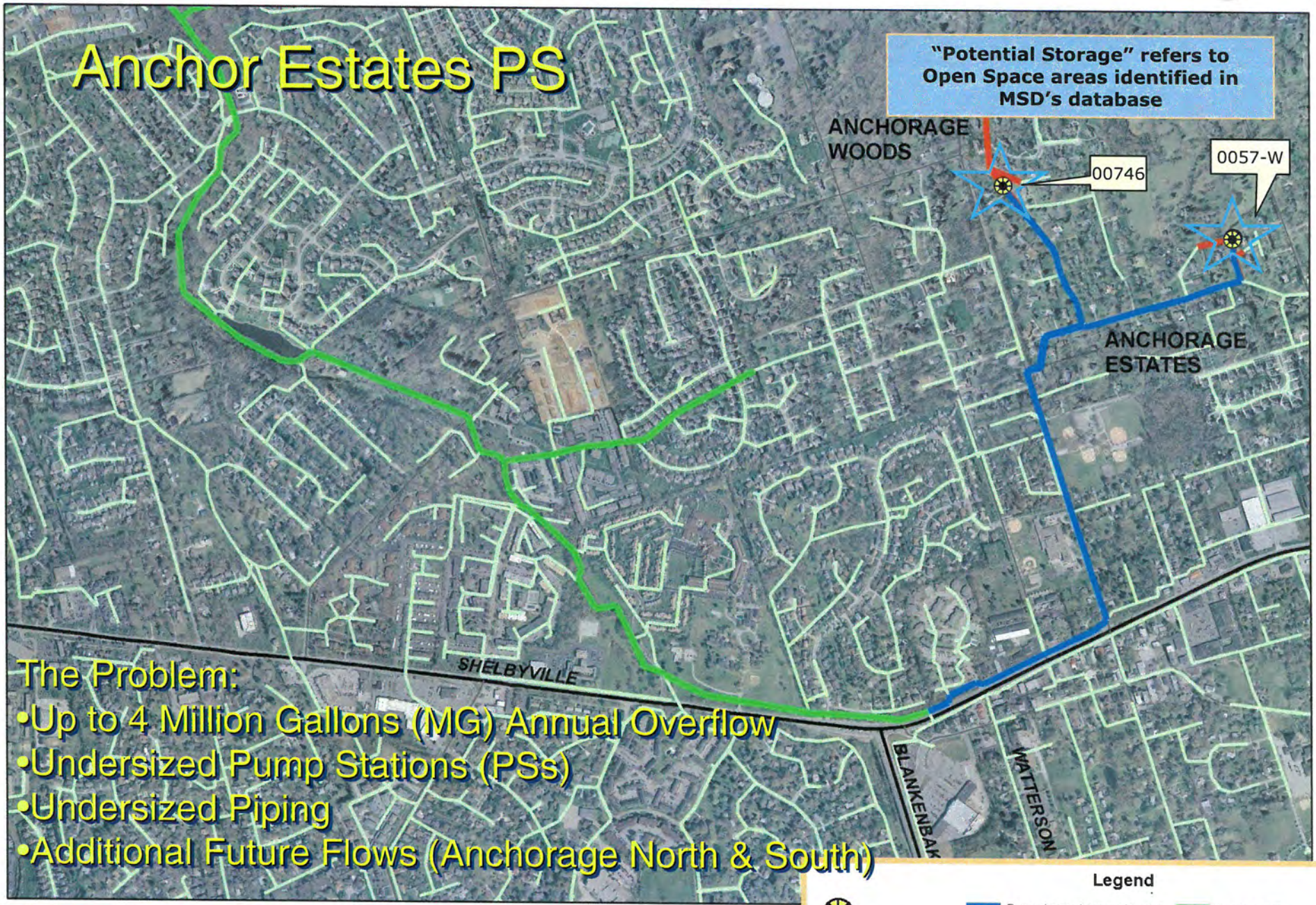
Middle Fork Watershed Issues

- Beechwood Village sewer system:
  The quintessential SSO / Inflow and Infiltration (I&I) Problem
  - Constructed in the 60's using Clay Pipe cut into bedrock
  - Dual collector sewers in each street
  - Initially included roof drains
  - High groundwater leading to I&I
  - Numerous sump pump connections
  - Pumping required to prevent basement flooding
  - Limited area for storage
- Interceptor bottlenecks (Mall area, upstream)
- Undersized Pump Stations
- Illegal connections – roof drains and sump pumps
- Old system, old technologies, old way of thinking about sewers
- In general, the usual suspects

SSO Remediation Options

- Three Representative Systems
  - Anchor Estates Pump Station (PS)
    - Up to 4 Million Gallons Annual Overflow
    - Undersized system locally
    - Future Flows Planned
  - Goose Creek PS
    - Up to 0.25 Million Gallons Annual Overflow
    - 7.4 MGD Pump Station has significant impact on downstream Overflows
  - Weicher Creek
    - Up to 1.25 Million Gallons Annual Overflow

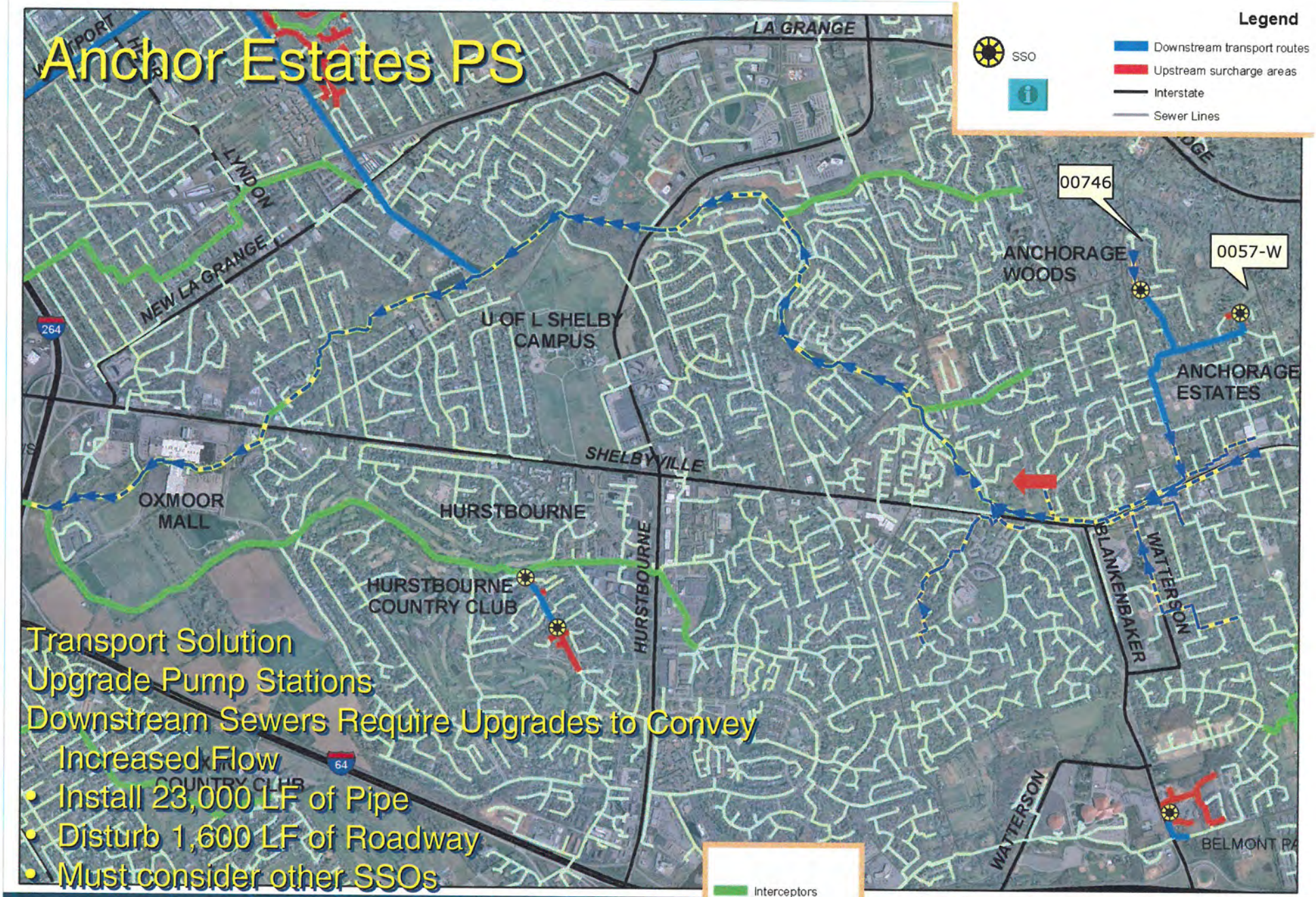
Anchor Estates PS



The Problem:

- Up to 4 Million Gallons (MG) Annual Overflow
- Undersized Pump Stations (PSs)
- Undersized Piping
- Additional Future Flows (Anchorage North & South)

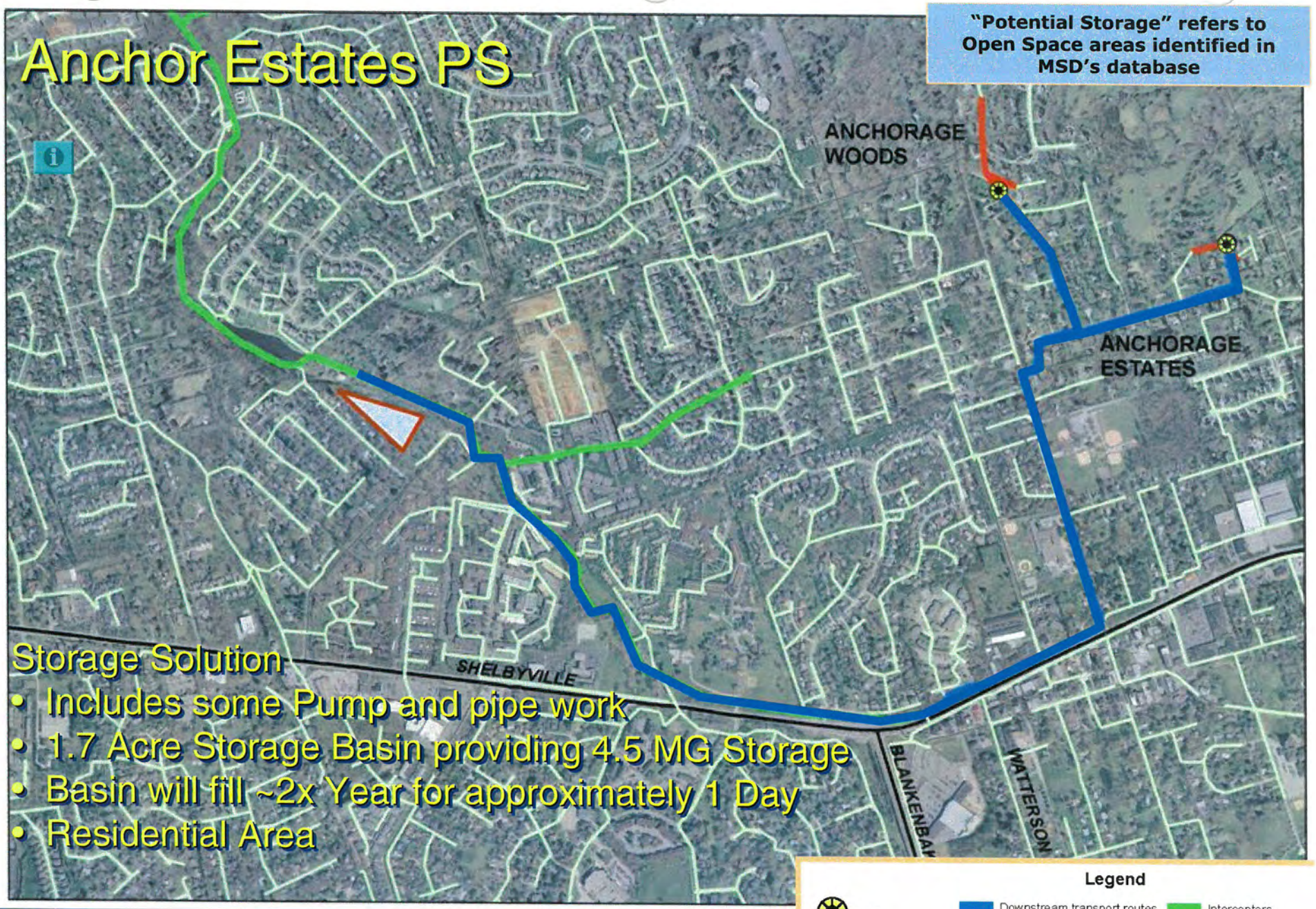
Anchor Estates PS



Transport Solution
Upgrade Pump Stations
Downstream Sewers Require Upgrades to Convey Increased Flow

- Install 23,000 LF of Pipe
- Disturb 1,600 LF of Roadway
- Must consider other SSOs

Anchor Estates PS

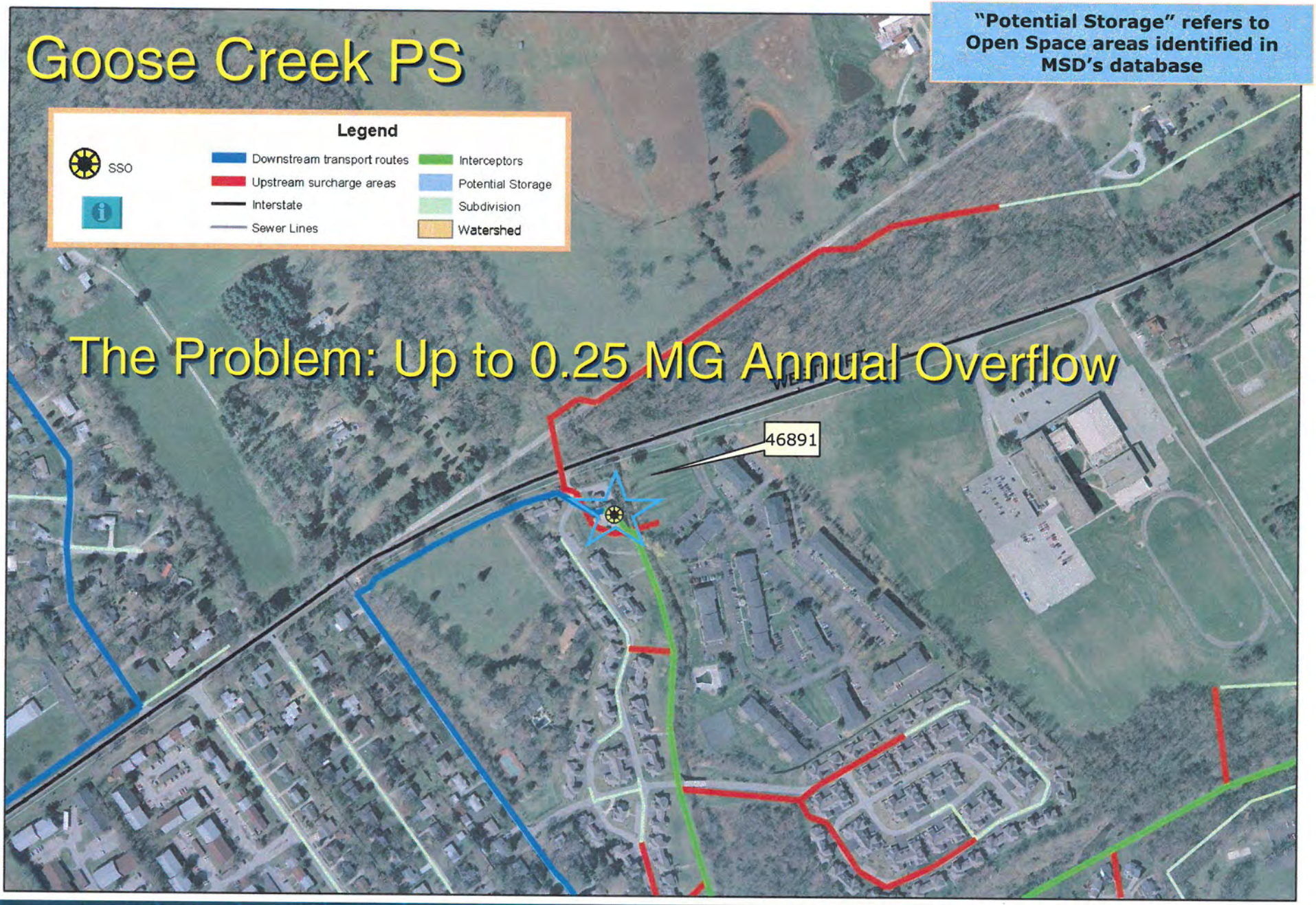


Storage Solution

- Includes some Pump and pipe work
- 1.7 Acre Storage Basin providing 4.5 MG Storage
- Basin will fill ~2x Year for approximately 1 Day
- Residential Area

Goose Creek PS

"Potential Storage" refers to Open Space areas identified in MSD's database



The Problem: Up to 0.25 MG Annual Overflow

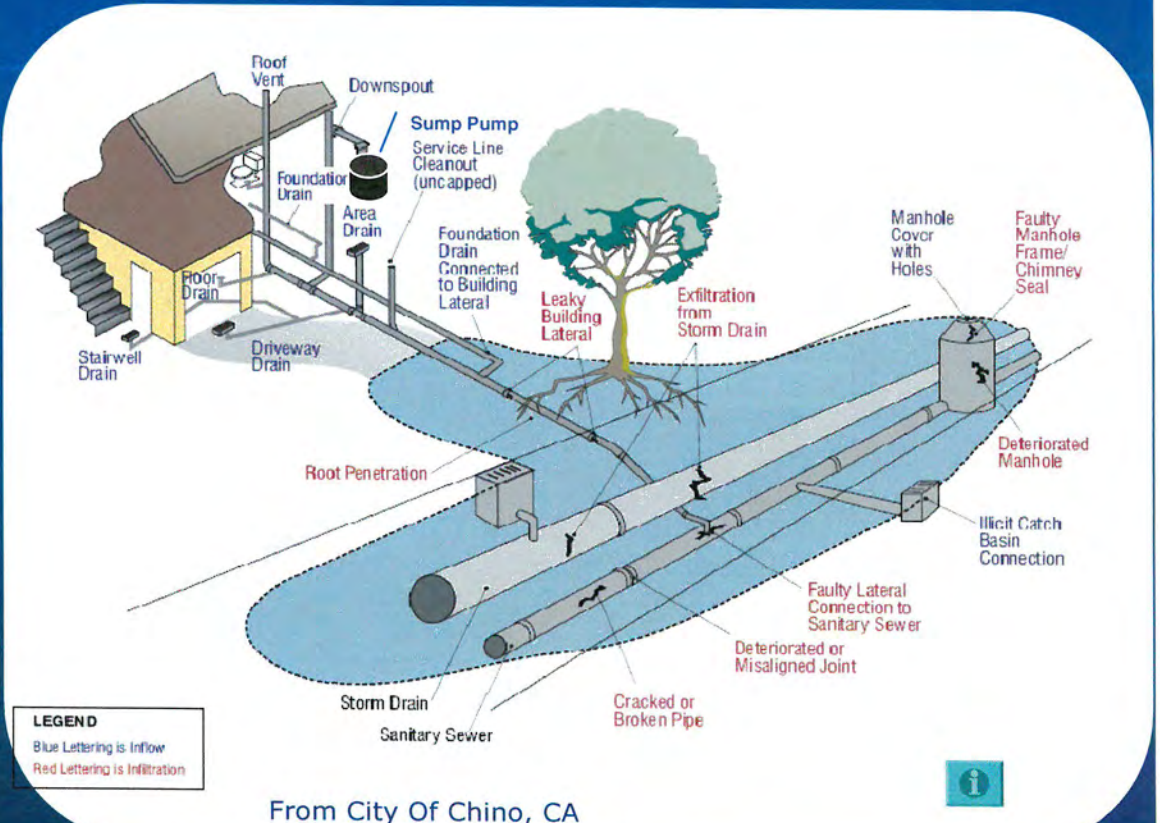
Goose Creek PS Flow-reduction

- Flow-Reduction requirements
  - 7% volume reduction
  - 25% peak-flow reduction
- Possible but not probable to eliminate overflow for large events
- Probable to reduce facility size

- Moderate overflow frequency
- Moderate overflow volume

Statistics on Watershed

- 650 Manholes
- 141,000 Feet of Pipe
- Approximately 3500 homes
- High Peaking factor: Wet-weather flow is 20 times Dry-weather flow

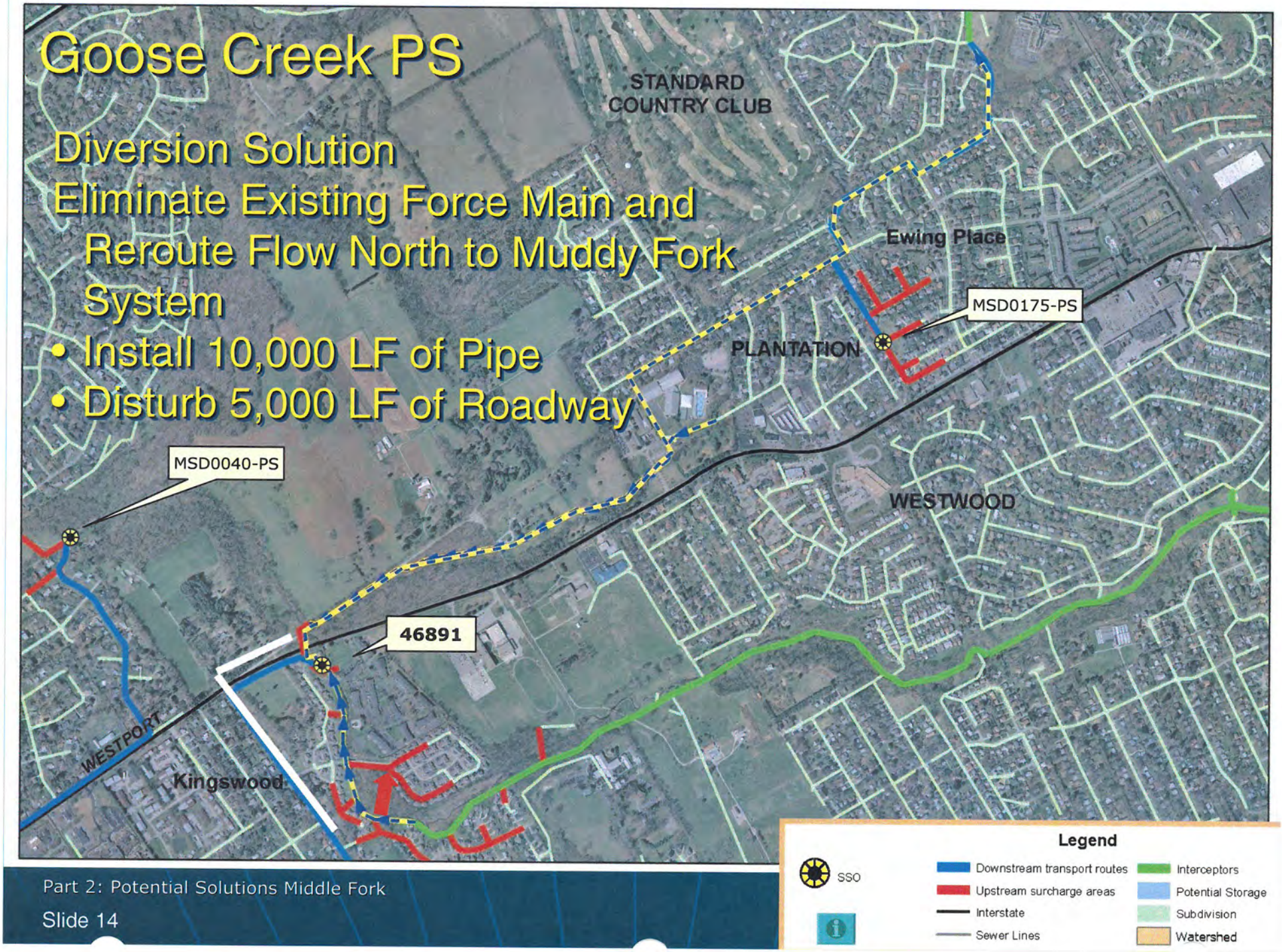


From City Of Chino, CA

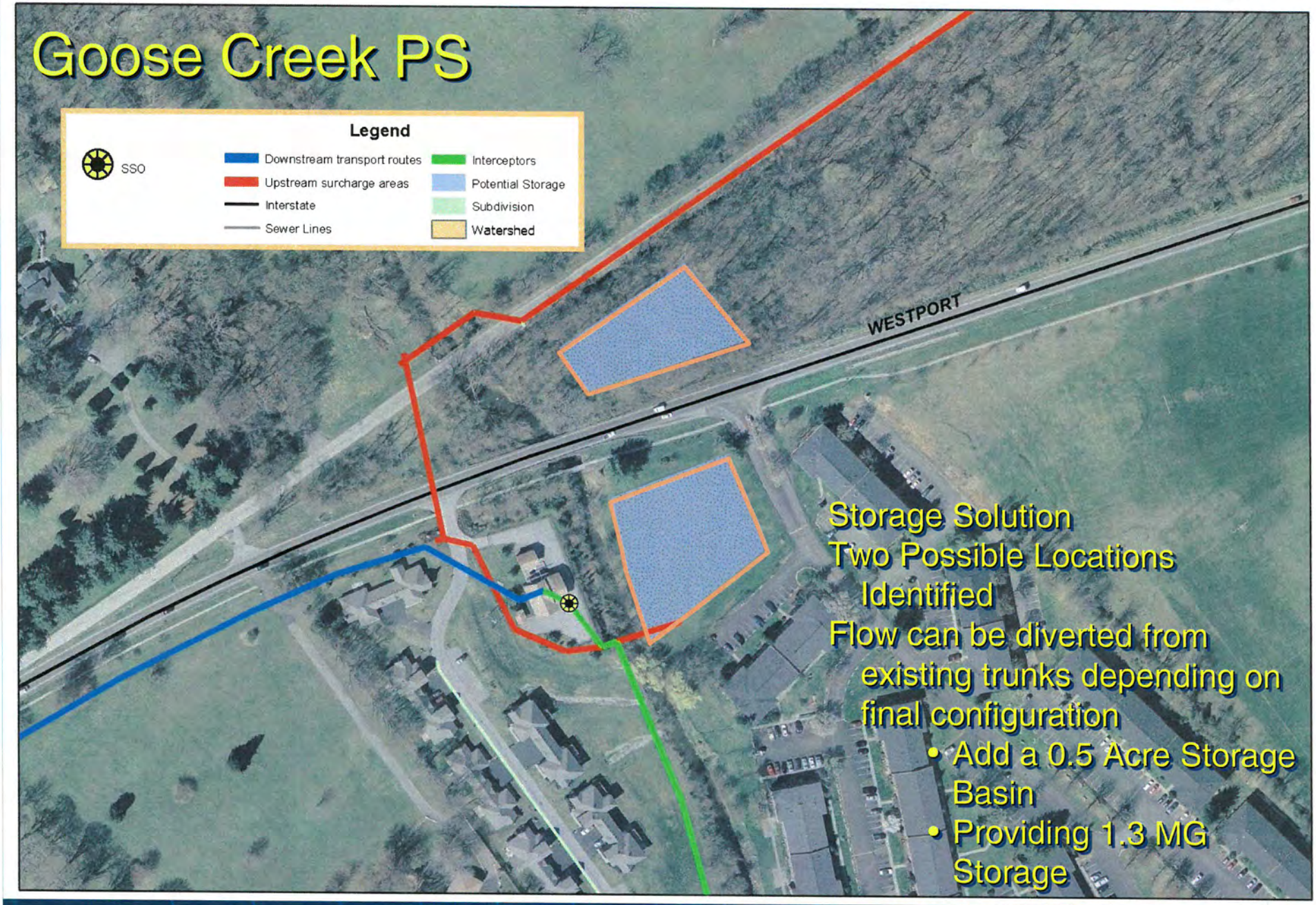
Goose Creek PS

Diversion Solution
Eliminate Existing Force Main and Reroute Flow North to Muddy Fork System

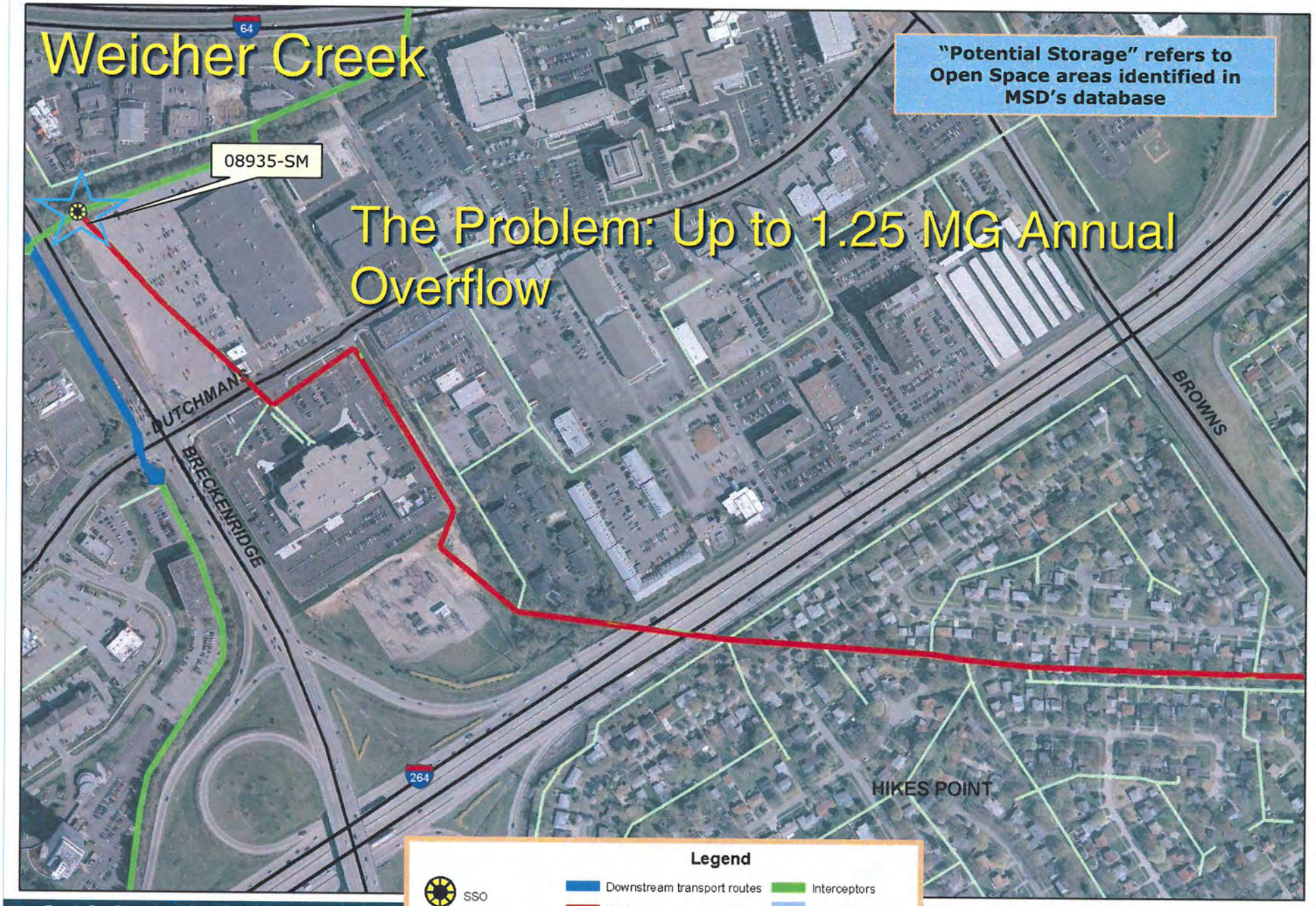
- Install 10,000 LF of Pipe
- Disturb 5,000 LF of Roadway

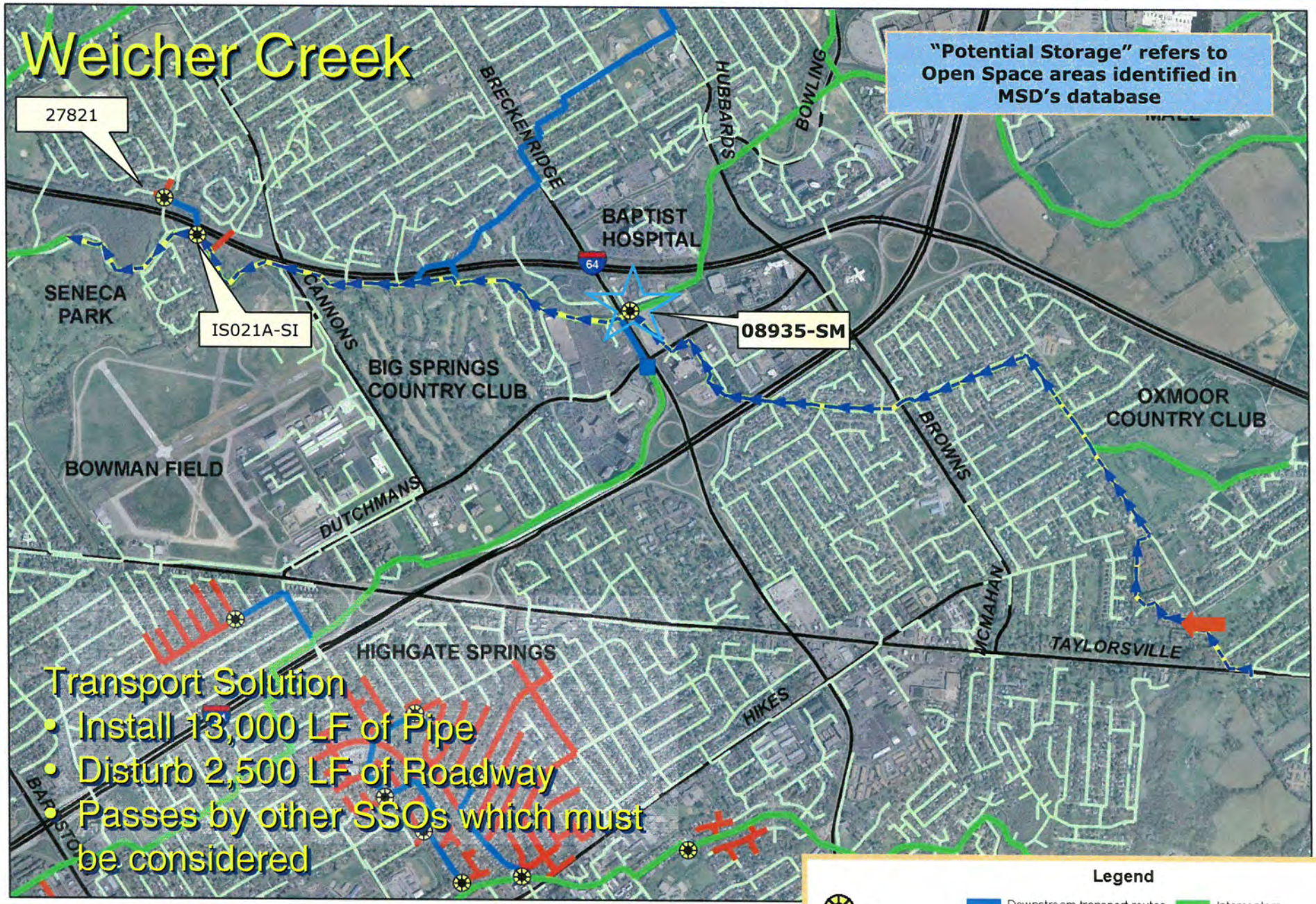


Goose Creek PS



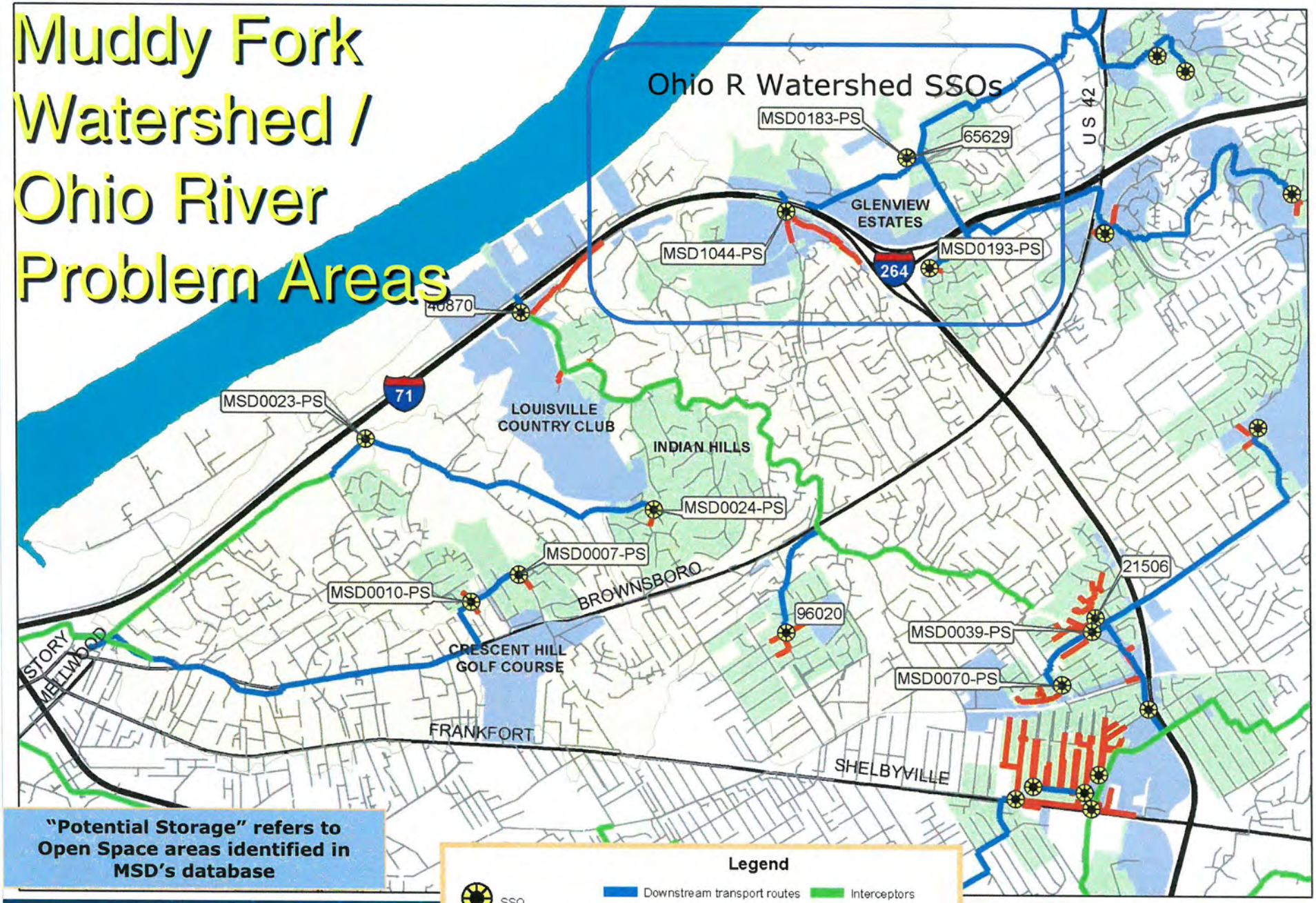
Storage Solution
Two Possible Locations Identified
Flow can be diverted from existing trunks depending on final configuration
- Add a 0.5 Acre Storage Basin
- Providing 1.3 MG Storage


Weicher Creek
"Potential Storage" refers to Open Space areas identified in MSD's database
08935-SM
The Problem: Up to 1.25 MG Annual Overflow
DUTCHMANS
BRECKENRIDGE
BROWNS
HIKES POINT
64
264
Legend
SSO
Downstream transport routes
Upstream surcharge areas
Interstate
Sewer Lines
Interceptors
Potential Storage
Subdivision
Watershed

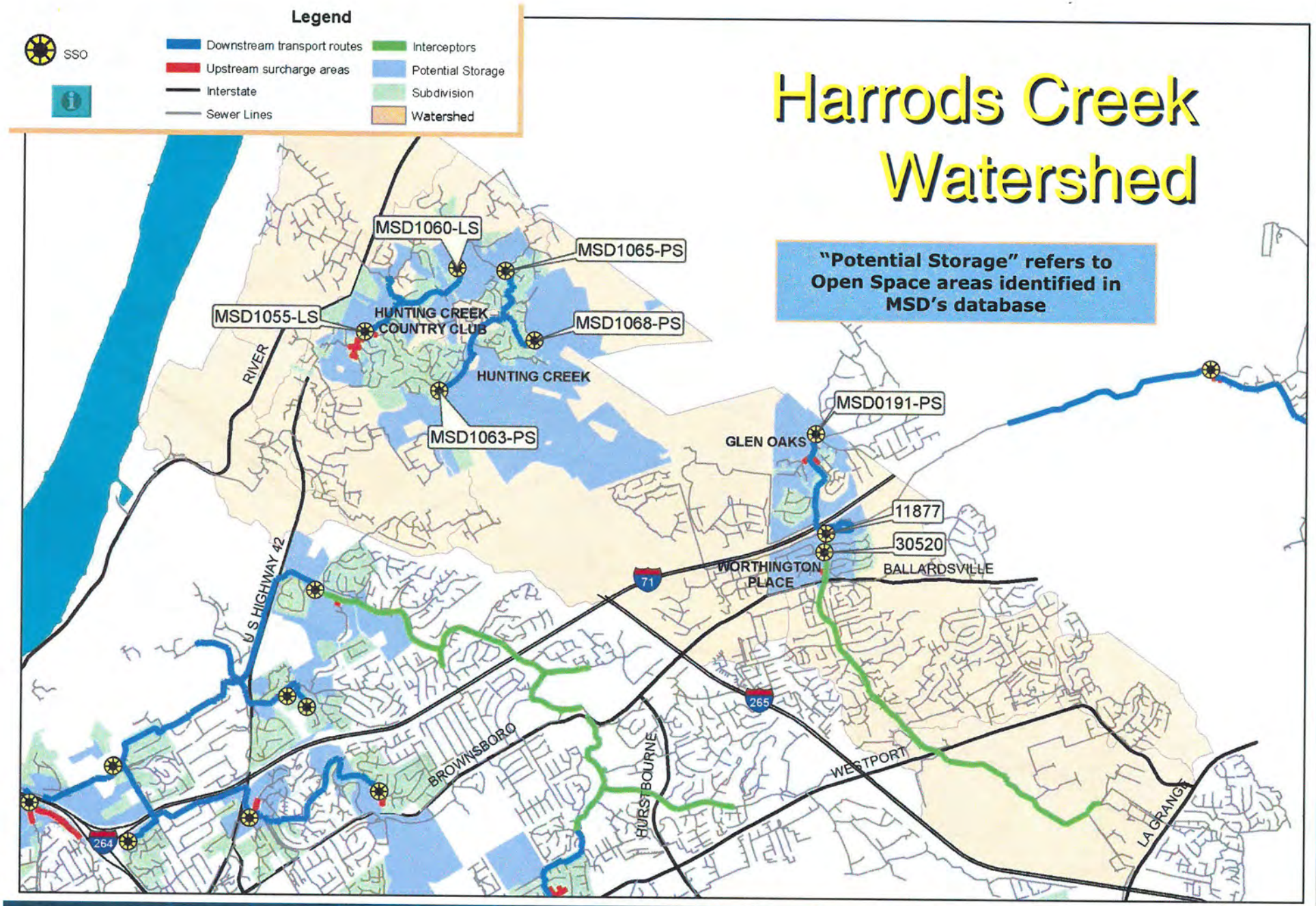

Weicher Creek
"Potential Storage" refers to Open Space areas identified in MSD's database
27821
IS021A-SI
08935-SM
BRECKENRIDGE
HUBBARDS
BOWLING
BAPTIST HOSPITAL
64
SENECA PARK
CANNONS
BIG SPRINGS COUNTRY CLUB
OXMOOR COUNTRY CLUB
BROWNS
BOWMAN FIELD
DUTCHMANS
MCMAHAN
TAYLORSVILLE
HIGHGATE SPRINGS
HIKES
Transport Solution
• Install 13,000 LF of Pipe
• Disturb 2,500 LF of Roadway
• Passes by other SSOs which must be considered
Legend
SSO
Downstream transport routes
Upstream surcharge areas
Interstate
Sewer Lines
Interceptors
Potential Storage
Subdivision
Watershed

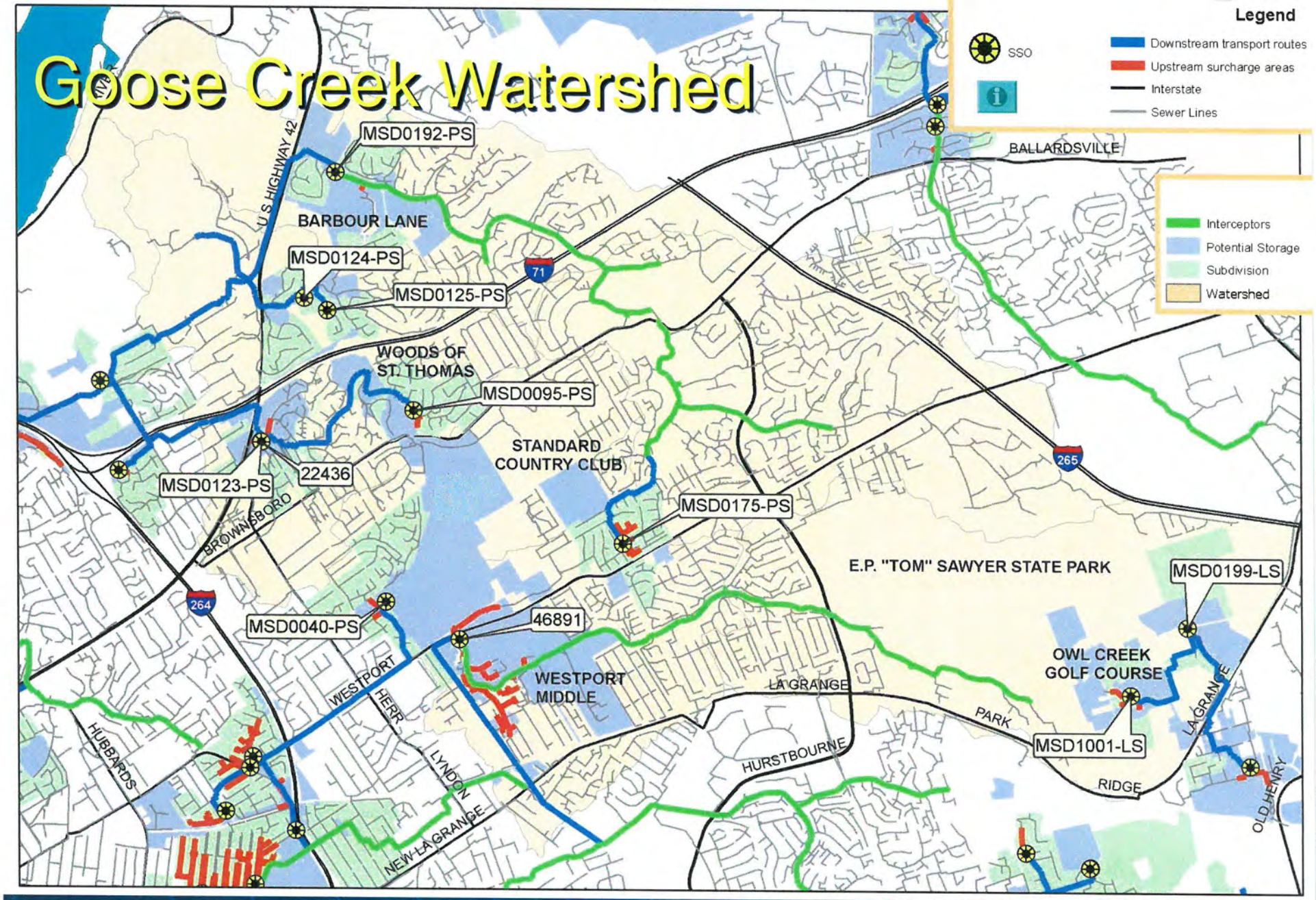

Weicher Creek
64
DUTCHMANS
BRECKENRIDGE
UMFLS
BROWNS
264
Storage Solution
• Add a 1 Acre Storage Basin Providing 2.5 MG Storage
• Upstream of SSO
• May require pumping to fill or empty,
• Little additional piping
"Potential Storage" refers to Open Space areas identified in MSD's database
Legend
SSO
Downstream transport routes
Upstream surcharge areas
Interstate
Sewer Lines
Interceptors
Potential Storage
Subdivision
Watershed

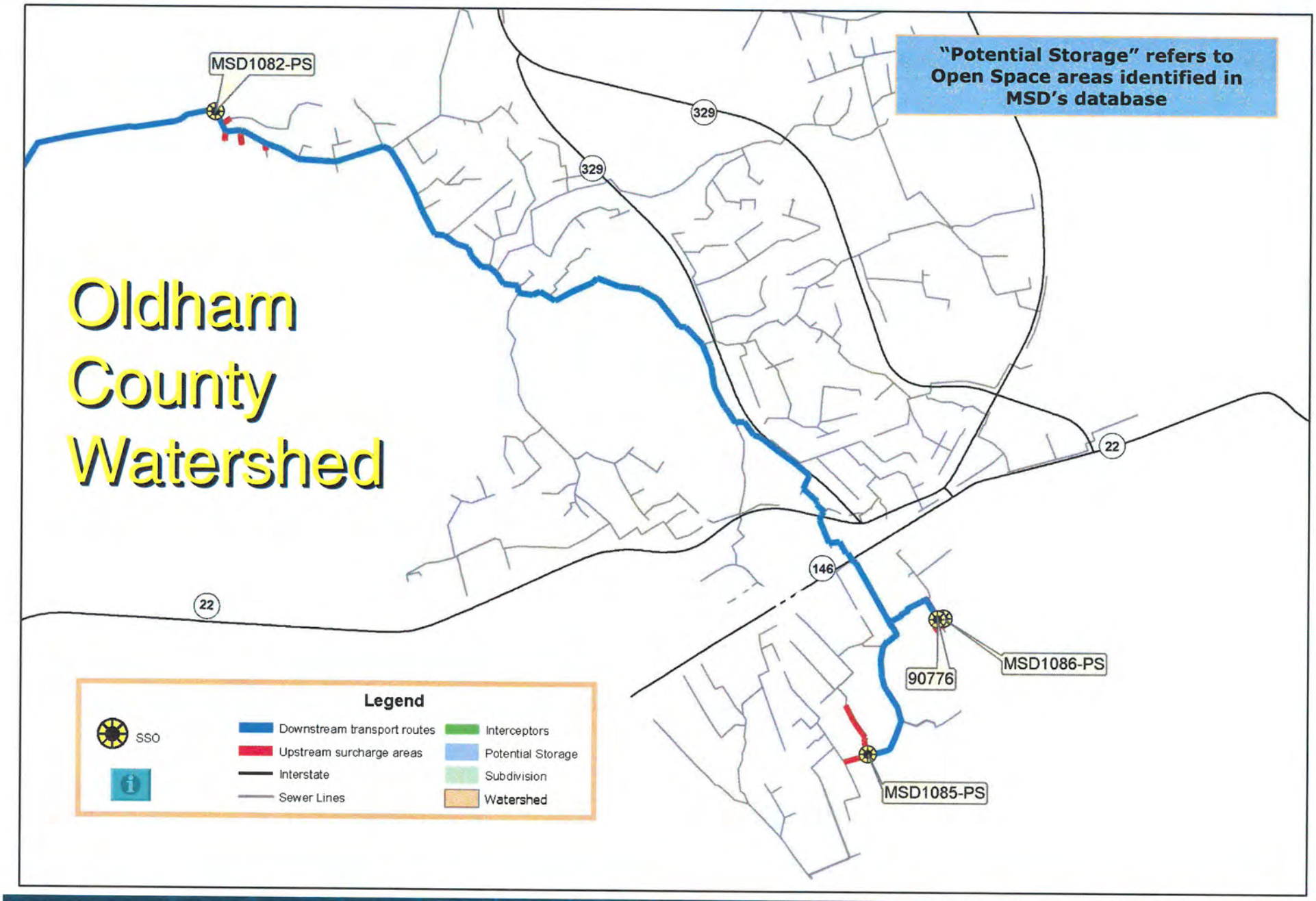
Muddy Fork Watershed / Ohio River Problem Areas



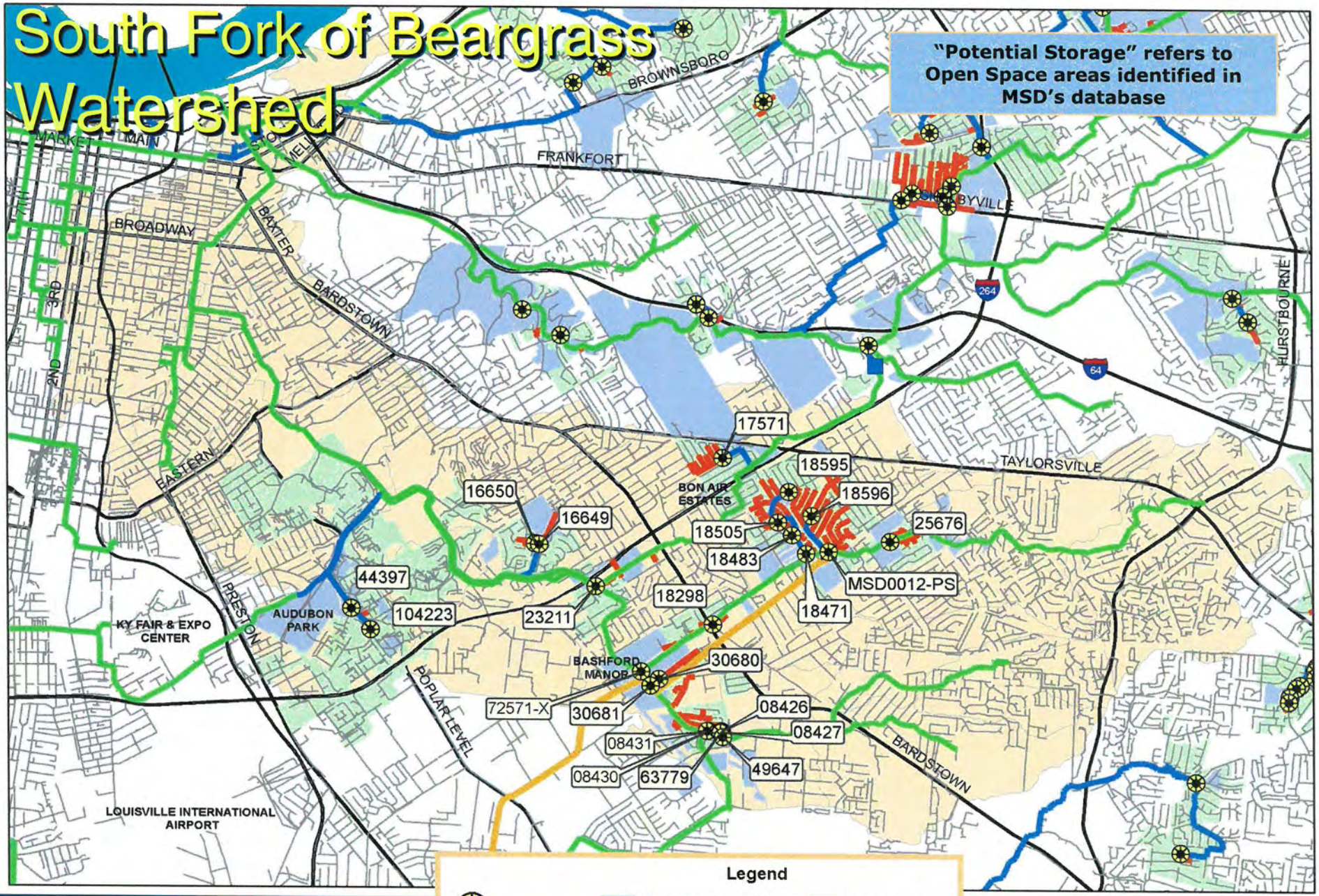
"Potential Storage" refers to Open Space areas identified in MSD's database


Legend
SSO
Downstream transport routes
Upstream surcharge areas
Interstate
Sewer Lines
Interceptors
Potential Storage
Subdivision
Watershed
Harrods Creek Watershed
"Potential Storage" refers to Open Space areas identified in MSD's database
MSD1060-LS
MSD1065-PS
MSD1055-LS
HUNTING CREEK COUNTRY CLUB
MSD1068-PS
HUNTING CREEK
MSD1063-PS
MSD0191-PS
GLEN OAKS
11877
30520
WORTHINGTON PLACE
BALLARDSVILLE
RIVER
U S HIGHWAY 42
71
265
264
BROWNSBORO
HURSTBOURNE
WESTPORT
LA GRANGE


Goose Creek Watershed
Legend
SSO
Downstream transport routes
Upstream surcharge areas
Interstate
Sewer Lines
Interceptors
Potential Storage
Subdivision
Watershed
MSD0192-PS
MSD0124-PS
MSD0125-PS
MSD0095-PS
MSD0123-PS
22436
MSD0175-PS
MSD0040-PS
46891
MSD0199-LS
MSD1001-LS
BARBOUR LANE
WOODS OF ST. THOMAS
STANDARD COUNTRY CLUB
BALLARDSVILLE
E.P. "TOM" SAWYER STATE PARK
OWL CREEK GOLF COURSE
WESTPORT MIDDLE
U.S. HIGHWAY 42
BROWNSBORO
WESTPORT
HERR
LYNDON
NEW LA GRANGE
HUBBARDS
LA GRANGE
PARK
HURSTBOURNE
RIDGE
OLD HENRY
71
265
264

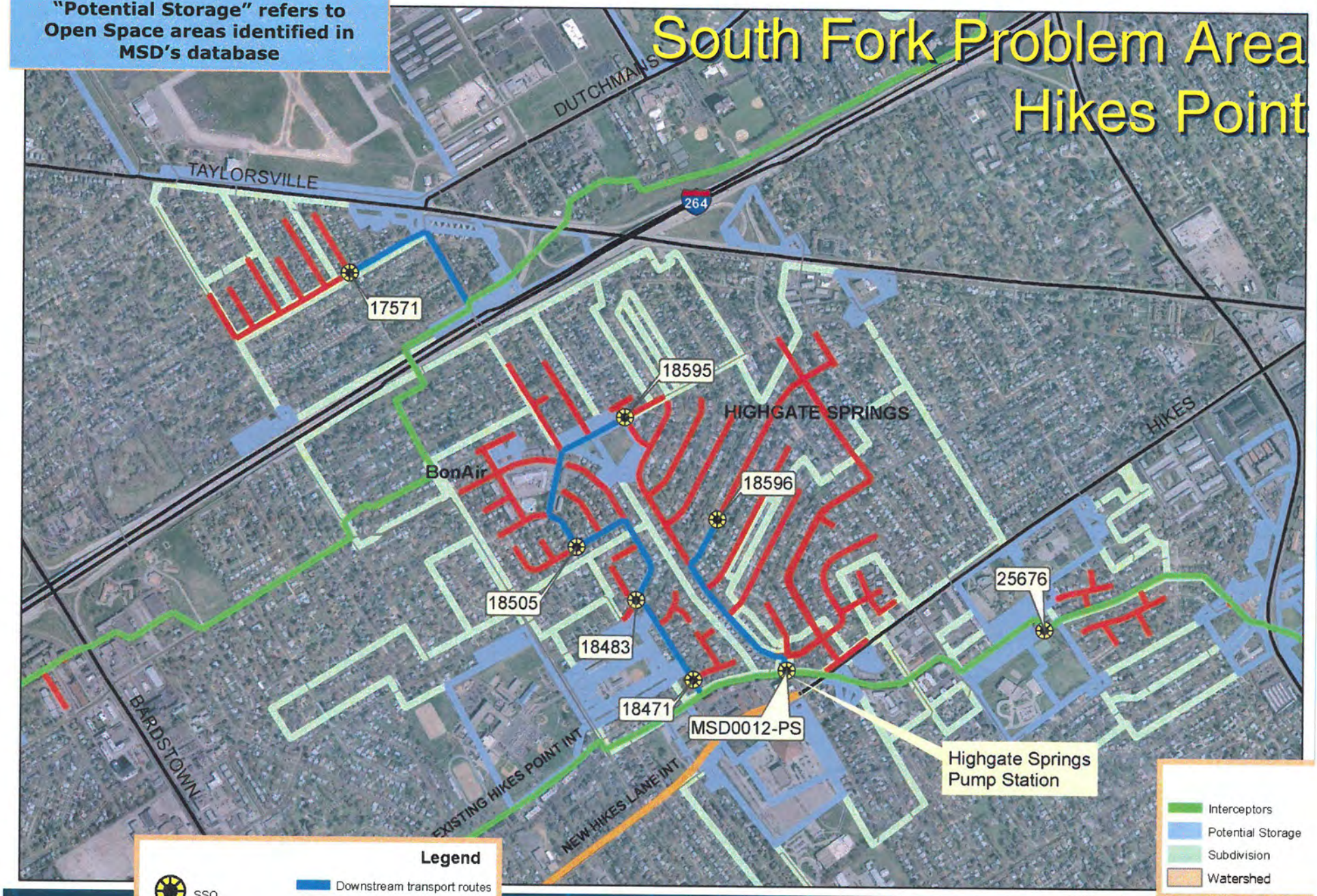

"Potential Storage" refers to Open Space areas identified in MSD's database
Oldham County Watershed
MSD1082-PS
329
329
22
146
22
90776
MSD1086-PS
MSD1085-PS
Legend
SSO
Downstream transport routes
Upstream surcharge areas
Interstate
Sewer Lines
Interceptors
Potential Storage
Subdivision
Watershed

South Fork of Beargrass Watershed

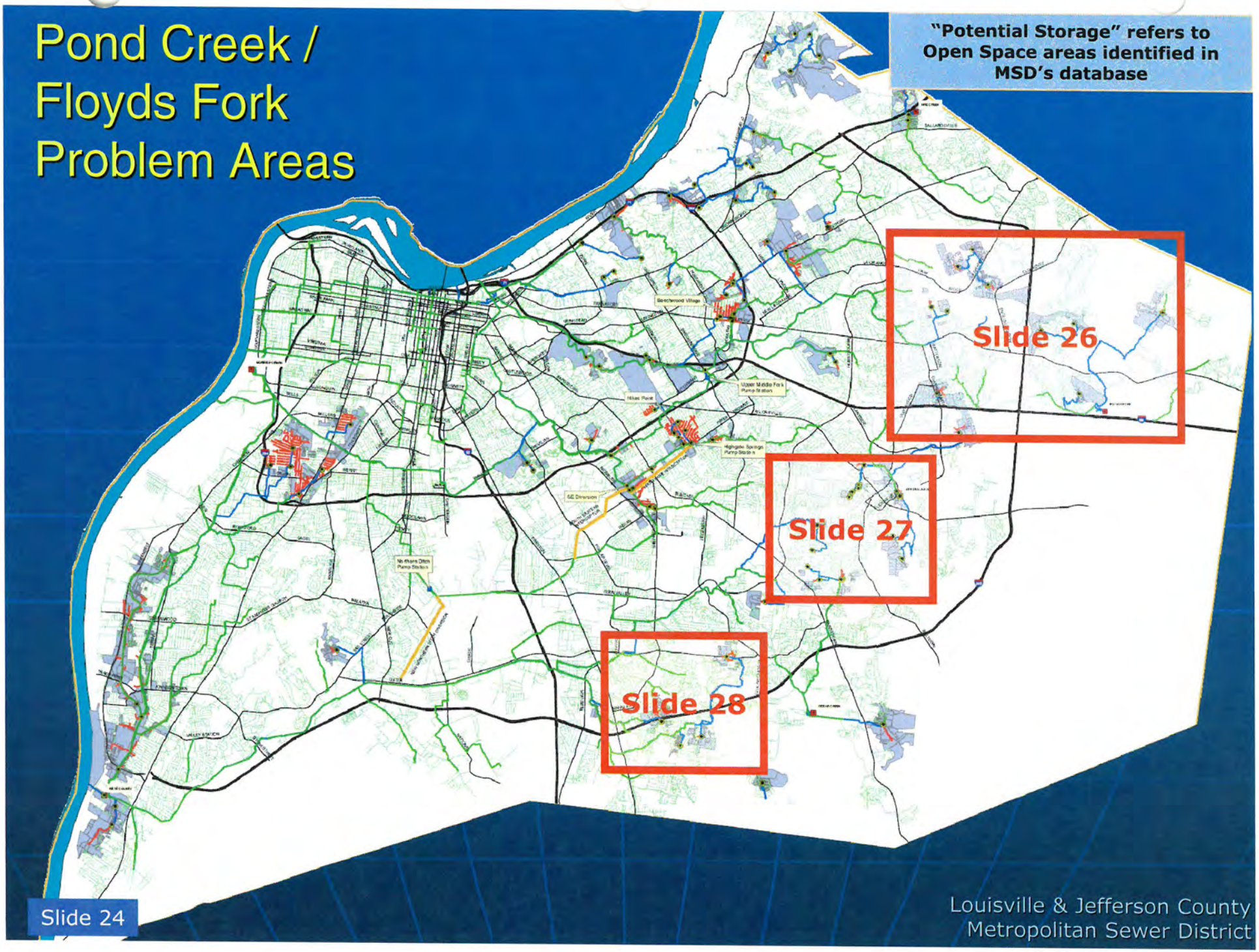


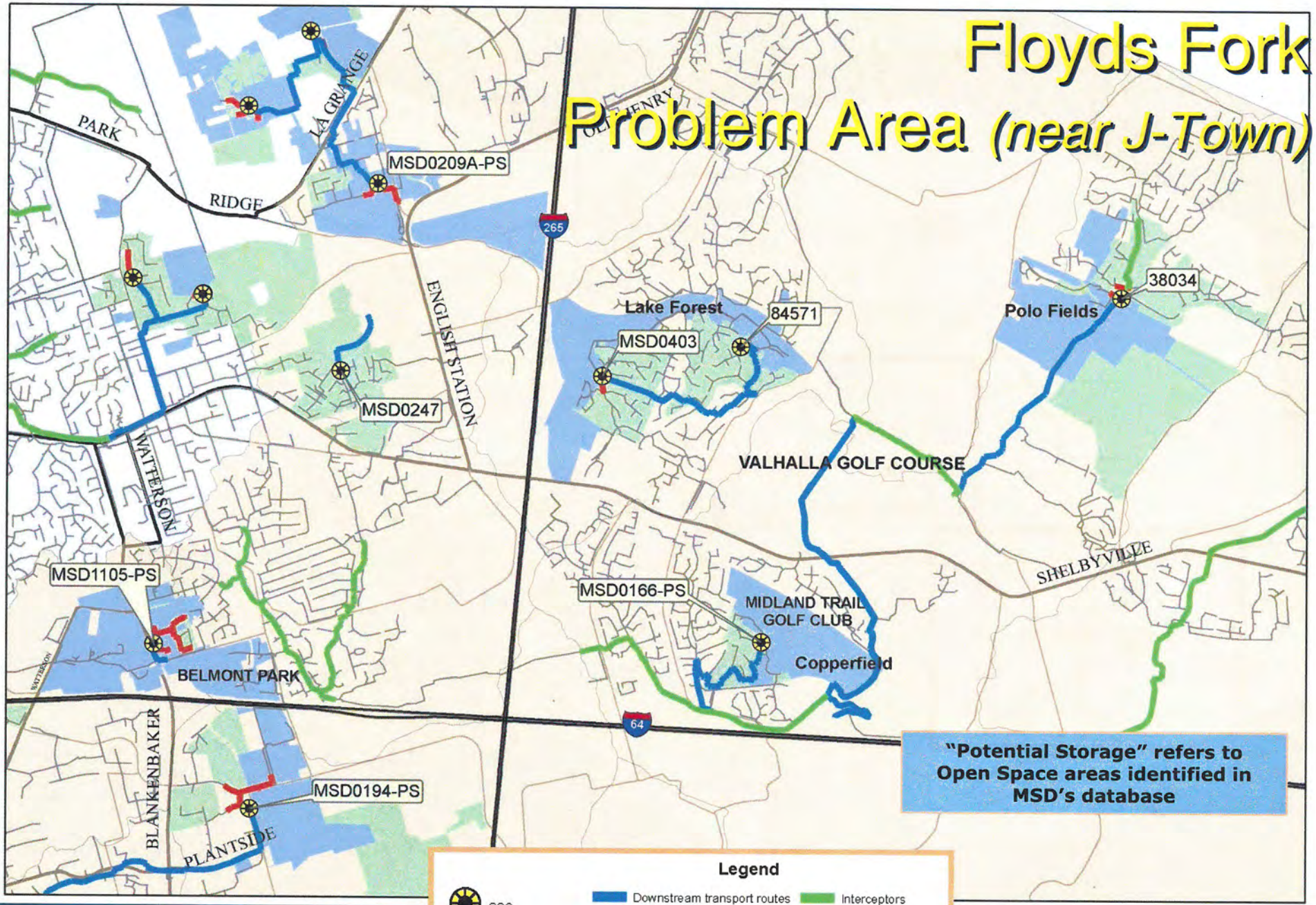
"Potential Storage" refers to Open Space areas identified in MSD's database

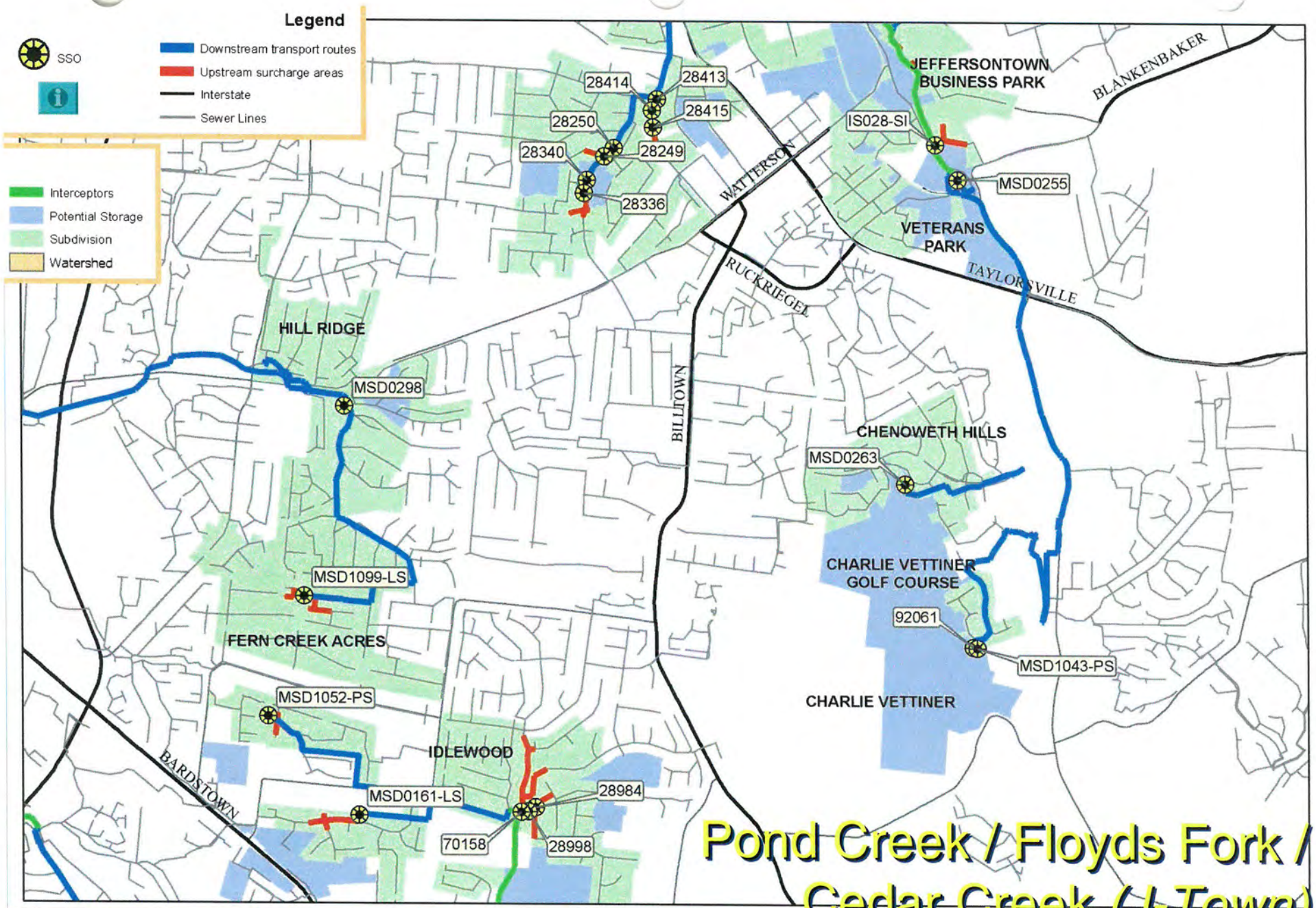
South Fork Problem Area
Hikes Point



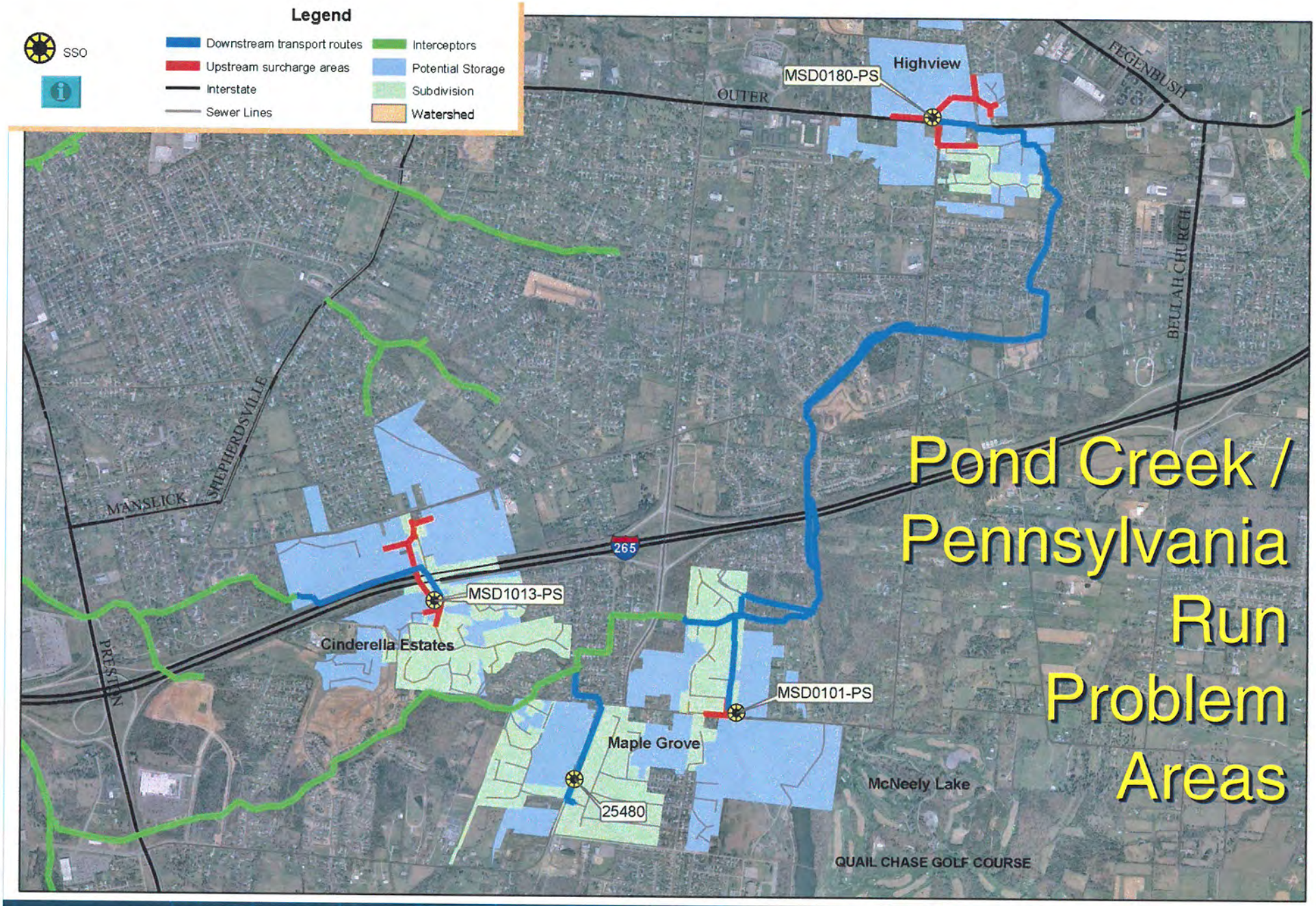
Pond Creek / Floyds Fork Problem Areas



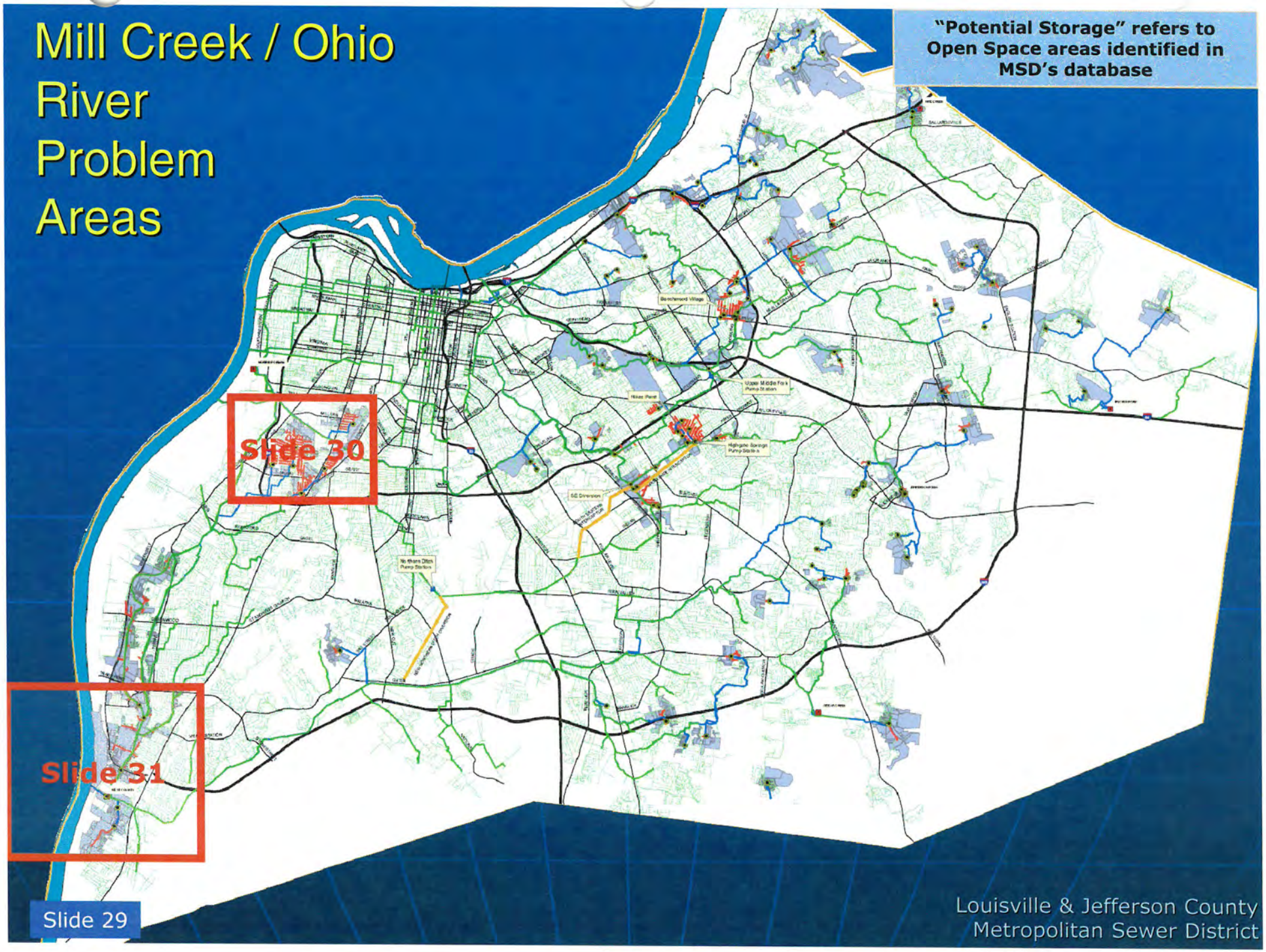

Floyds Fork
Problem Area (near J-Town)
PARK RIDGE
LA GRANGE
OLDENRY
MSD0209A-PS
265
ENGLISH STATION
MSD0247
Lake Forest
84571
MSD0403
38034
Polo Fields
VALHALLA GOLF COURSE
WATTERSON
MSD1105-PS
MSD0166-PS
SHELBYVILLE
MIDLAND TRAIL GOLF CLUB
Copperfield
BELMONT PARK
64
BLANKENBAKER
MSD0194-PS
PLANTSIDE
"Potential Storage" refers to Open Space areas identified in MSD's database
Legend
SSO
Downstream transport routes
Upstream surcharge areas
Interstate
Sewer Lines
Interceptors
Potential Storage
Subdivision
Watershed



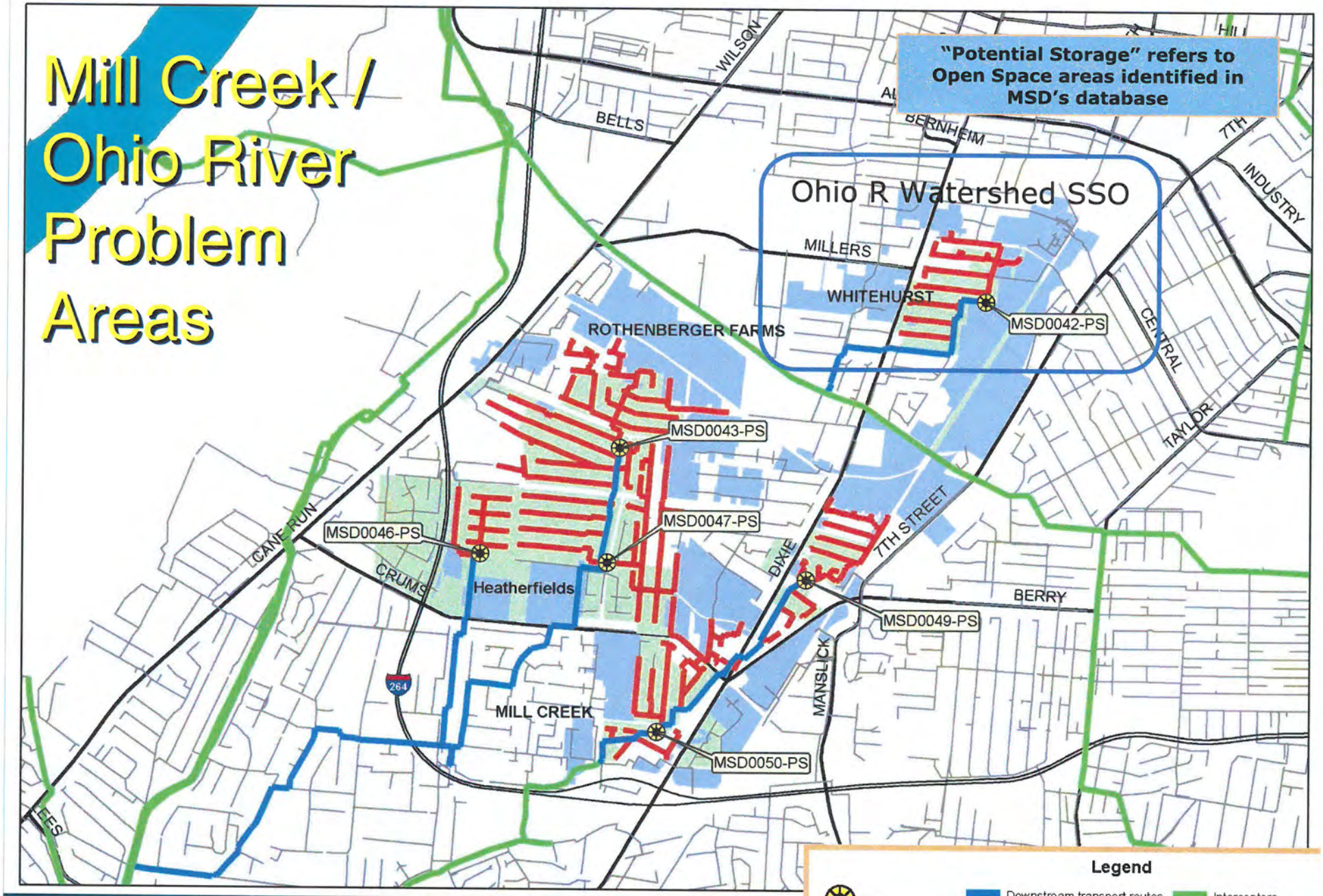
Pond Creek / Floyds Fork / Cedar Creek (J-Town) Problem Areas


Legend
SSO
Downstream transport routes
Upstream surcharge areas
Interstate
Sewer Lines
Interceptors
Potential Storage
Subdivision
Watershed
Highview
MSD0180-PS
OUTER
FEGENBUSH
BEULAH CHURCH
SHEPHERDSVILLE
MANSLICK
PRESTON
265
MSD1013-PS
Cinderella Estates
MSD0101-PS
Maple Grove
25480
McNeely Lake
QUAIL CHASE GOLF COURSE
Pond Creek / Pennsylvania Run Problem Areas

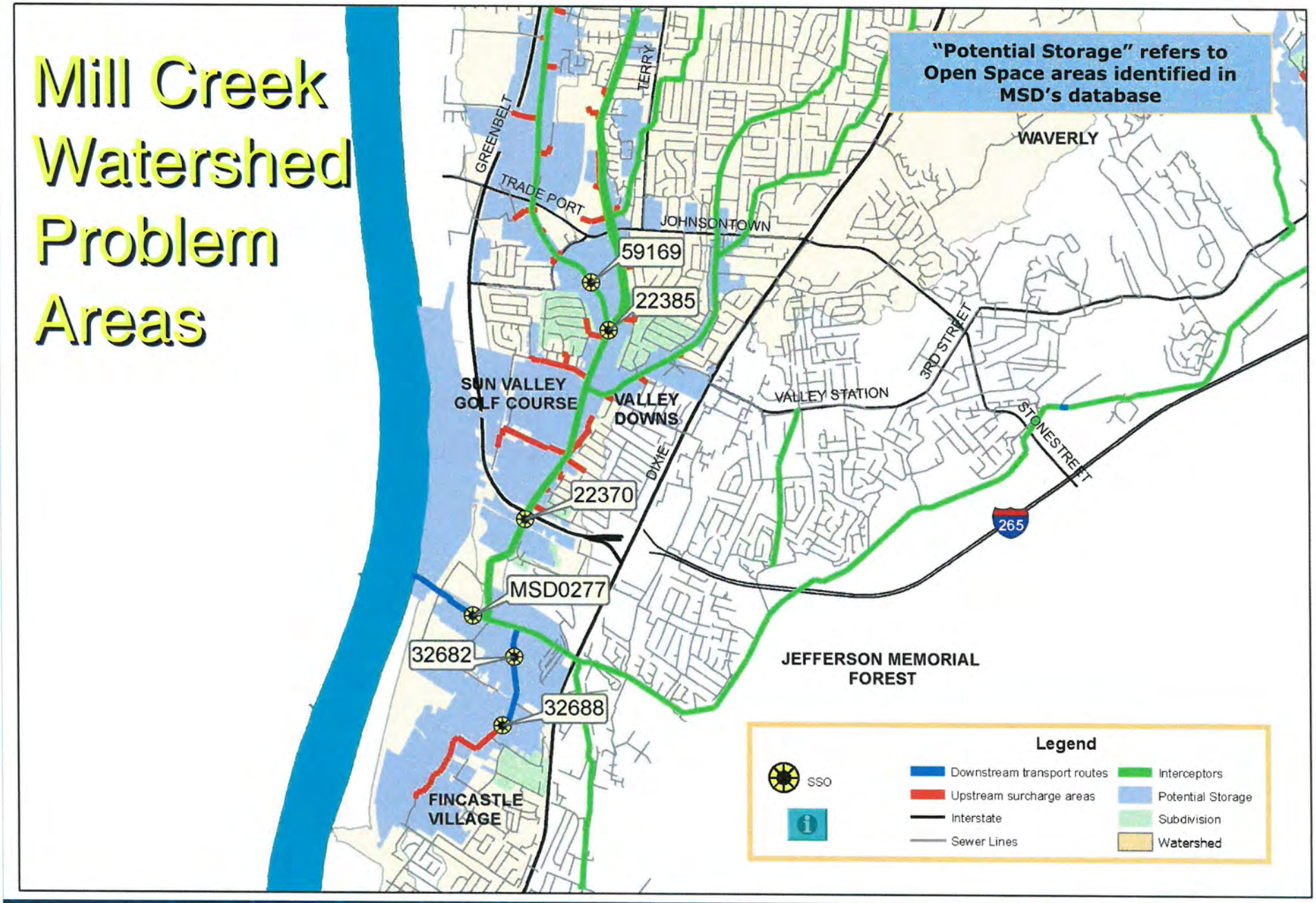
Mill Creek / Ohio River Problem Areas



Mill Creek / Ohio River Problem Areas



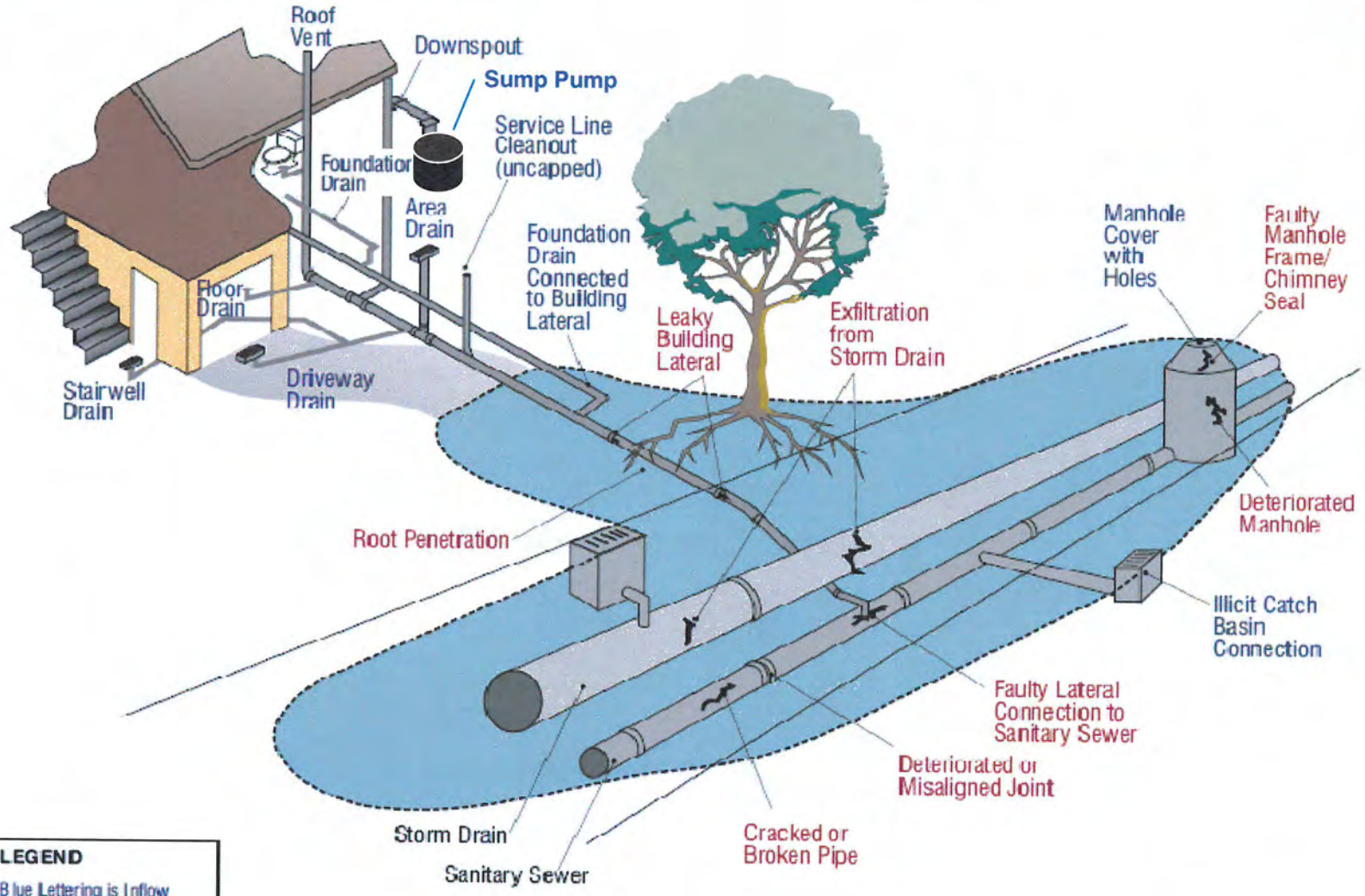
Mill Creek Watershed Problem Areas



Summary

- Inflow and Infiltration
  - Manholes
  - Sewers
  - Private Property: drains, sump pumps roofs
- Remediation Techniques
  - Flow Reduction
  - Transport and Diversion
  - Storage
- Flow Reduction Techniques
  - Chimney Seals
  - Manhole Repair
  - Water-tight lid
  - Installation of Cured-in-place Pipe
  - Property Service Connections Repair
  - Private Property
- Transport and Diversion Techniques
  - Traditional Method of Sewer Line Replacement
  - Horizontal Directional Drilling HDD
  - Pipe Bursting
  - Pump Stations
- Storage Techniques
  - In-line
  - Off Line
    - Open
    - Covered
- Part 2: Potential Solutions
  - Overview of MSD Service Area
  - Possible Downstream Transport routes
  - Possible Storage Sites
    - Upstream surcharge areas
    - Open areas
  - Solutions Specific to Middle Fork
  - General for Other Watersheds

Question and Answers



From City Of Chino, CA

Typical Sources of Infiltration and Inflow