

Social Dynamics of Stormwater Management:

Private Lands in the Alley Creek Watershed

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Introduction

Urban Ecology seeks to understand the interactions between biophysical and social processes in human-dominated systems¹. Watershed boundaries serve as a compelling tool through which to study urban ecology as the biophysical properties of a watershed are highly intertwined with human activity and social systems².

The way land is developed and used has a direct impact on the quality of the receiving waterbody. Urban watersheds are characterized by high levels of development in the form of roads, buildings, and parking lots that support and impact quality of life. These features create large percentages of impervious surfaces that impede the infiltration of stormwater during rain events and alter the natural hydrology of the watershed. Mitigating the impact of runoff from this development is crucial to improving the health of local rivers and creeks and their ability to support wildlife and recreational opportunities for residents and visitors.

The urban landscape is dynamic and constantly evolving with the destruction of old buildings, development of new buildings, creation and loss of parkland, restoration of ecosystems, and the upgrade and maintenance of supporting infrastructure. In addition, there is a flux of people moving across the watershed boundary changing demographic and economic characteristics. Watershed management involves working within this dynamic physical and social landscape to encourage stakeholders (e.g. landowners, government agencies, planning and zoning commissions) to implement actions that support goals to improve the receiving waterbody. Depending on the size and density of a watershed, this could involve the cooperation and coordination of anywhere from hundreds to millions of individuals.

In addition, or perhaps as a result, the traditional role of engineers and city agencies has been to provide solutions in the form of design, construction, and maintenance of centralized hard infrastructure located on public lands and in the public right of way. This “invisible” infrastructure is often undervalued by the public as it is out of sight, reliable, and requires no specific knowledge for its use. Over the last decade or so, a paradigm shift towards treating stormwater as a resource as opposed to a waste product has shifted solutions from expanding treatment plants and large storage tanks to include smaller, decentralized projects that capture and use stormwater at the source. Green infrastructure (GI), or the use of distributed, vegetated systems to capture stormwater runoff, has thus evolved as a competing solution to managing urban runoff.

¹ (Alberti et al., 2003)

² (Pickett & Cadenasso, 2006)

In 2012, the New York City Department of Environmental Protection (DEP) formally included GI as part of its consent order with the EPA for mitigating combined sewer overflows. In addition to grey infrastructure improvements, a goal was set to manage stormwater from 10 percent of the impervious surfaces in NYC using green infrastructure by 2030.³ While the DEP expects to fulfill the obligations of the Consent Order largely by installing GI on public property, in most watersheds, this goal cannot be met by capture on public property alone and will involve some capture on private lands. Best practices for engaging with homeowners in urban watersheds have yet to be developed.

Decentralized GI projects present new opportunities to engage actors that previously did not concern themselves with stormwater infrastructure. This paper will use the Alley Creek watershed in Queens, NY as a case study to examine community perceptions of private property for watershed planning. In the Alley Creek watershed, 62 percent of the land area is zoned as residential which indicates that homeowners have a particularly strong influence over the landscape of the watershed. Therefore, understanding how homeowners perceive their private property, what factors drive their maintenance practices, and what prevents implementation of stormwater management measures can assist decision-makers in developing appropriate programs, incentives, and regulations to achieve better land use practices on residential property.

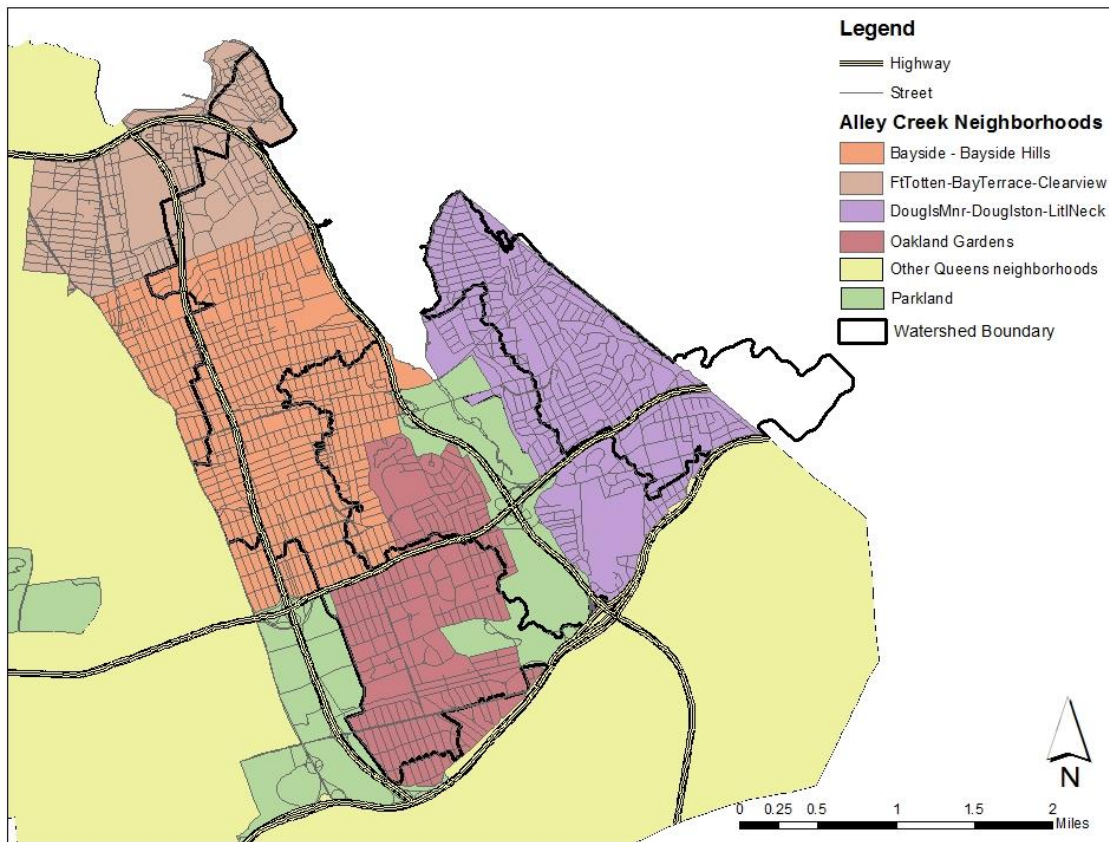
The specific objectives of this research are to 1) define and characterize social-site typologies of private homeowners, 2) design effective methods of outreach and engagement for each of these typologies and 3) offer management recommendations moving forward. By breaking homeowners and their landscapes into distinct typologies, we can begin to address individual homeowners in groups and develop appropriate methods of outreach, engagement, regulation and incentives accordingly.

Site Description

The Alley Creek watershed is composed of five neighborhoods, namely Bay Terrace, Bayside, Douglaston, Little Neck, and Oakland Gardens. The boundaries of these neighborhoods are only roughly defined as often the neighborhoods are lumped together and referred to as either Bayside or Douglaston. Alley Pond Park surrounds Alley Creek and runs down the middle of this watershed, serving as a boundary between the two neighborhoods. Major thoroughfares crisscross the watershed with the Cross Island Parkway running north-south through the center of Alley Pond Park and Northern Boulevard, Long Island Expressway, and Grand Central Expressway lying east-west across the watershed. These highways break up the neighborhood fabric and often serve as informal neighborhood boundaries.

³ http://www.nyc.gov/html/dep/html/stormwater/nyc_green_infrastructure_plan.shtml

Figure 1: Neighborhoods Comprising the Alley Creek Watershed



In addition to this broad neighborhood construct, there are a number of households that have aligned into smaller communities. These communities are defined by a physical boundary, often based upon historical development patterns. Until the early 1900s, the Alley Creek watershed was sparsely developed with mostly farmland and large estates for few wealthy New Yorkers. These families sold property in large areas and a developer would purchase, subdivide and develop the land, building hundreds of houses at once. Regardless of the developer, almost all of this early development up until the 1950s was constructed according to the garden city planning ideal, which sought to combine the amenities of urban life with ready access to nature typical of rural areas. The populations that moved into these developments were mostly white, middle to upper class families that were fleeing urban centers with the rise of suburbanization.

New York City was the first municipality in the U.S. to introduce zoning in 1916. Some communities within the Alley Creek watershed were established prior to the institution of zoning regulations. These

communities continue to maintain their own set of deed restrictions that additionally regulate the allowable characteristics of buildings, their uses, and a number of other aesthetic preferences such as minimum lot size, setbacks, and historic factors. Further, there are two developments that are designated as privately owned areas, namely Douglas Manor and Bayside Gables. While these communities are rare in NYC, this status allows the community to maintain exclusivity in exchange for being self-sufficient. While residents still pay the same taxes, they additionally assume the costs of community upkeep, including maintaining their own streets, parks, sewer systems, insurance, and often security. All of these additional rules and restrictions have an impact on the private property landscape in Alley Creek.

Currently, of the approximate 4,900 acres within the Alley Creek watershed, 62% of the area is zoned as residential property with an additional 15% zoned as open space and outdoor recreation and the rest a mix of commercial and public land. While overall the watershed remains a middle-upper to upper class demographic that is changing rapidly, giving way to a mostly Asian population. In some neighborhoods, for example, the shift to an Asian majority has already occurred. According to the US Census from 2000 to 2010 in the neighborhood of Bayside, the percentage of the population that identified as White decreased from 60% to 46% while the Asian population increased from 33% to 47%⁴.

An area of concern for many of the residents is the destruction of existing homes and their replacement with larger “McMansions”. Despite zoning regulations that aim to maintain the historic character of the neighborhoods, homes continue to be constructed that push these zoning boundaries to the maximum in terms of height and overall area. This has created a tension with some of the existing population. While much of this work is being done by developers that want to maximize their profit by building houses that will receive the greatest return, many of the new homeowners are of Asian descent and they are being blamed for the changes taking place. As such, much of the narrative around new development, preserving historic features, and new homeowners is being framed as an immigration issue. As will be presented throughout the report, issues of land use, immigration, neighborhood character and environment are all intertwined and correlated in complex ways.

Methods

Qualitative data was collected over the course of ten weeks from June through August 2014. The methods used for this research were mostly based on participant observation, interviews, and overall immersion into the community as the researcher lived on-site. Over 50 conversations were had with representatives of the city government, community board, civic and homeowners associations, local libraries, Queens Borough Community College, Queens Botanical Garden, active local citizens and other local cultural and environmental institutions. General observations of land uses were made while spending time walking and traveling within the watershed.

⁴

<http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF>

Contact with the community was initiated from a number of different angles. The first point of contact was with the five local libraries located within the watershed. In addition to reaching out directly to their Friends of the Library groups, the Queens Library website maintains a list of local civic associations and other cultural organizations that was used to identify active organizations in the area. The District Manager at Community Board 11 was approached directly and provided contact information for local leaders. An event at the Bayside Historical Society, located on Fort Totten, provided an introduction to more active citizens. From these points of entry, other introductions were made in a snowball-like fashion. Direct contact was made with other agencies and institutions by obtaining email addresses and phone numbers through the organization's websites.

In addition to these informal conversations, interviews were conducted with homeowners that had received a rain barrel from the DEP in the past. Addresses of these homeowners were obtained through a publicly available map maintained by the DEP⁵. Nineteen (19) homeowners with rain barrels were identified within the Alley Creek watershed. Of these homeowners, nine (9) responded to the request for an interview. An additional homeowner with a rain barrel was identified and interviewed during other data collection activities. In total, 10 of the 20 homeowners with rain barrels were interviewed, resulting in a 50% response rate.

Within the last two years, three public meetings were held within the Alley Creek watershed to address stormwater and watershed management. These meetings were hosted by different parties and offer an opportunity for comparison of outreach methods, engagement strategies, and results. The first meeting was hosted by the NYC Department of Environmental Protection (NYCDEP) on May 13, 2013 as part of the public outreach required by the consent order for Long Term Control Planning for combined sewer overflows. This was the second of two meetings. The second meeting was hosted by the NYC Department of Parks and Recreation on Jan 31, 2014 as a community outreach meeting for the development of their Alley Creek Habitat Restoration and Watershed Management Plan. This was the second meeting of a three meeting series. The third meeting was hosted by the graduate student researcher of this study, on August 1, 2014 at the request of the Friends of Douglaston Library group to talk about water infrastructure in general. Each meeting resulted in differences in attendance and participation of the public. And while no specific aspect of these meetings can be singled out as creating these differences, a comparative analysis of the outreach and messaging strategies employed was conducted. A summary of these meetings can be found in the table below and more detailed analysis in the Appendix.

⁵ Note that the DEP map is currently undergoing renovation and hasn't been updated in the last couple of years. But there has only been one recent local distribution of rain barrels since this time and the offer was only to homeowners within a small portion of the western edge of the watershed.

Date	Title	Host Org	Location	Attendance
May-13	Alley Creek Long Term Control Plan Public Meeting #2	NYC Department of Environmental Protection	APEC	10
Jan-14	Alley Creek Habitat Restoration and Watershed Management Plan Community Outreach Meeting	NYC Department of Parks and Recreation	APEC	23
Aug-14	The Waters of Queens: Dirty or Clean?	Graduate Student	Douglaston-Little Neck Library	>45

Detailed field notes were kept throughout the research period. Weekly updates were given to US Forest Service social science researcher advisors that helped iteratively refine my research question, inquiry, and strategy for data collection.

Exploratory Characterization and Definition of Social-site Typologies

Over the course of the research period, it became evident that there was a multiplicity of perspectives held about private property by homeowners within the watershed. For instance, many current residents grew up in the neighborhood, own their homes and have lived in the same location for decades. These residents value the historical character and want to preserve the neighborhood in “its garden city ideal”. Then, there are empty nesters that, now that their kids are grown and left the household, have more time and money to spend on their hobbies such as gardening. They also are looking to downsize soon and move into apartments to decrease their property management needs, opening up space for new homeowners and continuing the ever-changing demographics of the watershed.

In order to capture all of these perspectives and provide a framework for thinking about private homeowners and their potential for stormwater management, it was decided that the development of a social-site typology would be a useful endeavor. Defining a typology would allow for the breaking down of the “public” into groups that contain individuals with shared characteristics. As one employee from DEP remarked, “It will depend on the individuals you talk to.” But it could be added that, if you talk to enough individuals, patterns and shared thinking become illuminated.

The goal of the typology is to better understand the variety of perceptions of private land held by the community and how those perceptions influence behavior toward their landscapes. Particularly of interest are the barriers and opportunities for stormwater management. This social-site typology can then be used to determine the most effective outreach and engagement methods to be used with private homeowners in the Alley Creek watershed. Together with physical characteristics of the watershed, appropriate incentives and regulations that can be applied by city government can be assessed to assist in the adoption of stormwater management on private property.

The breakdown of the typology listed below is preliminary. Since the initial summer research was conducted, two focus groups were held with private homeowners. The data collected from these groups will further inform the development of this typology.

Clean Landscapers



Properties maintained by homeowners within this type are driven by a particular aesthetic where nature is controlled and highly manicured to produce a “clean” appearing landscape. The result of this aesthetic generally results in lush lawns, trimmed bushes along foundations, and no “messy” trees. Many of the newly constructed houses fall into this category as developers often remove existing vegetation to start with “clean slate”.

A homeowner in the neighborhood of Little Neck described her neighbor as having a neat yard and has even observed her picking up leaves off the lawn by hand. She described watching other new houses being built where everything on site is demolished and replaced with new landscaping.

The Jones



These property owners are driven to manage their landscapes by doing whatever is familiar, easy and in their best interest. The Jones types want to keep up with their neighbors and fit in but will deviate from the existing norms and alter their landscape to fit their immediate needs. Lawns are often preferred because they are familiar and perceived to be the easiest landscape to maintain. Many people within this typology have low skilled landscapers mow their lawns and sometimes trim bushes along foundations. Many times,

landscapers are hired by numerous households in a particular area to perform work on multiple front lawns at one time. Outside of lawn area, remaining open space is often developed or paved in order to meet a personal need or simply to avoid maintenance requirements of vegetated spaces.

A homeowner in Bayside described watching giant trees being cut down to build larger houses, garages and pools. Another saw a neighbor cement a whole backyard although wasn't sure if the goal was for entertaining or parking.

The Greens



Property owners within this type are consciously maintaining their landscapes in a way that aligns with what they believe is good for “the” environment. What is best for the environment is not consistent among this group and can result in a number of different activities, including reduced pesticide and fertilizer use, vegetable gardening, forested landscapes, use of native plants, preserving existing vegetation, and more. These homeowners are not necessarily incorporating green infrastructure for stormwater management but are interested in doing the

right by the environment.

A homeowner in Douglaston allowed their backyard to return to a wooded landscape and referred to themselves as “treehuggers”. Another homeowner in Bayside commented that his yard is referred to as “the rainforest” by kids in the area as he little by little eliminated the grass and planted more trees. Others, especially rain barrel owners, use their limited space to grow vegetables for themselves and their family. All of these activities show a respect and appreciation for the environment, whether or not the practice is actually the most beneficial in terms of stormwater management.

Early Adopters



Homeowners within this type have taken actions on their property specifically to address stormwater management, from disconnecting downspouts and redirecting towards vegetated surfaces to installing rain barrels and permeable pavement. These homeowners are motivated by a desire to conserve water and/or mitigate the impact of stormwater on their community.

Rain barrel owners are an example of homeowners willing to go out of their way to retrieve and install new technology and maintain over time. These homeowners often participated in other environmentally sound activities such as organic vegetable gardening and pesticide-free landscaping.

Historical Preservers



These residents have generally lived in the area for extended periods of time and feel deep attachment to their neighborhood. They share an affinity for a particular aesthetic of a past era, usually the one during which their housing development was constructed. This preference is reflected in their current property use. As land use is constantly changing in NYC, many of these residents have active civic lives through which they seek to maintain the past aesthetic of choice. This participation has resulted in the designation of historic districts and the

downzoning of neighborhoods in the watershed to maintain the current low density housing scheme.

A subset of this typology is older residents that live singly or in couples and no longer have children living in their households. Often retired, these homeowners use their extra time to rediscover hobbies such as gardening and other community related activities. Those residents that have taken up gardening as a hobby value their flower beds and diversity of plant species.

Maintained Without Direct Input



The people living on these properties do not have direct control over how their landscape is managed. This can include properties that are rented out, condominiums, co-ops, or assisted living style housing where a management firm is hired to handle landscaping needs. This type was not deeply explored during this study and can benefit from further research.

In a conversation with one building manager, he lamented not having enough time to do more than the bare minimum to upkeep the landscape and buildings he works on. He has to service multiple buildings a day throughout the city and so travel time reduces the amount of time he can spend at each building. Therefore, he focuses on basic maintenance and operational needs like reducing flooding. He said tenants end up being the ones to provide extra upkeep. He highlighted a building foyer where tenants are maintaining vegetable plants in the small area of open space.

Considerations for Outreach

How do you get a message about a natural resource issue to people within a given community?

Community Boards

A first point of entry into a community in NYC is through the appropriate Community Board. There are 59 Community Boards in the City and 14 within the Borough of Queens. The Alley Creek watershed overlaps two Community Boards with a majority of the area falling within CB 11 and a smaller northern portion of the watershed within CB 9. Community Boards are tasked with overseeing matters related to zoning, land use, city budget, and other community matters. A Community Board can have up to 50 volunteer Board members that receive two year appointments by the Borough President. A District Manager is hired by the Board members to oversee and operate the daily business functions of the Board. Each Board has by-laws by which it governs itself.

While the Community Boards were created to facilitate connections between city services and the residents of the City, the effectiveness of this structure is dependent on a number of factors. The District Manager is the only hired position and fields calls and complaints from the residents, talks to people about upcoming meetings, and compiles the monthly newsletter. Often this person ends up with more institutional knowledge than any of the Board members with their short term (2 year) appointments. Yet, the District Manager is not a formal member of the Board. Therefore, information asymmetries exist between the District Manager with the extensive local knowledge and the Board with decision-making power. Addressing these asymmetries will allow the Board to have more information by which to develop meaningful solutions to community issues and to make more informed decisions on issues concerning their neighborhoods.

Also, Community Board members are volunteers that want to do right by their community and while motivated and active, they may not have the level of expertise needed to understand all issues affecting their community. Yet, important city happenings are being presented to the Board first with the intention that the Board will then inform its constituents. If the Board does not fully comprehend the impacts and/or urgency of the material being presented by a city agency, for instance in the case of sewer system upgrades, then the information delivered to residents will reflect that and may not even be passed along.

Finally, the Board feels email communication is too heavily relied on for outreach to the community. With respect to water and sewer issues, a suggestion was made to include more educational information within mailed water bills to reach a broader section of the public.

Stewardship Organizations and Alley Pond Environmental Center (APEC)

In addition to the Community Boards, there are existing networks of civic and environmentally-focused stewardship organizations throughout the City. These networks and existing relationships can be capitalized on for outreach and engagement. Past US Forest Service research has begun to identify these organizations, their “turf”, and their connections to one another in major metropolitan areas

including New York City⁶. Partnerships with these community organizations can be beneficial for city agencies given the scope and scale of reaching out to millions of individuals. DEP and Parks are often relying on these networks to distribute meeting invitations and other information related to their operations.

When partnering with a community group, you are relying on their connections for distributing your information. Therefore, it is important to understand the organization's particular relationship with its network. Sometimes there are disconnections between how the government views the partner organization, how the organization views itself, and what the community is looking to the organization for. This will impact how messages move through the system. The more these perspectives are aligned, the more effective this option will be in delivering the right message to the target population.

In the Alley Creek watershed, the Alley Pond Environmental Center (APEC) is utilized as a primary contact for outreaching to the "environmentally-aware" community. While the name implies a focus on the local natural resource Alley Pond, the nonprofit organization's primary focus is on providing educational opportunities for students throughout the New York metropolitan region. Children come from all over the boroughs to take part in the outdoor and wildlife programming offered by APEC. City agencies often use APEC's physical space to host public meetings and their email list-serve to invite members of the public to these meetings. Yet, APEC's weekly newsletters are mostly filled with events and programs available for children and families. Therefore, using these newsletters and list-serve to send information about upcoming local public meeting may be less effective than expected as it includes people that are beyond the boundaries of the Alley Creek watershed and people may not be expecting this type of information from these newsletters. For instance, one rain barrel homeowner mentioned how his kids go to APEC for summer programming and so when I asked him if he had seen the invitation for the recent watershed meeting within one of the emailed newsletters, he replied that he usually just deletes them as he has been too busy lately. His kids are already at APEC so doesn't need to check the newsletter for more information.

Civic Associations

An additional benefit in the Alley Creek watershed is the number of active civic and homeowners associations that can be used to reach private property owners. The seven existing homeowners and civic associations were generally formed to preserve a particular single family home aesthetic against increasing development pressures and to address other communal issues such as crime and neighborhood beautification. Neighbors within these communities are highly connected with one another and share information related to property management and other issues.

⁶ (Connolly, Svendsen, Fisher, & Campbell, 2013)

New Partnerships

To reach the remaining segment of the population not directly involved within a civic association or APEC, new partnerships may need to be made, for instance, with the local libraries and churches that are involved in civic activities. One volunteer that I met with from a local library is an avid gardener and was a great connector within her neighborhood, sharing plants with her neighbors and supporting local landscapers.

An increasing challenge to outreach in this watershed is the changing cultural diversity and associated language barrier that arises with new immigrants. Acknowledging this shift is important when developing outreach materials to ensure inclusivity and negate any bias towards native English speakers. Some possible methods for reaching this community will be to partner with cultural centers and churches, the local libraries that are offering English as a second language (ESL) courses, and even through the school system as the children of these families often learn English more quickly and are more confident in their language skills. Watershed management can be used as a tool to build the partnership between existing, long term residents and new immigrant families and alleviate the perception that new immigrant families are destroying neighborhood fabric with their large out-of-context houses.

Considerations for Messaging by Type

Once you have people's attention, what do you want to tell them? How do you engage in a meaningful way?

As the findings from the previous analysis show, content and messaging affect the entire process of interacting with the public, from outreach to engagement. Distribution of information is one factor of outreach, but with the wrong message, people will not respond to the information you are giving them. The message should be tailored to the audience and highlight an aspect of what is important to them. For example, framing green infrastructure in terms of stormwater management limits its appeal to those homeowners that care generally about "the environment". To reach a broader audience, the message used to engage the public may need to connect on a more personal level. As one local community leader noted, "There's a need to connect people to the reasons why and how. This is an expensive area and there are a lot of two income families so they do not have a lot of spare time." A case study in Chicago came up with similar conclusions, "Until communications around the Milwaukee Avenue Corridor stopped focusing on "stormwater solutions" and started emphasizing "landscape improvements," local property owners had little interest in participating." ⁷

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<http://www.metroplanning.org/news/article/6903>

The typologies can be used to gauge the perceived barriers to adopting green infrastructure and messaging can be developed that addresses these concerns. Common barriers include cost, time, knowledge, interest and risk. These barriers can be addressed by providing targeted and appropriate opportunities for each typology. For instance, if lack of knowledge is the barrier, then an appropriate solution would include providing more seminars and educational programs. If lack of resources is the major barrier, then incentive programs would allow these people to adopt GI. More research is needed to determine exactly what these barriers are but a preliminary analysis of barriers and opportunities by typology is provided below.

Table 1: Major Barriers to Green Infrastructure Implementation by Social-Site Type

	Major Barriers				
	<i>Cost</i>	<i>Time</i>	<i>Interest</i>	<i>Knowledge</i>	<i>Risk</i>
Clean Landscapers			X	X	
The Jones	X	X	X		
The Greens	X			X	X
Early Adopters				X	X
Historical Preservers		X	X		
Without Control	X	X		X	

Clean Landscapers

Barriers: This type will tend to choose aesthetics over environmental considerations. Generally, these homeowners are already investing resources and time into their landscapes. The largest barriers with this type are interest in and knowledge of GI options.

Opportunities/Messaging: The goal of messaging to this group would be to show how GI can be aesthetically pleasing. Pavement and hard surfaces are often preferred to meet their clean aesthetic and contribute negatively to stormwater management. Promoting permeable pavement options may be an easy sell to homeowners within this type.

The Jones

Barriers: These homeowners are time and resource-constrained and want to do whatever is easiest with respect to their landscapes. Lawns are perceived to be easy and moreover, familiar and so is the most common landscape of this type. Private property will also be altered to fit individual needs, such as paving of front yards to make a parking spot for their car. Interest, time, and resources all prevent The Jones from taking on stormwater-related projects on their property.

Opportunity: This type is least likely to respond to GI messaging that is focused on improvements to “the” environment. To promote interest for GI with these homeowners, messaging will need to shift towards how GI will personally benefit them, such as promoting flood reduction, health benefits, or reduction in maintenance costs/time as compared to lawn care. Additionally, GI incentive programs that address the resource and time barriers will be popular with this type.

The Greens

Barriers: This type is mostly limited by lack of knowledge of GI techniques and the associated risk to their property. Also, since these homeowners feel strongly about protecting the environment, they may participate in activities that favor a different, and potentially conflicting, environmental objective. For example, a large vegetable garden may be desired over a rain garden or forested area. These homeowners also may be limited in terms of time and resources.

Opportunity: This type is most likely to respond to the current messaging that focuses on the greater environmental co- benefits of GI. Connecting these homeowners to existing resources and expanding educational and outreach programming would assist in attracting more of these homeowners to adopt GI practices.

Early Adopters

Barriers: These homeowners are the most likely to adopt GI as they have already taken action towards water conservation and stormwater management on their property in some form. But installation of one type of practice does not mean that a homeowner is aware or informed of other actions he/she can take. This barrier of knowledge along with the associated risk of new technology mostly limits GI adoption with this type.

Opportunity: The greatest opportunity available lies within this typology as these homeowners already accept the need for water conservation and stormwater management. The remaining barriers to overcome are most likely practical ones. There exists a need to connect these homeowners with professionals that can assist them in installation of more advanced techniques such as permeable pavement and rain gardens.

Additionally, since the DEP maintains a map with rain barrel owners and other GI adopters, these homeowners can be identified and specifically targeted with resources. From these early adopters, GI techniques can spread to nearby neighbors.

Historical Preservers

Barriers: In some ways, this type will be the hardest to budge because they are stuck on a particular aesthetic and least likely to want to change. Probably more stable financially due to longevity in the

neighborhood and therefore not going to be swayed by financial incentives. Interest and time are the major barriers for this type.

Opportunity: With cost not necessarily being a huge factor, an opportunity lies in a design challenge for professional landscapers and architects to incorporate GI into historical aesthetic. To combat interest barrier, messaging could market the potential for increased property values as more and more homeowners are seeking green buildings.

Maintained without direct input

Barriers: The barrier for this type is unique in that unlike a homeowner, the individual living within these properties has limited control over the landscaping practices. Typically, a management firm handles the landscaping. More research should be performed on the decision-making processes for these property types.

Opportunity: The centralized nature of the management of these large properties provides an opportunity to have a significant impact on stormwater management by convincing a limited number of decision makers. While an individual may not have complete control over the management of the property, he/she may be able to influence these key persons to adopt more environmentally-sound practices including GI. Also, there may be opportunity for an interested person to perform some landscape improvements, such as building and maintaining a rain garden.

Outside of the opportunities for an individual living within these properties, any cost savings or maintenance reductions due to GI installations can be marketed to building owners and management firms. Messaging could also show that renters and people living in these spaces want environmentally friendly landscaping.

Lessons Learned: Comparing Outreach and Engagement Methods from Three Public Meetings

Public meetings are a common tool used by city agencies to inform, gain input, or receive feedback from residents of a particular area on upcoming public works projects and planning initiatives. Within the last two years, three public meetings were held within the Alley Creek watershed to address stormwater and watershed management. These meetings were hosted by different parties (DEP, Parks, and researcher) and offer an opportunity for comparison of outreach methods, engagement strategies, and results. The Appendix contains a full analysis of the messaging and engagement methods used for three recent public meetings. Below is a summary of the lessons learned:

- **Outreach Methods:** Email and electronic communication have made it easy to spread a message to many people quickly and efficiently. But overreliance on these methods can lead to poor results in terms of attracting people to attend meetings. Door-to-door canvassing would

potentially reach more people but would require too much time and resources. Therefore, a combination of outreach methods needs to be considered in order to effectively attract people to a meeting. The source that someone hears about the meeting from is important. A small investment in making sure local leaders and community connectors understand the topic and importance of a planned meeting can go a long way as they will be more apt to promote your cause personally to others. Identifying these leaders and hand delivering flyers to them offers an opportunity for conversation about the cause and builds rapport and trust.

- **Flyer Content:** While some people may hear about a meeting by word of mouth, a majority of the public is going to view the invitation flyer as a stand-alone message (no people around to explain anything). Therefore, its content is extremely important in sparking interest and enticing people to attend public meetings. Technical jargon and acronyms should be avoided. Also, make clear in the flyer why the public should be interested in your topic. Often flyers include the goals of the meeting from the perspective of the city agency/presenter but these goals may be less important to the community. How does the objective of the meeting overlap with topics that may be of more interest to the public? For stormwater and green infrastructure related events, the typology framework offers suggestions for attracting various segments of the public. Using a variety of topics within the flyer could entice a diverse crowd to attend the meeting.
- **Engagement:** The purpose of a public meeting is generally to inform about activities in the area and receive feedback. Often the flow of a meeting tends to succeed in the direction of informing the participants but struggles in the ability to receive valuable input. This de-valuing of local knowledge can leave participants feeling disempowered and less likely to attend future meetings. To assist in alleviating this disconnect, prior to the meeting, identify the aspects of the plan that can be enhanced by local knowledge and public input. If possible, design interactive methods of gathering feedback as asking questions in a larger group may be uncomfortable for some people.
- **Meeting Content:** If the content of the meeting contains excessive technical jargon and analyses, people will be overwhelmed and lose interest. Therefore, in order to convey the most information to a general audience, prepare the meeting content with low expectations of prior knowledge. When presenting, gauge the collective knowledge of the audience by checking in with prompts and questions along the way. If the audience seems to have the technical background needed, then the decision can be made to skip those explanations.

Existing Regulations and Programs Impacting Private Land Management

A number of initiatives are already underway in throughout the City and the Alley Creek watershed to regulate stormwater and promote GI. The Alley Creek watershed is complicated in that it contains a combination of combined sewer, separately sewer and septic-serviced areas. Initiatives and regulations for GI are often related to and based on these sewer system boundaries and therefore are not distributed and offered equally throughout the watershed. This uneven distribution of programs can confuse residents as they identify collectively by other boundaries such as neighborhoods and civic groups. Below contains a summary of the initiatives underway and an analysis of their impact.

Community Initiatives

- **Stewardship Activities:** Some community organizations are already engaged in stormwater management or similar activities that can be capitalized on. Queens Botanical Garden (QBG) has a LEED platinum building that recycles stormwater through vegetation and reuses it for non-potable uses within the building and a parking lot that uses bioswales to capture runoff. A new LEED silver building is planned for APEC's offices that will include bioswales to capture parking lot runoff. The Douglaston Garden Club has over 100 members that take part in neighborhood beautification events and garden related seminars. These resources, in terms of example infrastructure and human interest, are assets to this community. Many people expressed a desire to have more seminars and events offered that explain why green infrastructure is important and how to get involved. Both QBG and APEC focus most of their activities on educational events for children and a suggestion would be to create more opportunities for adults. The Douglaston-Little Neck library has begun to fill this role and is looking to establish itself as the "green" library for the community, offering workshops on composting, local wildlife, and other related activities.

Regulation

- **2008 Yards Text Amendment:** In response to an increase in homeowners paving over front yards to create additional parking spaces, in 2008, New York City passed a regulation to require a minimum percentage of vegetated space for front yards. The amendment requires at least 20 percent vegetated coverage for a yard less than 20 square feet and at least 50 percent for yards 60 square feet or greater. Prior to the code, there was no requirement for vegetated area.

Unfortunately, according to the 311 website, a number of complaints are still being reported about neighbors paving over their front yards. In Alley Creek's watershed alone, over 130 complaints of illegal curb cuts and driveways have been filed since 2010. The complaints are sent to the Department of Buildings. People do not feel that enforcement has been significant enough and that the regulation is not hindering the trend of front yard paving. An article in the

Queens Chronicle dated as recently as March 2014 states people are still enraged and feel “the reason that residents continue to pave over their green space is because the law is too lax.”⁸ Sometimes fines are issued but rarely, if ever, are homeowners forced to remove the new paving. Often this is because it is difficult to prove that the paving was performed after 2008 when the regulation was in place. Also, the Department of Buildings, the city agency in charge of this regulation, does not have the resources to continually follow-up every case. A local contractor states, “While he has seen homeowners having to rip up their cement, a few years later, they’re paving again.”⁹ The cumulative impact of increasing impervious surfaces can have significant effects on the local sewer infrastructure and resulting overflows into waterbodies like Alley Creek.

- **2012 Stormwater Performance Standard:** DEP and DOB have collaborated effectively on the establishment of the latest stormwater performance standard. Effective as of July 2012, the performance standard applies to new development and major alterations where the total new stormwater release rate exceeds 0.25 cfs.¹⁰ As many smaller sites may not exceed this threshold, medium and large lots are most likely to be affected. The rule allows for a number of technologies to be used to from traditional dry well systems to green roofs and rain gardens. While allowed, the innovative vegetated systems are not being installed as frequently as other traditional solutions. Part of the reason for this is that special approval is required by DOB for these systems as they are considered “new technology”. The additional processing time is seen as a hindrance to the development timeline and the faster option is chosen.

In addition, architects, developers, and contractors may not be familiar with these techniques and so are not offering them as an option to homeowners. In an interview with a rain barrel owner, when asked about other techniques for capturing stormwater such as permeable pavement and rain gardens, she replied that she did not know about them. After the techniques were explained, she spoke about an enormous dry well that she just had installed in her backyard with the dimensions 6 feet deep and 4 feet wide. She had built an addition to the house and the dry well was sized by the architect based on the new stormwater requirement. If she had known about rain gardens, she would have opted for that because she feels the dry well is an eyesore as she can't even plant on it. She felt that it would be important to educate the architects because if they don't know about rain gardens and the like, then the construction

⁸ http://www.qchron.com/editions/queenswide/the-problem-with-paving-over-lawns/article_18b48d05-6681-5b28-a8e7-bc6f7570e06f.html

⁹ http://www.qchron.com/editions/queenswide/the-problem-with-paving-over-lawns/article_18b48d05-6681-5b28-a8e7-bc6f7570e06f.html

¹⁰ http://www.nyc.gov/html/dep/pdf/green_infrastructure/stormwater_guidelines_overview_2012.pdf

companies won't do it. Another resident in Bayside expressed similar notions as his neighbor just had two large drywells installed in this backyard.

Incentives

- **Rain Barrel Giveaway Program:** This program was started by DEP in 2008 as part of the Jamaica Bay Watershed Protection Plan. Not knowing what to expect that first year, the agency offered a free rain barrels to residents of Queens. With only 250 55-gallon barrels to giveaway, the DEP found that demand far exceeded the supply. In years since, the DEP has become more strategic about its rain barrel giveaway program, focusing on distribution within priority CSO areas. Residents within these designated areas will receive an email if the program is available to them and then they must follow instructions and pre-register to receive a barrel. This process ensures that all who sign up will receive a barrel on distribution day. The DEP then selects a distribution date and location and homeowners must pick up the barrel at that time and install it themselves. Given that only part of the Alley Creek watershed is within a priority CSO area, only residents within these areas have access to the Rain Barrel Giveaway Program. This confuses residents as CSO areas rarely follow neighborhood boundaries and people wonder why their friend was offered this benefit and they were not. The community board receives many requests for rain barrels and has also been inquiring whether the program can be brought back to their area.
- **NYC GI Grant Program:** Like the Rain Barrel Giveaway Program, this program is only offered for properties located within priority CSO areas. While a small percentage of the City's total investment in GI, this private property grant program is large compared to what other cities are doing. Currently, DEP has 29 active projects costing \$11.5M total. In addition to only being offered in CSO areas, there are some eligibility requirements that make this grant program difficult to obtaining for the private homeowner in the Alley Creek watershed. The grant requires a \$35,000 minimum ask, a 20 year restrictive covenant to ensure maintenance for at least that long, one owner per project, and the project must be publicly visible if not accessible. Because of these requirements, this GI Grant Program is mostly reaching community based and anchor institutions. Only a small portion of the Alley Creek watershed is eligible for projects and so far no projects have been implemented as a result of this program within the watershed¹¹.
- **Bioswale Implementation:** DEP's right-of-way contracts make up a majority of the GI Program's efforts and resources according to its 2013 Green Infrastructure Annual Report. These are being implemented in area-wide contracts of 200 to 300 bioswales at a time within priority CSO areas and therefore are not happening within Alley Creek. A story was shared of a local civic

¹¹ NYC GI Grant Reference Map

http://www.nyc.gov/html/dep/pdf/green_infrastructure/2014_gi_grant_reference_map.pdf

association that was interested in turning one of their planted road medians into a bioswale and DEP said they could not offer assistance as they are focused on priority CSO areas. The civic association even offered to share the costs but was turned down. While the prioritization of bioswale implementation based on those CSO sheds that are most in need is important, residents overall do not completely understand the boundaries and feel confused and discouraged from implementing these types of projects. While this is not directly a private property issue, the impact of being told that “you are not located in a priority watershed” could send mixed messages about the importance of stormwater capture. Given that the permit regulating separate storm sewers is currently being negotiated, those sewersheds will soon become a priority in the future. Interest in installing GI should be capitalized on when the window of opportunity presents itself, regardless of sewer type. If not DEP’s responsibility, what other organization could be assisting civic associations in achieving these goals?

Assessment of Possible Stormwater Management Actions

Where could people (city agencies, stewardship organizations, concerned citizens) put their focus to get the most “impervious area disconnected for their buck”?

The current strategies to address stormwater management only reach a small portion of the homeowners in Alley Creek; all of the incentives are focused only on CSO watersheds, the regulations are either poorly enforced or only address new development, and the education opportunities for adults are minimal or underutilized. The majority of homeowners that live within separate-sewered areas are being left behind. And while CSO watersheds are the current priority for the DEP, separately sewerred areas will come under increasing scrutiny as the permit for their regulation is developed. Further, homeowners do not identify with their sewer system type and do not understand why some neighbors are offered benefits and they are left behind.

In this section, a number of strategies were assessed for their ability to have a positive impact on stormwater capture versus the level of investment that would be required. Impact was evaluated based on both the biophysical and social improvements to the watershed. Keeping stormwater out of the sewers is the primary means for improving the water quality of a receiving waterbody, in this case Alley Creek. Improved water quality links to increased opportunities for recreational activities such as fishing and swimming. The impact of a given strategy can then be estimated by considering the number of homeowners reached by a particular action and the resulting impervious area that would be disconnected from the sewer system if that homeowner installed GI. Further, the biophysical benefits are maximized if retention options, or techniques that use vegetation or reuse to capture water, are used as opposed to detention techniques that store the water in cisterns, pipes, or other hard infrastructure. Since GI is promoted as providing additional co-benefits, such as improved air quality, reduced urban heat island effects, and increased property values, then it is equally important from a social perspective to strive towards even distribution of GI opportunities and installations across the

various populations throughout the watershed. Therefore, actions that engage a population that has been previously been under-served would be considered high impact.

The level of investment was estimated as the financial and human resources that would be required to achieve each strategy. Also, consideration for the feasibility of the action and the ease of implementation was accounted for in the estimate of level of investment. For example, a strategy that builds off of an existing project and is support by existing institutional infrastructure is considered to need a lower level of investment.

In addition to the existing programs being implemented by government agencies and stewardship groups outlined in the previous section, a few strategies piloted by other municipalities were considered in this analysis. A brief summary of these programs is listed below:

- *Post-development Stormwater Management Ordinance, Atlanta:* The previous stormwater rule focused on peak flows from large storms which led to the creation of large, dry detention ponds and expensive underground cisterns. The new Runoff Reduction Standard regulates that new construction projects must capture first inch of rainfall using infiltration, evapotranspiration or reuse for irrigation or indoor plumbing. Specific guidance and training is provided for engineers, architects, and other professionals that will be affected by the rule. This ordinance is an improvement upon NYC's current SW Performance Standard because it requires/prioritizes retention over detention and has supporting infrastructure to ensure professionals know and understand the standard.
- *Water Audit Program, Baltimore and RiverSmart Homes, District of Columbia:* This program provides water audit assessment services for free to homeowners in priority watersheds. The audit includes sending a staff person to perform an on-site assessment of a property and results in a set of recommendations the homeowner can take to manage stormwater runoff on their property. These recommendations include downspout disconnection, rain gardens, hardscape removal, and tree planting. Further, this program offers related services and rebates to assist homeowners with the costs of installing these practices. The cost of this program is supported by a stormwater fee implemented in Washington DC in 2010. This "mini-grant" program could provide incentives for homeowners in NYC that do not have a project large enough to apply for the NYC GI Grant Program.
- *Stormwater Facility Credit Program, Seattle:* In this program, a property owner can install an approved SW facility and receive a credit (cost reduction) on their drainage bill. The project is then inspected once a year for compliance. To implement this type of program in NYC, it would

require a restructuring of the SW charge. Currently, stormwater and wastewater costs are lumped in a single fee calculated as 159% of the charges of water supplied to that property.¹²

A 2x2 matrix was then developed with Investment on the horizontal axis and Impact on the vertical axis. Those strategies that were estimated to be High Impact-Low Investment were considered the low hanging fruit. These strategies should either be initiated or expanded to meet the stormwater capture needs of this watershed. The strategies that were either High-High or Low-Low Impact and Investment were evaluated for their benefits and potential application to this watershed. The strategies that are High Investment- Low Impact are not going to provide much opportunity for this watershed but were examined to determine if changes could be made to make these options more viable.

Table 2: Evaluation Matrix of Possible Strategies for SW Management

Impact	High	Train Local Leaders Revise SW Performance Standard Engage Immigrant Populations	Enforcement of Yards Text Amendment Water Audit Program w/rebates Rain Barrel Giveaway Program
	Low	Educational Programming for Adults	NYC GI Grant Program
		Low	High
		Investment	

Low Hanging Fruit (High Impact- Low Investment)

- **Train Local Leaders:** The Alley Creek watershed hosts a fairly large, active citizenry. These leaders of civic and homeowners associations, the community board, and other local institutions have some level of decision-making power at their disposal and so it is important that they are well informed about the problem of stormwater runoff pollution and the potential solutions available to them. These leaders maintain community ties built on a foundation of trust and mutual interest in neighborhood affairs and therefore can reach and influence a significant portion of the homeowners. The investment to provide this service would be relatively low with one to two trainings offered per year.
- **Engage Immigrant Populations:** Engaging this sector of the population in stormwater management is a high priority and crucial for the future of this watershed. Demographic trends over the last decade show a steady shift of the population in Alley Creek from mostly white to mostly Asian. Given the anti-immigrant sentiment that is connected to the development of new large homes and removal of existing vegetation, watershed management can be seen as a

¹²

http://www.nyc.gov/html/nycwaterboard/pdf/rates/fy2013_rates.pdf

community building initiative where misunderstandings can be addressed and trust built. A study of immigrant behaviors in New York City found fears of immigrant populations being less likely to engage in pro-environmental behaviors is unfounded. Of greater significance is their lack of involvement in environmentally oriented political behaviors.¹³ Therefore, investment should include a conscious shift of effort when conducting public meetings, volunteer opportunities, and outreach to overcome the language barrier and provide translation. Outreach strategies should include some non-traditional channels such as churches and schools where immigrant populations are most connected.

- **Revise the 2012 Stormwater Performance Standard:** The new stormwater performance standard is already being implemented in this watershed and is leading to the reduction of runoff to the sewer system from new and major redevelopment projects. Of the projects mentioned by community members, dry wells are the solution being suggested to them by architects and contractors. These residents do not like the dry wells and are open to new solutions. An opportunity exists to use these stormwater projects to engage with homeowners about new techniques that may be more desirable aesthetically, such as rain gardens, and offer the additional benefits associated with vegetation. Educating architects, contractors, and homeowners about their options while removing the barrier associated with additional processing time for review of these techniques could contribute to increased implementation of vegetated GI throughout the watershed. Also, the Storm Water Infrastructure Matters Coalition (S.W.I.M.) has begun to maintain a list of designers and contractors that are experienced with GI and homeowners undergoing this process should be connected with this list.

Mid-level (High-High or Low-Low)

- **Enforce Yard Text Amendment:** The enforcement of this regulation should be a priority for this watershed and throughout the City. The cumulative impact of paved front yards could produce significant increases in stormwater runoff. In addition to this stormwater impact, the paving of the front yards discourages other homeowners and makes them feel that the existing regulations are meaningless. The current barrier is the financial and human resource investment required to provide effective levels of inspection. A conversation with staff at DOB would be helpful for identifying other barriers and possible solutions. Because this issue has impact on stormwater runoff, collaborating with DEP may help meet the need. It would also be helpful to research the underlying reasons why front yards are being paved in the first place. Is there a lack of adequate parking space? Do people own more cars due to lack of viable public transportation options? Do people choose to pave for ease of maintenance over vegetated options? Knowing the answers to these questions would assist in developing appropriate

¹³ (Pfeffer & Stycos, 2002)

mitigation measures. And what about back and side yards? Should regulations be in place to conserve these pervious spaces as well?

- **Water Audit Program:** While the impact of this strategy could be high, it would require a high level of both human and financial resources to perform the audit and provide rebates, respectively. The District of Columbia and other cities have overcome this financial barrier by revising their wastewater charge to account for stormwater specifically. While NYC has and continues to consider SW fees, this option would be costly without that income stream. But with a significant number of properties that could benefit from a simple downspout connection and a scaled-down version of this Water Audit program could be considered. Also, rebates without an audit may not be far off in the future as the DEP is in the process of considering the feasibility a “mini-grant” program. Would be important to consider outreach methods if a program like this were implemented.
- **Rain Barrel Program:** A crowd pleaser that has low stormwater capture potential; as one DEP employee stated, the stormwater captured in a 55 gallon rain barrel is like “a sneeze in the ocean”. But when considering other impacts, including widespread engagement and diversity of homeowners impacted, this high demand program offers additional benefits that increase its overall impact. The rain barrel process can be used as an outreach tool and for public relations. Water rates have increased significantly in recent years and offering a rain barrel makes homeowners feel like they are getting something in return. And since homeowners self-select to obtain a rain barrel, of the rain barrel owners interviewed for this research, all of them were highly environmentally aware citizens. These early adopters could be interested in piloting other green infrastructure solutions and the rain barrel giveaway program is a great way to identify them. Also, to increase the stormwater impact of the program, can consider a joint rain barrel/downspout disconnect program.
- **Educational Programming for Adults:** More general than the leader training and engagement of immigrant populations, offering additional programming for adults on watershed, sewer system, and green infrastructure topics could grow the contingent of active community members attending infrastructure planning meetings and taking initiative to manage stormwater on their own property. Many resources including installation manuals, maps, presentations, and fact sheets, have been developed by organizations within this watershed and throughout NYC. This initiative would seek to connect these existing resources with homeowners in the watershed. For instance, GrowNYC has a great brochure on implementing stormwater management projects. This could be undertaken by the multiple community organizations, city agencies, and civic associations already conducting stewardship activities in the area.

The actual stormwater captured by this initiative would vary based on the intensity of the initiative and was conservatively estimated as low impact. But by making visible “invisible” infrastructure, a foundation is laid for future GI adoption as promoting education and awareness can empower citizens to take action. As demonstrated in the meeting held at the library, once people understand the basic functions of stormwater infrastructure, they can also begin to develop solutions.

Not Without Changes (Low Impact -High Investment)

- **NYC Grant Program:** Only a small portion of the watershed is eligible and given the restrictions of the grant, only a small number of properties are eligible within that. Queens Borough Community College could serve as a potential site but the technical expertise and administrative resources may not be present within the institution currently. The College is currently behind on a grant received in 2012 to retrofit a parking lot with bioswales due to staff changes and the need for more financial resources. This grant program could potentially assist QBCC in meeting its remaining financial needs. NYC DEP is also actively considering a mini-grant program that would allow homeowners to apply for grants to complete smaller GI projects. Outreach for this program would be an important component in order to ensure equal opportunities to all homeowners.

Conclusions and Final Recommendations

As the solutions to stormwater management shift from centralized engineering projects to distributed green infrastructure, stakeholder involvement needs to expand beyond traditional technical experts to include a broader spectrum of society. With a majority of the Alley Creek watershed zoned for residential use, the cumulative actions of individual homeowners have a significant impact on the health of a watershed and its receiving waterbody. The social-site typology created offers a lens for assessing private property owners and their land management practices related to stormwater management. While a multitude of perspectives exist, the development of a social-site typology in this study generalizes residents into 6 categories with shared motivations towards landscape maintenance and barriers to implementing GI.

Rather than addressing homeowners as a homogeneous group, the typology can be used to create diversified outreach and engagement strategies that cater to the variety of barriers towards and interests in GI. Messaging used to engage private landowners in GI practices will need to move beyond the narrative of improving water quality of local waterbodies to connect more with the interests of the public. Common barriers include cost, time, knowledge, interest and risk. How do these barriers overlap with the objectives of watershed management? Unlike GI implementation on public lands, promoting GI on private property will require placing higher value on obtaining local knowledge and input in order to gain access and permission.

In addition to controlling their own lands, individual homeowners may participate in local organizations, civic associations, and stewardship groups to address neighborhood-wide issues that are aligned with their values, interests, and priorities. This “social landscape” can be seen as a web of relationships between residents, organizations, and city agencies. Understanding this existing socio-political landscape can assist in identifying the most effective points of intervention to incite implementation of GI on private property. Democracy is best achieved with an informed and active citizenry. As such, action should be taken to promote organizations working towards watershed management goals and to include new immigrant populations in local decision-making processes.

Social-site typologies can be used along with the biophysical characteristics and social network analysis to develop appropriate strategies for watershed planning and management efforts. The following is a summary of recommendations for watershed management in Alley Creek.

- **Protect existing pervious area on private property** According to NYC DEP Alley Creek GI Plan data, the CSO portion of the Alley Creek watershed is estimated to be about 65 percent impervious. The DEP does not list Alley Creek as a “priority CSO area” and actions should be taken to preventing this watershed from becoming one. Pervious area on private property is already serving as a type of “green infrastructure”. At a minimum, maintaining existing pervious cover needs to be a priority. Enforcing the Yard Text Amendment is an example of an action that supports this goal by requiring minimum pervious coverage in the front yards of homes. Then, the focus can shift on making these pervious spaces more “productive” in terms of stormwater management. Revising the 2012 Stormwater Standard to promote vegetated GI solutions over traditional solutions will ensure the impacts of new construction and redevelopment are mitigated to the highest extent possible.
- **Capitalize on existing social networks and engage new populations** Decentralized solutions to stormwater management open opportunities to engage new, non-conventional actors. The existing social networks in the Alley Creek watershed have organized around local development issues in the past (e.g. zoning downgrades, complaints about paving of front yards). These networks can be capitalized on by training local leaders on issues related to stormwater management. Studies showed that educational efforts addressing groups were more successful than those that focused on individuals alone.¹⁴ A message of stewardship coming from a trusted neighbor is more likely to be received positively and have a larger impact than an impersonal educational campaign. Efforts should be made to engage populations not currently captured within these networks, namely the steadily increasing immigrant populations.
- **Beyond incentives** Cost is not the only barrier to GI adoption and therefore, incentives alone will not equate to widespread GI adoption. According to the typology, The Jones and The Greens

¹⁴ (Blaine, Clayton, Robbins, & Grewal, 2012)

will be most susceptible to cost-reducing incentives. A conversation with an employee working for the District Department of the Environment in Washington, D.C. stated that high income residences were not participating in their GI incentive program because they do not need the cost-savings and have different aesthetic preferences. Since these elites often set the desired landscape preferences, targeted efforts towards local leaders are again important.

- **Pilot more GI projects** Aesthetics and related social status/acceptance of new landscape practices are barriers to creativity in development of alternative residential environments.¹⁵ Yet, this role of social capital can also be important and utilized for adopting new practices, like GI, as homeowners are more likely adopt a new practice if an adjacent property has already installed it.¹⁶ The theory of diffusion of innovation seeks to explain how, why and at what rate new technologies are spread through cultures. Following a bell curve from left to right, innovators and early adopters start a trend by taking the risk and trying a new technology. Once these early adopters show that the technology is worthwhile, a group termed the “early majority” will begin to utilize the new technology and so on throughout the population. In the Alley Creek watershed, rain barrel owners can be seen as Early Adopters. These homeowners are most likely to be interested in other GI techniques. Through targeted engagement of these homeowners, GI installations can be spread throughout the watershed. Then, following the theory, homeowners adjacent to these projects will be more likely to adopt GI in the future as the risk and aesthetic barriers will have decreased.
- **Increase trust and communication between the “public” and the “city”** Often these entities, the public and the city, get generalized into stereotypical actors. In order for innovative and collaborative solutions to arise, miscommunications need to be addressed and awareness built of the complexity on either side. The typologies attempt diversify the “public” while an educational effort to breakdown the role of the various city agencies could provide more transparency of the decision-making around environmental issues.

Future Research Opportunities

As this research project was exploratory and many of the findings presented are preliminary, many opportunities for further research exist.

- **Comparative research with another watershed** This social-site typology was developed based on the Alley Creek watershed in Queens, NY and it would be strengthened by testing its application to other urban watersheds. Future research should conduct a similar research study

¹⁵ (Blaine et al., 2012)

¹⁶ (Green, Shuster, Rhea, Garmestani, & Thurston, 2012)

in another urban watershed with different physical and social characteristics, particularly one with different demographics, income distribution, and density of housing stock. Comparing the similarities and differences would offer new insights and highlight the more generalizable features of the typology across urban watersheds.

- **Controlled studies examining the impact of different outreach and engagement methods** This research highlighted the disconnect between the messaging used by regulators to engage the public in watershed-related activities and the actual interests of the public at large. City agencies and watershed managers focus on the public benefits of improved health of Alley Creek which only appeals to those homeowners that care generally about “the” environment. To engage more types of homeowners, messaging needs to be connected to the immediate concerns of homeowners such as landscape improvements and aesthetics. In addition, overreliance on electronic means of communication has led to low attendance at public meetings related to Alley Creek and water infrastructure. Future studies are needed to test these hypotheses.

An example of this kind of research is underway, led by the DEP, related to grease disposal. “As part of that pilot program, residents of one building in a Manhattan housing complex served as a control group and received DEP’s standard educational materials, while residents of another building in the development participated in additional meetings, workshops, and events focused on grease. The sewer service lines from both buildings were inspected and cleaned prior to the program, and crews will re-inspect the lines at the pilot’s conclusion to measure the relative improvement as a result of the intensive curriculum.”¹⁷ The DEP and other city agencies could look to the Urban Field Station for assistance in designing these social science studies for a range of social-site types and messages related to GI. Results will inform the city agencies on where to invest their resources in order to achieve the highest levels of public engagement.

- **Linking typologies to a spatially available dataset** In this study, the linkage between the social-site typology and the physical characteristics of the watershed is lacking. In order to predict the potential for stormwater capture by resident type, the typology would need to be linked to a spatially available data source. Market segmentation data is an example of a spatially available dataset of predicted consumer preferences. A study conducted in Baltimore, MD used market segmentation data and found lifestyle behavior to be the best predictor of vegetation cover on private lands over independent variables of income and education alone.¹⁸ By comparing and contrasting the typology developed in this research with existing market segmentation data, parallels and limitations of this data set for watershed planning can be identified. As market

¹⁷ http://www.nyc.gov/html/dep/html/press_releases/14-037pr.shtml#.VC6hLxZ0b5A

¹⁸ (Grove et al., 2006)

segmentation is available nationwide, there exists a desire to understand its applicability for generalizing to other watersheds.

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Appendix

Within the last two years, three public meetings were held within the Alley Creek watershed to address stormwater and watershed management. These meetings were hosted by different parties and offer an opportunity for comparison of outreach methods, engagement strategies, and results. The first meeting was hosted by the NYC Department of Environmental Protection (NYCDEP) on May 13, 2013 as part of the public outreach required by the consent order for Long Term Control Planning for combined sewer overflows. This was the second of two meetings. The second meeting was hosted by the NYC Department of Parks and Recreation on Jan 31, 2014 as a community outreach meeting for the development of their Alley Creek Habitat Restoration and Watershed Management Plan. This was the second meeting of a three meeting series. The third meeting was hosted by myself, a graduate student researcher, on August 1, 2014 at the request of the Friends of Douglaston Library group to talk about water infrastructure in general. Each meeting resulted in differences in attendance and participation of the public. And while no specific aspect of these meetings can be singled out as creating these differences, a comparative analysis of the outreach and messaging strategies employed offer some insight and lessons learned. A summary of these meetings can be found in the table below.

Date	Title	Host Org	Location	Attendance
May-13	Alley Creek Long Term Control Plan Public Meeting #2	NYC Department of Environmental Protection	APEC	10
Jan-14	Alley Creek Habitat Restoration and Watershed Management Plan Community Outreach Meeting	NYC Department of Parks and Recreation	APEC	23
Aug-14	The Waters of Queens: Dirty or Clean?	Graduate Student	Douglaston-Little Neck Library	>45

Outreach Methods

Outreach is extremely important in attracting members of the public to attend a meeting. First, the appropriate distribution methods need to be identified to get the invitation flyer in front of the target population. The Queens Community Boards (CB 11 and CB 9) and Alley Pond Environmental Center (APEC) are the first points of contact used by city agencies in this watershed. Meetings related to the watershed are generally held at APEC so they are involved early in the planning process. Then to promote the meeting, APEC includes meeting information as an event in their weekly emailed newsletter and may hang a flyer in their offices.

For CB11, the district manager generally receives all incoming community information and then compiles an emailed newsletter that will include the public meeting information. In addition, the DEP often presents an update to CB11 on the Long Term Control Planning process prior to hosting a public meeting. During an informal meeting with the Environmental Committee of CB 11, stormwater management and sewer system issues were discussed. At many points, members of the committee

stopped the conversation to ask “What is an outfall and WPCP? What is a CSO?” It was then clear that this committee, full of local leaders, did not possess the level of knowledge necessary to understand the LTCP presentations that they had been given and possibly other related stormwater related messages. Rather than admit their lack of understanding, the issue just goes under the radar and is not passed on to their constituents.

After a fruitful discussion, CB11 Environmental Committee members felt passionately that there needs to be more information out there about what to do (and not to do) related to stormwater management including topics such as catch basins and their connection to Alley Creek and use of 311 for reporting problems. Current methods of distributing information from the CB are heavily reliant on electronic means with emailed newsletters from Community Boards, civic associations, and local politicians. They felt that people are so overwhelmed with information that they either skim or do not read at all. Also, the elderly and others without access to internet are left out with these methods. One local leader mentioned that many of his group’s members are elderly and so while it is more time-consuming and expensive to mail out hard copy newsletters, he does because that is what they want. A suggestion was made by the CB to include educational information within the mailed water bills to reach a broader section of the public.

All of the meetings were advertised in a local newspaper, either the Queens Courier or Queens Ledger. Parks also used email to send their flyer directly to their watershed advisory committee, other stewardship contacts that they had collected over the years, and directly to volunteers that were associated with the zipcodes of the Alley Creek watershed (using an internally maintained Parks volunteer database). In addition, Parks posted the flyer on various social media sources including the facebook pages of local stewardship groups.

The flyer for the general water infrastructure meeting that I held was also included in the Queens Library events newsletter (printed and electronic), by email to the list-serve of the Douglaston Civic Association, and posters within the Douglaston-Little Neck library. The organizer of the library meeting was also instrumental in performing outreach as she was extremely excited about the talk and spread information by word of mouth. Ensuring that the leaders of community organizations understand the importance and purpose of the meeting can create advocates and serve as promoters of the meeting. Otherwise, the flyer becomes even more instrumental as it is the only interface between the organizers and the public.

The flyer itself needs to concisely convey the purpose of the meeting while sparking the interest of potential meeting attendees. While the distribution methods were similar, the language used within the outreach flyers varied greatly. People need to relate to something in the title (or on the flyer) in order to motivate themselves to attend the meeting. A comparison of the titles alone (see table) shows the spectrum of technical jargon used and potential for relatability. The title for the DEP meeting, which

attracted the least number of attendees, would require someone to know what a “Long Term Control Plan” is. While explained more in the rest of the flyer, an individual may never read that far if not intrigued by the title. The title of the Parks meeting uses less technical language but still assumes some prior knowledge. These two titles are likely to only attract those that are extremely concerned with the environment.

ALLEY CREEK LONG TERM CONTROL PLAN

PUBLIC MEETING #2

Wednesday, May 1, 2013
Alley Pond Environmental Center
228-06 Northern Blvd., Douglaston, New York 11362
6:00pm to 8:00pm

DEP will provide a brief presentation at 6:30pm.

As part of the LTCP Program, DEP is developing comprehensive evaluations of long term solutions to reduce combined sewer overflows (CSOs) and improve water quality in New York City's waterbodies and waterways. The goal of each LTCP is to identify appropriate CSO controls necessary to achieve waterbody-specific water quality standards, consistent with the Federal CSO Policy and the water quality goals of the Clean Water Act.



At the meeting, you will learn about DEP's proposed alternatives, related water quality conditions and recreational uses for Alley Creek and Little Neck Bay.

HOW TO GET INVOLVED?
DEP staff will be available to answer any questions you may have.

To RSVP, please email ltcp@dep.nyc.gov or call DEP's Community Partnerships Office at (718) 595-3498.

Directions: visit the website at <http://www.alleypond.com> for travel by car or mass transit.

For more information on DEP's CSO program, please visit our LTCP Program website at www.nyc.gov/ltcp or follow us on Facebook: www.facebook.com/nycdep



QUEENS LIBRARY *Enrich Your Life®*
presents

The Waters of Queens: Dirty or Clean?



What happens to the water when I flush my toilet? Where does all the storm water in the gutter go? Set your mind at ease for the next time you turn on the tap by learning about the water infrastructure that supports over 2 million Queens residents and its effects on urban rivers, creeks and bays.

Dawn Henning, a graduate student at Yale University, has spent the last decade working in New York City on urban water projects and community-based planning.

Refreshments will be served.
Friday, August 1
4:00 p.m.
Douglaston-Little Neck
249-01 Northern Boulevard, Little Neck
718-225-8414
Train: LIRR
Bus: Q12, N20, N21

Admission is free. www.queenslibrary.org
This program is sponsored by the Friends of Douglaston/Little Neck Library.
Queens Library is an independent, not-for-profit corporation and is not affiliated with any other library system.

Library Hours
Mon./Thu./Fri. 11-7
Tues. 2-7
Wed. 1-7
Sat./Sun. closed



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In conversations with an employee of the DEP, a comment was made that a talk about parks is more exciting than a sewer talk and more members of the community are actively involved in parks not sewers. If this is the case, then how do you make a sewer talk more relatable to people? This was the challenge I faced when designing the presentation on water infrastructure in Queens for the library meeting.

When designing the outreach materials for the library meeting, I knew the title was important and needed to be catchy. I sent multiple title options to the meeting organizer at the Library and allowed her to select one. My personal favorite, “Gutter Talk: There's Poop in the Water!” was not chosen but rather the more subdued “The Waters of Queens: Dirty or Clean?” was preferred. In hindsight, I believe this title choice was excellent. The first half of the title connects directly to people as we all rely and depend on water as a resource. The second half is intriguing and a question that people probably can't answer but would like to know. Sparking curiosity and making the topic matter of water infrastructure relevant to the public is an appropriate purpose of the title if the goal is to attract a range of public

participants to the meetings. This meeting attracted the largest number of attendees with over 45 people present and some others turned away because the room was at capacity.

Time, location and its potential impact

Scheduling of the meeting can affect attendance and should be considered as much as possible when hosting a meeting focused on public engagement and participation. Time of year matters as winter weather is unpredictable and can make traveling difficult, people often travel in the summer for vacation, and other potential holiday related conflicts. All of the meetings were held in the late afternoon and evening with the focus on making sure people that are working can attend. The DEP and Parks meetings were held at APEC while the other presentation was given at a local library. Meetings were held at all different times of the year and without specific data it is difficult to state what impact this may have had.

Actual content of the meeting

Finally, once people are convinced to attend your meeting, the material presented and methods of engagement are extremely important for conveying knowledge, soliciting feedback, and encouraging questions and comments. In reviewing presentation slides, summaries of meeting minutes, and through my own experience, I found each meeting used different presentation styles to varying degrees of success. I would define a successful community meeting as one where the attendees feel they've learned something and were heard throughout the process and that the host received valuable feedback to assist their planning process.

With this framework in mind, the Parks Department had a successful meeting as the methods used were interactive (vision statement exercise and identifying specific concerns for the watershed) and solicited a number of specific suggestions from the attendees. On the other hand, DEP presentation slides were heavy with technical wording, maps, graphs, and acronyms that prevented people from following the topic. The questions asked by the meeting participants indicate their desire to have technical jargon explained. Also, it seemed that the limited scope of the LTCP to CSO areas frustrated some participants that are interested in the watershed as a whole. The DEP responded well to these comments, highlighting the upcoming MS4 permit that will be addressing other stormwater runoff issues. As for the general water infrastructure presentation, the below comment was sent to me from the library organizer:

"What also impressed me was the q & a session. We drew a diverse crowd of folks of all ages and level of knowledge of the topic. Among the other attendees were an NYC DEP engineer; a member of the Sierra Club; District Manager, Community Board 11; and even a little boy and his teen brother. They

all asked such interesting questions and made such great comments. We could have easily gone on for another hour; that's how high the level of interest was in your talk!"

There were also follow-up requests asking if I would give the presentation at other locations or on another topic. I believe the interactive nature of the presentation facilitated the sharing of local knowledge and provided a safe space for questioning. There was an exchange of ideas and knowledge both ways: I was able to learn about the community's history, landmarks, and practices from participants as they gained more general and technical knowledge about infrastructure from me.

Summary

While the distribution efforts by all meeting organizers were similar, resulting attendance and participation at each meeting differed. The meeting flyer and its content are extremely important in sparking interest and enticing people to attend public meetings. The content of the meeting should not overwhelm people with technical analyses but inform people enough to receive feedback and concerns. The audience needs to feel comfortable asking clarifying questions in order to stay interested and offer opinions and feedback on complex, technical information.

In follow-up conversations with DEP, a staff member indicated that the agency is expanding the content of their public meetings to include more interactive methods such as a community mapping exercise to identify ways the public uses of local waterbodies. These types of methods do more than inform but allow the public to include their input in a meaningful way.

But it was also suggested that what the DEP does may be too technical for the community to understand and so their input only goes so far. If this is true, then how do we get the public up to speed on these issues? If DEP doesn't have the time to explain all the concepts during their meeting, what organizations can be filling this role? I see this more as an opportunity for educational programming than a barrier to involvement. The level of attendance and interest at the meeting I held this summer proves to me that this community has interest in understanding and providing stewardship to their local environment. Building the capacity of the public should be prioritized, especially as implementation of green infrastructure on private property will involve more direct participation than past infrastructure improvements.