



Public Works Committee Agenda

Tuesday, December 13, 2016 at 4:00 pm

Whitefish Bay Village Hall

- 1. Call to Order**
- 2. Review and Approve minutes of November 14, 2016 Public Works Committee Meeting**
see attachment
- 3. Draft PPII Program**
see attachment
- 4. 2016 / 2017 Project Update**
- 5. Next scheduled meeting – to be determined**
- 6. Adjournment**

Posted: 12/9/16

Upon reasonable notice, efforts will be made to accommodate the needs of disabled individuals through appropriate aids and services. Contact Village Hall at (414) 962-6690. It is possible that members of and possibly a quorum of members of other Boards, Commissions, or Committees of the Village including in particular the Village Board may be in attendance in the above stated meeting to gather information; no action will be taken by any other Boards, Commissions, or Committees of the Village except by the Board, Commission, or Committee noticed above. Agendas and minutes are available on the Village website (www.wfbvillage.org)

Cc: Village Board; Village Manager, Department Heads; Village Attorney



Public Works Committee Minutes
Monday, November 14, 2016 at 4:00 pm
Whitefish Bay Village Hall

I. Call to Order and Roll Call

The meeting was called to order at 4:03 pm.

Present: Trustee Serebin, Trustee Miller, Trustee Davis.

Also Present: Village Manager Steven Sheiffer, Public Works Director John Edlebeck, Village Engineer Mustafa Emir, Staff Engineer Spencer Charczuk, and resident George Svoboda.

II. Approval of Minutes September 15, 2016 Public Works Committee Meetings

Trustee Serebin moved, seconded by Trustee Davis to approve minute for September 15, 2016. Unanimous in favor. Motion approved.

III. Lancaster Avenue Storm Sewer Lining Project Contract Award

John stated that the village received competitive bids from 5 contractors. Visu-Sewer was the apparent low bidder with a bid of \$157,000. Minor construction inspection services will be provided by Clarke Dietz.

Trustee Serebin moved, seconded by Trustee Davis to recommend to the board to award the Lancaster Avenue Storm Sewer Lining Project to Visu-Sewer.

IV. Cramer Street Storm Sewer Project-Design Engineering Service Agreement

John discussed the improvements that were recently constructed adding an additional storm sewer catch basin and pipe on Cramer Street and at Cramer and Glendale. John and Mustafa ran the model multiple times to find a remedy for the surface flooding experienced in the area. The addition of another storm sewer pipe will add considerable capacity in the area. Early estimated costs are estimated to be in the range of \$125,000, depending on scope of the project as well as pavement restoration. Trustee Serebin asked if residents will have the ability to connect private storm sewer sump pump lines. John stated that it will be looked into during the design of the project. This improvement will provide relief for the Cramer Street storm sewers and allow that system to respond similar like other areas in the village during peak rain events.

Trustee Davis moved, seconded by Trustee Miller to recommend to the board to award the Cramer Street Storm Sewer Project-Design Engineering Service Agreement.

V. **Clark Dietz Village Engineer Contract Renewal**

John recommended that the 2 year contract with Clark Dietz be extended in lieu of hiring a staff Village Engineer. Mustafa discussed the benefits of using a contract engineer as a cost saving. The contract for this year was \$90,000 with an estimated \$70,000 expended so far this year. Trustee Davis asked about Clarke Dietz relationship with MMSD. Clarke Dietz represents clients of MMSD, but not MMSD directly.

Trustee Serebin moved, seconded by Trustee Davis, to recommend to the board the award of the 2016 Sanitary Sewer Improvement Project. Unanimous in favor. Motion approved.

VI. **2016/2017 Project Updates**

2016 Roadway and Utility Project: roads are open on all three construction areas. Parkway turf restoration is being completed on Berkeley Boulevard and Elkhart Avenue. Sections of the Berkeley Boulevard concrete pavement were damaged during construction and will need to be replaced. Trees are being planted on Berkeley Boulevard and Elkhart Avenue.

WisDOT HSIP Safety Grant applications are moving forward and will provide funds for safety improvements along Lake Dr., Silver Spring and other local intersections. George Svoboda expressed concerns of increased noise with the proposed high friction asphalt surface treatment that is planned to be used for these improvements. TADI and village staff will investigate and provide more information on the impacts of high friction asphalt in regards to noise levels.

The 2016 Sanitary Sewer Improvement Project on Fairmount ran into to some underground utilities which required the modification of the design alignment. Palisades work should begin sometime after Thanksgiving or early December.

PPII: a proposed program is being prepared to address PPII using funds from MMSD. This proposed program will be on the December Public Works Committee meeting agenda.

VII. **Next Scheduled Meeting- Tuesday, December 13, 2016 at 4:00pm**

Trustee Davis motioned to adjourn, seconded by Trustee Serebin. Unanimous in favor. Motion approved. Meeting adjourned at 5:16pm.

Village of Whitefish Bay

Private Property Inflow-Infiltration (PPII) Reduction Program

November 30, 2016

Mustafa Emir, PhD, PE

Purpose

The Village of Whitefish Bay believes that the backup of sanitary sewers into basements is unacceptable and must be reduced and eliminated to the greatest extent possible. The Village's current efforts to fulfill this objective consist of the following two approaches:

- 1- Implement sanitary sewer main hydraulic improvements through larger diameter pipes, rerouting of sewer mains to create more capacity and achieve lesser basement backup risks.
- 2- Reduce the amount of water inflowing and infiltrating into the sanitary sewer system in order to manage existing sewer main capacities in a manner that reduces basement backup risks.

Hydraulic Improvements:

Since 2014, Whitefish Bay has conducted a focused hydraulic review of high-risk basement backup areas and identified sewer main segments that can be either upsized and/or rerouted to reduce basement backup risks.

The sewer main improvement projects result in immediate benefits to our residents and provide much needed peace of mind in areas that have suffered frequent and persistent basement backup events. This type of improvement will generally provide a significant jump in the level of protection and should continue to be our first line of defense against basement backups. In this sense, hydraulic improvements are the backbone of our basement backup reduction strategy and will continue to be implemented throughout the Village to offer a higher level of basement backup protection to our most vulnerable areas.

Inflow-Infiltration Reduction Improvements:

The reduction of clear water entering sanitary sewer mains is a complementary sanitary sewer system management strategy. Any amount of reduction of the total amount of flow in the sanitary sewer system during rainfall events will increase the overall level of basement backup protection and should be included in the response to this problem.

Accordingly, the Village has developed a multi-faceted approach to the reduction of rainfall dependent flows in the sanitary sewer system:

- 1- Sanitary sewer main lining,
- 2- Sanitary sewer manhole rehabilitation, and,
- 3- The lining and rehabilitation of private property sanitary laterals

While the first two strategies have a long history in Whitefish Bay, the third one is newly proposed for implementation. The lining and rehabilitation of the private property laterals is part of the Private Property Inflow-Infiltration reduction program championed by the Milwaukee Metropolitan Sewerage District (MMSD).

The PPII Reduction Program in Whitefish Bay is proposed to be based on the findings, conclusions, and recommendations contained in reports prepared and published in 2011 and 2012 by Village officials and consultants. Specifically, the proposed program generally follows the recommendations of the Final_Report on Inflow and Infiltration Study, published in February of 2012 by Donohue & Associates, and Final Report on Sanitary Sewer Study, published in December of 2011 by Donohue & Associates.

Problem Definition

Clear or non-waste water that enters sanitary sewer mains reduces the capacity of sewer mains to transport domestic wastewaters. Inflow and infiltration (I&I) are terms used to describe the ways that groundwater and stormwater enter into dedicated wastewater or sanitary sewer systems.

- **Inflow** occurs when rainfall enters the sewer system through direct connections such as roof leaders, yard drains, catch basins, sump pumps, manhole covers and frame seals or indirect connections with storm sewers. Improper connections can be made in either residential homes or businesses and can contribute a significant amount of water to sanitary sewer systems. An 8-inch sanitary sewer can adequately move the domestic wastewater flow from up to 200 homes, but only eight sump pumps operating at full capacity or six homes with directly connected downspouts may overload the capacity of the same eight inch sewer pipes. A single sump pump can contribute over 7,000 gallons of water to sanitary sewer systems in a 24 hour period, the equivalent of the average daily flow from 26 homes.
- **Infiltration** is groundwater that enters sanitary sewer systems through cracks and/or leaks in the sanitary sewer pipes. Cracks or leaks in sanitary sewer pipes or manholes may be caused by age related deterioration, loose joints, poor design, installation or maintenance errors, damage or root infiltration. Groundwater can enter these cracks or leaks wherever sanitary sewer systems lie beneath the water table or the soil above the sewer system becomes saturated.

Average sewer pipes are designed to last about 50-75 years, depending on what type of material is used. Often sanitary sewer system pipes along with the lateral pipes attached to households and businesses have gone much longer without inspection or repair and are likely to be cracked or damaged, particularly in a community with homes as old as those found in Whitefish Bay.

Service laterals can be particularly insidious as these are often poorly constructed and rarely, if ever, inspected until a failure occurs. They are often near trees and shrubs whose roots can penetrate and degrade the lateral. It is not uncommon for service laterals to contribute 50% or more of the total I&I.

Previously Completed Sanitary Sewer System Flow Monitoring and I-I Assessment

The Whitefish Bay flow monitoring program was performed from April through August of 2011. The objective of continuous flow monitoring was to obtain accurate, current information on the flow characteristics of the study area necessary to accurately analyze the gauging tributary areas for infiltration during high groundwater periods and for rainfall related inflow during wet weather periods. The information provided by flow monitoring aids in locating those areas that have excessive infiltration/inflow and determine if they warrant further investigation.

Inflow Summary:

Flow meter and rainfall data were analyzed to identify periods of wet weather when inflow occurred. Flow meter data during the wet weather period (generally over several days) was compared to flow

meter data during a selected dry weather period (usually a period immediately preceding the storm) provided this period is representative of similar groundwater conditions. The rate and volume of inflow tributary to a subsystem was computed by subtracting the dry weather flow data from the wet weather flow data.

For each significant storm event during the flow monitoring period, both the peak inflow rate and the total inflow volume was calculated. The peak inflow rate is the largest rate difference, determined over a one-hour period, between the storm event hydrograph and the dry weather hydrograph.

For each of the flow meters analyzed, the inflow due to rainfall is determined as “Average Capture Coefficient”, which is a measure of the amount of rainfall that finds its way into the sanitary sewer mains.

As such, the higher the Average Capture, the higher the potential of inflow into the sanitary sewer mains in a given flow meter area.

The results of the inflow analysis are summarized in Figure 1 where extremely high inflow potential exists in RED and YELLOW areas and high inflow potential is found in GREEN and LIGHT BLUE areas. In other words, these are highest priority areas of the Village where rainfall induced inflow potential is most severe.

Infiltration Summary:

Base infiltration, or base flow, results from precipitation that infiltrates into the soil and eventually moves through the soil to the sewer. This is also referred to as ground water infiltration. Infiltration is typically estimated using spring flows when the seasonal groundwater table is high.

To determine infiltration, wastewater flow meter data was examined to identify periods of dry weather, generally at least three to five days without a storm event. Data following rainfall events was excluded until flow returned to pre-rainfall levels.

During dry weather periods, nighttime minimum flows were analyzed to estimate average infiltration rates.

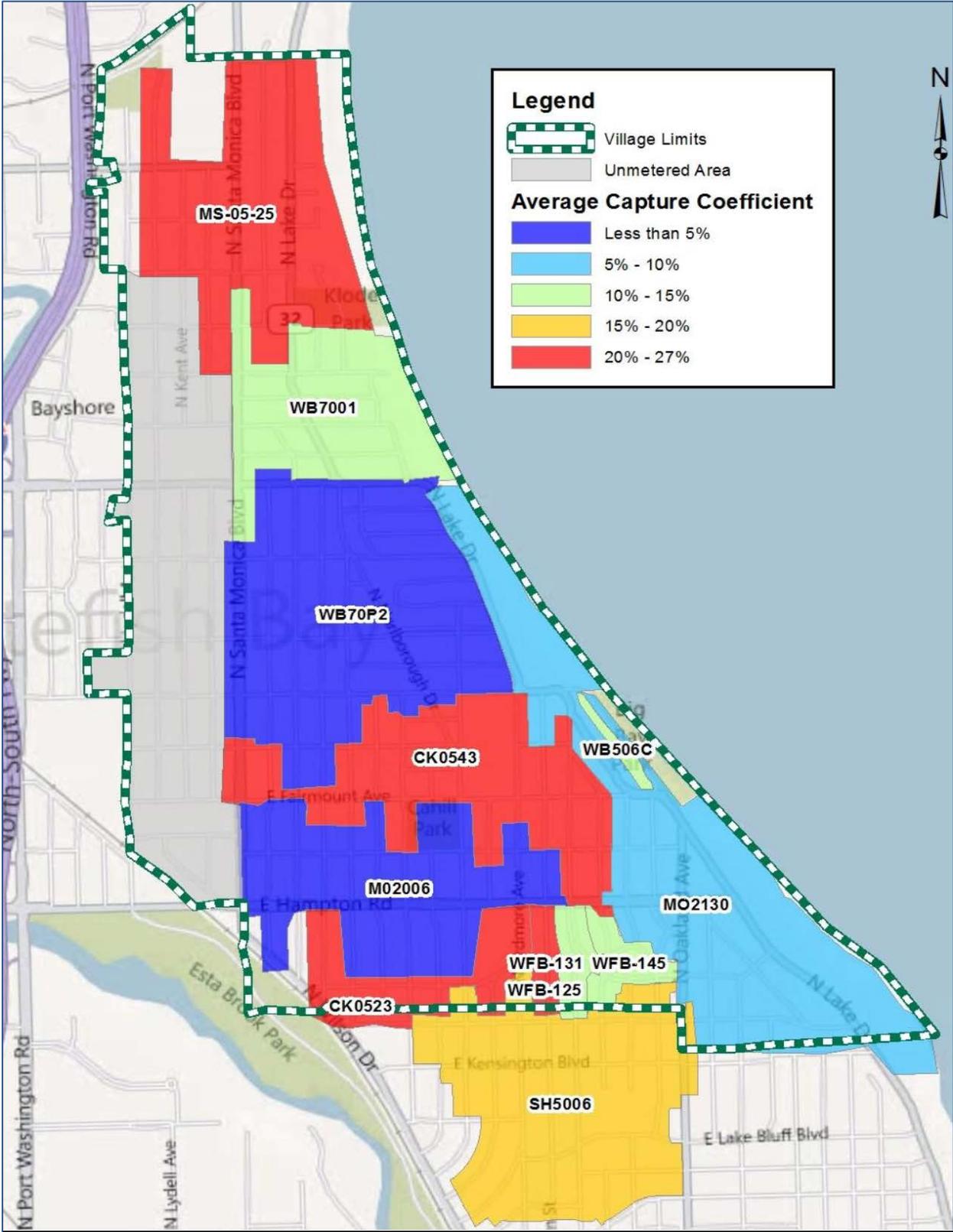
The nighttime minimum flow represents a period of minimal sanitary flow; therefore, a high percentage of the nighttime minimum flow may be attributed to groundwater infiltration.

Two industry standard metrics were used to quantify infiltration. The first of these two metrics normalizes wastewater flows by population.

Flows in excess of 120 Gallons-per-Capita-per-Day (GPCD) are generally considered excessive. The average infiltration rate for all of Whitefish Bay was **124 GPCD**, therefore found to be excessive by industry standards. A closer look into infiltration potential within the Village is conducted using a second metric that takes into account the size and length of sewer mains in each flow meter area.

Figure 2 shows the rating of flow meter areas according to infiltration potential based on Gallons-per-Day-per-Inch Diameter-Mile of sanitary sewer main. YELLOW and RED areas are subject to excessive infiltration, GREEN area subject to high infiltration, and the rest showing low infiltration potential.

Figure 1 - Inflow Potential Summary



Public Sanitary Sewer Collection System H Reduction Efforts in Whitefish Bay

Whitefish Bay has been implementing an aggressive sanitary sewer inspection and replacement program. 95% of the sanitary sewers have been televised, and those in poor condition identified. IN the past 11 years, the Village has replaced approximately 25 percent of the sanitary sewers, sealed manholes, and replaced service laterals within the street right of way in order to reduce transfer of water from storm sewers crossing over them.

Each year, Whitefish Bay undertakes the lining of public sanitary sewer mains and the rehabilitation of public sanitary sewer manholes to prevent leaks and seepage of groundwater into the sanitary sewer conveyance system. The significant progress in sewer main improvements in the last decade is shown in Figure 3. The green and red colors indicate streets with improved sanitary sewer mains.

Private Property Inflow and Infiltration Source Assessment

In addition to clearwater entering the sanitary sewer system through the public components of the collection system, clear water can enter the sewer system from private property sources and can account for 40 to 80 percent of the total clear water entering the sanitary sewer system. These private sources are numerous and many are difficult to identify without home and basement inspections. A partial list of potential private property sources are as follows:

- Foundation drains connected to the sanitary sewer lateral.
 - Foundation drains are intended to keep basements dry by draining groundwater around the property to prevent the foundation walls from failing. The foundation drains were originally constructed to discharge into the building's sanitary lateral. To reduce clear water entering the sanitary sewer system, properties constructed after February 16th, 1953 were required to have sump pumps rather than foundation drains so as not to discharge into the sanitary sewer.
 - Most properties in Whitefish Bay (75 to 80 percent) were constructed prior to 1953 and most probably have foundation drains connected to the sanitary sewer unless a sump pump was later installed by the property owner. Depending on the functionality of the foundation drains, the clear water from foundation drains may contribute to significant flows, which could overload the sanitary lateral or contribute to overloading of the sanitary sewer in the street, both of which can cause basement backups.
 - A 2011 resident survey identifies those properties with reported sump pumps and is provided for reference as Figure 4.
- Downspouts directly connected to the sanitary sewer lateral.
 - Based on the responses to the post flooding resident survey, approximately 30 percent of all downspouts discharge into the ground, the rest are assumed to be connected to the sewer laterals, thereby contributing wet weather flows into the sanitary sewers.
 - An in-ground discharge in the absence of a storm sewer system or storm lateral may indicate a connection to the sanitary sewer lateral. Accordingly, approximately 50% of downspouts discharging into the ground (representing 15% of all downspouts) may be connected into the building's foundation drain or sanitary lateral.

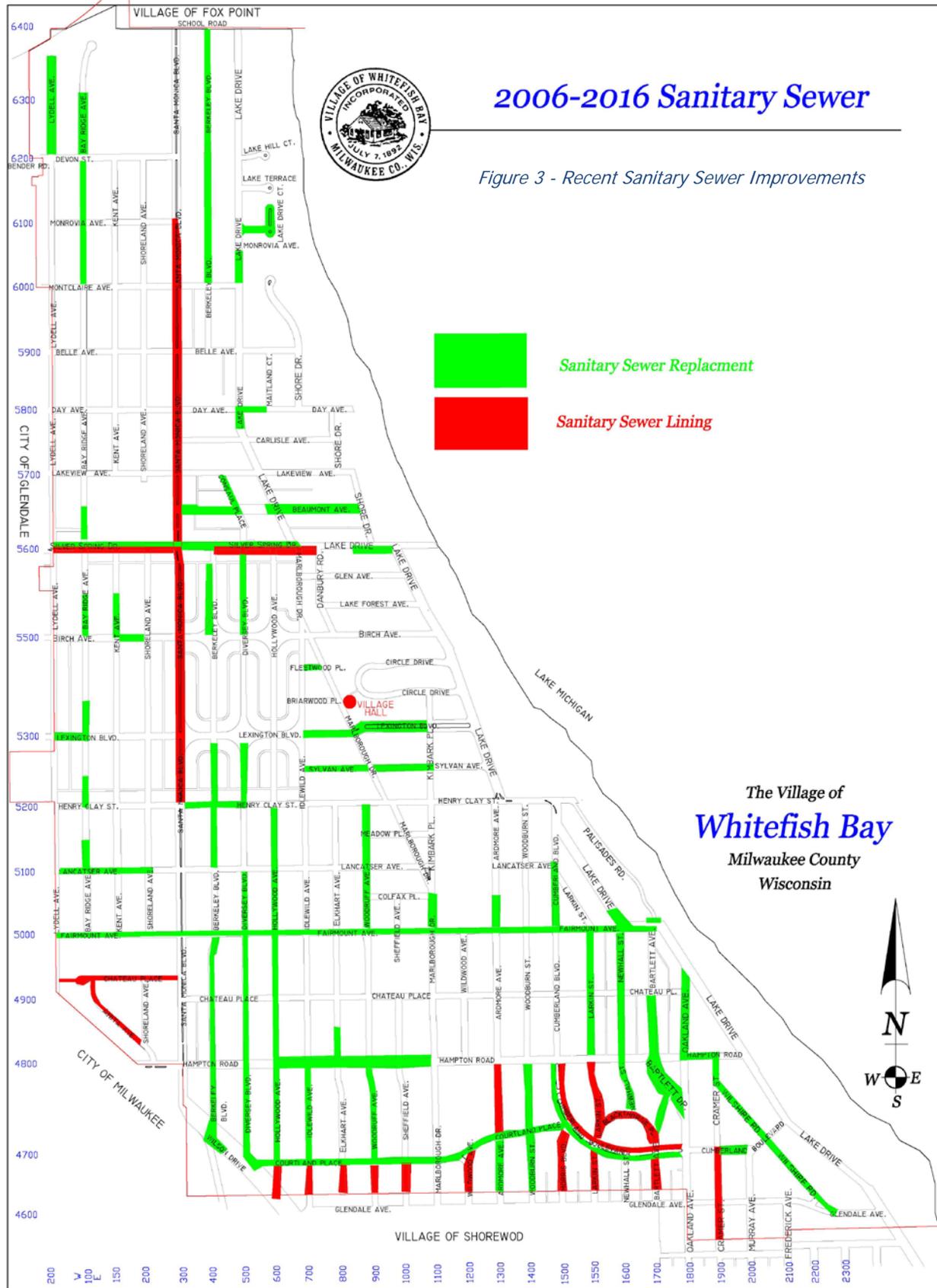


2006-2016 Sanitary Sewer

Figure 3 - Recent Sanitary Sewer Improvements

 Sanitary Sewer Replacement

 Sanitary Sewer Lining



The Village of
Whitefish Bay
Milwaukee County
Wisconsin





- There are approximately 340 homes more than 100 feet from a storm sewer, which also have downspouts discharging into the ground. An in-ground discharge in the absence of a mini storm system or storm lateral may indicate an illegal connection. Therefore, the downspouts, approximately 50% of downspouts discharging into the ground and 15% of all downspouts, are likely illegal connections into the building's foundation drain or sanitary lateral.
- A comprehensive field verification of downspouts was performed in 2012 and the summary results of that study is included in Appendix 2.
- Sanitary sewer laterals that are defective, with loose joints, or root intrusions that allow groundwater to leak into the lateral.
 - Sanitary sewer lateral pipes (building sewers) convey wastewater from the property plumbing to the Village sanitary sewer system. It is the responsibility of the property owner to maintain this lateral from the building to the Village sewer (Village code - Section 13.24 Sewer Drain for Each Building).
 - During sewer replacement projects, the Village replaces the lateral from the Village sewer to the street right of way (i.e., property line).
 - Although the lateral maintenance on the private property is the responsibility of the property owner, maintenance is typically ignored until there is a partial or total failure and subsequent sewer backup. Laterals are typically 8 to 10 feet below ground, constructed of clay, can crack, and be subjected to intrusion of rainwater and tree roots, which can cause leaks and blockages. Another source could be the missing or deteriorated joint gaskets, which are intended to prevent clear water from entering the system.
 - Currently, the Village only replaces the portion of the lateral within the street right of way during sewer replacement projects.
- Sump pumps discharging into the sanitary service lateral, basement sink, or basement floor drain.
 - A properly installed and operating stormwater sump pump receives the groundwater collected by the foundation drain and ejects the water outside the building. In general, the discharge is either to the adjacent ground or where available, into a dedicated storm sewer lateral.
 - Sump pumps that direct the discharge directly into the sanitary lateral, basement floor drain or sink are illegal connections.

Potential Elements of a Private Property Inflow and Infiltration Source Elimination Program

- Foundation Drain Disconnection Program
 - Factors to be considered in implementing a foundation drain disconnection and sump pump installation program include the following:
 1. Location within the inflow reduction priority area.
 2. Willingness of the homeowner in having their foundation drains disconnected from the sanitary lateral and allow the installation of a new sump pump, including financial participation, if required.
 3. Availability of a collection system on the street to handle the water ejected from the foundation.

4. Functional foundation drains that will collect groundwater and deliver it to the sump.
 5. Presence of code compliant electric service in the home.
- Downspout Disconnection Program
 - Per Village Code Section 13.45, downspouts are required to be disconnected from the sanitary sewer laterals to prevent clear water from entering the sewer system. Accordingly, the Village continues to investigate for downspouts illegally connected to the Village sanitary sewer system and enforce disconnection.
 - Private Sanitary Sewer Lateral Rehabilitation
 - Previous PPII related work in the Village has focused on studying the existence and sources of inflow and infiltration in sanitary sewer mains. Having established that there is a problem with Inflow and infiltration, the focus has shifted to implementing fixes to reduce the amount and incidence of inflow and infiltration originating from private property sources.
 - Lateral rehabilitation will include some or all of the following methods:
 1. Lateral Replacement: in some cases, laterals may have to be replaced due to excessive structural damage. However, the Village anticipates that lateral replacements will be exceedingly rare.
 2. Lateral Lining: leaky laterals may be either entirely or partially lined. From a technological perspective, the laterals in Whitefish Bay will be suitable for lining in almost all cases. Lining is the predominantly accepted method to reduce I-I in private sanitary laterals.
 3. Lateral Grouting: laterals where joints are identified as the source of inflow may be rehabilitated by joint grouting. A tried and true rehabilitation method, these methods can effectively address individual leakage points. Because grouting is considered to be a relatively short-term solution (i.e., 10 years or so) it is not commonly used in publicly funded private lateral rehabilitation.
 4. Service Tap Grouting and Lining: broken or damaged taps are a known source of leakage into the sewers. In some cases, the laterals may be fine, but have broken connections. Grouting and lining at the taps should be part of the Village's lateral rehabilitation arsenal. Though rare, service tap grouting and lining may be an effective and low cost approach to reducing inflow sources where laterals and mains may be fine, but the service tap has failed.

PPII Reduction Target Areas and Implementation Sequencing

Priority 1. WB5004 and WB5003

We recommend that the sequencing of the PPII reduction be based on fixing the “worst first” based on the assessment of inflow and infiltration potential in each metered area in the Village.

Combining the worst inflow and the worst infiltration areas shows that our number one priority must be the reduction of private property sources in the Fairmount Avenue Corridor in Sewershed WB5004 (525 properties, 163 acres), and the East Courtland Place corridor in Sewershed WB5003, (170 properties, 48 acres).

In order to achieve PPII reduction amounts sufficient to reduce basement backup risks during wet weather events, we would expect a relatively high number of laterals to be rehabilitated (i.e., approximately 75 percent). In approximate numbers, this translates to about 525 laterals rehabilitated.

- A. High infiltration area bound by Henry Clay Street, Chateau Place, Diversey Boulevard, and Larkin Street, labeled as Priority 1 – High Infiltration in Appendix 1.

Study findings justify the need for lateral rehabilitation by lining to reduce the amount of infiltration in the system. Lateral rehabilitation should specifically concentrate on Fairmount Avenue Corridor in Sewershed WB5004.

For the purpose of planning, we are assuming that a typical sanitary sewer lateral lining installation will cost \$6,000 per home. Typically, the lateral installation will have the following features:

- a. No entry in to the home is necessary
- b. Only a very small hole (12 inch or so) is excavated in the front yard, near the front of the house
- c. The hole is used to access the sanitary lateral for lining
- d. The liner is installed remotely from the sanitary main
- e. The process requires no participation or involvement by the home owner, other than the initial consent for lining installation.

- B. High inflow area bound by Courtland Place, Glendale Avenue, Woodburn Street, and Wilson Drive, labeled as Priority 1 – High Inflow in Appendix 1

Study findings indicate the need for specific focus on downspout and foundation drain disconnections that may be the cause of high inflow behavior. This effort should specifically concentrate on East Courtland Place corridor in the western two thirds of Sewershed WB5003.

- a. As part of the PPII Reduction Program, we propose that a foundation drain disconnection/sump pump installation program be implemented as a “pilot program,” but not necessarily in this high inflow priority area because:
 - i. As seen in the map in Appendix 1, the high inflow priority area is generally confined to the 4600 block along the Village’s south border, between the Village limits and Courtland Place.
 - ii. There are no separate sump pump discharge collection systems in the high inflow priority area. Whitefish Bay has started installing this type of collection system starting with the 4700 block construction of Hollywood, Idlewild, Woodruff, Elkhart, Sheffield, and Bartlett.
- b. For the purpose of planning, we are assuming that a typical foundation drain disconnection effort will cost \$10,000 per home.

Even within a Pilot Program, there are several financial decisions that must be made to control costs:

- i. Cost Caps
- ii. Cost of sump crock, pump
- iii. Cost of electrical improvements

- iv. Costs in finished basements, limits and limitations of construction in finished basements
 - v. Foundation drains that require fixing along the basement walls if the drains are not draining properly
 - vi. Cost of discharge pipe through front yard, sidewalk and curb if necessary
- c. As part of the PPII reduction effort, we propose that the findings of the 2011 Downspout testing program be revisited and used to confirm ongoing disconnection compliance within the high inflow priority area. We do not anticipate a significant cost for this effort as the disconnection itself, if needed, will be paid for and possibly performed by the home owners.

Priority 2. WB5008

This area is generally bound by School Road, Belle Avenue, Lake Drive and Berkeley Boulevard. Previous studies have found that Sewershed WB5008 (750 properties, 162 acres), indicates a very high degree of inflow during rainfall events. Priority 2 area is shown in Appendix 1.

We recommend that Sewershed WB5008 be scheduled for the second wave of PPII reduction efforts, possibly in nine years, with specific emphasis on downspout and foundation drain disconnections that may be the cause of high inflow behavior, similar to Priority 1 response detailed above.

PPII Reduction Schedule and Budget

The Village of Whitefish Bay currently has a PPII account balance of \$835,823.00 in the program fund at MMSD. We assume that the Village’s annual PPII allocation from the MMSD will continue to be about \$135,000. The proposed schedule uses the accumulated funds first, and then starts supplementing the annual program by gradually increasing amounts contributed by the Village.

Over a quarter of the laterals in the priority area are targeted in the first two years of the program, and at no budget impact to the Village. Starting in year 3, we anticipate that the Village will begin contributing financially to the program, and by year 5, the program will evolve to be funded by MMSD and the Village in equal amounts.

Within the MMSD service area, several municipalities have initiated PPII Reduction programs using many approaches and many funding schemes. A recent summary of how each community has undertaken this effort is provided in Appendix 3.

When implemented in a sustained schedule, we anticipate that significant improvements can be obtained over the nine-year implementation horizon. The following table presents a sample 8-year program to rehabilitate 430 laterals within the Priority 1 – High Infiltration area.

If the Pilot Program for foundation drain disconnection is implemented, we would anticipate that some of the funds for lining would be redirected to the pilot. Typically, we would expect that on a block with 20 or so homes, a third of the properties might have all the prerequisite conditions for effective disconnection, so the program’s implementation cost could be as high as \$60,000 for 5 to 10 installations.

For the purpose of planning, we are assuming that the Foundation Disconnection Pilot Program be assigned a budget of \$75,000. Budgeting this amount away from lateral lining means that the Village cost share ramp-up shown in the following table would arrive quicker and be a little steeper.

Potential Schedule of PPII Reduction Program – Lateral Lining Only

Year	Funding				Annual Laterals Lined	Cumulative Laterals Lined	Total Laterals = 525
	MMSD	Whitefish Bay	Annual Project	Balance			Percent Completed
2016	\$ -	\$ -	\$ -	\$ 835,000.00	0	0	
2017	\$ 135,000.00	\$ -	\$ 450,000.00	\$ 520,000.00	70	70	13%
2018	\$ 135,000.00	\$ -	\$ 450,000.00	\$ 205,000.00	70	140	27%
2019	\$ 135,000.00	\$ 40,000.00	\$ 300,000.00	\$ 80,000.00	45	185	35%
2020	\$ 135,000.00	\$ 85,000.00	\$ 300,000.00	\$ -	45	230	44%
2021	\$ 135,000.00	\$ 135,000.00	\$ 270,000.00	\$ -	40	270	51%
2022	\$ 135,000.00	\$ 135,000.00	\$ 270,000.00	\$ -	40	310	59%
2023	\$ 135,000.00	\$ 135,000.00	\$ 270,000.00	\$ -	40	350	67%
2024	\$ 135,000.00	\$ 135,000.00	\$ 270,000.00	\$ -	40	390	74%
2025	\$ 135,000.00	\$ 135,000.00	\$ 270,000.00	\$ -	40	430	82%

Appendix 1

PPII Reduction Target Areas and Implementation Sequence

PPII REDUCTION TARGET AREAS & IMPLEMENTATION SEQUENCING

VILLAGE OF WHITEFISH BAY



1 in = 800 ft

800 400 0 800 Feet

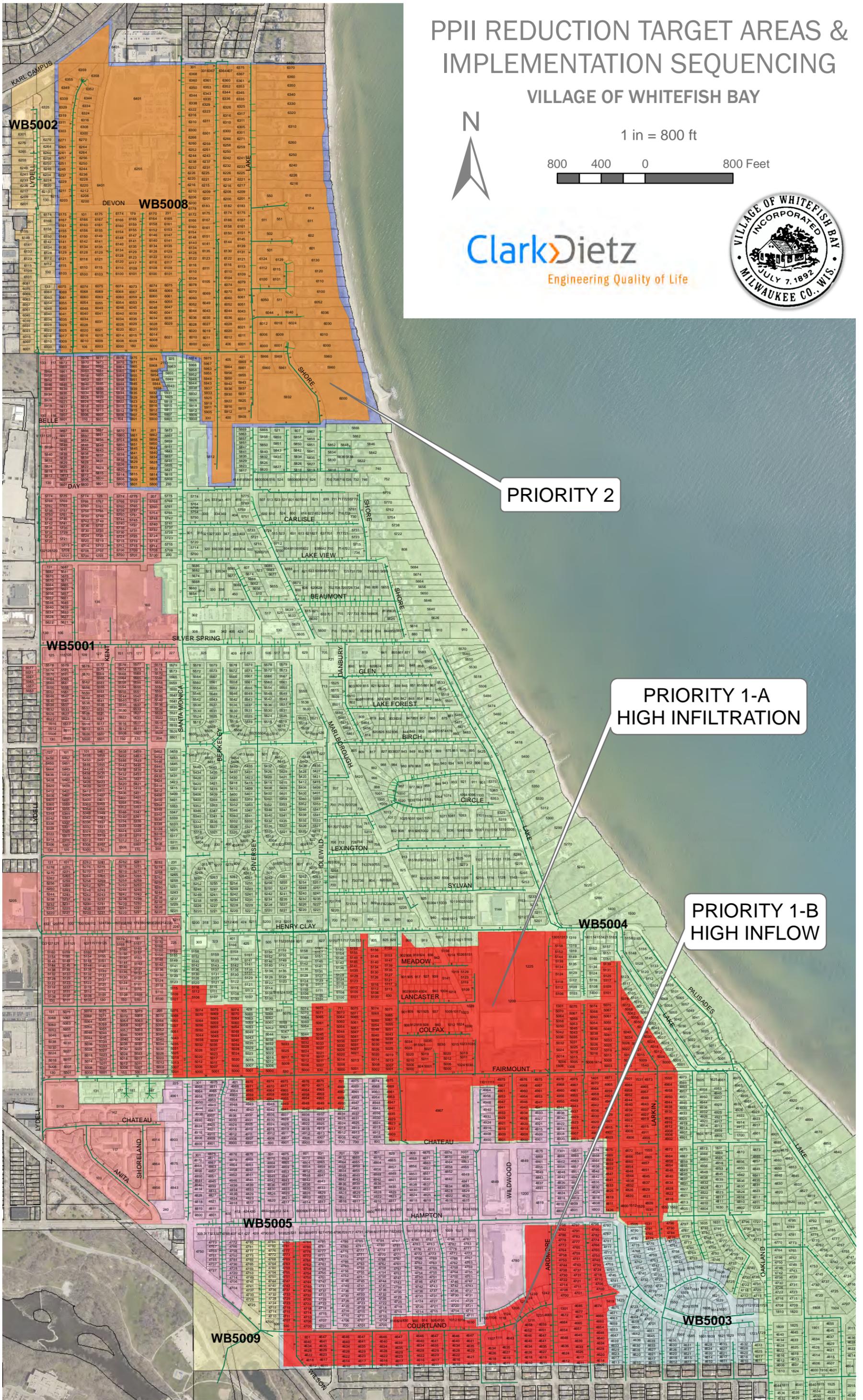
ClarkDietz
Engineering Quality of Life



PRIORITY 2

**PRIORITY 1-A
HIGH INFILTRATION**

**PRIORITY 1-B
HIGH INFLOW**



Appendix 2

Whitefish Bay Downspout Connection Study Executive Summary

**2013 Downspout/Clear Water Compliance Program
Village of Whitefish Bay
Engineers Project No. W131424.00**

Project History

The Village in the continuing effort to ultimately reduce flooding and sewer back-ups within the Village has determined to document the residential address and discharge location (storm sewer, sanitary sewer or to surface) of downspouts that discharge below the ground grade. This documentation and study will help the Village identify clear water discharge to the sanitary sewer system by downspouts. Previously, the Village completed two preliminary undertakings to help identify potential locations. In 2011 the Village sent out a mail survey, of which approximately 900 residents responded documenting various cases of their downspouts going below ground. In 2012, the Village performed a sidewalk survey and recorded 213 locations where the downspouts were observed to discharge below grade. In order to complete the study, verify and document the actual discharge location of these downspouts, the Village contracted with GAI, Consultants; known formerly as Crispell-Snyder, Inc., to perform on-site inspections of these previously recorded locations and determine if dye water testing of the downspouts was required.

Project Scope

Existing Data

GAI prepared an initial comprehensive spreadsheet documenting the total list of residents, including names, addresses, source of inclusion on the comprehensive list, and in some cases the number of downspouts discharging to below grade. The list is based upon the previously provided 2011 mail survey spreadsheet and the 2012 sidewalk survey spreadsheet provided by the Village. The data was cross-referenced, compared, sorted and grouped to eliminate any duplication of the two spreadsheets to create the comprehensive list. Using the comprehensive spreadsheet GAI created an output file and map of these locations for clear water inspection.

Upon review of the initial comprehensive spreadsheet the Village provided documentation of the properties that have previously passed a clear water compliance test since January of 2011. These properties were tested at the time of sale, and GAI cross-referenced this list and eliminated any property from our initial comprehensive spreadsheet that had passed the clear water compliance. Upon completion of this comprehensive list GAI met with the Village for a review and confirmation of the list and the location map (*Exhibit A*).

Data Verifications

Once the comprehensive list of addresses had been confirmed a visual verification was completed to corroborate the two previous studies. This included sending out notifications to each resident on the final comprehensive list that GAI is entering their property for a visual inspection of their downspouts and discharge locations. Within the notification, Village Municipal Code, Chapter 13, was referenced which stated the right of the Village or representative to enter their property for these inspections. Upon notification, the residences were visually inspected to confirm the downspouts that actually discharge below grade. The intent of this inspection was to identify and confirm the discharge locations of downspouts to further reduce the number of properties that will require dye water testing. The inspections included walking the perimeter of the main building and any auxiliary building. The final visual inspections were recorded on-site and the comprehensive list was again updated accordingly. The visual inspections reduced the comprehensive list from 1043 to 223 residences requiring dye water testing. *(See Exhibit B and the attached spreadsheet for identified residences for testing)*

Dye Water Testing

After meeting with the Village to confirm the visual inspections, GAI sent out another notification to the remaining residents that require discharge verifications (dye testing). This letter followed the same mailing process as the visual inspection; including the use of Village letterhead and Village envelopes, and the approval of Village staff and attorney prior to mailing. The letter stated the findings from the visual inspection, and stated that further testing will be required to determine the discharge of their downspouts. The letter was informational and educational explaining to the resident(s) the process and need for the dye water testing of the downspouts. It explained the process of introducing dye water into the downspout at ground grade level or through their gutters. It provided them with the approximate time of the inspection; however, no appointments were included within the notifications. The letter included a contact representative from GAI to call with questions.

Upon notification to the residents the dye water testing of the downspouts was performed. The testing was performed at the accessible downspout location per each property, including those available at grade, or at the gutter locations. Dye tablets were inserted and water introduced into the downspouts connections from ground level for, first story gutters, and at two story gutters (up to 20' +/- high) or at the exposed connections prior to or at the ground grade entrance. For each dye water test a visual inspection of the nearest downstream storm manhole, catch basin, sanitary manhole and surrounding surface areas was performed determine if the dye water is entering any of these utilities or discharging at the surface grade. The water for this project was provided from the Village public works building to a tanker truck to pump the water to the downspout locations. For any downspout that discharged into the ground that is inaccessible where dye water cannot be introduced without modifying the downspout by means of physical alterations or disassembling they were not tested and the Village notified.

Findings

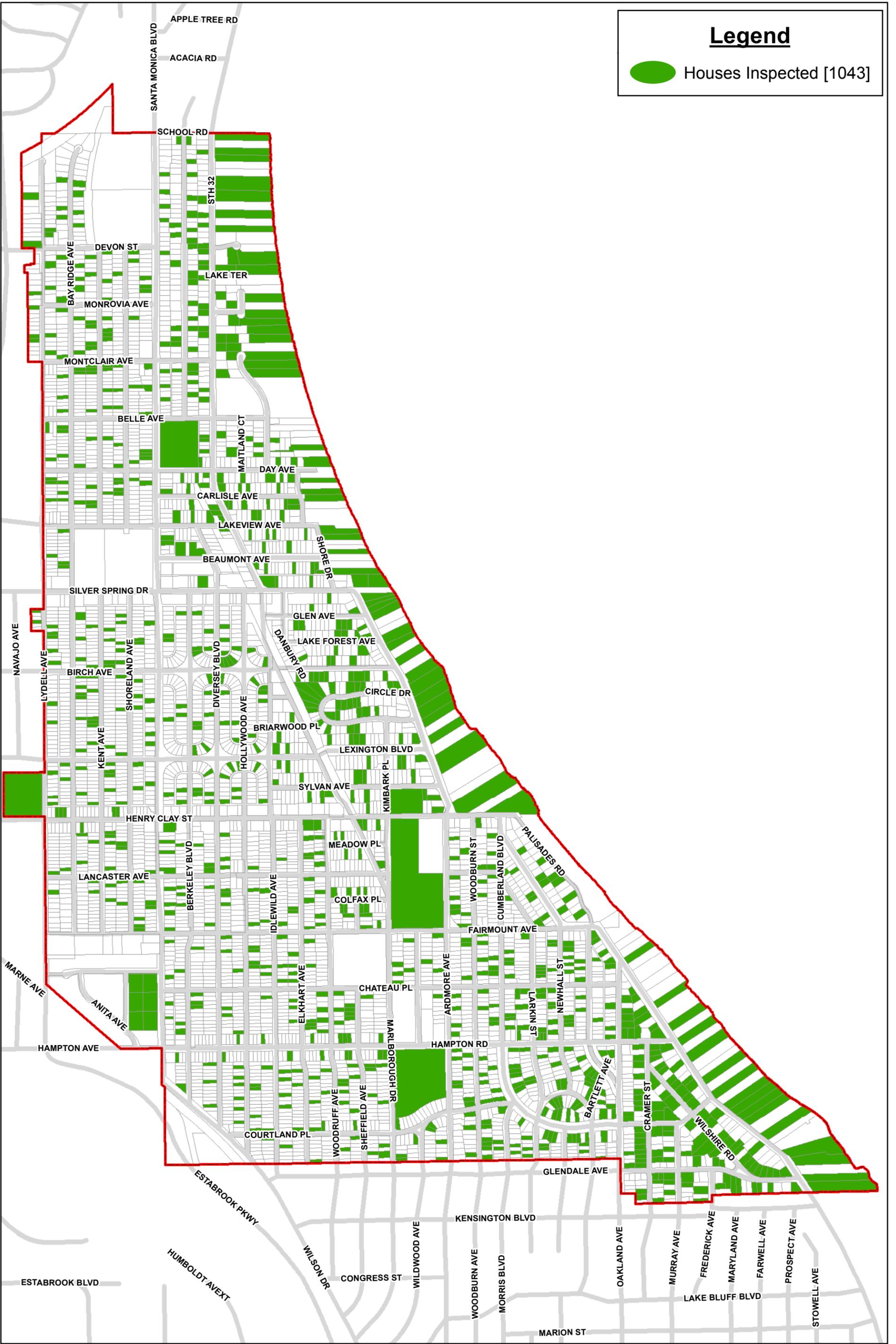
From the existing data and sources provided by the Village it was determined that 1,043 residences required to be visually inspected to confirm the downspouts discharge location (*See map Exhibit A*).

The visual inspections began on September 21, 2013 and were completed October 9, 2013. After the visual inspections were completed and the data compiled it was found that there were a total of 219 residences that displayed that the downspout discharged below surface grade and should be dye water tested.

Of these 219 residences 78 of them were able to be tested either at the grade level or from a first floor gutter. The remaining 145 would be tested at a second floor or greater height at the gutter (*See map Exhibit B*). The two categories were done separately by two different subcontractors contracted by GAI. The at grade or first floor gutter downspout dye water testing was performed beginning October 23, 2013 and completed by October 28, 2013. The second floor or greater gutter downspout dye water testing was performed beginning November 5, 2013 and completed by November 18, 2013. There are ten (10) residences identified to discharge water into the sanitary sewer system by visually seeing dye water entering the flow channel at the downstream manholes. Fifty-eight residences have undetermined discharge locations either due to that fact that the gutter was inaccessible (which are few) or the appearance of dye water was not observed. In these cases we confirmed it does not enter the sanitary system. Therefore we believe all but 4 of the 223 parcels have been successfully tested. The remaining residences discharge locations varied from the ground surface, to the street, the storm sewer and varying combinations of these. (*See map Exhibit C*) A detailed spreadsheet identifying the dye water testing results for each of the residences is also included. This spreadsheet summarizes the findings and provides notes for each residence tested.

Legend

 Houses Inspected [1043]



The GAI GIS map contains information including but not limited to Milwaukee County. This data is subject to constant change. GAI makes no warranties or guarantees, either expressed or implied, as to the accuracy or correctness of this data, nor accepts any liability arising from any incorrect, incomplete or misleading information contained therein.

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**Village of Whitefish Bay
Milwaukee County, Wisconsin**

**Exhibit A
Inspected Houses**



 **gai consultants**
transforming ideas into reality[®]
1 inch equals 1,000 feet



Legend

- At Grade or First Floor Testing [78]
- Second Floor and Higher Testing [141]

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Appendix 3

Summary of PPII Reduction Programs in Communities in the MMSD Service Area

Municipality	Program Plans	Type of Work	Description of PPI/I Program Work	Other Municipality Independent Work	# of Properties	Program \$ Committed	Resident Cost Share
Bayside	Target areas identified, utilize all available program funds	Policy set, investigative in progress	Dye water injection, lateral CCTV, lateral CIPP		NA	\$ 282,235	0%
Brookfield	Target areas identified, could utilize all funds under original \$151M Program	Policy set, investigative in progress	Home inspections, dye water inj, lateral CCTV		1000	\$ 1,353,184	0%-50%
Brown Deer	Assessed needs, suggests \$500M total program to address needs	Finalizing policy, self directed investigative and construction	Lateral lining	Lateral lining	362	\$ 248,000	75%-90%
Butler	Assessing needs through investigative work	Investigative	Dye water flooding with simultaneous sanitary CCTV	Village owned and directed flow monitoring	300	\$ 34,647	TBD
Caledonia	Accumulating funds					\$ -	TBD
Cudahy	Target areas identified, original \$151M would address a fraction of identified needs	self directed investigative and right of way work	installation of storm laterals to divert illegally connected sump pumps	Storm lateral installations	7	\$ 19,525	0%
Elm Grove	OK with the proposed budget, intend to submit in 2012	Investigative/ construction	CCTV, dye test, property inspections, lateral CIPP lining	Constructon inspection	100	\$ 394,120	0%
Fox Point	Target areas identified, original \$151M would address a fraction of identified needs	Policy set, investigative, construction	Lateral televising, lateral rehab	Home inspections	120	\$ 442,390	50%
Franklin	Current funding exceeds needs	Planning/Investigate/ construction	Lateral televising, storm ditch flooding, metering, CIPP lining, lateral relay, foundation drain disconnect	Investigative	96	\$ 1,154,250	0%*
Germantown	Target areas identified, intend to utilize available funds	Planning, investigative	Dye water inj, lateral CCTV		80	\$ 412,665	0%
Glendale	Target areas identified, could utilize all funds under original \$151M Program	Planning, investigative, construction	Home inspections, CIPP lining, foundation drain disconnect		122	\$ 886,021	0%*
Greendale	Intend to utilize funds available, need educational effort first, investigations in 2012	Investigative	Dye water flooding, CCTV, lateral rehab		60	\$ 529,500	0%
Greenfield	Resolution has passed Council May 2012, will be implementing a program	Plan/Investigate/Constr uction	CCTV, lateral rehab, foundation drain disc.	CCTV, site inspections	2500	\$ 1,323,905	25-50%
Hales Corners	Waiting for results in other muni's	none to date			0	\$ -	TBD
Menomonee Falls	Working on assessment of need and target areas, plan to submit by Jan 1	Planning/ investigative			283	\$ 965,350	0%
Mequon	Intend to utilize funds available	policy pending approval, investigative work on hold	Developing a resolution and conducting an investigative pilot		100	\$ 522,990	0%
Milwaukee	Intend to utilize all funds available, will only address a fraction of needs	investigative, construction	Lateral CCTV, CIPP lining, foundation drain disconnect		1000	\$ 11,087,625	0%*
Muskego	Intend to use funds available, target areas will be address with alternative funding if necessary	Policy set, planning, investigative, construction	Home inspections, dye water inj, lateral CCTV, trench dams, grading		100	\$ 304,971	0%
New Berlin	Will adjust scope of work to funding available	Investigative	CCTV and rainfall simulation, lateral rehab		200	\$ 1,659,167	0%
Oak Creek	Current funding exceeds needs	none to date	transferred to SBMP		0	\$ 29,000	TBD
River Hills	Target areas being identified, Could spend total program allocation by 2014, needs exceed budgeted	investigative, construction	Metering, CIPP lining		30	\$ 269,000	0%
St. Francis	No info					\$ -	TBD
Shorewood	Target areas being investigated, needs will exceed funding available	investigative, construction	Storm flooding, lateral CIPP lining	mainline CCTV	150	\$ 747,013	0%
Thiensville	Target areas identified, accumulating funds	extensive self directed construction	Foundation drain disconnect, lateral CCTV		21	\$ 155,009	0%
Wauwatosa	Identifying target areas, needs exceed available funding, will spend program \$ on construction	extensive self directed investigative / construction	Lateral televising, metering, lateral CIPP, lateral grouting	Storm flooding, mainline CCTV, soaker hose, ~\$1M spent to date	3300	\$ 2,069,000	0%
West Allis	Intend to utilize available funds	construction	foundation drain disconnect, lateral lining	lateral lining and mainline rehab, proposing municipal PPI/I fund	357	\$ 1,580,000	Cap
West Milwaukee	Identifying target areas, intend to utilize all available funds	construction	Lateral lining	Storm flooding	72	\$ 67,338	0%
Whitefish Bay	Identifying target areas, intend to utilize all available funds, needs exceed budget	investigative	Metering, CCTV	ROW lateral replacement, metering, modeling, downspout investigation	380	\$ 261,000	TBD