November 3, 2010

Ms. Katie Pritchard, Village President
Village of Whitefish Bay
5300 N. Marlborough Drive
Whitefish Bay, WI 53217

Re: Whitefish Bay Flooding

Dear Ms. Pritchard,

After careful consideration and evaluation of a number of alternatives, we are confident that the best response to flooding for the Village of Whitefish Bay is both short-term and long-term. A regulatory approach to reduce inflow and infiltration into sanitary sewers is necessary. Implementing this as soon possible would ensure the long-term success of the sewer infrastructure. A green infrastructure approach is appropriate in the short-term. This will be a highly visible action that residents will not only benefit from, but can learn from as well. Its impact, while immediate, will be long-lasting.

In making our determination, we focused our analysis on alternatives that the Village had not previously explored. Our goal was to create a series of options that would be both efficient and effective as stand alone plans, or combined approaches to storm water management. This is what we have done.

As you are well aware, the Village flooding is a highly emotional subject. Residents pay high taxes and demand that their money go a long way. That being said, we present our recommendation with the knowledge that a lack of communication with residents is unacceptable and can result in harsh behavior, overreaction and misinformation. Whitefish Bay has done a decent job of communicating their response to the flooding. However, upon implementation of any alternative, it must be clear how the Village is working for its residents and what impact its actions have on individual homeowners.

You can expect objection to the implication that residents must do something themselves about the flooding. Residents may also dispute the idea of reducing what little usable green space the Village has, for storm water storage. This is why communication of the benefits and trade-offs of good storm water management are so important. We have delivered alternatives that will be both highly visible and direct in their approach to the problem to make your job of communication easier.

Finally, residents can take ease knowing that there will not be a tax increase associated with our alternatives. Additionally, while we attempted to help those most affected by the flooding, your implementation action will ultimately help the community as a whole. We are confident that our analysis will provide valuable insight as you consider the future of the Village of Whitefish Bay.

Sincerely,
Joe Berkhahn
Christopher Marx
Mark Sauer

EXECUTIVE SUMMARY

After two drastic rainstorms in the summer of 2010, residents in Whitefish Bay have renewed awareness and concern in regards to inadequacies in its sewage system. After four major instances of a devastating rain event causing flooding in residents' home since 1997, many residents are demanding that the Village do more to prevent flooding. More specifically, the Village is under pressure to fix deficiencies in its storm sewer system and prevent sanitary sewer backflows into people's homes as has happened recently.

Four alternatives were created to assist the Village in evaluating the best possible remedy for home flooding during rain events. Two alternatives involve the incorporation of "green" infrastructure; bioswales and high-functioning rain gardens along public land that improves the surrounding area's storm water capacity. The next alternative examines a change in municipal ordinance code that mandates private drain disconnections from sanitary sewer lines during ownership transactions. Lastly, the option of not taking any action is proposed. Five criteria were developed to evaluate the alternatives: effectiveness, cost, efficiency, administrative feasibility, and equity. The criteria were selected to reflect the confines of the village government's ability and the urgency of the affected residents' concerns.

Alternative 1: Hampton Avenue Biorention- The boulevard along Hampton Avenue would be replaced with a bioswale storm water retention system. This alternative will ease a severely affected area of flooding at minimal cost with no property acquisition.

Alternative 2: Private Drain Disconnect Ordinance- The persisting problem of storm water breaching into sanitary sewer lines through home connections would be gradually eliminated with this alternative that mandates a disconnection during a transfer in property ownership. This alternative will reduce the problem of older homes stressing the sanitary sewer system for more than it can safely convey during rain events.

Alternative 3: Public Land Rain Garden Installation- This alternative places high performing rain gardens in opportune locations on existing public land such as parks and schools. This alternative provides a cost-effective remedy with existing resources in the most distressed of flood-affected areas. It preserves and maintains the recreational functions by the many village residents

Alternative 4: Do Nothing- The village would take no change in yearly action and continue its gradual schedule of sewage infrastructure upgrades.

Recommendation: The Village of Whitefish Bay would benefit greatly from implementing a combination of short-term, immediate impact solutions and long-term solutions. Implementing a regulation to disconnect improper private connections to sanitary sewer lines now gives the Village a healthier, more manageable future. Creating green infrastructure now allows residents to see their government in action, working for them. It also provides an opportunity for the Village to educate and motivate its residents to help themselves through site level storm water best management practices on their own properties. The short-term impact of green infrastructure will pale in comparison to the long-term impacts the Village can expect. By regulating, educating, and motivating, Whitefish Bay will improve the quality of life for its residents and act as a leader and role model for other municipalities locally, statewide, and nationally.

PROBLEM

The Village of Whitefish Bay has a problem with storm water flooding and sanitary sewer backflows that occur during high rainfall events. Since 1997, there have been four instances of residential basement flooding caused by storm and sanitary sewer backflows, including two in the summer of 2010. The storms and backflows caused significant flooding in residents' basements, extensive property damage, property value reductions, and constituted a health risk.

The storm water and sanitary sewer backflows are a concern for the village for a number of reasons. If certain properties are known to be flood prone, property values will decline in those locations. Residents will either have to invest significant money in preventative solutions, purchase insurance, or be forced to deal with expensive cleanup. If flooding is concentrated in a specific area, home values may collectively lower and potentially destabilize the neighborhood. Furthermore, the backflows result in a health risk for residents and those involved in the cleanup from mold and sanitary sewage exposure.

The extent of the problem is three fold. First, the storm sewer system was immediately inundated during these excessive storms. Because of that, the 15 bypass connections which allow sanitary sewer overflows to inflow into storm sewer pipes were actually working in reverse. Second, direct downspout connections and foundation drains to sanitary sewers still exist in 73% of homes in the Village. Finally, broken or improperly connected laterals also offer infiltration into the sanitary sewer which adds to the capacity of an already stressed system.

Because there are a variety of sources contributing to the problem, assessing the level of investment necessary to solve the problem is difficult. Since 2006, the Village has spent over $32 million on Capital Improvement Projects on both sanitary and storm sewer infrastructure. Additionally, while unprecedented rainfall did occur, the weather patterns preceding the recent flooding events indicate that the level of expected rainfall has risen, and will continue to rise in the future.

A wide range of stakeholders may play a role in both the cause and solution. Sanitary sewer systems consist of laterals, interceptors, and mains. The laterals connect individual residences to interceptors, which drain into larger mains for transport to treatment centers. The Village of Whitefish Bay is responsible for maintaining the interceptors, while private residents are responsible for the laterals (beginning at their property lines), and the Milwaukee Metropolitan Sewage District (MMSD) is responsible for the mains. These mains also collect all the sanitary waste from MMSD's service area to the north. In addition, the Wisconsin DNR may impose sanctions on the Village of Whitefish Bay if it is continues to allow storm sewers that drain into surface water to become contaminated by sanitary sewer overflows. Finally, Village officials may lose the support of residents who are already voicing their concerns about the quality of village leadership.

The severe flooding events during the summer of 2010 reestablished Whitefish Bay's ongoing battle with storm water and sanitary sewer infrastructure in the worst of ways. Ultimately, *the capacity of the current storm and sanitary sewer infrastructure in Whitefish Bay resulted in the inability to alleviate flooding during periods of heavy rainfall.* The result was angry and

concerned residents and confounded city officials. However, the four storm events, particularly the most recent one on July 22, 2010, were exceptional storms. Knowing this, it would be imprudent for the Village to make policy based on these exceptions; rather, they must act evenhandedly in creating long-term solutions based on efficient and effective criteria.

In addition to the village residents calling for sewage back-ups to be solved, MMSD has requested that ten communities, including Whitefish Bay, must start planning how to reduce excessive flows from sanitary sewers. The Village is required to create peak-flow reduction plans that will show how it will find evidence of water leaking into both public and private sewers, as well as how the Village will identify clear water links to the sanitary system.

CRITERIA FOR EVALUATION

Effectiveness: The preferred solution must reduce the amount if inflow and infiltration in the sanitary sewer system by 50% by the year 2015.

Rationale: This reduction should be from the 2010 levels reported by MMSD. Reducing inflow an infiltration in sanitary sewers will allow Whitefish Bay to better manage both of their combined sewer systems and allow MMSD to be more efficient in treating waste water.

Efficiency: The preferred solution must prevent 300 gallons of storm water from entering the sanitary sewers for every $3,500 spent.

Rationale: The 1979 Private Property Infiltration/Inflow Pilot program established that the maximum amount hourly inflow rate for a foundation drain at 5 gallons per minute. Considering that the maximum inflow rate continues for an hour, an estimated 300 gallons of clear water will be generated per connection. The cost element is roughly equivalent for the removal and installation of a sump pump discharging to grade. Eliminating these connections will reduce inflow into the sanitary sewer system and allow it to operate at its design capacity. Additionally, this directly addresses MMSD's request by creating a plan to reduce the amount of inflow and infiltration.

Administrative Feasibility: The preferred solution must fall within the legal authority of Whitefish Bay's administration to enact and enforce.

Rationale: The legal authority to regulate storm water management comes from a variety of sources at both the local and state level. Whitefish Bay should use the legal authority it has to regulate storm water management for itself.

Equity: The preferred solution must allocate resources in preference to areas where the concentration of previously flooded homes and buildings has been the highest.

Rationale: According to reports published by the Village manager, specific areas within the village have experienced the brunt of flooding. These areas should be focused on first in order to avoid excessive amounts of property damage in the event of another large rainfall event.

Cost: The preferred solution must not cost more than $1,200 per linear foot.

Rationale: It costs roughly $1,000 to $1,200 per linear foot to replace sanitary and storm sewer infrastructure in Whitefish Bay roads. Looking at an alternative which costs less than this will allow the Village to look at cheaper and more natural systems like green infrastructure. Additionally, spending less money can mean avoiding a tax increase.

ALTERNATIVES

Alternative 1- Hampton Avenue Bioretention

This alternative would create a new storm water bioswale along Hampton Avenue from Marlborough Road west to Santa Monica Boulevard. Hampton Avenue currently contains a ten foot wide grass boulevard in the median of the road which runs eight and a half blocks or 2,500 feet. For its lengths, this boulevard contains less than five (ornamental) trees and very few planting beds. An open air storm water bioswale (roughly 48" feet deep) could contain up to 76,500 gallons of storm water which would continuously drain into the existing storm sewer running along Hampton Avenue and then south along Diversey Boulevard to the Milwaukee River. This would eliminate 394 gallons per minute from entering the sanitary system during a twenty four hour (or 10 year) storm. There is also potential to create a bioswale along Santa Monica Boulevard from Hampton Avenue north to the Jewish Community Center at the Fox Point border.

Bioswales can be stand alone storm water facilities or pretreatment devices for storm water being conveyed to larger downstream facilities or water bodies. There are many different ways to design bioswale systems. A typical system will use a 3:1 (horizontal/vertical) ratio to determine depth and width. In more urban environments, it is often necessary to increase that ratio to something roughly 2:1 to ensure greater depth and storm water capacity. A prime example of the system to be implemented in Whitefish Bay is located at the former Pabst Brewery site (See Appendix).

Bioswales, which are Low Impact Development tools, encourage infiltration to retain runoff volume and use a variety of physical, chemical, and biological processes to reduce runoff pollutant loadings such as phosphorus and nitrogen. Infiltration of storm water into the ground may be enhanced by adding gravel or other permeable material below the channel bottom. Bioswales are useful to treat heavily trafficked roads like Hampton that have high runoff potential and non-point source pollutant loads from vehicles. Additionally, because of its proposed location and depending on its design, the bioswale can act as a traffic calming device for Hampton Avenue. Finally, bioswales can act as storage basins for snow in winter months.

The major costs associated with bioswales include the construction costs and operations and maintenance costs. The cost of this bioswale system would be anywhere from $0.50 - $10 per square foot to construct, putting the capital cost at $27,000 per block, or $270,000 ($10/sq.ft). This is the cost of a stand alone bioswale and does not include the cost of re-engineering the road to create bump outs for traffic calming or grey infrastructure costs to connect to the storm system. Adding these elements (if necessary) would increase the price range per square foot and the overall capital cost. Routine operation and maintenance are necessary to gain public acceptance of the highly visible nature of the bioswale and ensure proper function. Weeding, pruning, and trash collection should be part of the Department of Public Works routine maintenance schedule to maintain the aesthetic acceptance, and regular checks of the integrity of the system should be preformed every few years.

Alternative 2- Reduce Inflow to Sanitary Sewer via Ordinance

This alternative, over time, would eliminate the connection of private (residential) and municipal storm water connections to the sanitary sewer system. This includes roof drains,

foundation drains, and sump pumps presently connected to the sanitary sewer system. It was estimated that 73 percent of the homes in Whitefish Bay have foundation drains which are connected to the sanitary sewer system (Earth Tech 1999) and contribute approximately 17,500 gallons per minute maximum to the system. A second report challenged the effect that disconnection of the laterals from the sanitary system would have because the estimated contribution can not accurately be measured (Bonestroo 2002). Both of the reports recommended separating the laterals as an alternative, but discounted the alternative because it was too expensive. This alternative takes a two phased approach at reducing the inflow in to the sanitary system.

The first, short term, element to the alternative involves acquiring as much knowledge and data about the existing system laterals as possible through televising and measurements. Previous reports have already identified that connections are a significant source, but did not physically measure the lateral inverts or televise the line to gauge condition. This service could be performed on a voluntary basis outside of the targeted areas, but should be made mandatory in the areas where multiple flooding events have occurred. The expense of the televising could be consumer reimbursed or set up through the Village and MMSD through the Private Property Inflow & Infiltration Program which was recently implemented. The program could be established with an estimated cost of $100 per household for televising a lateral, but a reduced rate could likely be sought if multiple households in same area can be televised during same mobilization. At most, the monitoring, based on televising all homes (3,500) estimated to have foundation drains connected to the sanitary sewer, would cost a total of $350,000. During televising, the invert measurements and locational data can be noted as well for future recommendations. While this will not directly solve a problem, the data and measurements will allow for further concentrated efforts to reduce inflow, targeting the most critical and problematic areas.

The second phase of this alternative is a longer term approach to reducing the inflow to the sanitary system. By implementing a regulatory measure, a certificate of compliance will be needed to propose an ownership change. The certificate of compliance verifies that there are no illegal sanitary connections, meaning any clear water discharges to the sanitary sewer are prohibited. Several adjacent municipalities require this certificate in various ways. The Village of Fox Point has performed inspections and mandated that all illegal connections be remediated. The Village of Bayside and City of Mequon have mandated that inspection and remediation occur at the point of sale of homes. At the time of inspection, an assessment and recommendation of an appropriate remediation measure should be provided. Remediation measures could include lateral abandonment and sump pump installation, re-routing lateral to storm sewers where applicable and if no other reasonable remediation can be found, the household can be granted an exemption at which time the lateral should be rehabilitated for any defects. The exemption would need to be brought up to the village board and proved that all reasonable efforts are not feasible and then voted on for exemption. Over time, this alternative will continually eliminate clear water sources of inflow to the sanitary system at a minimal cost.

The success of this alternative depends highly upon a voluntary effort of the Village residents because they will need to allow lateral monitoring, approve the mandate on the lateral separation, and ultimately pay for the remediation measures on a case by case

basis. Another factor which was noted in previous reports is the level of uncertainty of success that the lateral separation will have on the overall amount of inflow.

Alternative 3- Public Land Rain Garden Installation

The village would use its existing public lands and properties to increase storm water storage capacity using newer "green" technologies that require minimal changes to existing sewage infrastructure. Despite the lack of undeveloped space in the village, the several public parks and school properties offer land and acreage that could better hold storm water than its current capabilities. By using newer green landscaping techniques such as rain gardens, Whitefish Bay's public land could be made to better hold onto storm water that would normally end up in overburdened storm sewers.

Because of the extensive public use that many of the parks receive, a creative and thoughtful green landscaping placement would preserve the recreational integrity of the spaces while upgrading their storm water retention function. Throughout the 2.1 square miles of the Village, there exist green landscaping potential at the sites of Cumberland School, Richards School, Buckley Park, Big Bay Park, Klode Park, Cahill Park, Lydell School, Whitefish Bay Park, and the combined site of the High School and former Armory property. The potential assessment doesn't even include the possible participation of private entities such as the Catholic Parishes and private business owners.

Of the available public parcels and green technologies, installing rain gardens with land most closely located to the worst flooded areas makes the most effective use of limited resources. The Village leadership has expressed concern about the cost for any flooding remedy and creating new government revenue is difficult in a municipality with already high rates of taxation. Selectively targeting high-impact areas with a powerful "bang-for-buck" technique also opens up the possibility of an incremental and expandable approach for this alternative further down the road.

In accordance with data of household flooding locations, the public areas of Cahill Park, Cumberland School, and Cumberland Boulevard will receive applications of high-functioning rain gardens. The respective areas border neighborhoods in which entire city blocks were affected by flooding and would benefit from any measure of better drainage tendencies. Cahill Park and Cumberland School attract heavy usage of their green space, especially from area families and children. Equipping the parcels with rain gardens would require careful placement around the edges and fringes of park space that heeds clear of regular patron usage (See Appendix).

The cost and performance figures of $12 per square foot and 1 gallon per square foot are based on the most conservative estimates by given by the MMSD for typical rain gardens. Along Cumberland Boulevard, the boulevard through the middle of the street covers roughly an acre of green space. Converting all of the boulevard green space into a high functioning rain garden would save approximately 43,080 gallons in a 10-year rain event over the course of an hour, with an installation cost of roughly $517,000. Similarly, Cumberland School could yield as much as 1.19 acres of convertible green space from its vast property outside of its athletic fields. That would save 51,706 gallons in a similar sized rain event at a cost of roughly $620, 470. Lastly, the space at Cahill Park might yield as much as 0.73 acres

convertible green space from unused portions that could hold about 31,800 gallons at the cost of $381, 500. Collectively, the public spaces could retain a minimum of 125,000 gallons of water during a 10 year storm event at a cost of no more than $1.5 million.

While installing rain gardens require an initial investment, the annual maintenance costs are moderate and quite negligible to the immediate benefits they provide. The success of installing rain gardens on Cahill Park, Cumberland School, and Cumberland Boulevard could used as an example for other public properties and provides a program which could easily be expanded in the Village.

Alternative 4- Do Nothing

The nature of the storms that occurred in Whitefish Bay were unprecedented and beyond the realm of rational planning. There will likely not be another storm of this magnitude in our lifetimes. The village already has a capital improvement plan in place and is spending millions of dollars on infrastructure improvements, which are thought to increase the capacity of the sewer system and reduce the potential for sewerage back-ups.

ALTERNATIVE EVALUATION

Alternative 1 - Hampton Avenue Bioretention

Effectiveness- The Hampton Avenue bioswale does not meet this criterion. Adding a bioswale to Hampton Avenue is not directly addressing the integrity of the sanitary sewer system, rather it is providing an overland flow path for excess rain water to enter the storm sewer and ultimately the Milwaukee River.

Efficiency- The bioswale on Hampton Avenue does not meet this criterion. Although the bioswale will not significantly reduce the amount of flow going to the sewers, it is likely to attenuate the flow during peak periods of intensity by providing temporary storage, thus reducing the peak flow in the system. As an added benefit, research has proven that bioswales can reduce up to 70% of total pollutants found in surface runoff.

Administrative Feasibility- The Hampton Avenue bioswale meets this criterion. Hampton Avenue is a local road of which Whitefish Bay has authority. However, in order to do construction on the road surface and the sewer system, the Wisconsin Department of Transportation and MMSD would have to approve plans for development. Maintenance would continue to be provided by the Village Department of Public Works.

Equity- This alternative is preferred given the equity criterion. Creating a bioswale on Hampton Avenue, in the southern portion of the Village is in close proximity to the majority of those most affected by previous flooding.

Cost- The Hampton Avenue bioswale meets this criterion. At the highest approximation, this alternative would cost $10/sq.ft. which is significantly less expensive than replacing sewer infrastructure under the roads. Maintenance costs (pruning, trimming) can be expected to remain virtually the same as maintenance (mowing) is already preformed along Hampton Avenue's boulevard.

Alternative 2 - Eliminate Clear Water Inflow to Sanitary Sewer

Effectiveness- Even if the ordinance were put in place today, this alternative would not meet the criterion. In the short term, this alternative is purely data collection and further investigation to establish the severity of the issue. Over time, as homes are turned over

and laterals are separated from the sanitary system, inflow and infiltration will be significantly reduced.

Efficiency- This alternative represents the baseline cost estimated to change a foundation drain lateral from flowing into the sanitary sewer to another alternative. There are methods that can be taken to separate the foundation lateral, which could likely be less expensive than adding a sump pump which drains to surface. Therefore, this alternative meets the criterion.

Administrative Feasibility- This alternative meets the criterion. Several adjacent municipalities have enacted similar ordinances which call for the disconnection of all clear water connections to the sanitary system. The biggest hurdle that would need to be overcome is to gain the public acceptance of the ordinance. The majority of the homes in Whitefish Bay remain unaffected due to having their foundation lateral connected to the sanitary system and most likely would not respond favorably initially.

Equity- This alternative does not meet the criterion. The ordinance would cover the entire municipality and only affect those that are looking to sell/buy a property.

Cost- This alternative meets the criterion. There is already information available through previous reports about which areas and properties are likely to have clear water connections, but not to the extent that is needed for analysis. The cost of televising a lateral is roughly $100, and with a contract to televise an entire community, the cost in mass would likely be much less. In all there are roughly 3,500 homes that were estimated to have clear water connections to the sanitary system. In total, without discounting, the total would be $350,000.

Alternative 3 - Public Land Rain Gardens

Effectiveness- This alternative does not meet this criterion because like alternative number 1, it does not directly address the sanitary sewer system. However, due to the high level of effectiveness in reducing surface storm water rain gardens provide, the infiltration into sanitary sewers is expected to decline.

Efficiency- This alternative meets this criterion. The rain gardens function at least 1 gallon of water per square foot at the cost of no more than $12 per square foot.

Administrative Feasibility- Green space along Cumberland Boulevard and Cahill Park falls under direct jurisdiction of the Village. Cumberland School, while ultimately owned by the village, is managed and maintained under the school board. Therefore, this alternative meets this criterion.

Equity- The alternative meets the criteria by responding to the most affected areas of the village. The cost of the improvements might be immediately absorbed or gradually accommodated over the course of the village's capital improvement budgets affecting impacted users right away and having minimal generational equity.

Cost- The cost for upgrading the stated properties would be approximately $1.519 million. Although a higher cost than the other alternatives if fully implemented, this alternative does meet the criterion.

Alternative 4 - Do Nothing

Effectiveness- This alternative does not meet the effectiveness criterion. By doing nothing, the Village cannot be sure the amount of inflow and infiltration will be reduced.

Efficiency- The do nothing alternative does not meet this criterion. There is no way to prevent storm water from entering the sanitary sewers by doing nothing.

Administrative Feasibility- This alternative does meet the administrative criterion. However, the Village must be cognizant that MMSD is requiring that municipalities create action plans to reduce the connections from private property to sanitary sewer laterals.

Equity- This alternative does not meet the equity criterion. Everyone will receive the same response and those most in need, or those previously flooded, will not be helped anymore than those who were not flooded.

Cost- The do nothing alternative meets this criterion. The Village will not spend any money if they decide not to act in any way.

	Alternatives			
Criteria	**#1 Bioswale**	**#2 Regulatory**	**#3 Rain Gardens**	**#4 Do Nothing**
Effectiveness	No*	No*	No*	Possible
Efficiency	No*	Yes	Yes	Possible
Administrative Feasibility	Yes	Yes	Yes	No
Equity	Yes	No	Yes	No
Cost	$ 270,000	$ 350,000	$ 1,500,000	$ -
	Best	**Intermediate**	**Worst**	

* While each specific criterion is not met directly, storm water will be removed from the system indirectly.

FINAL RECOMMENDATION

The Village must establish a plan to reduce the amount of excessive flows from sanitary sewers by orders of MMSD. There are several ways to accomplish this. First, the Village can reduce the amount of flow for which the system is designed, or attempt to change the residents' habits, thus using less water for sanitation purposes. Second, they can reduce the amount of flow leaked into public and private sanitary sewers and laterals through cracks and holes. Finally, the Village can reduce the amount of storm water runoff which is generated at the surface during peak periods, subsequently exceeding the capacity of the storm sewers and thus bypassing into the sanitary system. We believe the later two options to be more feasible.

After evaluating the alternatives, we have concluded that one single alternative will not significantly reduce the amount of excess flows in the sanitary system. Rather, a combination of **Alternatives 1, 2 & 3** will provide long and short terms solutions over a wide array of facilities.

Therefore, we recommend that Alternative 2 be implemented immediately. This will ensure an effective long-term impact on the Village with no capital cost. Alternative 2 is recommended and should be implemented regardless of the inclusion of Alternatives 1 and 3. Alternatives 1 and 3 are immediate impact, efficient solutions which will have both positive short and long-term effects. We recommend implementing them now, although they may be better budgeted for in the future.

APPENDIX

Pabst Brewery Site Pictures

Cahill Park Green Space Conversion