Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155-4194

319/Clean Water Partnership/ Total Maximum Daily Loads

Semi-Annual Report for Reporting Year 2010

Reporting Period: ☐ January 1 through June 30, 2010 (Due August 1, 2010)
☒ July 1 through December 31, 2010 (Due February 1, 2011)

All information is required by U.S. Environmental Protection Agency (EPA). Do not leave blanks. This report form can be typed using your computer. Use the "**tab**" key to move through the fields of this form. Enter responses using text and check boxes as indicated. Keep a copy for your records.

I. General Report Information

1.	Project Title:	Duluth Residential Stormwater Reduction Demonstration Project for Lake Superior Tributaries		
2.	Project Sponsor:	City of Duluth/Utility Operations		
3.	Project Representative:	Chris Kleist		
4.	Email Address:	ckleist@duluthmn.gov		
5.	Loan Sponsor (if applicable):			
6.	Contract Number:	B10575	Loan Number:	
7.	MPCA Project Manager:	Karen Evens		
8.	Contract Start Date:	2-27-2008	Contract End Date:	6-30-2011
9.	Best Management Practice (BMP) Name (Refer to BMP List):	570, 912		

10. **319/Clean Water Partnership (CWP) only** - Nonpoint Source (NPS) Category (Refer to NPS Definition of Categories):

	Primary	Secondary	Others
Category			

11. **319/CWP only** - NPS Functional Category (Refer to NPS Definition of Categories):

	Primary	Secondary	Others
Category	**20**	**600**	

12.	Waterbody type (refer to NPS Waterbody Type):		**ST**	
13.	Hydrologic unit code (8 digits):	04010102	Latitude-longitude:	**46'50''11''' x -92'00''22'''**
14.	**319/ CWP only:** Type of pollutant(s) addressed (refer to NPS Pollutants):	**1500**		
15.	Ecoregion (refer to NPS Ecoregion):	**5000**		

16. Basin name (check all that apply): Statewide

- ☒ Lake Superior
- ☐ Lower Mississippi/Cedar
- ☐ Upper Mississippi
- ☐ Minnesota
- ☐ Rainy
- ☐ Red River
- ☐ Des Moines
- ☐ Missouri
- ☐ St. Croix

II. Project Description

1. Project Description Summary (taken from work plan summary) – Include at least two paragraphs that briefly summarize the project scope, the processes and the events that occurred **before** this reporting period.

We propose to demonstrate the effectiveness of residential Best Management Practices (BMPs) at reducing stormwater runoff problems for Lake Superior tributaries. We will install residential BMPs in a subwatershed in an older residential neighborhood and compare the runoff to that of similar control subwatersheds without stormwater BMPs. The neighborhoods identified for the program are located in the Lester-Amity stream system that is on the Minnesota 303(d) list for turbidity. Tributaries receiving the runoff from the targeted neighborhoods/subwatersheds are being severely eroded by high peak flows and deliver highly turbid water to the stream. Water flow, temperature, and turbidity measurements will be taken within storm sewers in both subwatersheds before and after BMP installation, requiring *three* full field seasons of work. Flow, temperature, and turbidity data from storm sewer flow will be posted and interpreted on the educational Lake Superior Streams website, as will final results. Residents' knowledge of runoff issues, solutions, and responsibilities will be evaluated at the beginning and end of the project. Results from this demonstration project should be applicable throughout the Great Lakes.

Both Lester River and Amity Creek are on the Minnesota 303(d) list for excessive turbidity. Other Lake Superior North Shore and South Shore streams, and streams elsewhere around the Great Lakes, face similar problems. In the western arm of Lake Superior, streams nearing the lake often cut through clay or clay loam soils. These highly erodable soils are particularly vulnerable to excessive stream power caused by high levels of runoff during heavy rainstorms and snowmelt (Anderson et al. 2003). Runoff from residential neighborhoods helps to create these high peak flows, leading to the erosion that creates turbidity in Amity Creek and similar stream systems. City staff report many complaints from residents about wet yards and winter icing from sump pump activity. The City is seeking an effective program for addressing this nuisance ponding at the source, as well as reducing flows to the storm water system and reducing winter icing problems.

The Amity Creek tributary under consideration for the proposed project runs turbid during storm events, and has severely eroding banks and gullying due to excessive runoff received from adjoining neighborhoods' storm sewers. Excessive runoff, and the associated sediment caused by the increased erosion, often carries greater loads of nutrients and chloride into streams (Anderson et al. 2003). In Duluth, total runoff infiltration is not feasible, so this project is directed at reducing high intensity flows, primarily by retention with some increased infiltration. We will demonstrate that runoff retention BMPs implemented at the residential level can reduce storm sewer peak flows. The project will also document the challenges and solutions to retrofitting older residential areas (30-50 yrs old) with runoff BMPs. The end result will reduce runoff/footing drain discharge within a problem subwatershed and create a demonstration project for other Lake Superior and Great Lakes communities.

The project began Feb. 27, 2008. Prior to this, the project leaders met with the Minnesota leaders of the 319 SIDMA Social Indicators Evaluation project. These researchers are assisting EPA in developing an evaluation survey tool to help document improvements in knowledge and awareness by the public in areas where 319 programs are active. Our project was selected as a test case; several of us helped beta-test the SIDMA software and survey system; later, two different survey types were developed and administered as pre-BMP installation surveys: the KAP survey given door-to-door by a Minnesota Conservation Corps college crew and the EPA SIDMA survey at a neighborhood meeting. The door-to-door survey was very successful, with a 72% response rate.

Monitoring equipment (flow, temperature, conductivity, and turbidity) was installed in the neighborhood storm sewer systems from April –November, 2008. Collection of the pre-BMP storm sewer flow and temperature data was quite successful, and the high number of rainstorms in 2008 provided an interesting pre-BMP dataset. The two control streets are fairly well matched in terms of runoff amounts, with the study street being somewhat more difficult to figure out. However, season and apparently the amount of soil saturation make a large difference in the amount of runoff coming through storm sewers. For example, rainfall events in the spring and early summer, or following another rainstorm, result in high amounts of runoff, while similar amounts of rain in mid-to-late summer and after a dry spell result in much lower runoff amounts. Two volunteers willing to read rain gauges were found near the target neighborhoods and provided with rain gauges, monitoring instructions, and data collection spreadsheets. They have been providing data from April – October on rain amounts to help determine the exact amount of rain falling on the neighborhoods. This helps us check the numbers coming from the city's recording rain gauges, which are several miles from the study site.

All residents of the three streets in the target area were invited to a neighborhood meeting in early September. At this meeting, we had the residents take and provide feedback on the SIDMA survey. The SIDMA survey, with its locked choice of questions, was not a good fit for our small project, taking a long time for folks to fill out and providing our research team with little of the information that we really wanted to get from residents. The main goal of the meeting, however, was to provide the residents with a description of the project and information about the potential BMPs that we will be offering to the street that is chosen as the treatment street. Surprisingly, the street showing the most interest was the one we had not considered because its storm sewer pipes are a slightly different configuration than the other two streets. The meeting went well, although it was attended by only about a dozen residents (out of more than 70 households invited).

After consideration of a number of factors, we elected to install BMPs on the street whose residents showed the greatest amount of interest in participating in the project because they truly had runoff problems. Twenty-two households accepted some type of BMP. All residents willing agreed to provide at least 10 hrs of assistance with the project, most of which will consist of caring for the BMPs that they receive. MCC high school students and college students were provided with training on stormwater and BMPs, and provided the manpower for BMP installation (supervised by Sea Grant, Barr Engineering, SWCD, and NRRI personnel, and assisted by a Sea Grant student intern and technical staff from NRRI). BMPs installed included planting of over 250 trees and shrubs and fencing them to prevent deer damage. Green Duluth crews volunteered time to plant wildflowers and wildflower seeds in various areas to help encourage property owners to mow less lawn. The MCC crews re-dug 200 feet of stormwater runoff ditch in the unbuilt alley between two of the streets. This will increase the capacity of the ditch to store stormwater. Stormwater storage was further increase by installing 5 ditch checks (these look like rock dams) along the ditch to slow and hold back some of the stormwater and make sure that it drops any sediment it is carrying. Five rain gardens were created on 4 properties, ranging in size from about 50 sq ft. to about 100 sq ft. These were planted with a variety of flowers and other plants. Two of the gardens have underdrains leading to rock-filled sumps for additional water storage. Drain tile was

installed in two properties beneath swales to improve conditions for the property owners and reduce water runoff onto the street, which was creating a large ice problem in winter and resulting in large amounts of salt being applied. If this fix works, chloride entering the stream from this section of street should be greatly reduced. Rock sumps along the curb were dug in a number of places where water is flowing from sump and foundation drains. These sumps provide additional water storage and will help reduce peak flow during rainstorms. Twenty rain barrels were installed; most were 50 gallon, but one was 100 gallon. These will hold back over 1000 gal of water during each rainstorm if the residents remember to empty them between storms.

2010 is the year for post-BMP-installation monitoring of stormflow in the stormsewers, and to assess how well the BMPs perform for residents and their satisfaction with them. To that end, monitoring equipment was re-installed in the storm sewers of all 3 streets in March to record flow, turbidity, temperature, and conductivity data. We also wanted to encourage more folks to build rain gardens in Duluth, so we organized a rain garden workshop, complete with planting a rain garden that we constructed on a willing property owners yard just outside the study area. We were able to give all workshop attendees a walking tour of the rain gardens previously installed in 2009 in the study neighborhood, which looked very nice even after just one year of growth.

2. Specific Project Goals – Include numeric, quantifiable goals for environmental improvement, the number of Best Management Practices to be installed, **pollutant reductions** as well as programmatic and social goals.

We are using paired subwatersheds (neighborhoods) of Amity Creek to demonstrate the effectiveness of homeowner BMPs to reduce residential stormwater and footing drain water to storm sewers. The resulting data will be interpreted on an existing stream education website and used to educate neighborhood, city of Duluth, and regional residents on stormwater issues, individual responsibility, and BMP options. Flyers and training materials developed in the course of this project will be used by the City, Minnesota Sea Grant, and other local agencies and groups to inform area residents about stormwater issues and BMP choices that individuals can implement. All of these activities will result in reduced stormwater inflow to storm sewers.

- We will install as many residential stormwater runoff reduction BMPs as the grant can afford and homeowners in the target neighborhood will accept – the target is at least a dozen homes accepting a BMP.
- The project will result in a measurable increase in the knowledge and understanding of neighborhood residents about stormwater runoff issues, environmental problems, and ways that they can help solve the problem (i.e., increase in individual responsibility).
- We expect that the stormwater flow will be measurably reduced in the storm sewers of the target neighborhood. These storm sewers flow into a local 303d-listed stream, Amity Creek.
- The ability of the Regional Stormwater Protection Team members to cooperate and collaborate on stormwater runoff reduction issues will be substantially increased by their collaboration on this project, making future projects both more likely and easier to initiate.

III. Semi-annual Report Information

1. Project activities completed during last six (6) months according to the program elements or tasks:

Program Element 1: Pre-installation analysis of paired watersheds
All objectives are now complete.

Program Element 2: Stormwater BMP installation (all objectives are complete as of the end of this project period)
Objective E: Design property-specific BMPs. This objective is complete.

Objective F: BMP installation training
We held a second rain garden class on Aug. 11 and had about 18 attendees. For the class, we built a rain gardens just outside the project area in the yard of property owners very eager to participate in reducing stormwater runoff. MCC high school crew chief leaders provided the labor for the rain garden construction, along with graduate student volunteers from NRRI, a Sea Grant student intern, and technical staff from NRRI. Class participants expressed surprise at the level of technical content and detailed information provided in the workshop. Several participants said they didn't expect to come away with enough information to build their own rain garden and were pleasantly surprised that they felt after the class that they could. The class was also very interested to see the rain gardens planted in 2009, and was happy to be able to help plant the class rain garden. The rain garden classes were conducted by Eleanor Burkett of University of Minnesota Extension Service, with organizational and planting assistance from MN Sea Grant staff and project personnel. The City of Duluth provided support to create the rain gardens for the classes, including arrange for materials to be brought to the project site and providing personnel and equipment to remove the excess clay dug out of the rain garden areas.

This objective is now complete.

Objective G: Install stormwater BMPs: This objective is complete.

Program Element 3: Post-installation analysis

Objective H: Collect post-installation data
We re-installed the monitoring equipment in the stormsewers of all 3 streets beginning in late March 2010. The equipment will remain in place until late fall 2010 collecting post-installation data. See attached figures.

This objective is now complete.

Objective J: Education, outreach, and evaluation

The post-installation door-to-door Knowledge, Attitudes, and Practices (KAP) survey was done on all study streets the week of September 13th. Karlyn Eckman with the Social Indicators Project again provided major support and did much of the survey prep work and follow-up analysis. We again used the Minnesota Conservation Corps college crew to conduct the actual surveys. Valerie Brady and Jesse Schomberg gave the MCC crew background information about the project and stormwater; Karlyn Eckman trained the crew in survey techniques and survey data entry. The survey itself contained many of the same questions as the original survey so that we could determine whether or not residents had gained knowledge or changed their attitudes or practices as a result of the project, and to figure out whether these changes (if there were any) would be confined to the study street where most of the work was done, or would spread to the neighboring "control" streets. Survey crews went door-to-door and were able to get responses from the majority of residents.

Jesse Schomberg and Valerie Brady have given several outreach presentations on stormwater that include examples and information on this project. In addition, city staff, especially Chris Kleist and Todd Carlson, use this project as an example in their stormwater presentations to local classrooms. Notable presentations include an invited keynote presentation to the Minnesota Wastewater Operators Association on July 28 in Grand Rapids, Minnesota by Valerie Brady ("Stormwater's Biotic Impacts and Human Solutions"). Karlyn Eckman presented a poster on our survey results at the Water Resources Conference in the Twin Cities in October.

We organized a second neighborhood meeting for September to bring all neighborhood residents up to date on the work and how the BMPs responded to their first full summer of use, as well as results from the post-installation survey. Unfortunately, no one showed up, despite sending individual post cards to all households in the neighborhood. Perhaps part of the cause was a major pro football game by the Vikings the same night as the meeting. We will try again to entice residents to attend an informational meeting this spring to inform them on the project results.

Objective K: Administration

As has been the case for the entire project, grant and project administration continues to require higher amounts of time than originally anticipated on the parts of Chris Kleist and Valerie Brady. However, we have become quite a bit more efficient at these tasks than we were at the beginning of the project.

2. Challenges faced (optional):

- Since we discovered that our classroom-based plans were inappropriate for training the MCC youth who would be working with us on BMP construction, we instead provided hands-on training with intensive supervision for the installation work with the MCC crew. Then we held two rain garden workshops open to local landscapers, garden center personnel, and the general public to train them in rain garden planning and installation.
- More sand, sediment, and debris are moving through the storm sewer pipes than we expected, burying the monitoring probes at times. This has resulted in a need for more frequent equipment care than was anticipated, causing higher personnel costs for monitoring than we projected. This has also caused the chloride and turbidity data to be quite compromised. On the other hand, it provides a good teaching opportunity for us to talk to the residents about keeping the storm sewers clean.
- Something washed down the storm sewer on Kingston St. in June 2010 and smashed into the monitoring equipment, damaging it. We sent it to the company, who were able to retrieve most of the monitoring data stored on the device. The company immediately provided a replacement monitor, so we only lost about a week without some monitoring equipment in place.
- Administratively, the Expenditure Report is in a form that is very difficult for the University and the Project Manager to complete, and it may be impossible to make the amounts exactly match those that are invoiced. However, detailed monthly invoices are submitted by the University of Minnesota's Sponsored Projects Administration office and detailed personnel effort records are maintained by the University and NRRI based on bi-monthly (2 week) reporting intervals.
- There are significant problems with the storm sewer flow dataset that are compromising data analyses as we attempt to determine what difference the BMPs may actually have made on stormwater runoff from properties.
    - One problem is that there are gaps in the storm flow events where for some reason the data recorders stop recording for several minutes or longer despite relatively high flows (See Figure 2 for an example). We have been interpolating to fill in these data gaps and generate usable storm event comparisons.
    - The relative amounts of storm water coming off the 3 streets is not stable relative to each other. We had expected that for all storms, one street would have more and one less, etc, and that this relationship would be relatively stable. Instead, the relationship seems inherently unstable and we have yet to be able to determine predictors of the amount of runoff from any given street or why a street can generate the most runoff in one storm, and then the least runoff in the next storm. We have as yet been unable to come up with a work-around or solution to this problem for data analysis.
    - One of the control streets, Ivanhoe, was resurfaced by the city in 2009, making its pre and post installation data not comparable to each other. We will likely have to forgo using the data from this street for our analyses.

3. Summary of monitoring data collected:

Table 1. Storm sewer flow data for 2010 for the two-block area of all three streets in the neighborhood.

2010 Month	Rain (inches)	Kingston (control)	Ivanhoe (control)	Idlewild (treatment)
March	0.72	1,364,095	1,710,635	501,560
April	0.77	20,940	130,680	1,750
May	2.87	352,130	313,930	31,750
June	6.2	438,250	1,609,375	422,900
July	2.1	27,930	30,005	10,600
August	5.2	182,130	573,800	211,350
September	3.0	67,265	113,040	6,150
October	3.4	565,320	841,510	439,800
2010 totals	**24.3**	**3,018,060**	**5,322,975**	**1,625,860**

The older control street (Ivanhoe) contributes more stormwater than the newer control street (Kingston), in general, during rainstorms (Table 1), but these data have not yet been weighted by drainage area. The stormwater flow from the treatment street (Idlewild) was usually the lowest this year, although it has been variable in previous years. As expected, the amount of water entering storm sewers depends on the dryness of the soil, so that rain events shortly after snowmelt result in greater storm sewer flows than rain events that occur later in the spring and summer after the soils have dried.

Table 2. A summary of rainfall and storm sewer flow by season for the entire project period for all three streets. Idlewild is the treatment street, but monitoring of its flow did not begin until fall 2008.

	Season	Rain amount (inches)		Kingston Street flow (gallons)	Ivanhoe Street flow (gallons)	Idlewild* Street flow (gallons)
		Lakeside	Airport			
2008	spring		6.6	642,755	4.263,245	
	summer		13.6	777,435	1,206,967	
	fall	9.5	7.7	284,193	1,202,400	*33,165
2009	spring	5.2	5.9	2,221,935	1,474,205	1,087,700
	summer	8.9	11.2	962,235	226,675	185,100
	fall	6.0	7.2	654,350	188,095	56,600
2010	spring	4.4	7.6	1,737,165	2,155,245	535,180
	summer	13.5	14.6	648,805	2,326,220	644,851
	fall	7.1	8.9	634,840	972,835	445,950

*Idlewild only has two months of data in 2008 (Oct and Nov)

Figure 1 shows a summary of the flow volumes by month in each of the street's storm sewers for storms large enough to provide 1.5 inches depth in the storm sewers, which helps prevent dropped flow readings by flow monitoring equipment.

Note: Data are collected in residential stormwater sewers and thus are not appropriate for the STORET system. Therefore these data are not being submitted to STORET, but will be made available on request to interested parties.

4. Have all monitoring stations been established in STORET? ☐ Yes ☒ No

5. Are the data being routinely submitted for storage into STORET? ☐ Yes ☒ No Last submittal date:

6. Are the data being annually entered into E-Link? ☐ Yes ☒ No Date last entered:

7. Identify any significant **findings** and **results** of the project to date, as well as any unanticipated findings:

Unanticipated: The willingness of so many property owners to accept BMPs. We had been quite worried about a low acceptance rate. However, most folks wanted at least a little something (shrubs or a rain barrel) and several who had initially declined ended up approaching us during construction and asking to be included. We were very heartened by the response.

2009 BMP installations: Twenty rain barrels capable of holding back over 1000 gal were installed. Five rain gardens capable of holding back several hundred gallons of water each were installed. The stormwater ditch in which ditch checks were installed should be able to store several hundred more gallons of water. Each of the rock sumps can hold 100-200 gal of water. More than 250 trees

and shrubs were planted and fenced on 18 properties to increase infiltration and encourage smaller lawn sizes.

The response rate to our follow-up survey was 76%. A full report on the results of the surveys will be included in the final report, but highlights include: some increase in stormwater knowledge by all residents, with quite bit of increase in knowledge by study street residents for questions like "where does the stormwater flow to". There was also an increase in the number of residents who said that it is both the city and property owners responsibility to help control stormwater. Most study street residents who received BMPs indicated that they liked them, thought the BMPs might be helping but weren't quite sure yet, had been maintain their BMPs and would continue to do so, and would recommend similar BMPs to their friends.

Completely unanticipated in terms of the amount of variability is the instability of the relationship of storm runoff amounts from the 3 streets in terms of relative volumes compared among the 3 streets. We had expected that for all storms, one street would have more and one less, etc, and that this relationship would be relatively stable. Instead, the relationship seems inherently unstable and we have yet to be able to determine predictors of the amount of runoff from any given street or why a street can generate the most runoff in one storm, and then the least runoff in the next storm.

8. Describe specific (quantifiable, if possible) results achieved during this period:

Flow, temperature, turbidity, and conductivity monitoring devices were successfully installed in two storm sewer pipes and quantitative stormwater runoff and stormwater temperature data were collected from April to November, 2008, 2009, and 2010.

Both rain garden workshops went very well despite wet weather which required postponing the "hands-on" planting portion of the first workshop. Participants were very pleased with the extensive amount of information and "how-to" knowledge provided to them. The residents who offered their property for use to build the rain gardens for the workshops are quite pleased with the results so far.

9. Summarize any work plan changes:

After the work plan was written, but prior to the start of the contract, the project team realized that one of the two proposed locations was not as appropriate for this work as previously thought. Since only one location was to be selected, the inappropriate location was dropped from consideration at that time and all efforts have since focused on the Lakeside neighborhoods.

During the organizational meeting, the project team expressed doubt about installing BMPs at the neighborhood school because that school is now on a list for closure and much of the school grounds do not drain into the storm sewers that are being monitored. Instead, we installed all the BMPs in the target neighborhood, which are those properties that drain to the storm sewers on the middle street (Idlewild St.).

We discovered that our BMP installation training workshop, planned as largely a classroom exercise, would be inappropriate to adequately train the MCC youth who will be providing the labor for most of our BMP installation. Thus we held on-site hands-on training with high levels of project personnel supervision.

Rain garden workshops for local residents and area landscape professionals are being held this summer (2010). These workshops included a tour of the Lakeside study area to view the one-year old rain gardens, which look very nice and seem to be functioning well.

10. List anticipated activities for next six (6) months:

Objective I: Analyze stormwater data

We will be doing major work on figuring out how to solve the data problems mentioned in section 2 and analyzing the stormwater runff data once we figure out how to solve or work around these problems. This will consume most of our time on this project until the project's end date.

Objective J: Education, outreach, and evaluation

We will hold another neighborhood meeting this spring to update residents on project and survey results since no one attended the fall meeting.

We will be working on more web pages for the Lake Superior Streams website that will inform the public about the project. We will post summary results that are explained for the general public. We are thinking about how to turn some of the storm runoff data into "vignettes" that feature animated graphs to illustrate the flow through the storm sewer from the neighborhoods.

11. List all products (documents, pamphlets, videos, maps, etc.) produced in this reporting period.

We have created a number of presentations about this project, the BMPs, and our results thus far. We have also created a couple of handouts about the project and BMP options as well as collecting handouts on BMPs from a number of other organizations around the state and nation. Maps of the neighborhood area showing storm sewer flow direction have been created.

Rain garden, stormwater, and other BMP information have been included in the handouts that Sea Grant provides to the public through booths at various venues. This has helped increase Sea Grant's information about environmentally-sustainable living.

Some of our rain garden work was featured in a video on residential stormwater runoff control created by Parthe Productions for St. Louis County. The video is available on YouTube at: http://www.youtube.com/user/StLouisCountyMN

IV. Expenditure Information for this Period

CWP: Provide a copy of the Expenditure Report with cumulative expenditures and this period's expenditures budget balances by work plan program element. The format for the Semi-Annual Expenditure Report is available on the Web at: http://www.pca.state.mn.us/publications/wq-cwp7-09.xls.

☒ Expenditure Report attached

Note *- the Expenditure Report requires a level of detail that cannot be matched by University research managers, and is probably impossible for the project manager to complete accurately. Detailed monthly invoices are submitted by the University of Minnesota's Sponsored Projects Administration office to the City (forwarded to MPCA), just as they are for other MPCA and EPA grants. Detailed personnel effort records, including match, are maintained by the University and NRRI based on bi-monthly (2 week) reporting intervals. The matter should be discussed with Naisan Madson, Senior Accountant, Sponsored Financial Reporting 200 Oak Street SE Suite, Suite 450, Minneapolis, MN 55455 Phone: 612-624-8262 Fax: 612-626-0321 Madso067@umn.edu. We will submit a summary of Match contributions as soon as possible with the same level of detail as per the University Invoice. Match amounts from the University typically are running about 3 months behind the MPCA reporting periods.*

CWP, 319, and TMDL - Complete the table below:	**Amount**
Total Grant Amount:	**167,383**
Total Match Amount (if applicable)	**167,384**
Total Project Amount:	**334,767**
Cumulative Grant Expenditures through this period:	**130,052**
Cumulative Match Expenditures through this period:	**179,354** (exceeded requested match amount)
Total Cumulative Expenditures through this period:	**309,406**

Date form completed:	1/31/2011
Please submit to:	Karen Evens, MPCA

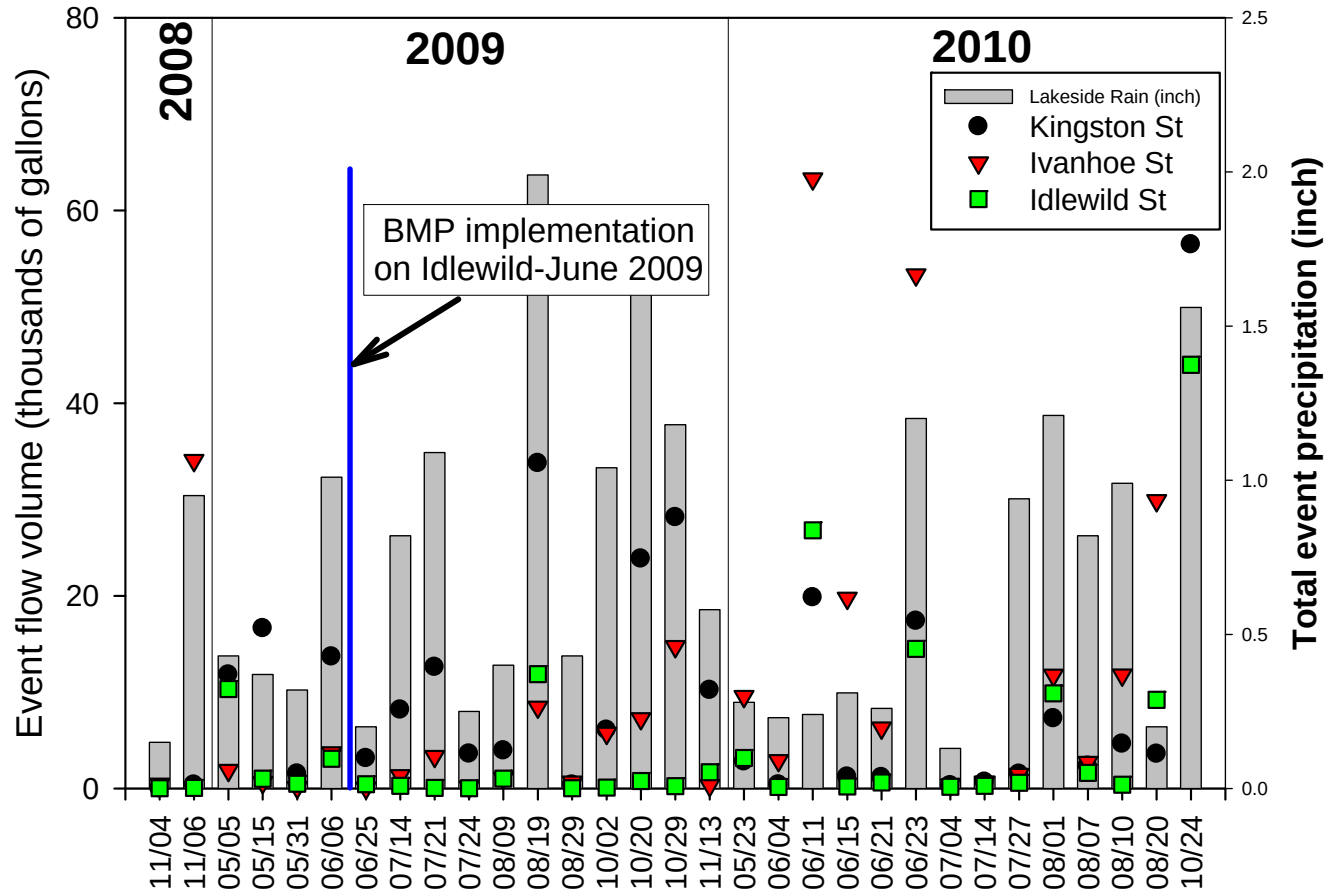

Figure 1. Summary of stormwater flow volumes in the storm sewers of each of the three treatment streets for the entire project period for storms that generated at least 1.5 inches of flow depth in the storm sewers. We had to restrict consideration to storms of this size because of problems with accurate flow readings by the sensor at lesser depths in the storm sewers. The blue line shows when BMPs were installed on Idlewild, the treatment street. Note that because Idlewild was not under consideration for the project at the beginning, it did not receive monitoring equipment until the end of the first year, reducing the number of pre-installation storm events.

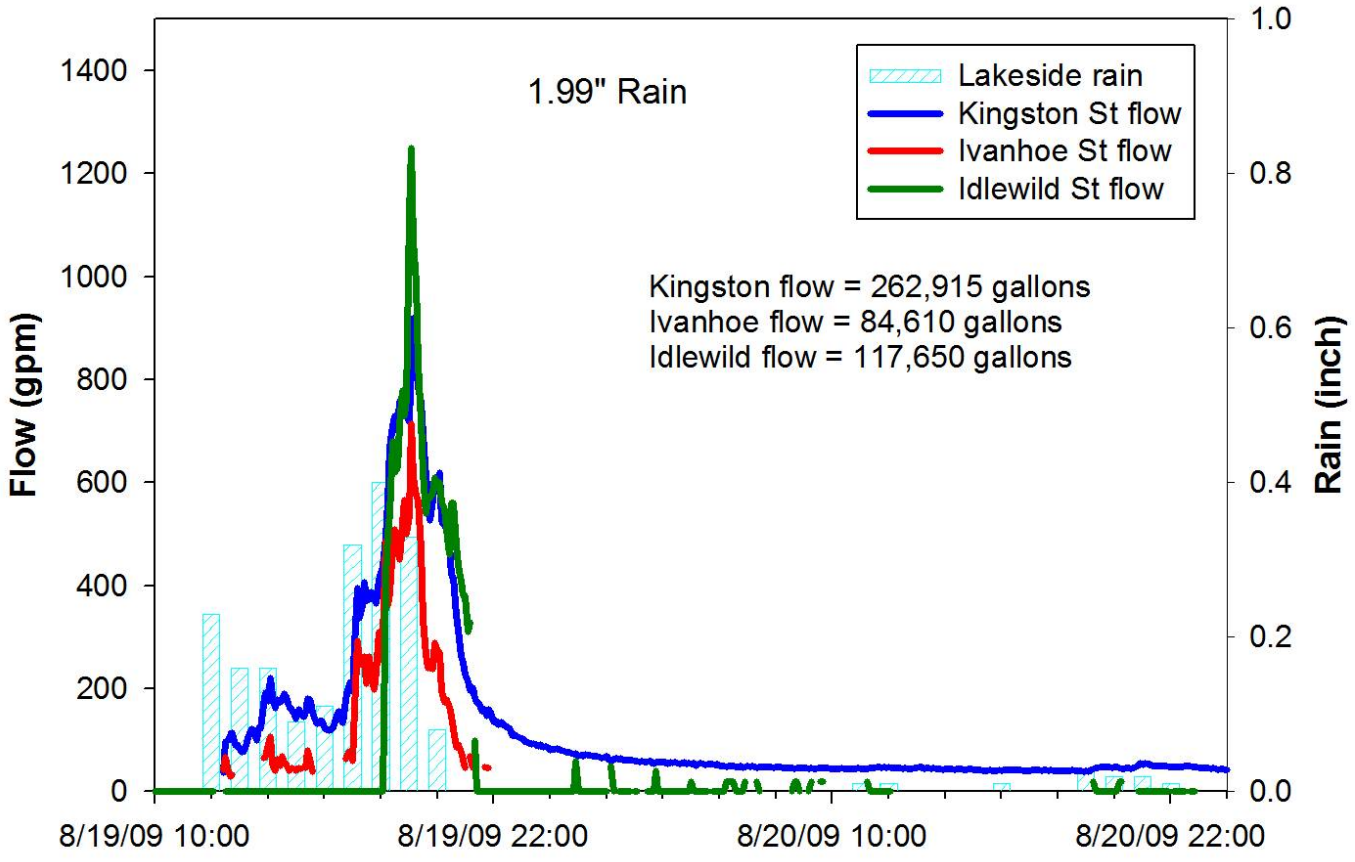

Figure 2. A storm event showing major gaps (arrows) in the flow data due to sensors in the storm sewers not reading flow for unknown reasons during a major storm. Researchers are attempting to fill these gaps by interpolation to create enough usable event data to determine the runoff reduction effect of the BMPs that were installed on Idlewild Street.