

Source: Public Works

*Jah*

Agenda Item No: REP 17-14

To: **City Council**  
From: **City Manager and Staff**

*MM*

**Council Meeting Date:** Feb 17, 2014

**Re:** Evaluation of I&I Programs (CM # 3932)

**EXECUTIVE SUMMARY:**

Staff has prepared for Council consideration a report concerning Inflow and Infiltration reduction efforts and the evaluation of the effectiveness of the efforts to date.

**DISCUSSION:**

At the November 4, 2013 Council meeting, staff was directed to provide a report on all of the evaluations that have been performed concerning the Inflow and Infiltration (I&I) program in the pilot study basin, and plans to continue to evaluate the effectiveness of the program if it were to continue and be expanded. The attached report contains a brief history of I&I problems with the city's sanitary sewer system, efforts completed to date to reduce I&I, evaluations that will be completed to determine the effectiveness of these efforts, and alternatives should the current efforts prove to be ineffective.

**FISCAL IMPACT:**

None with this report.

**VISION IMPACT:**

<http://www.gocolumbiamo.com/Council/Meetings/visionimpact.php>

Columbia and its neighboring communities will be a place where the air, water, land, and natural aesthetic qualities of our environment shall be protected by a combination of conservation strategies including, but not limited to, regulations and ordinances, conservation incentives, education programs, and smart growth planning.

**SUGGESTED COUNCIL ACTIONS:**

For information only.

FISCAL and VISION NOTES:					
City Fiscal Impact Enter all that apply		Program Impact		Mandates	
City's current net FY cost	\$0.00	New Program/ Agency?	No	Federal or State mandated?	No
Amount of funds already appropriated	\$0.00	Duplicates/Expands an existing program?	No	Vision Implementation impact	
Amount of budget amendment needed	\$0.00	Fiscal Impact on any local political subdivision?	No	Enter all that apply: Refer to Web site	
Estimated 2 year net costs:		Resources Required		Vision Impact?	Yes
One Time	\$0.00	Requires add'l FTE Personnel?	No	Primary Vision, Strategy and/or Goal Item #	5.3
Operating/ Ongoing	\$0.00	Requires add'l facilities?	No	Secondary Vision, Strategy and/or Goal Item #	
		Requires add'l capital equipment?	No	Fiscal year implementation Task #	

**Council Report**  
**CM Tracker # 3932**  
**Evaluation of Inflow and Infiltration Programs**

Excess water that enters the sanitary sewer collection system is referred to as inflow and infiltration, or more commonly I&I. Inflow refers to stormwater that flows into the sanitary sewer system via direct connections, such as from roof drains, foundation drains, storm drains, sump pumps, holes in manhole covers, etc. Infiltration refers to stormwater and ground water that enters the sanitary sewer collection system through the sewer mains and manholes due to cracks, joint failures, faulty connections, etc. Infiltration generally increases as the sewer system ages and needs replacement.

Sanitary sewer systems are designed to convey wastewater from homes and businesses. I&I adds rainwater and ground water to the sanitary sewer system which must then be transported and treated like wastewater. During periods of rainfall, the flow due to I&I can increase enough to become the major portion of water in the sanitary sewer system, and can increase to the point that the total capacity of the sewer system is used. Once the available capacity is used, the sewer system will then backup into buildings, or overflow from manholes, and released into the environment. These overflows violate state and federal environmental regulations and can create a public health risk. I&I can also interfere with operations of wastewater treatment facilities resulting in a lesser quality of water being discharged from the treatment facility.

I&I is a problem that many sewer systems are being required to address through regulatory enforcement actions (abatement orders or consent decrees) by state environmental agencies and/or the United States Environmental Protection Agency (EPA). The Missouri Department of Natural Resources has contacted the city regarding possible regulatory enforcement and requiring the reduction of sanitary sewer overflows and backups into buildings due to excessive I&I. It is possible that Columbia will be subject to some type of regulatory enforcement order in the future, which will require reduction of I&I and the elimination of sanitary sewer overflows due to I&I. The backups and sanitary sewer overflows caused by I&I, are not new or recent problems. Records of backups into buildings are found as far back as the late 1960's; and as far back as the 1970's for sanitary overflows, due to I&I. These problems likely were occurring for a much longer period of time however, records earlier than that do not exist.

The EPA's Construction Grants Program was used to fund part of the cost for the city's regional wastewater treatment plant. As part of the grant program, the city hired a consultant to perform an analysis of I&I, and subsequently conducted a Sewer System Evaluation Survey of the city's sewer system. This survey was completed in 1978, and identified extraneous flows due to I&I of over 48 million gallons a day during periods of rainfall (5 year frequency storm lasting 4.5 hours). The reports from the survey recommended rehabilitation of some problems that were determined to be cost effective in 1978. In addition, it was recommended that the city's maintenance program be expanded to include rehabilitation of I&I sources, not considered cost-effective in 1978, to prevent additional I&I due to further deterioration. There are no records that indicate the recommended rehabilitation program was ever initiated following these studies. I&I has continued to cause operational problems with the collection system and the wastewater treatment plant. Currently, the average daily flow at the wastewater treatment plant is 15.8 million gallons per day. During periods of heavy rainfall, flows exceed 60 million gallons per day.

In 2004, Black & Veatch completed a Wastewater System Facilities Planning Report for the city, which identified basins in the sanitary sewer system that have excessive I&I. The report recommended that a comprehensive I&I investigation be conducted to identify I&I sources for removal. Following these recommendations, TREKK Design Group was hired in 2008 to conduct a pilot investigation. Based on the Facilities Planning Report, and the pilot

investigation, staff prepared a report in 2010 for Council that outlined a program to reduce the amount of I&I entering the City's sewer system. This program recommended a basin based I&I reduction program consisting of three phases for each basin. The work included in each phase is as follows:

Study Phase:

- Flow monitor sewer system in study area to establish baseline condition
- Smoke testing
- CCTV inspections
- Manhole inspections
- Internal and external building inspections
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Construction Phase:

- Rehabilitate all priority public sewer mains and all defective public sewers in study area
- Rehabilitate defective sewer manholes in study area
- Replace/rehabilitate defective service connections and service laterals located within public right-of-way or easement that are connected to public sewer mains. Defective service laterals will be rehabilitated or replaced from the connection point with the public sewer to the public right-of-way or edge of the sewer easement where a cleanout will be installed
- Rehabilitate any portion of a defective PCC sewer located within the flood plain
- Work with property owners to get all Priority 1 sources removed
- Work with property owners who wish to have Priority 2 sources removed on a voluntary basis
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Confirmation Phase:

- Perform post construction flow monitoring to determine the effectiveness of the work performed. (Previously referred to as determination of the change in the ratio of the average wet weather flow to the average dry weather flow)

Following this report, Chapter 22 of the City Code was revised in 2011 to establish an abatement financial assistance program, and an I&I reduction program. The first program basically allows for the city to repair violations on private property, and includes provisions for the property owner to reimburse the city for the costs of the repairs by payments made on their utility bill, at 4% interest. The second program provides for city reimbursement to property owners for removal of certain sources of I&I on their property.

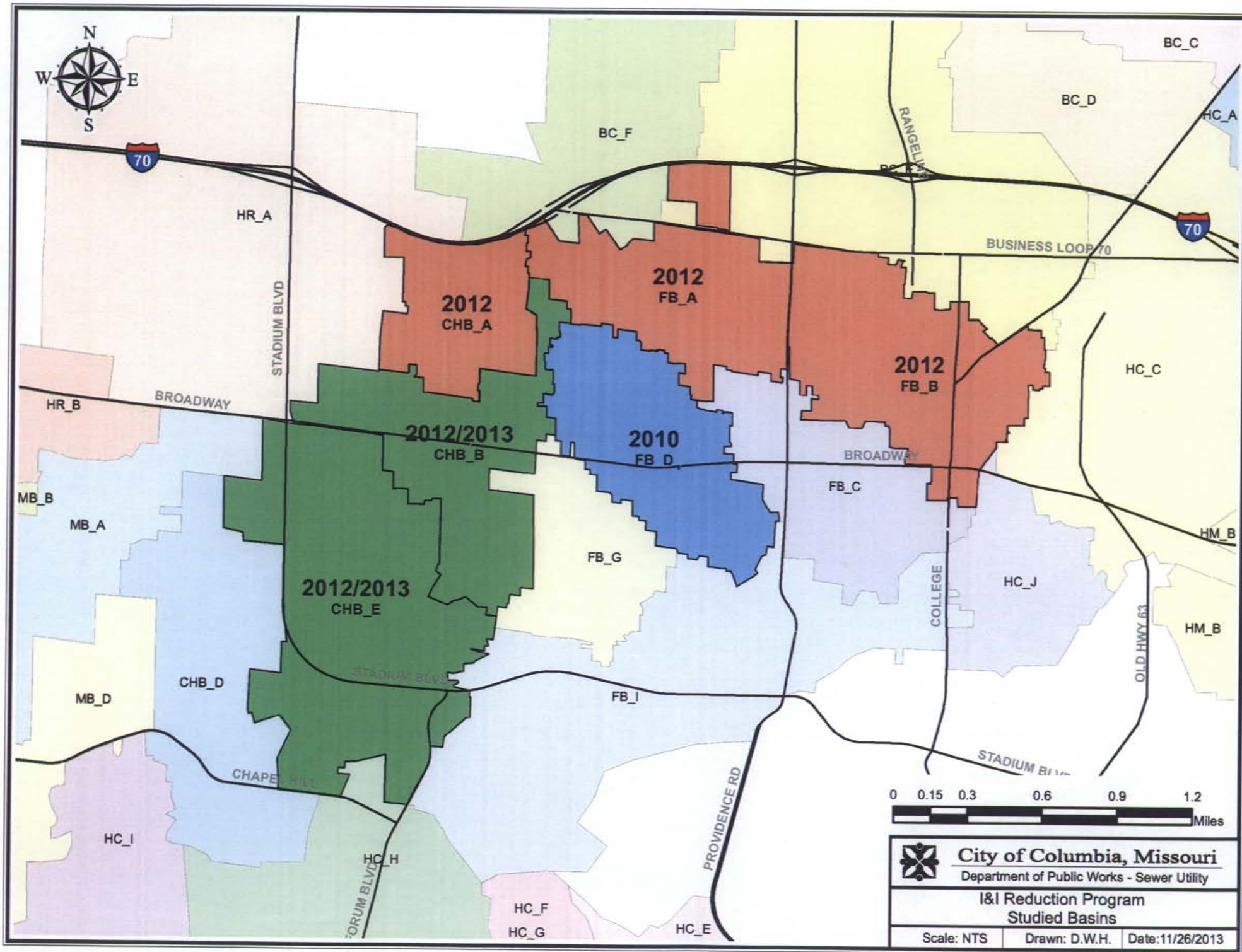
I&I investigations have been completed in six basins; these basins are shown on the attached map. The final reports for the investigation in the basins labeled CHB\_E and CHB\_B, have not yet been submitted. The first construction phase project for removal of I&I sources from the public sewer were included as part of a broader maintenance project identified as the Sanitary Sewer Main and Manhole Rehabilitation Project. A public hearing was held for this project in April of 2012, and Council authorized the project to be bid and constructed. The construction began in September of 2012, and is currently nearing completion. This project included some I&I rehabilitation work in basins labeled FB\_D, FB\_B and FB\_A, as shown on the attached map. The work did not include rehabilitation of all defective public sewers in these basins. The rehabilitation focused on the sewer mains with the most severe problems, and those located in the closest proximity to storm drainage facilities. The work did not include the rehabilitation of any six inch diameter public sewers or replacement of any private common collector sewers. In addition to this project, private sources of I&I continue to be removed through the reimbursement program.

Now that this project is nearing completion, an initial confirmation phase will need to be completed to determine the effectiveness of the rehabilitation completed to date. A flow meter is

in place at the downstream end of the basin identified as FB\_D, and meter data is being collected. This meter will need to remain in place until data can be collected from 8 to 10 rain events of different magnitudes. Once this data is collected, it can be analyzed and used to help determine how effective these efforts have been in reducing the amount of I&I entering the system. The ultimate determination of success or failure will be based on whether or not backups and sanitary sewer overflows are reduced in frequency and duration.

Staff continues to be optimistic that these rehabilitation efforts will be effective in reducing I&I since similar approaches by other utilities have resulted in a reduction of I&I flow. Rehabilitation of the aging portions of the system need to be completed, even if the rehabilitation alone does not significantly reduce I&I. If it does result in a significant reduction, it is doubly beneficial to complete the rehabilitation of the system. The results of the current flow metering will not be conclusive at this time, as the projects completed have not addressed all identified public sewer I&I rehabilitation needs. Should the results show that the work completed to date does not have any significant reduction in I&I flows, staff will need to begin investigation of alternative actions to address the reduction of I&I, and reducing backups into buildings and sanitary sewer overflows. Consideration would need to be given to the following:

- Additional system rehabilitation.
- Increased efforts at private common collector sewer elimination.
- Expansion of the private source I&I removal to include replacement of property owner's private service laterals from the building to the sewer main.
- Expansion of the private source I&I removal to include disconnecting foundation drains.
- Providing wet weather storage facilities that would store excess flow during rain storms, and then release the stored water into the sanitary sewer for treatment after the storm is over.
- Wastewater treatment plant upgrades and construction of relief sewers to convey the I&I flows to the wastewater treatment plant.



**City of Columbia, Missouri**

Department of Public Works - Sewer Utility

**I&I Reduction Program  
Studied Basins**

Scale: NTS	Drawn: D.W.H.	Date: 11/26/2013
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