ABSTRACT

Title of Document: FILTER AS METAPHOR: THE MCMILLAN SAND FILTRATION

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Boon of the municipal water works projects in the 19th century was generated by the need to secure a reliable, efficient and publicly available source of fresh water and prevent the spread of disease, as the number of inhabitants in cities was ever increasing. These water works projects were built out of necessity to maintain the health, safety and welfare of the population they served. The McMillan sand filtration system is a testament to late 19th century engineering and public works design. With the advent of new technologies and growing population, a new, more cost effective, and faster filtration system was built to replace the old slow sand filtration method. This thesis springs from the question of "how can the McMillan sand filtration site maintain its historical role identity and function?" New technologies have rendered the facility obsolete. This thesis will address through alternative master planning, different scenarios by investigating specific intentions. It

will also seek to strengthen the community through adaptive re-use of its existing structures, the linkage of the community to the surrounding neighborhoods and its relationship to the city of Washington, DC.

FILTER AS METAPHOR: THE MCMILLAN SAND FILTRATION SITE

By

Adrienne Michelle Jones

Thesis submitted to the Faculty of the Graduate School of the
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Introduction

"Filter *noun*

1a: a porous article or mass (as of paper or sand) through which a gas or liquid is passed to separate out matter in suspension b: something that has the effect of a filter"

²Filter *verb*

"1: to subject to the action of a filter"[1]

The idea of a filter as metaphor stems from the function of the McMillan sand filtration site that is implied in its name. The word "filter" can have different meanings. One way to think of filter is as a porous material such as sand that when a substance comes in contact with it such as water, some of the material passes through, while other parts of it are captured. In this instance, clean purified water passes through, while the impurities are captured (Fig. 1). Another way to think of filter is as an object that produces the same effect as a filter. One might think of Google™. This is a web-based search engine that screens information and displays information that is relevant while selectively omitting information that is unrelated. Another way to think of filter is through the act of filtering. People, light, air, water and information are some examples of objects that can be filtered.

Other aspects that are equally important to the idea of filter are flows and layers (Fig. 2). Flow characterizes the media that is filtered. It must pass through the porous mass thereby creating different paths of travel. The filter itself consists of different layers. It is these different layers that make the filter so effective. Keep in mind these ideas of filter as

[1] Merriam-Webster's Collegiate Dictionary, 10th ed. (New York: Reader's Digest, 1998) 686.

we explore the history of the McMillan sand filtration site and subsequently how it is translated into a design proposal.

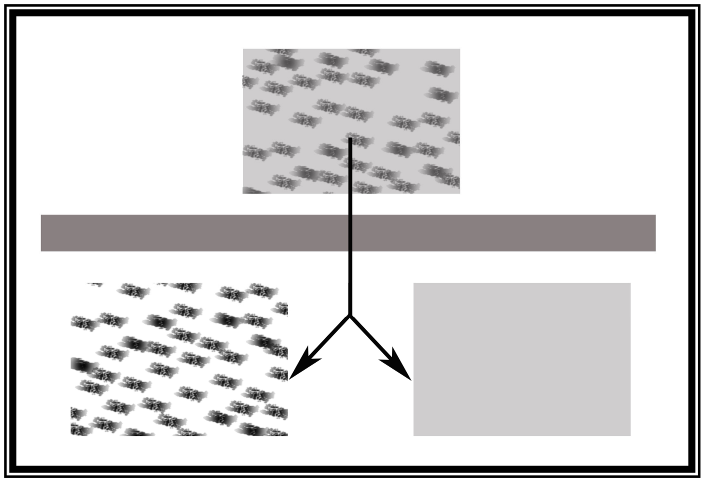

Fig. 1	Filter Diagram, Author	

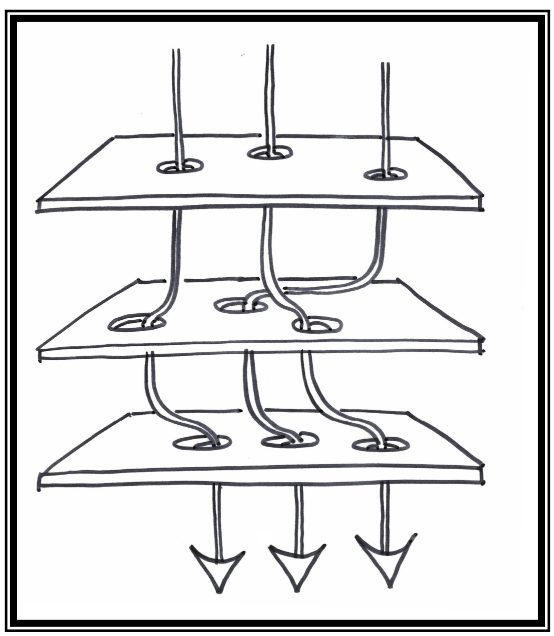

Fig. 2	Flow and Layer Diagram, Author	

Chapter 1: The Site

History

Part of the significance of the McMillan sand filtration site lies within the historical context of Washington DC. Today the site is located in Washington, DC along North Capital Street, NW (Fig. 3). Washington has a rich tradition of open space that together with its urban fabric, shape its unique urban form. This tradition comes from two significant plans in the city's history, the emblematic L'Enfant's Plan of 1791 and the more recent McMillan plan of 1901.

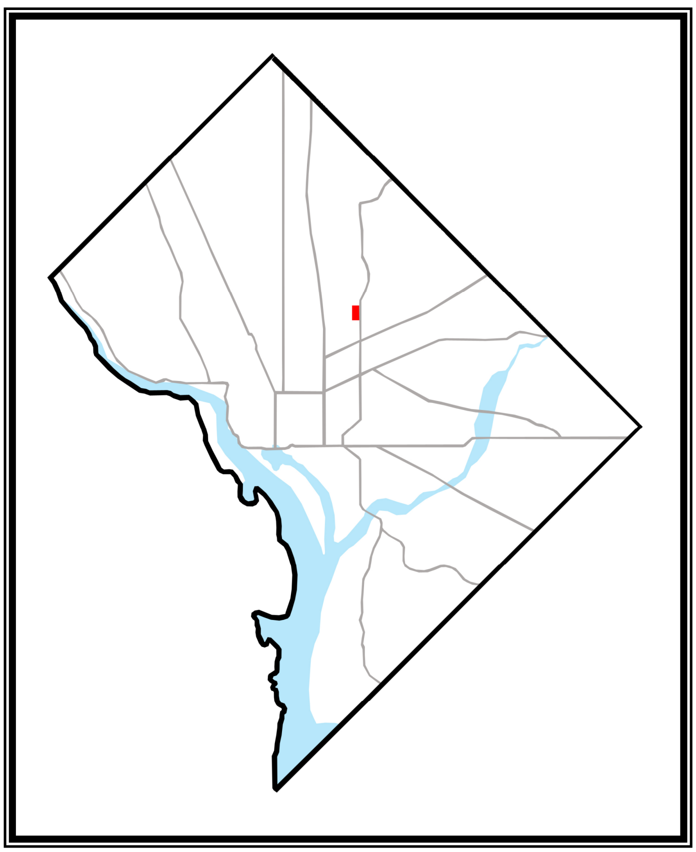

Fig. 3	Vicinity Map, Author	

In 1790, congress passed the Residence Act establishing the federal city along the Potomac River.[2] George Washington selected a site near Georgetown and commissioned Pierre Charles L'Enfant for its design (Fig. 4). In L'Enfant's design of the city, he combines beauty of a city, with function that served both pragmatic and political means, and was infused with symbolic meaning that is embedded in the relationship of the avenues and the public open spaces.[3] His methodology is outlined in his "Observations explanatory of the Plan," printed on the manuscript map. He began by choosing prominent topographical features for numerous public squares. He then connected them through a system of broad avenues. Lastly he inserted a grid of streets to create neighborhoods around the squares.

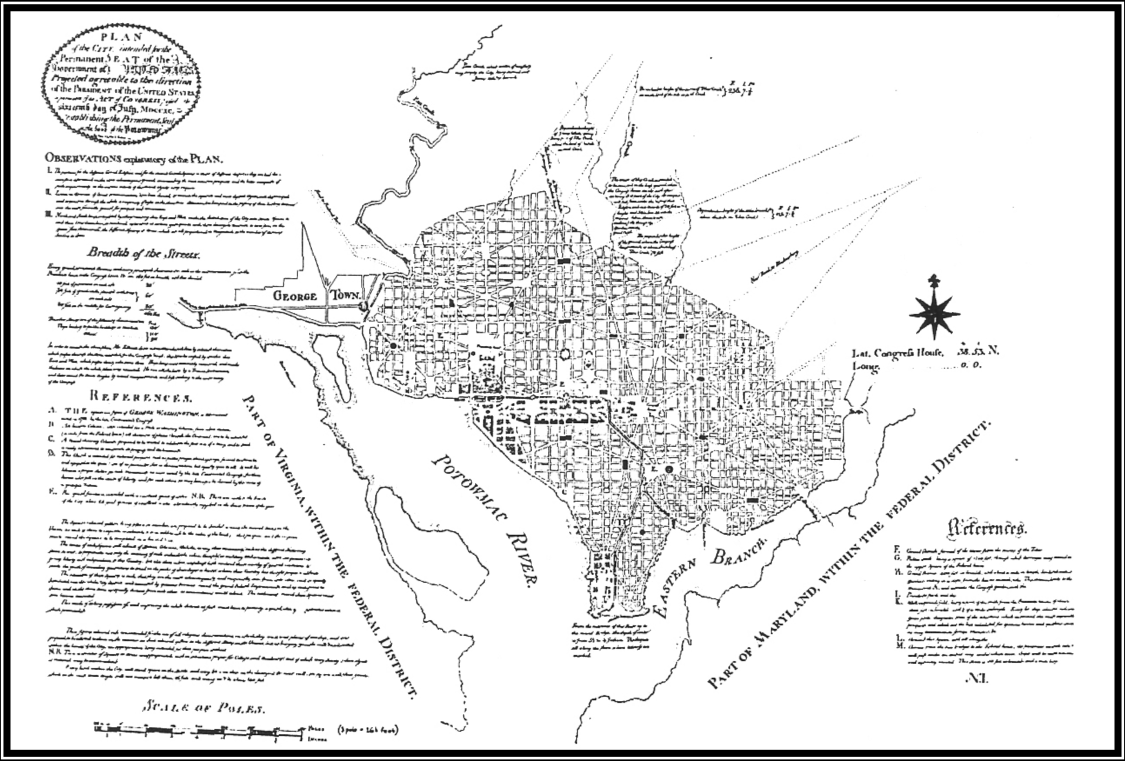

Fig. 4	Plan of the City of Washington, 1791, Pierre Charles L'Enfant	

[2] Pamela Scott, *Capital Engineers*: *The U.S. Army Corps of Engineers in the Development of Washington, D.C., 1790-2004*, (Alexandria: U.S. Army Corps of Engineers, 2005) 6.
[3] Scott, 16.

Fig. 5	The McMillan Park Plan of 1901, Washington DC, Park Commission	

In 1901 the Senate Committee, appointed the Park Commission, consisting of prominent figures of the City Beautiful Movement including planner/architect Daniel Burnham, architect Charles McKim, landscape architect Frederick Law Olmstead Jr., and sculptor Augustus Saint Gaudens.[4] The Park Commission was sponsored by Senator James

[4] Charles Moore, *The Improvement of the Park System of the District of Columbia*, (Washington: Government Printing Office, 1902) 8.

McMillan.[5] The purpose of the Park Commission was to develop a comprehensive plan for preserving park space in the portions of the District beyond the limits of the city of Washington and provide for the recreation and health of a constantly growing population.[6] The spaces that were chosen worthy of preserving as parks were primarily hilltops from which extensive views could be obtained.[7] The idea was to create a park system where people could move from one park to the next without leaving the park system. The Park Commission developed the McMillan Park Plan of 1901 as part of the Senate Report entitled, "The Improvement Effort for the Park System of the District of Columbia" (Fig. 5). The Report also discusses the implementation of facilities for promoting healthy recreation during the hot summer. Compared to other cities, Washington was far behind in providing fountains to improve health and give pleasure. The Report declares:

> "The original plans of Washington show the high appreciation L'Enfant had for all forms of water decoration; and when the heats of Washington summer are taken into consideration, further argument is unnecessary to prove that the first and greatest step in the matter of beautifying the District of Columbia is such an increase in the water supply as will make possible the copious and even lavish use of water fountains."[8]

The McMillan sand filtration site plays a role in the connective tissue as a piece of the park system. The site was intended to be preserved as open space to promote the health of the general public. The park system connects to the McMillan sand filtration site on its north, east and west boundaries (Fig. 6).

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[5] "Thirteenth Annual Report," *The DC Historic Landmark and Historic District Protection Act of 1978*, (Mar. 1992) 6.
[6] Moore, 7.
[7] Moore, 79.
[8] Moore, 28.

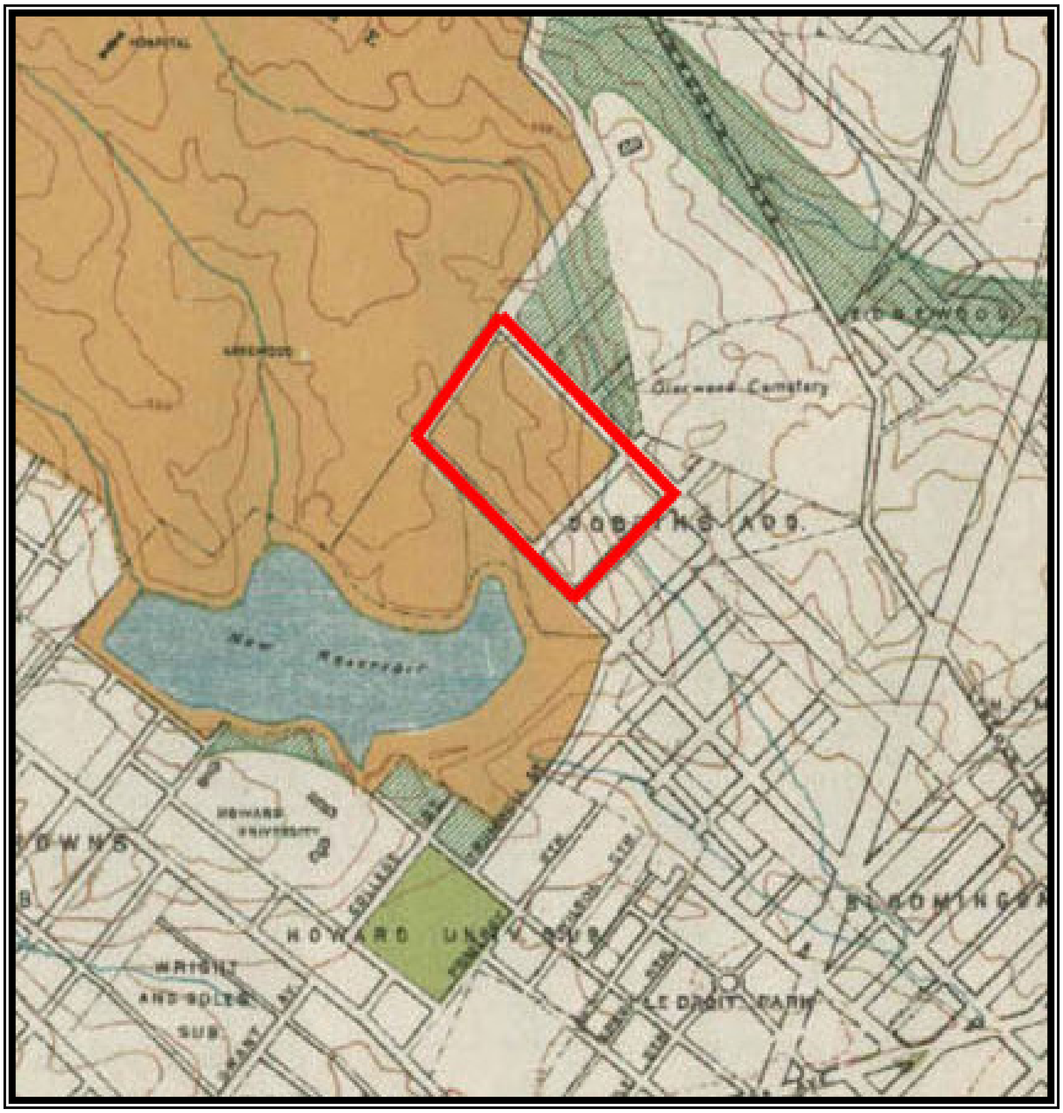

Fig. 6	Site on the McMillan Park Plan of 1901, Park Commission and Author	

The first known records of the McMillan sand filtration site attribute it to the farm of Joseph A. Smith who was a deputy clerk of the Circuit Court. There were numerous springs on the site and were identified as a water source by L'Enfant.[9] Congress purchased a portion of the site in 1832 that included several of these springs, and by 1833 pipes had been

[9] "Thirteenth Annual Report," 6.

fabricated to transport water to the Capital building for fire protection. By 1836, a water main was in operation serving a number of fire hydrants on Pennsylvania Avenue.

Congress authorized a new reservoir in1882 to improve water flow to the eastern parts of the city. Major Garret J. Lydecker, the Engineer Commissioner of the District of Columbia at this time, selected the site of the Smith Spring near Howard University for the new reservoir, on high ground east of Rock Creek. Construction of a new tunnel and reservoir began immediately, but was abandoned due to faulty construction methods. It seems the project was much more challenging that originally anticipated. Later, Congress regained interest to complete the tunnel and reservoir and work resumed in 1898. The tunnel was finally completed in 1901, and the reservoir was brought into operation in 1902.

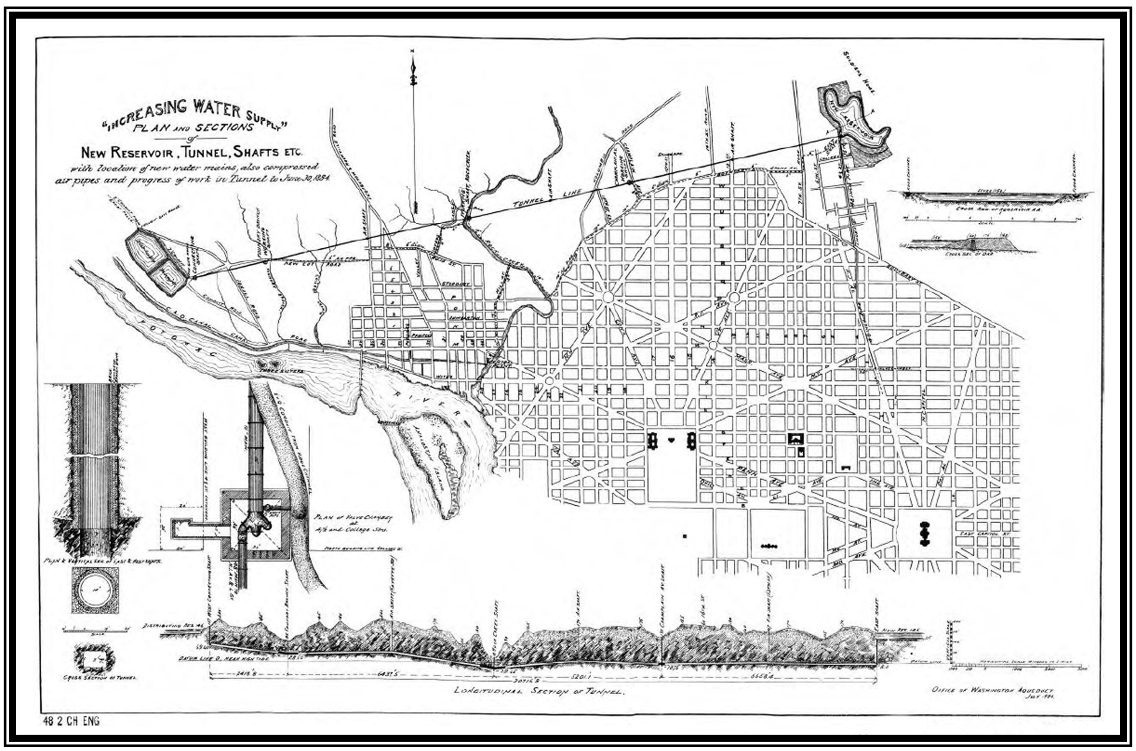

Fig. 7 The Plan of the New Washington City Tunnel, 1883, Corps of Engineers

The city water was frequently turbid. While the water was healthier than well water, the aesthetic qualities drove people to use well water. Public Health officials felt this preference left the city vulnerable to disease outbreaks. With this, the Senate ordered a water filter feasibility study in 1886. Concluded from this study was the recommendation to filter the city water, but no further actions were taken at this time. A second filtering study was conducted in 1900 by Colonel Alexander M. Miller who recommended construction of a mechanical filtration system at the newly constructed reservoir. Local professional and citizen organizations objected to the chemicals used in the mechanical filtration process. The Senate Committee on the District of Columbia chaired by Senator McMillan held hearings on the issue. A Senate-appointed committee of civilian experts recommended chemical-free slow-sand filtration, and Congress approved construction in 1901. The filtration system was designed by Miller and construction was completed in 1905 (Fig. 7). The following year the reservoir and filters were named in honor of the late Senator McMillan, who died in 1902.[10]

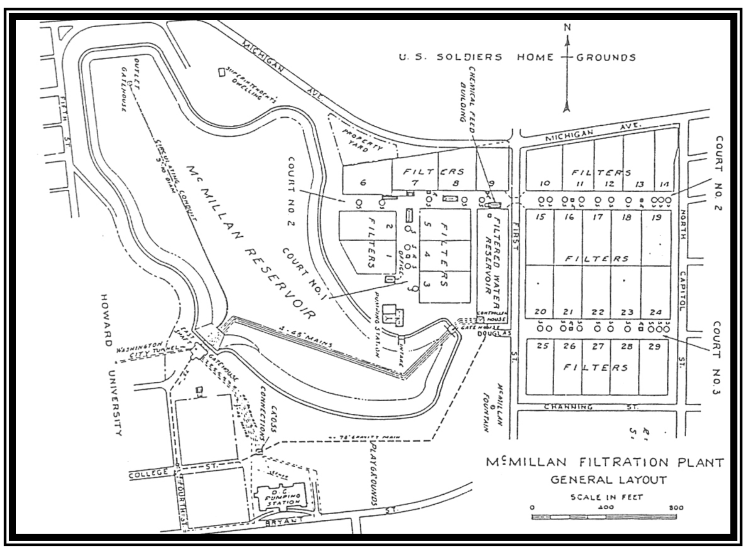

Fig. 8	McMillan Reservoir & Filtration Plan, Historical Plat, 1906	

[10] Harry C. Ways, *The Washington Aqueduct, 1857-1992* (Washington: US Army of Corps of Engineers, 1993) 92.

The site and the area around the reservoir were designed to become a park as part of the Park Committee plan. The McMillan Park was conceived by 1906, and the design and landscaping plan was undertaken by Frederick Law Olmstead, Jr. It was dedicated as a memorial to Senator McMillan who was instrumental in much of the planning for the capital during the preceding years. Funds were appropriated from Congress in 1911, and the utilitarian nature of the site became transformed with the addition of allee of hawthorns and cork trees, walking paths, and a fountain dedicated to Senator McMillan (Fig. 9).

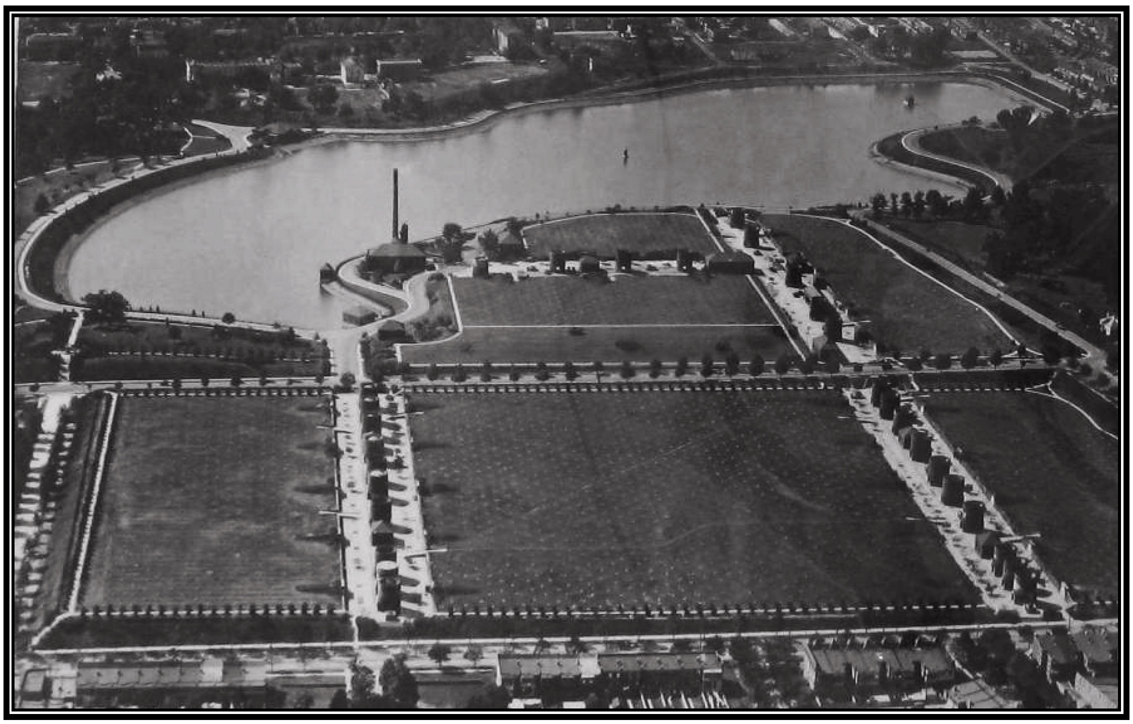

Fig. 9	McMillan Park, historic photo	

In 1941, the park was closed to the public and was fenced off for fear the Germans would poison the capital's drinking water. The slow sand filtration system remained in operation until 1985, when a new mechanical filtration plant was constructed over filter beds #3, #4, and #5. This new computerized facility made obsolete the remaining filter beds, and in 1987, the Federal Government sold the 25 acre parcel, east of First Street, to the District of

Columbia. The city issued requests for proposals to developers, without undertaking any historical reviews of the property. A number of citizen groups opposed the proposed development, and in 1991, the site was granted landmark status by the District of Columbia Historic Preservation Review Board.[11]

Beginning in 2000, the District of Columbia Office of Planning (DCOP) held several community workshops with initial proposals for development of the site with consideration of park and open space. In 2007, the city selected Vision McMillan Partners, a group of companies led by EYA, to develop the site. The current proposal has been met with criticism from the surrounding neighborhood communities.

[11] "Thirteenth Annual Report," 6.

Elements of the Site

1. Water

Water for the McMillan Filtration Plant originated from the Potomac River at the Great Falls Dam. The water traveled along a gravity fed aqueduct designed by Montgomery Meigs in the 1850's. The water first passed through the Dalecarlia and Georgetown sedimentation reservoirs before entering the Washington City Tunnel and passing under Rock Creek at a depth of 120 feet. Upon reaching the gate house at the McMillan Reservoir, the water was pumped vertically 20 feet and then west to the 29 filter beds. After passing through the filter beds, the water was then collected in an underground reservoir. This reservoir fed the Bryant Street Pumping Station and supplied the city with clean water.

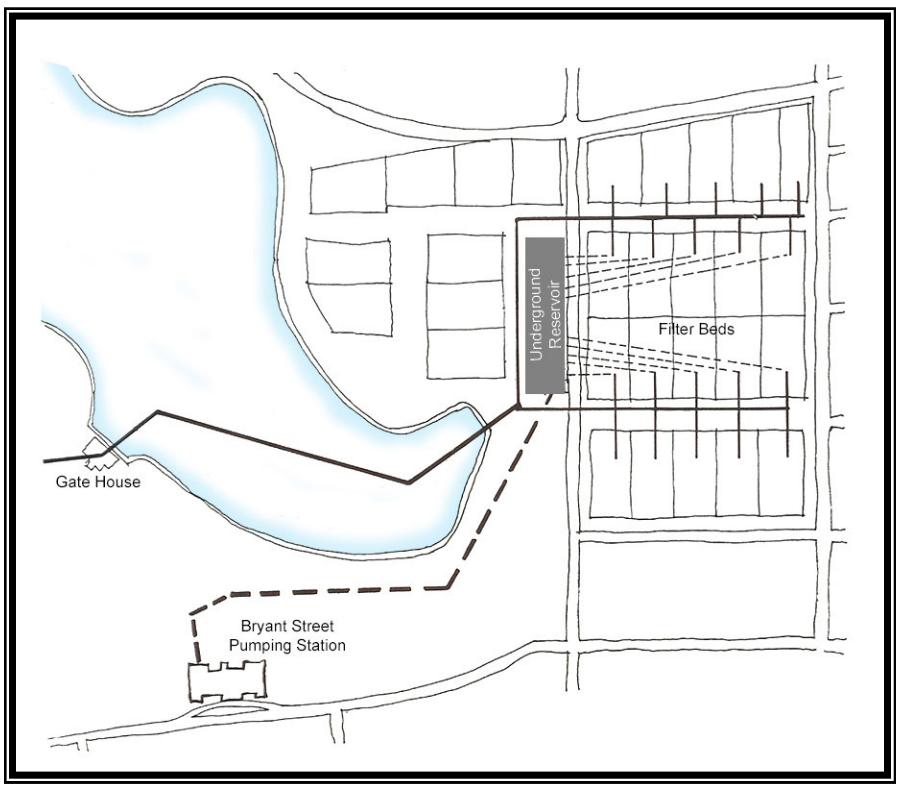

Fig.10	Water Route Diagram for McMillan Filtration Plant, Noonan and Author	

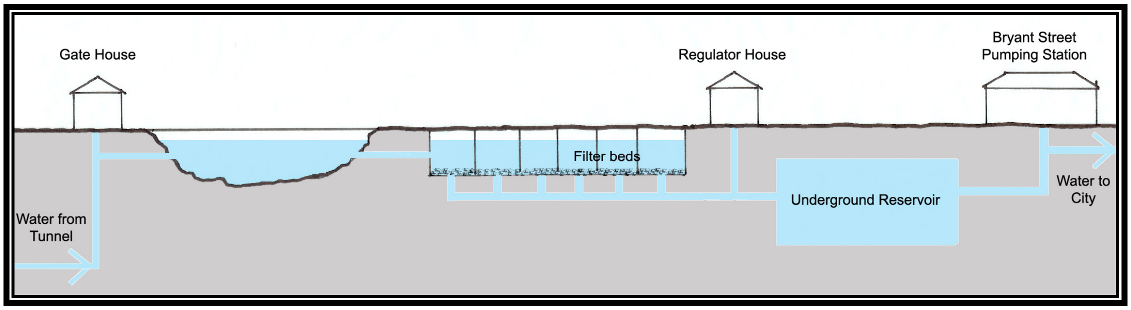

Fig.11	Water Flow Diagram for McMillan Filtration Plant, Author	

2. Filter Beds

There are a total of 20 filter beds that occupy the majority of the site underground. Each filter bed is an acre in size and constructed of unreinforced poured in place concrete. The perimeter of each filter bed is constructed of concrete walls with a secondary system of groin vaults supported by piers fourteen feet on center. The filter beds are lit naturally from manholes above placed every twenty eight feet on center. These manholes also served as easy access for dumping new sand into the filter beds.

Fig.12	Filtration Bed Interior, Author	

Fig.13	Regulator House, Author	

3. Regulator Houses

There are four regulator houses on the site. Measuring twenty four by twenty nine feet, two regulator houses occupy each of the service courts. Each regulator house controlled the flow of water to and from its five respective filter beds. Not only would the regulator house control the flow of raw water to the filter beds, but would also control the flow of clean filtered water from the filter beds to the underground reservoir. While the other structures on the site were completely utilitarian, the regulator houses were also decorative as red Flemish bond brick buildings with clay tile roofs.

4. Sand Washers

There are twelve sand washers that occupy the site. Measuring three by eight feet, six sand washers occupy each of the service courts. The purpose of the sand washers was to scrub the sand clean. Periodically, sand from the filter beds was pumped out to the sand washers after the sand was used to filter raw water into clean, purified water. The sand was forced through funnels in the sand washer as a slurry mixture of sand and water. Once scrubbed clean, the sand would them be pumped into the sand bins.

Fig.14	Sand Washer, Author	

5. Sand Bins

There are twenty sand bins that occupy the site, one for each filtration bed. Measuring thirty-two feet high and twenty-three feet in diameter, ten sand bins occupied each of the service courts. The purpose of the sand bins was to hold the sand after being cleaned in the sand washer, until it was ready to return to the filter bed. When the sand was ready to be redistributed, a horse drawn cart was loaded beneath the bin. Once, filled, the cart was driven to a manhole, the sand was dumped into the filter bed and was evenly distributed.

Fig.15	Sand Bin, Author	

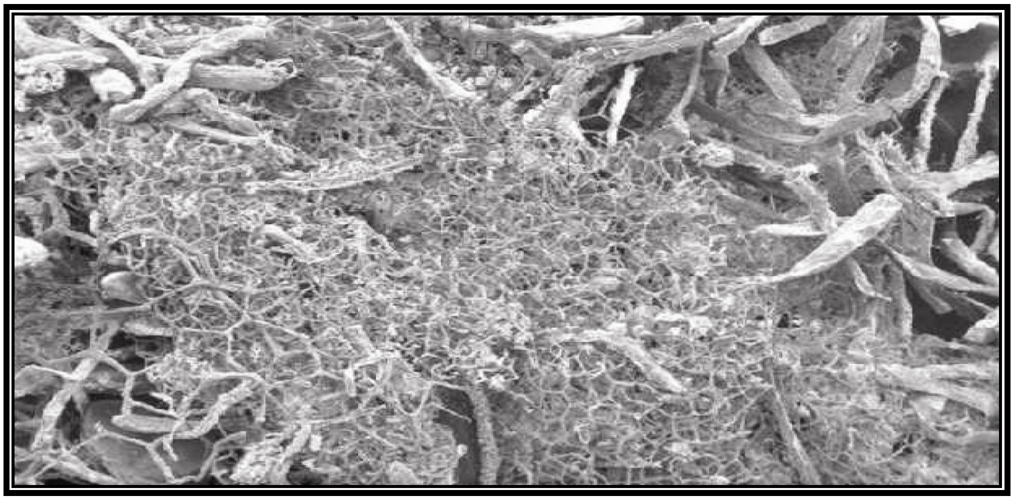

Fig.16	Schmutzdecke (enlarged 20x), Campos	

6. Schmutzdecke

The schmutzdecke is considered a fibrous media contributing to the purification of water. It forms at the top layer of the sand in the filter beds. The orientation of the filaments is assumed to be oriented in a random and transverse plane to the flow of water. Therefore, the schmutzdecke contributes to the removal of particles and allows microbial dynamics within the pores in a similar way as the underlying sand layers. As a result, schmutzdecke is assumed to consist of several independent layers.[12]

[12] L. Campos. "Modeling and Simulation of the Biological and Physical Processes of Slow Sand Filtration" (PhD diss., University of London. 2002), 152.

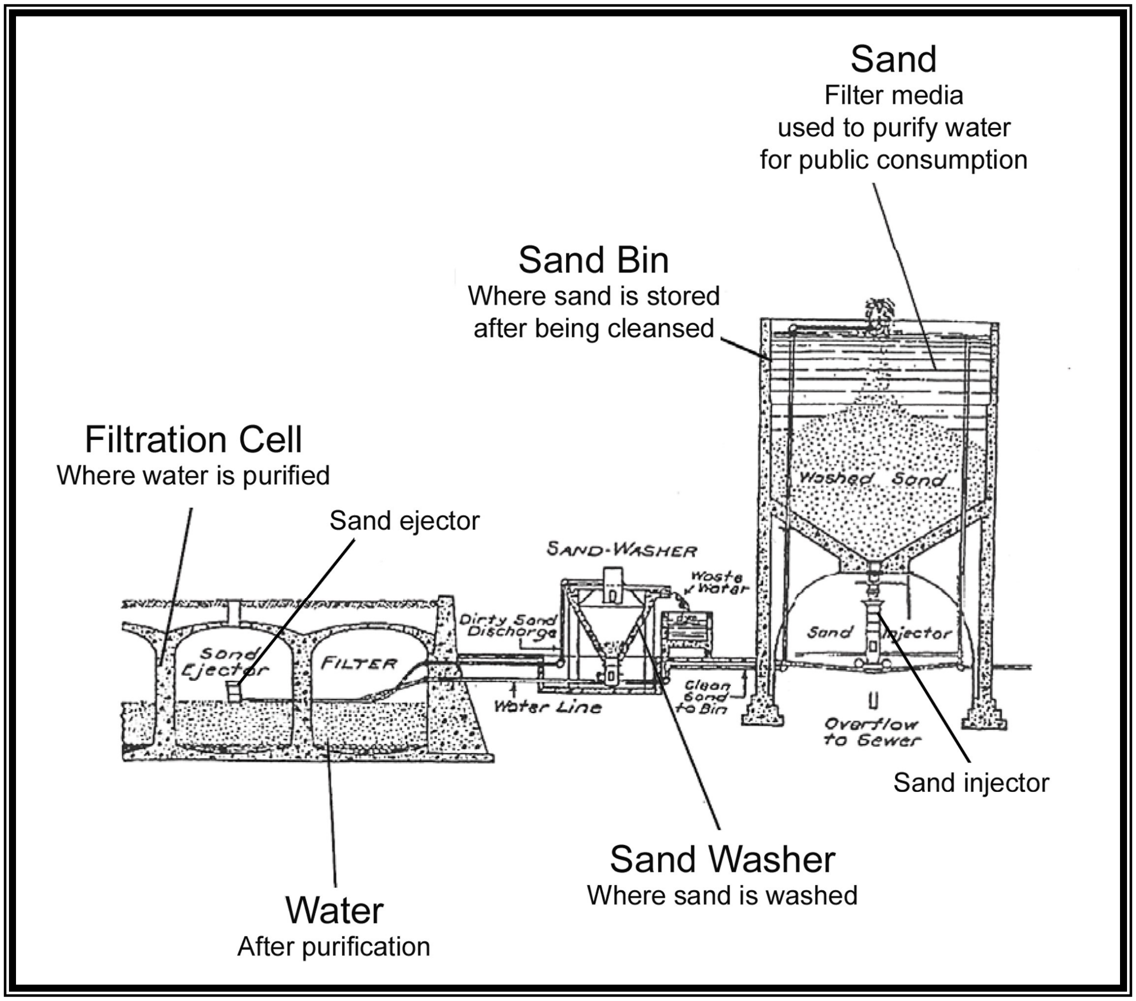

Fig.17	Water Filtration System, Greenhorne & O'Mara and Author	

Site Analysis

The thesis site is located in the upper central portion of the District of Columbia bounded by North Capital Street and First Street, NW in the east-west direction and Michigan Avenue and Channing Street as the north and south boundaries. The site is also has a rich context of numerous institutions and historic neighborhoods. To the north are several hospitals including Washington Hospital Center, Children's Hospital, and Veteran' Administration Hospital. To the east is a thin wedge of row housing and Glennwood Cemetery. To the south is the historic Bloomingdale residential neighborhood. The west boundary consists of the city's current water filtration plant and Howard University.

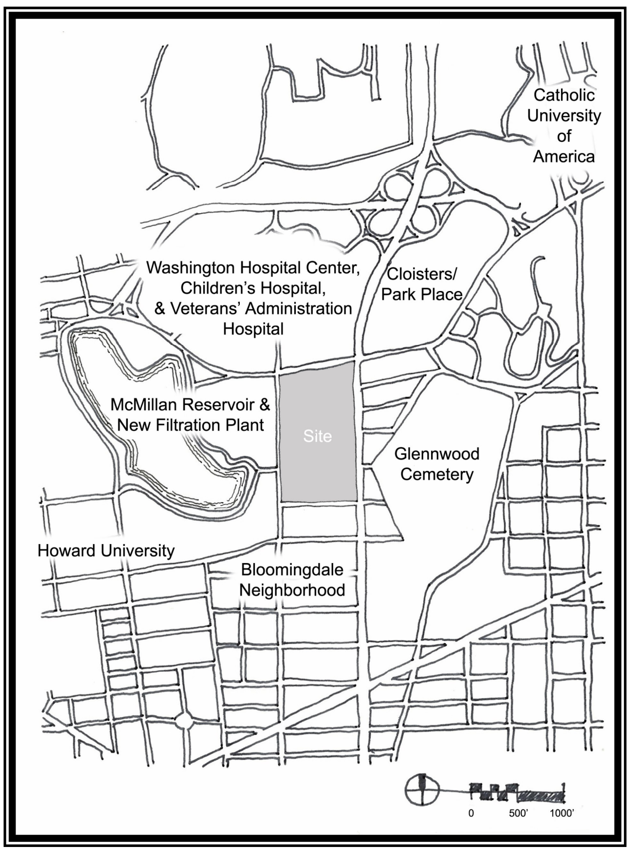

Fig.18	Existing Context, Author	

Fig.19	Existing Site Plan, Author	

Fig.20	Figure/ground, Author	

The Figure/ground representation of the site and context leads one to believe there is a large amount of open space in the general vicinity that is easily accessible (Fig. 20). A better representation includes overlaying fenced boundaries associated with the site and context (Fig. 21). The fenced boundaries physically disconnect the site from much of its surrounding context. The wedge of row houses east of the site is currently cutoff from most of its surroundings.

Fig.21	Figure/ground with Fenced Boundaries, Author	

One of the important elements discussed in the introduction of this thesis was the importance of flows in relation to the idea of filter. By creating openings in the fenced boundaries would permit movement or “flows” through the otherwise static spaces (Fig. 22).

Fig.22	Connections through Fenced Boundaries, Author	

The view corridors from the site provide a visual connection to significant symbolic buildings of our nation's capital. The site is situated on high ground which provides the benefit of distant views of both the Washington Monument (Fig. 23) and the dome of the Capital Building (Fig. 24).

Fig.23	View of Washington Monument from Site, Author	

Fig.24	View of Capital Building Dome from Site, Author	

There has been various degrees of deterioration to the underground filtration beds (Fig. 25). Most of the filter beds show signs of deterioration. Eight filter beds in the south east portion of the site show signs of significant deterioration. The remaining eight perimeter filter beds show signs of moderate deterioration at the site boundaries. Four interior filter beds are structurally stable.

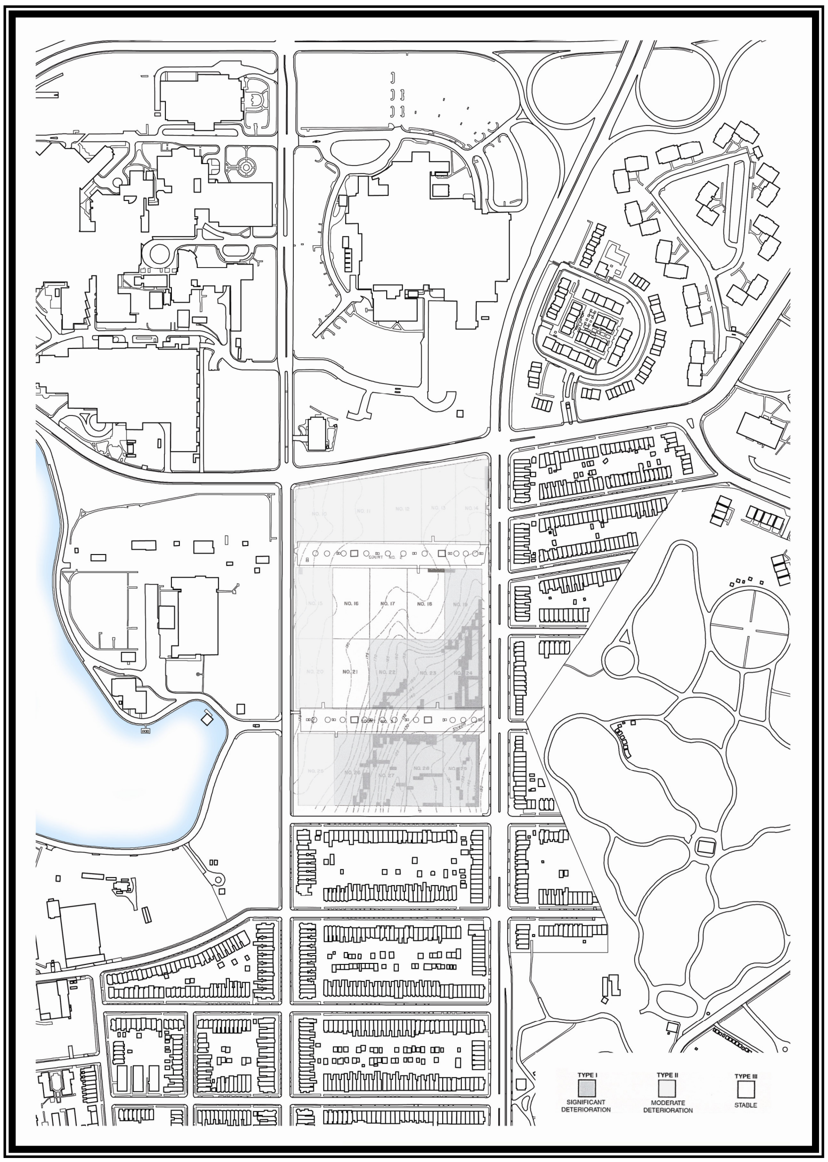

Fig.25	Filter Bed Conditions, Greenhorne & O'Mara and Author	

The topography of the surrounding area allows for a significant amount of water runoff to flow onto the site (Fig. 26). With the neighboring hospital complexes having a large amount of impervious surface, there is potential to collect the water runoff from these

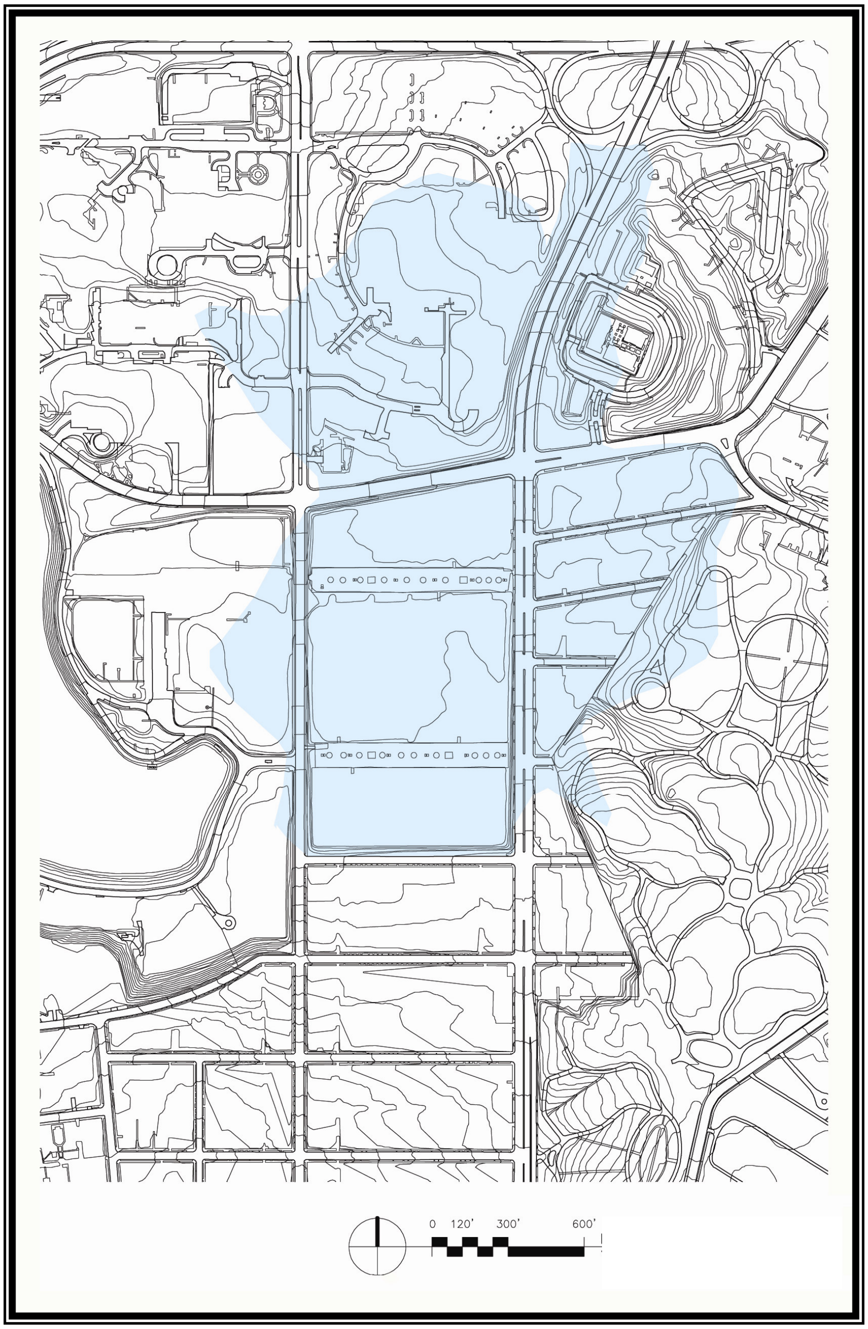

Fig.26	Water Runoff, Author	

sites as well (Fig. 27). With the average rain fall for Washington DC equaling 43 inches per year and wall collection for the site equaling about 5,672,000sf, the amount of water that can potentially be collected could fill an Olympic sized swimming pool 257 times.

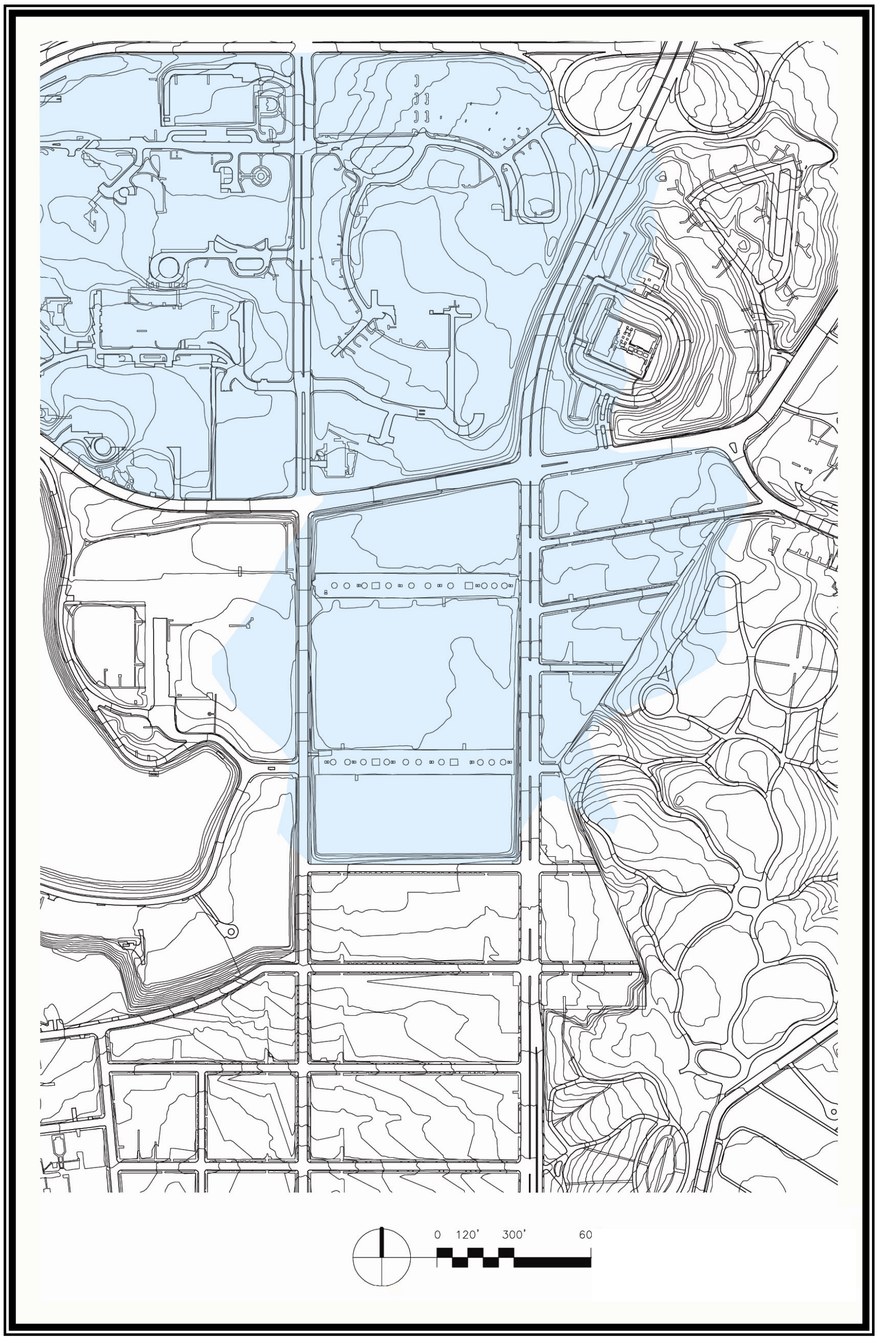

Fig.27	Potential Water Collection, Author	

There are several metro stations located further than a five minute walk from the site (Fig. 28). The DC office of Planning is proposing a trolley line to run between the Georgia Avenue metro station and the Brookland metro station that will travel along the northern boarder of the site on Michigan Avenue.

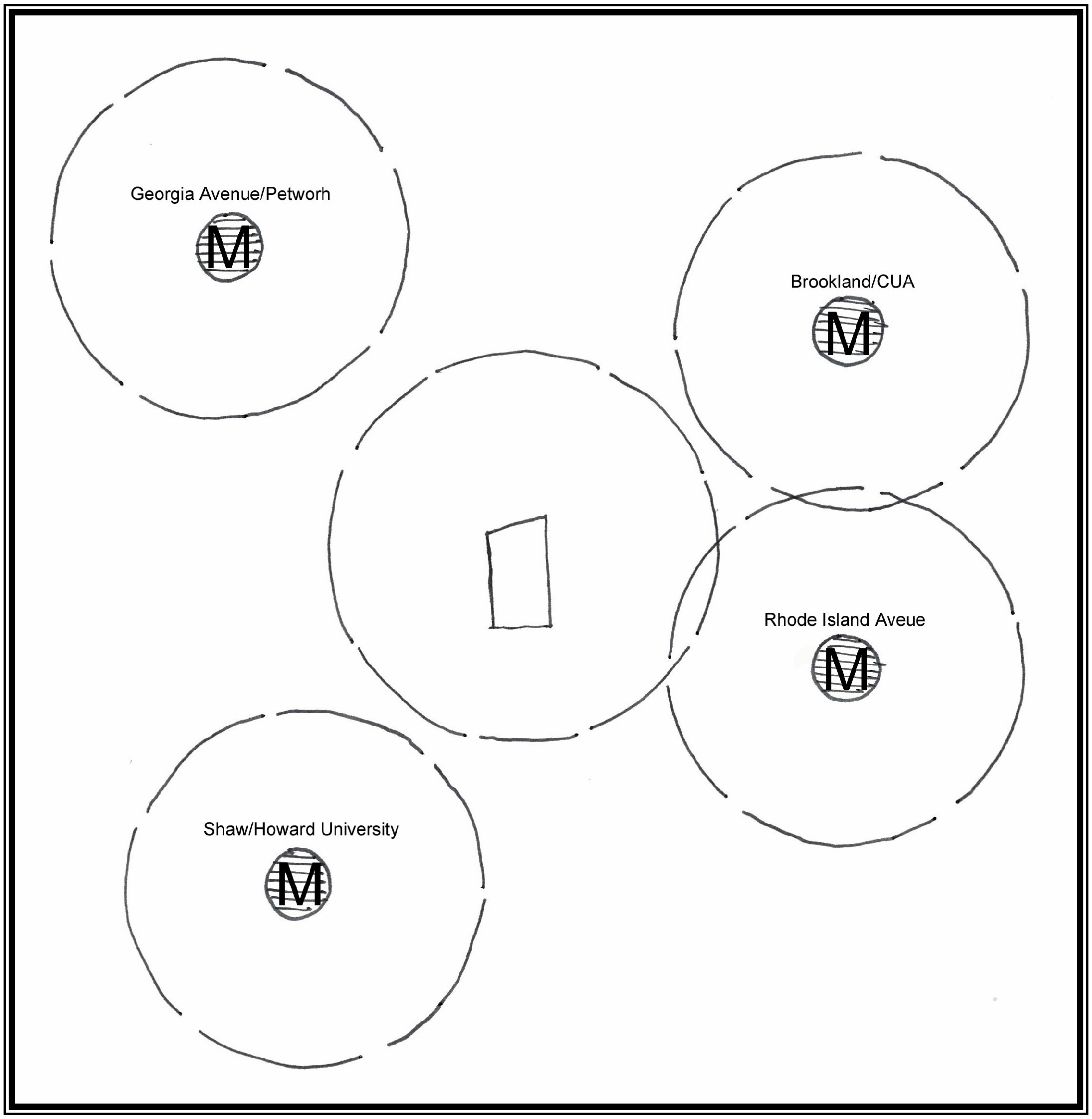

Fig.28	Site and Metro Station 5-minute Walks, Author	

Previous Proposals

There has been much debate about the McMillan sand filtration site as to what should be done with the site. Today it is one of the largest unused parcels of land in the District of Columbia. The District of Columbia Office of Planning (DCOP) held a series of workshops in 2000 that produced several schemes for developing the site (Fig. 29). The concept-A scheme follows the guidelines of the McMillan Park Plan of 1901 (Fig. 6). Most of the site is reserved as open space with the south portion of the site developed as residential. While this

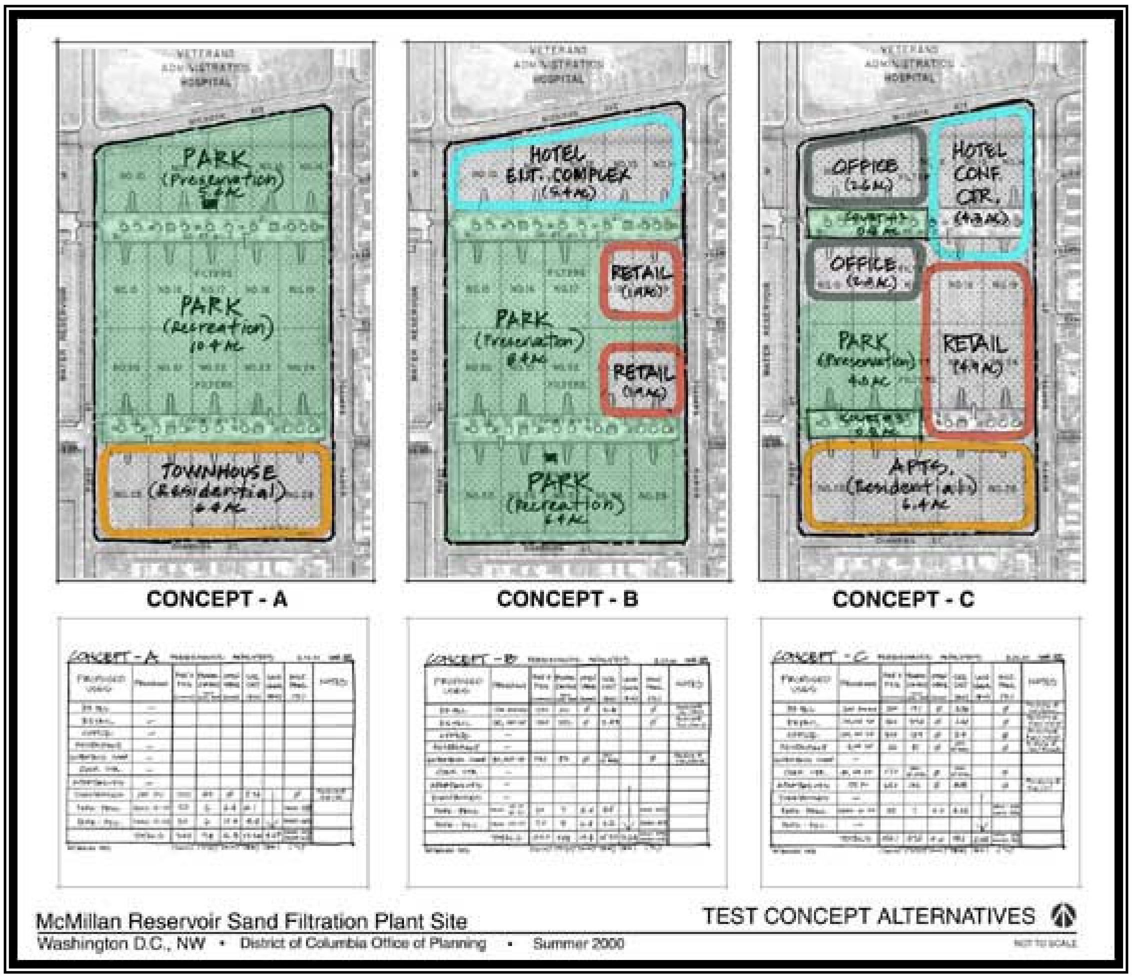

Fig.29	McMillan Reservoir Sand Filtration Plant Site Test Concepts, DCOP	

proposal harks back to the vision of the McMillan Park Commission, the amount of money it will take to stabilized the site and run utilities does not make this scheme economical.

The concept-B scheme maintains more than half the site at open space, while introducing a hotel and retail component. This scheme take on the role of providing uses for the immediate neighborhoods, but fall short in taking on a more civic role for the city. This scheme is also not economically viable.

The concept-C scheme proposes residential, office, retail, and hotel uses with about a quarter of the site dedicated as open space. While this proposal appears more economically viable, the open space becomes cutoff and disconnected. This scheme severs itself from the McMillan Park Plan of 1901 and fails to take on civic role for the city.

While schematically all three schemes propose some level of preservation, it is unclear to what extent the filter beds will be preserved. The sectional relationship of the context to the proposed interventions is also not addressed. How will one experience the preserved areas of the site? What story will be told with the proposed development? How can the site take on a more civic role as it did with its original purpose?

The most recent proposal for the site has been developed by Vision McMillan Partners. Vision McMillan Partners was selected by the city as the developer for the site in 2007. The most recent concept master plan was presented in a community meeting in February 2009 (Fig. 30). The program consists of preserving some key elements, public open space, residential, office, retail, and boutique hotel. This proposal is most reminiscent of the DCOP concept-C scheme. The driving force of this scheme is the economical factor. The developer anticipates making a surplus after selling the property in the market (Fig. 31). The developer's scheme further reduces the amount of open space. The scheme also proposes only preserving a small portion of three of the filter bed, some of which are shown as significantly deteriorated in the filter bed conditions diagram (Fig. 25). The plan was presented without any context and rotated so that north was facing east. This effect was disorienting and did not allow one to see how the plan fit in with its context. Perhaps the rational was to present the plan this way because there was little thought put into the contextual relationship. This plan fails to pay tribute to it historical significance both as part of the McMillan Park Plan and the civic role serving the city as the water treatment facility.

This plan does little in preserving open space to promote health and well being as was intended by the McMillan Park Plan. If anything, this plan is in violation of the values that plan instilled. The portion of the filter beds that are preserved does little to express the significance of these utilitarian structures. It is also unclear how one will experience the filter beds. The civic role that this site once served will be lost with the proposed development of this scheme and does little to relate to the bigger scale of the city.

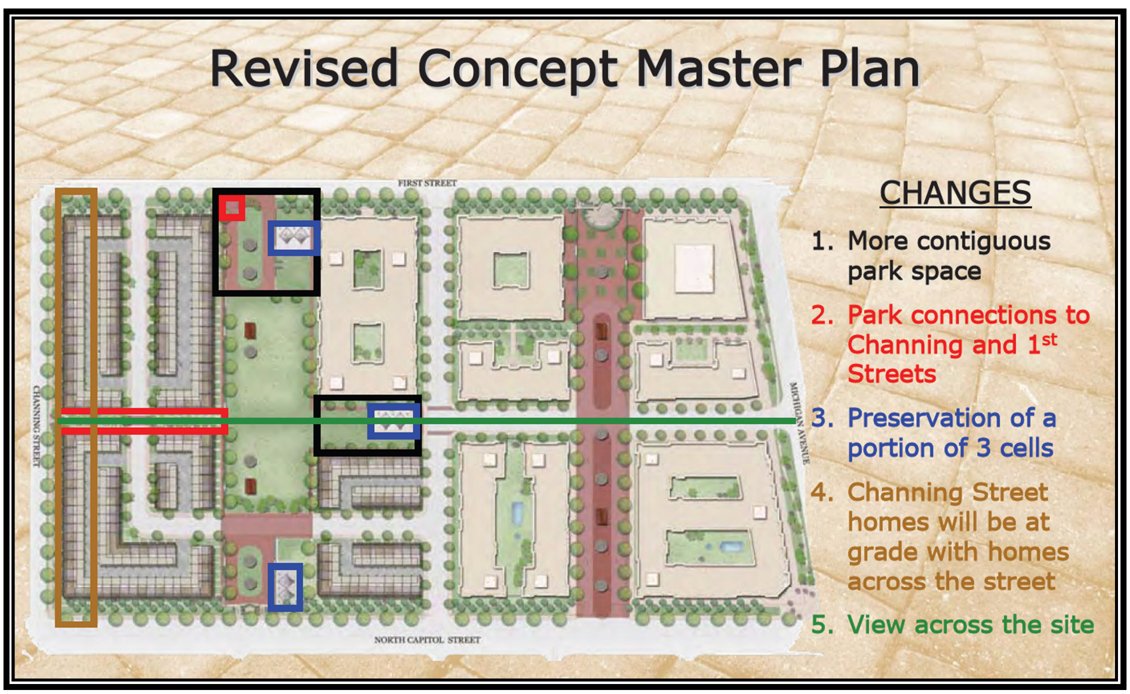

Fig.30	Revised Concept Master Plan, Vision McMillan Partners	

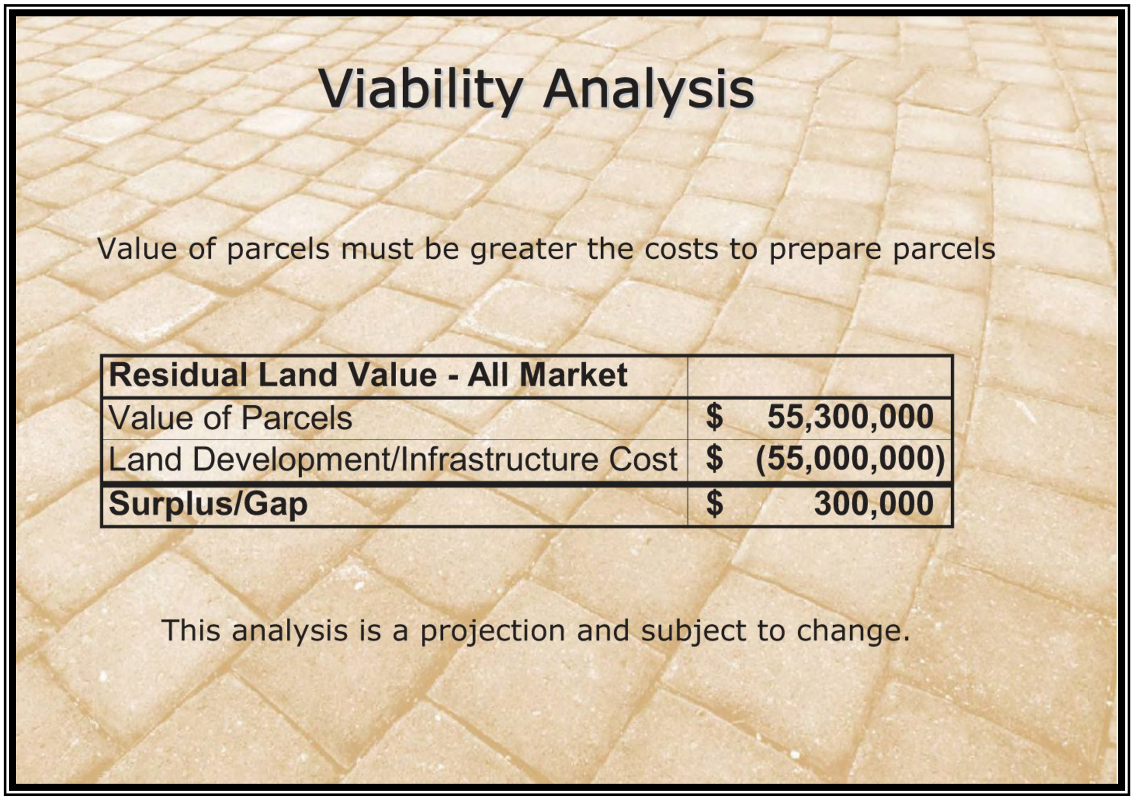

Fig.31	Viability Analysis, Vision McMillan Partners	

Chapter 2: Precedents

Precedent 1: Watercycle, Montreal, Canada

Watercycle is a student project that mends together a water treatment facility and an urban park. The project seeks to rethink water management specifically within the context of the city of Montreal. It attempts to create a link between the functional water treatment in the city, which is often invisible to the public eye, and the poetic celebration of water. This project treats snow, recycles residual grey water, and creates a new type of urban park. The spaces guide the visitor along a journey through which one discovers the process of filtration.

Fig.32	Watercycle Urban Park Rendering, Marie-Gil Blanchette	

Fig.33	Watercycle Site Plan, Blanchette	

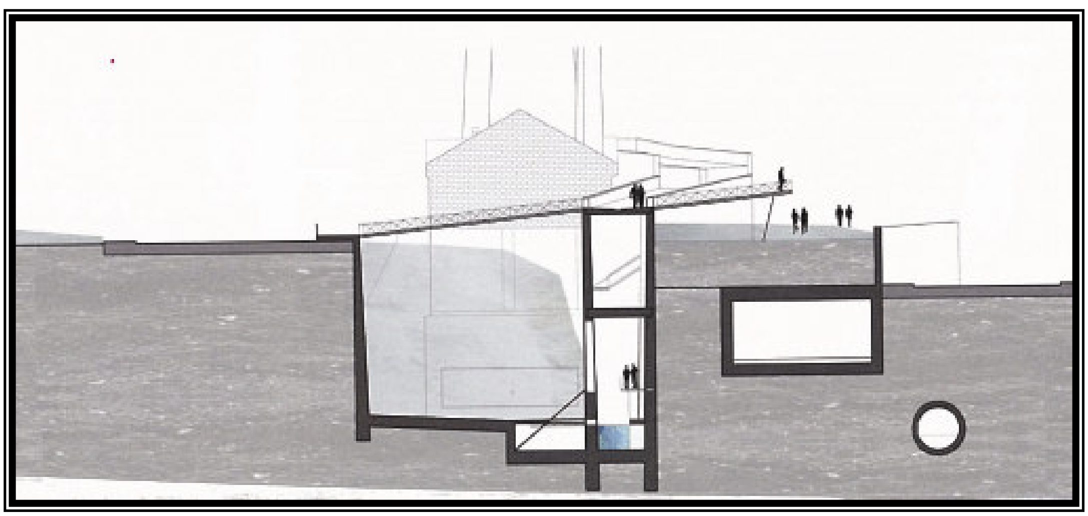

Fig.34	Watercycle Section, Blanchette	

Fig.35	Watercycle Scale Comparison, Blanchette and Author	

Watercycle has many aspects that correspond well with this thesis. The site is situated on an urban condition and deals specifically how to deal with filtering city water.

The project has both a building component and an urban park component. These components work together to teach the public about the process of filtering water. The complex sectional relationship of the site is also an element to this thesis site that will have to be utilized.

Precedent 2: Parque del Aqua, Bucaramanga, Colombia

This park sits on the grounds of a renovated water treatment plant. The park was conceived as a way to bring nature into the city and also reminds residents how precious the water is that they enjoy everyday. When the water treatment plant was built in 1920, it provided open, meadowlike area that local residents informally adopted as a park for passive recreation. A new plant was built in the 1960s that consumed much of the land formally used as a park. The new park moves as a linear promenade around the buildings and was conceived as a way of celebrating water. Originally 9.14 acres were planned for renovation, but only 5 acres were built in 2002.

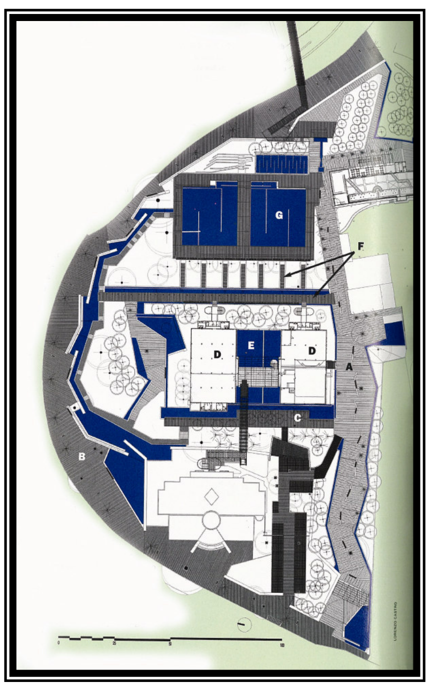

Fig.36	Parque del Agua Site Plan, Lorenzo Castro	

Fig.37	Parque del Agua Bamboo Path, Guillermo Quintero	

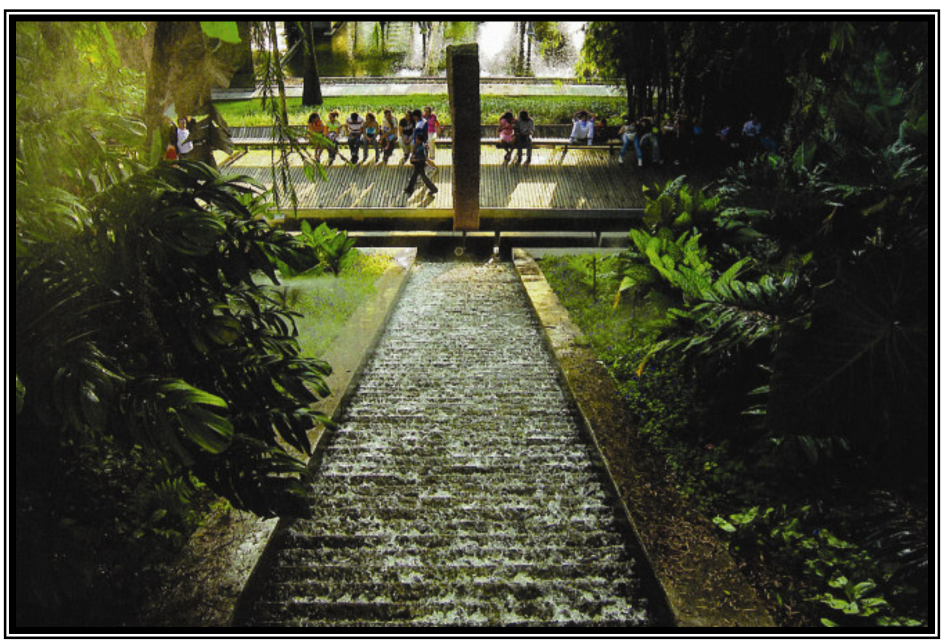

Fig.38	Parque del Agua Waterfall, Quintero	

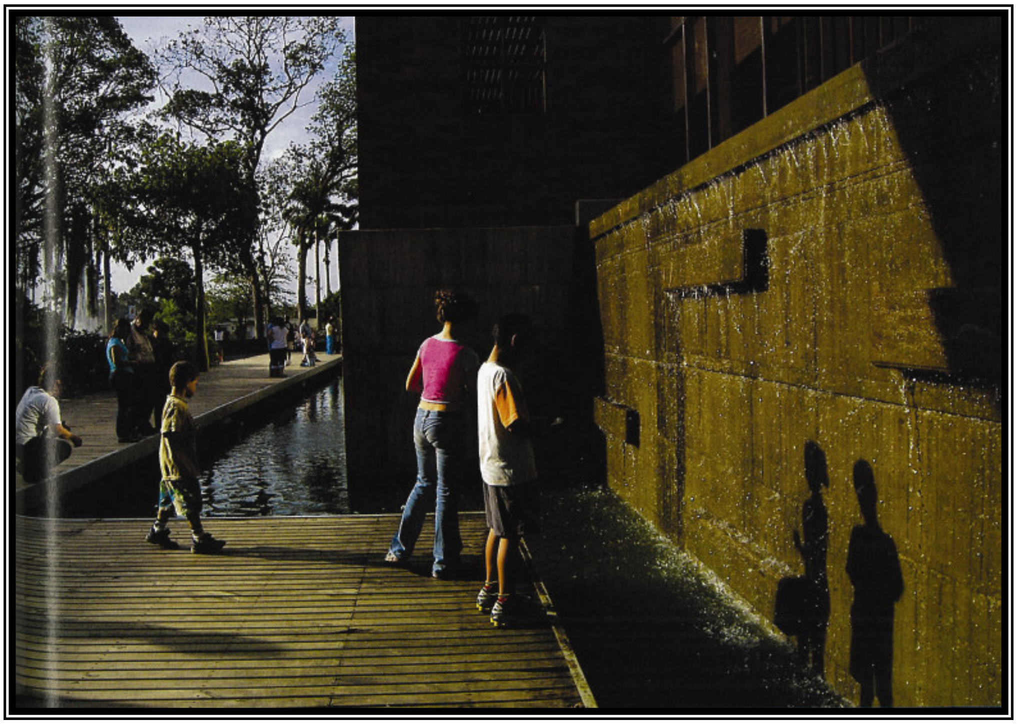

Fig.39	Parque del Agua Linear Pond, Quintero	

Parque del Agua uses water elements to emphasize water movement along the linear park. While the celebration of water is expressed, the filtration process is not evident to the visitor. One of the challenges of the site was a 60 foot change is elevation across the site. The boardwalks become a series of ramps that slope with the varying topography. The idea of the park was to link it to the historical significance of the site both as a park and a water treatment facility. The park is located on 5 acres and the linear walking path wraps around and through the existing vegetation and newly assembled administrative buildings. Each of the different walking paths has a different theme. The overall experience of the park is united by the common element of water.

Fig.40	Parque del Agua Scale Comparison, Castro and Author	

Precedent 3: Sidwell Friends Middle School, Washington, DC

Sidwell Friends Middle School is located in Washington DC between Rock Creek and Glover Archbold watersheds. Completed in 2006, one element that drove the design of the building was water. It was important not to allow water runoff to exit the site as the campus sits atop two watersheds, both with significant ecological value. One of the most prominent elements of the school is the constructed wetland that treats wastewater and manages stormwater. Rainwater runoff from the roof trickles down rain chains and travels down water cascades before ending up in the biology pond.

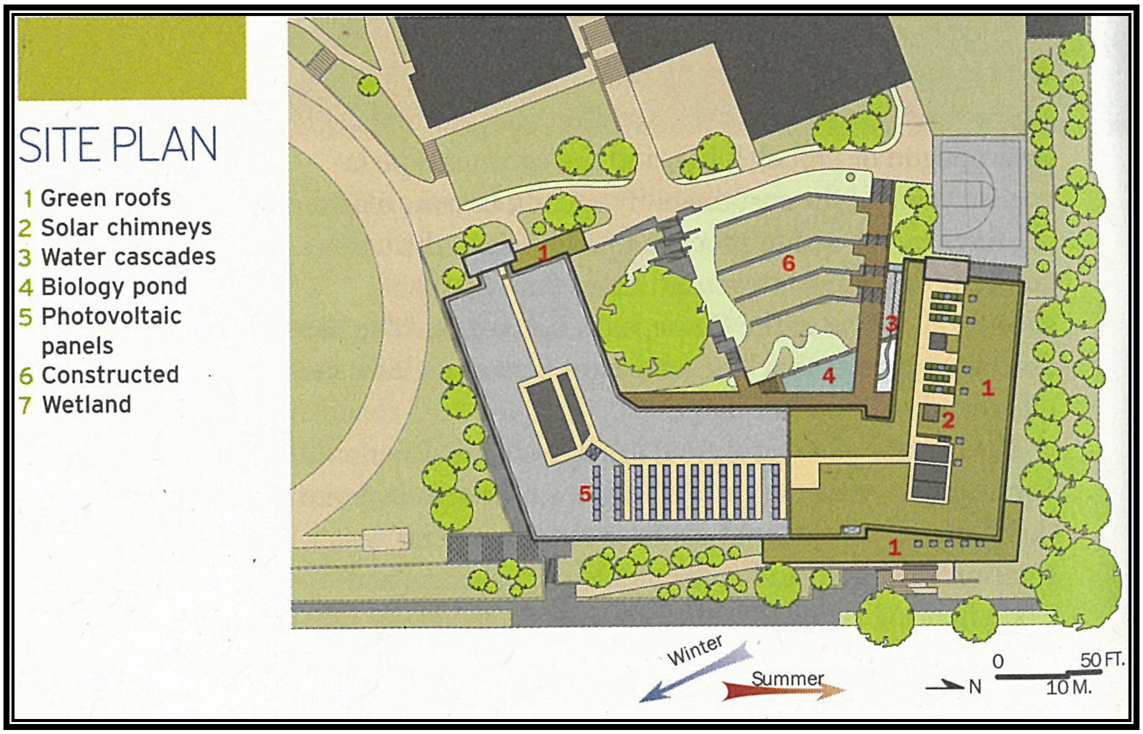

Fig.41	Sidwell Friends Middle School Site Plan, Malin	

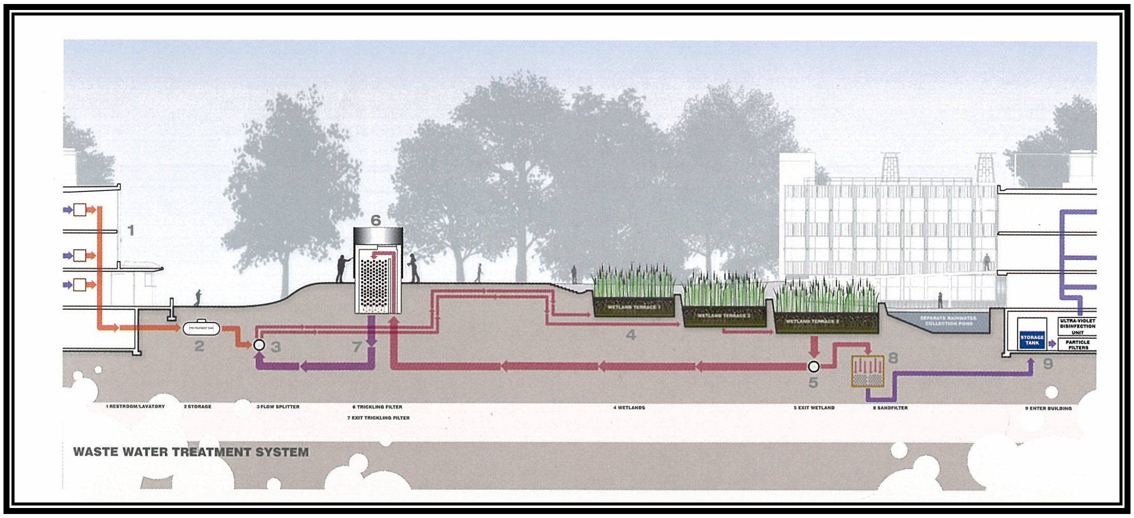

Fig.42	Water Filtration Diagram, Moe	

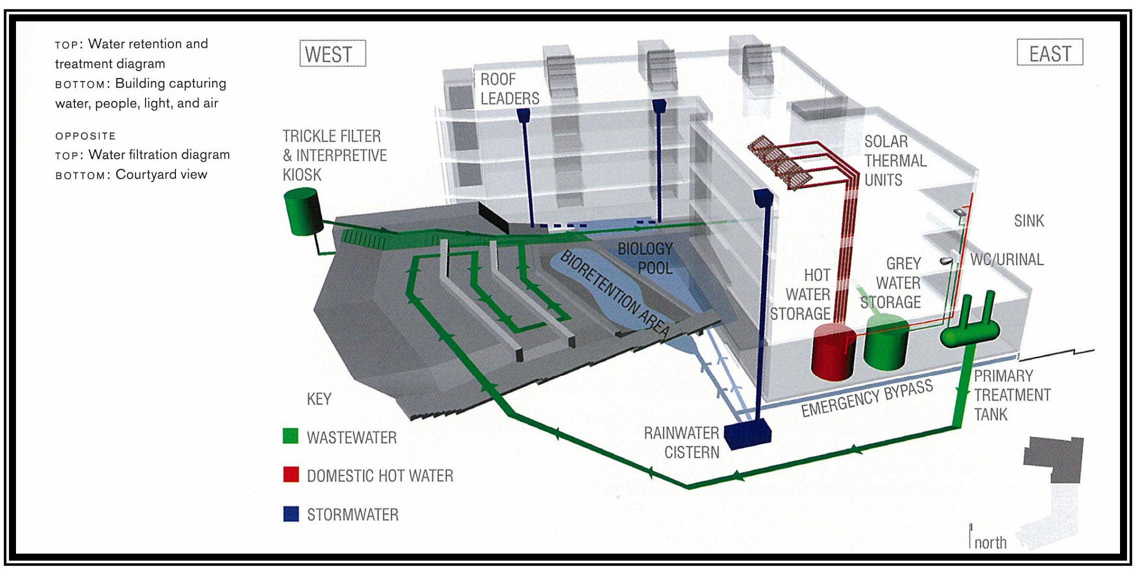

Fig.43	Water Retention and Treatment Diagram, Moe	

Fig.44	Courtyard View, Moe	

Not only does the site mitigate water runoff and treat wastewater on-site, the wetland also treats the wastewater from a neighboring building on the campus (Fig. 42). Introduced to the wetland was more than 80 plant species, all native to the region. The constructed wetland and biology pond create an outdoor classroom to learn about ecological systems and environmentally conscious water management.

Fig.45	Sidwell Friends Middle School Scale Comparison, Malin and Author	

Precedent 4: Viaduct des Artes, Paris, France

The Viaduct des Artes consists of an abandoned railroad viaduct converted into an elevated linear park with shops and artisan studios below. The structural expression of the vaults is maintained and reinforced with repeating unifying storefronts. The viaduct was initially erected in 1859. The conversion of the railroad viaduct into a park and retail project was completed in 1993.

Fig.46	Viaduct des Artes Exterior View, Michel Denance	

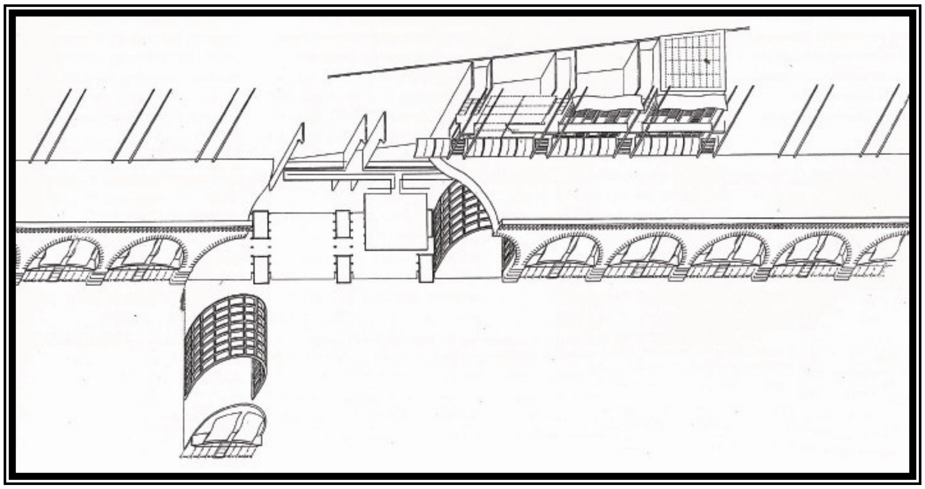

Fig.47	Viaduct des Artes Axon, Patric Berger	

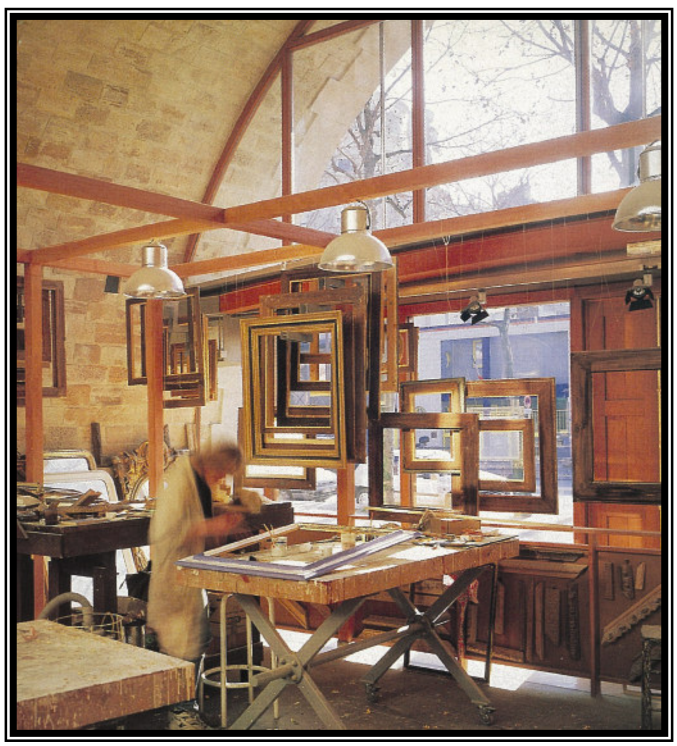

Fig.48	Viaduct des Artes Interior View, Denance	

Precedent 5: Les Bains des Docks, Le Havre, France

Les Bains des Docks designed by Atelier Jean Nouvel was built in 2009. The project was to reinvent the public pool. The 92,570sf aquatic center was inspired by natural lagoons and Roman baths, offering a myriad of ways to experience water. Following the Roman model, several different experiential options exist for the visitor.

Fig.49	Les Bains des Docks Plan, Nouvel	

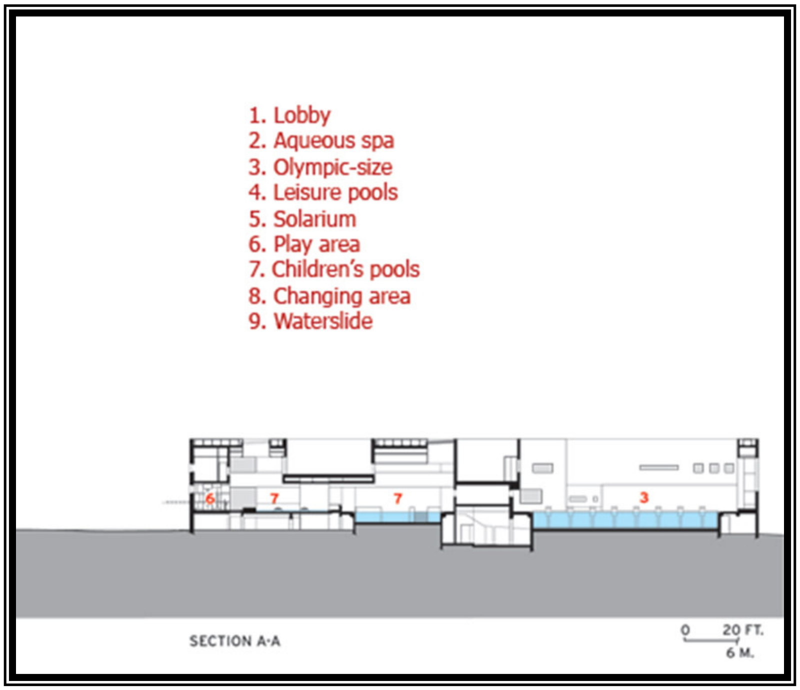

Fig.50	Les Bains des Docks Section, Nouvel	

Fig.51	Les Bains des Docks Exterior View, Roland Halbe	

Fig.52	Les Bains des Docks Interior View Leisure Pool, Halbe	

Fig.53	Les Bains des Docks Interior View Aqueous Spa, Halbe	

Chapter 3: Design Approach

Design Goal

The initial selection of the McMillan Sand Filtration Site for the proposition of this thesis derives from the aesthetic value from the existing structures. It is with further investigation that reveals the equally important functional and symbolic values that are not at once evident from the surface. The site is made up of a series of levels beginning with the open space above the sand filtration cells, the service courts and below the surface, the level within the filtration cells. There are also a series of narratives relating to the aesthetic, functional and symbolic values of the site that are reminiscent of the important element of a filter, that of multiple layers. There are a series of questions that begin to arise that begin the development of these narratives.

The first question deals with the fundamental reason for filtering the water in the first place. Why was filtering water important? As discussed earlier, filtering the water was important to prevent the spread of disease, and to promote health with the increasing population.

The second question relates to the specific filtration method implemented at the site. Why was the slow sand filtration method preferred and how did it work? The slow sand filtration method was advocated by both local professional and citizen organizations. They objected to the chemicals used in the mechanical filtration process and in favor of the natural biological process used in the slow sand filtration method.

The third question pertains to the McMillan Park Plan of 1901, which was initiated by Senator James McMillan. The site was part of the link within this larger park system that connected a series of parks. The surface of the sand filtration site was a park and memorial dedicated to Senator James McMillan. How can the site be reinitiated as part of this larger park system?

The final question that arises considers the current condition of the sand filtration cells. Why did portions of the site deteriorate over time while other parts remained virtually intact? This relates to the original location of the Tiber Creek, which was filled in for the purpose of constructing the slow sand filtration cells. The deterioration is further exemplified because the structures were constructed of unreinforced concrete.

These underlying narratives influenced a set of design intentions for the intervention of the site. The design intentions begin to formulate the program and a set of relationships of the site.

Design Intentions

The first intention is to promote both public and environmental well-being and literacy. The reason for filtering water in the first place was to prevent the spread of disease and promote public health. This was especial evident at the McMillan site because the filtering process chosen used natural biological processes without the use of chemicals. Some of the filtration cells may be adaptively re-used to collect and manage stormwater runoff from areas beyond the site boundaries. This is especially critical to Washington D.C. with the combined sewer system in place for parts of the city. During times of heavy rainfall, the combined sewer system is unable to handle the large volume of water, which then bypasses the water treatment facility and is dumped directly into neighboring waterways (Fig. 54). This not only pollutes the waterways, but damages the natural ecosystems and poses an unhealthy environment for the population down stream. By allowing the site to reveal the ways it is promoting health, it becomes a didactic experience.

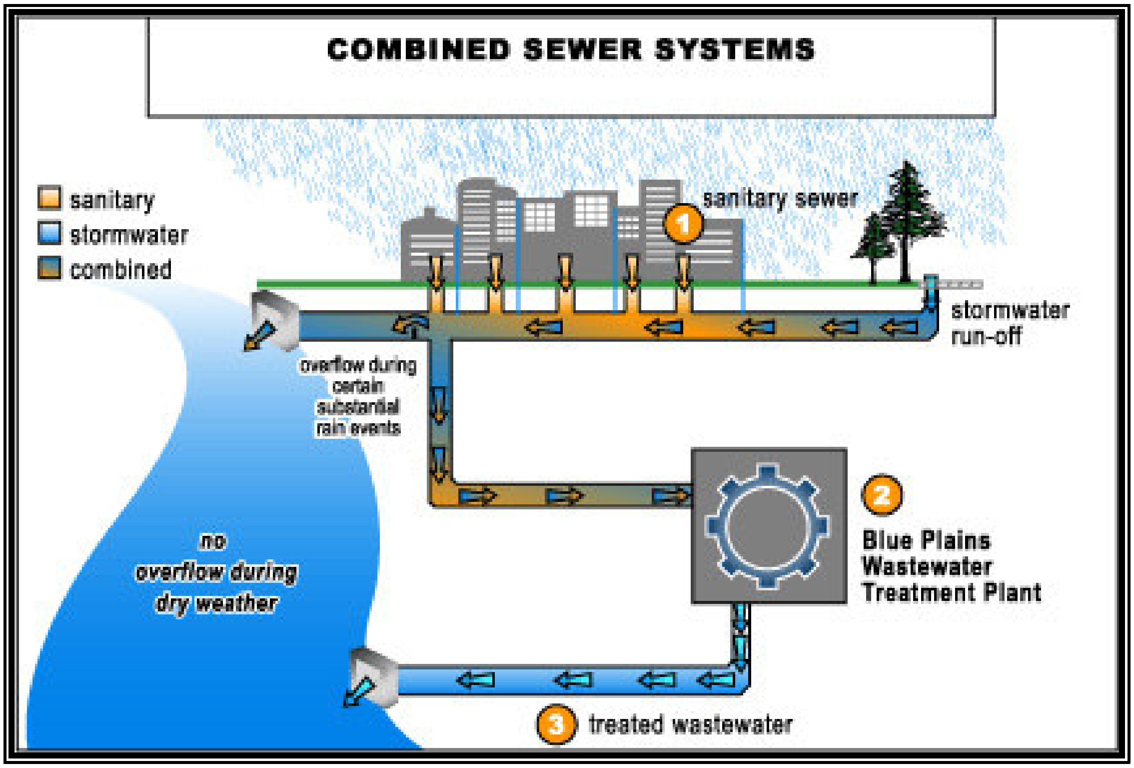

Fig.54	Combined Sewer Systems, D.C. Water and Sewer Authority	

The second intention is to reveal historical and proposed significance of the site & connection to the larger historical context of Washington D.C. The significance of the filtration process is not at once evident from the surface. The complexity of the multiple levels, topography, and submerged filtration cells allows for opportunities to selectively remove and add elements to tell the story of how the filtration process worked. As mentioned previously, the site has views of the Washington Monument and the dome of the Capital Building. The site will also serve as a park, relinking a series of open spaces.

The third intention is to create a sequence of spaces that memorialize the accomplishments of Senator James McMillan. As mentioned previously, the surface of the sand filtration site was a memorial park dedicated to Senator McMillan. Part of this thesis will focus on reestablishing the site as memorial in his honor. Senator McMillan was known for his involvement in the Senate Park Improvement Commission. One of his greatest accomplishments as chairman of this committee was the creation of the National Mall and its influence on how the National Mall appears today. As mentioned previously, Senator McMillan was instrumental in the creation of the McMillan Park Plan of 1901. The site was intended to be a link within the series of parks that connected around the District of Columbia. The decision for selecting the slow sand filtration method over the mechanical method was overseen by Senator McMillan. Senator McMillan was an advocate for the health and well-being of the people of Washington D.C.

Chapter 4: Program

Program Description

The site will consist primarily of open space with several different functions. Some of these open spaces will be habitable, while others will only have a visual connection as it will be used to contain stormwater. The overall character of the site will serve both as a community amenity as well as a national treasure for visitors around the world to visit. The Memory Walk will serve as reminder of how the water was filtered through the filtration cells and will culminate with a Memorial Plaza for Senator McMillan. The Sculpture Gardens will display works of art from local artists and provide spaces for smaller musical performances. The Lawn will consist of open space for recreational activities with stormwater collection below. The Biofilter Gardens will naturally filter the collected stormwater using native plants. The filtered stormwater will then enter the Restoration Garden where it will slowly penetrate into the ground, restoring the water into the aquifer. The Restoration Garden will also serve as a place for relaxation and personal healing, an escape from the busy life of the city. There are two existing service courts that will be adaptively reused. One will be preserved as is, while the other will be selectively sliced away to reveal how the different elements in the service courts functioned. There will be two building facilities on the site that serve the neighboring communities. The Biofilter Learning Facility will be used by both neighboring universities and local schools for understanding the biofiltration process and the ecological systems associated with it. The Biological Gardens will serve as outdoor classrooms for students to study natural habitats, plants, small animals and insects. The Community Center will house recreational activities for the neighboring communities including the local residents and rehabilitation patients from the neighboring hospital complexes.

Site Tabulations (1,214,650 sf)

Memory Walk	124,450 sf
Sculpture Gardens	169,200 sf
Lawn	162,000 sf
Biofilter Gardens	93,600 sf
Restoration Garden	82,800 sf
Stormwater Collection	261,000 sf
Biofilter	36,900 sf
Retention Pond	91,200 sf
Service Courts	150,000 sf
McMillan Memorial Plaza	43,500 sf

Biofilter Learning Facility Tabulations (60,500 sf)

Lobby	600 sf
Administration	540 sf

Director's Office	130 sf
Courtyard	2,900 sf
Faculty Offices 10 @ 150 sf	1,500 sf
Kitchenette	200 sf
Teaching Laboratories 3 @ 3,360 sf	10,080 sf
Classrooms 4 @ 840 sf	3,360 sf
Outdoor Classrooms 4 @ 560sf	2,240 sf
Research Laboratories 6 @ 1,600 sf	9,600 sf
Biofilter Pump Rooms 3 @ 1,680 sf	5,040 sf
Library	2,400 sf
Janitor Closet	56 sf
Restrooms	850 sf
Storage	650 sf
Loading	880 sf
Mechanical Room	2,500 sf

Community Center Tabulations (64,600 sf)

Lobby	1,100 sf
Front Desk	400 sf
Coat Check	450 sf
Restrooms 2 @ 480 sf	960 sf
Janitor’s Closet 2 @ 56 sf	112 sf
Women’s Locker Room	1,800 sf
Men’s Locker Room	1,800 sf
50 Meter Pool Area	17,400 sf
Therapy Pool Area	4,000 sf
Classroom/ Party Room	540 sf
Pool Storage	540 sf
Equipment Room	1,900 sf
Meet Room	350 sf
Gymnasium	9,400 sf
Gymnasium Storage	730 sf
Mechanical Room	1,050 sf

Cafe	2,600 sf
Lounge	1,100 sf
Game Room	3,100 sf
Game Room Storage	150 sf
Computer Room	575 sf
Ceramics Room	815 sf
Kiln Room	180 sf
Crafts Room	815 sf
Club Room 3 @ 800 sf	2,400 sf
Kitchen	580 sf
Storage 2 @ 190 sf	380 sf
Wood Working	1,300 sf
Tool Checkout	350 sf
Project Storage	350 sf
Gallery	3,500 sf
Loading	250 sf

Chapter 5: Design Proposal

The design proposal is a culmination of the design intentions previously discussed. The overall organization of the design is divided into two clear zones with the procession weaving back and forth between these two zones (Fig. 55). The end result is a rich, didactic understanding of the different narratives illustrating the history of the site, married with the new purpose for how the site is used.

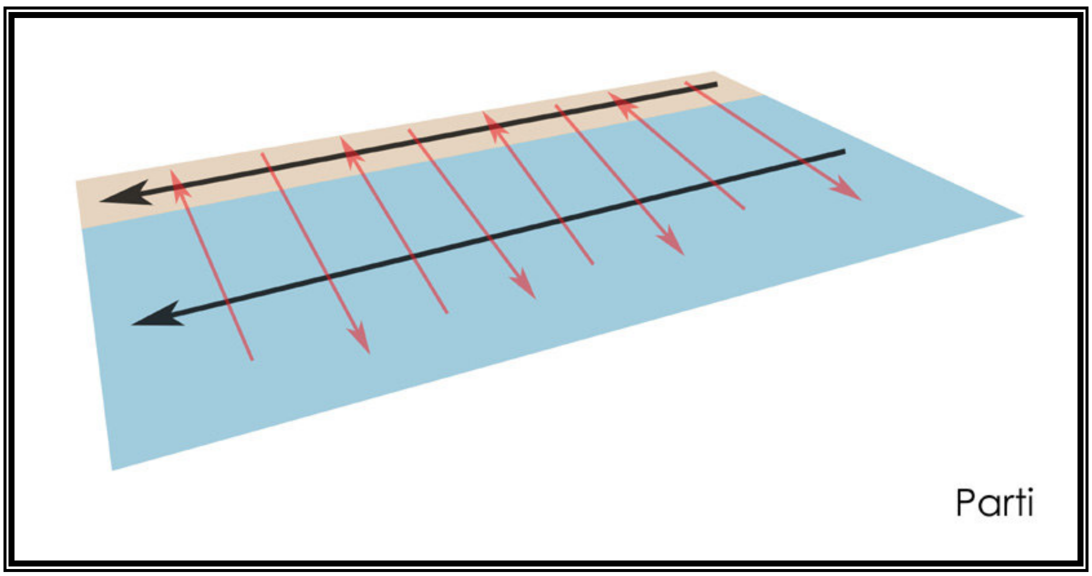

Fig.55	Parti, Author	

There are several entrances to the site (Fig. 56). The most prominent entrance occurs along Michigan Avenue, with secondary entrances along First Street and North Capital Street. There are a variety of options for moving through the site. Each option provides a different sequence for how the narratives unfold. Each level is connected through a series of ramps or stairs. The upper most level is the McMillan Memorial Plaza that culminates the Memory walk and provides views over the site and of the landmarks in the distance.

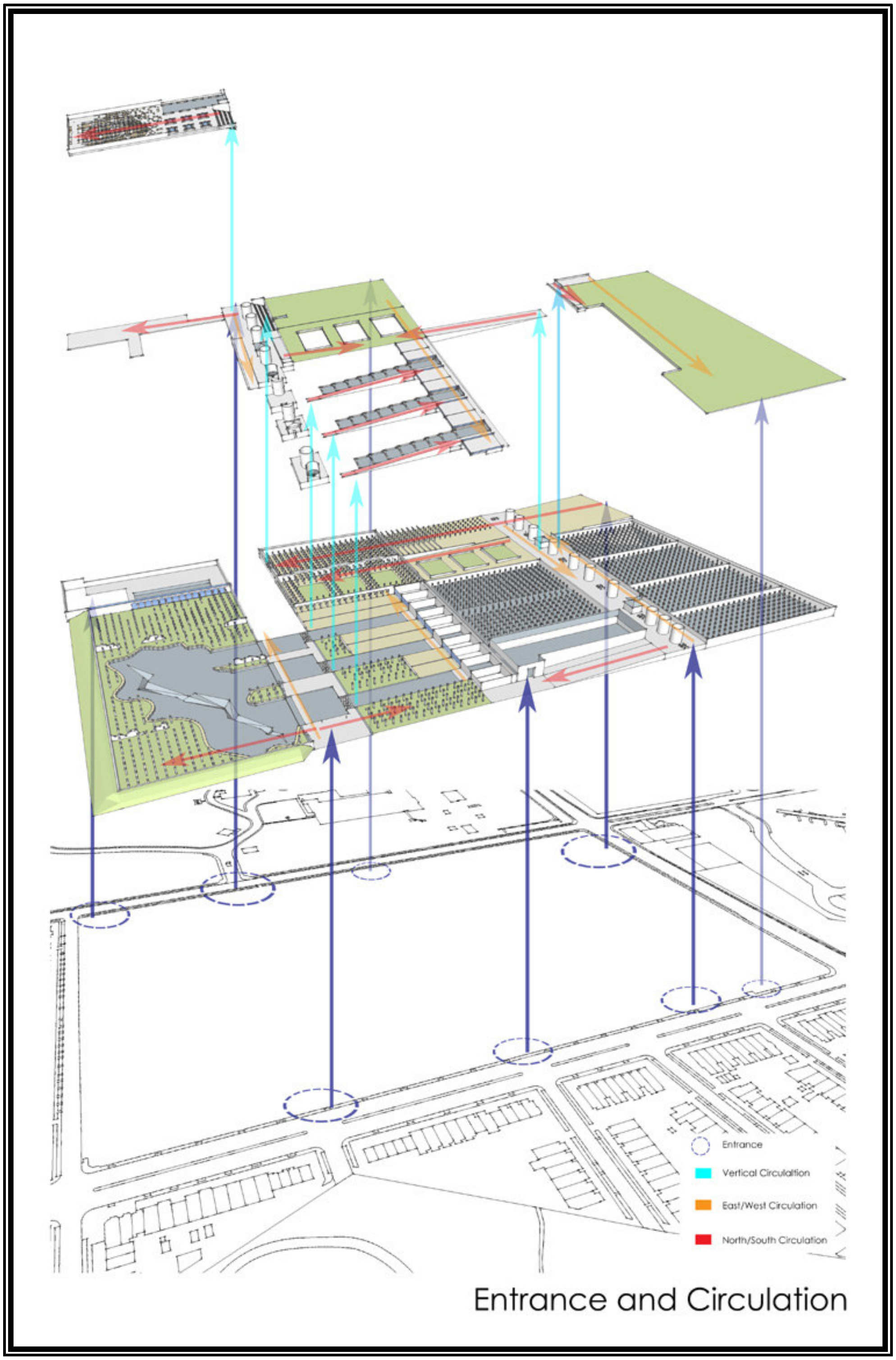

Fig.56	Entrance and Circulation, Author	

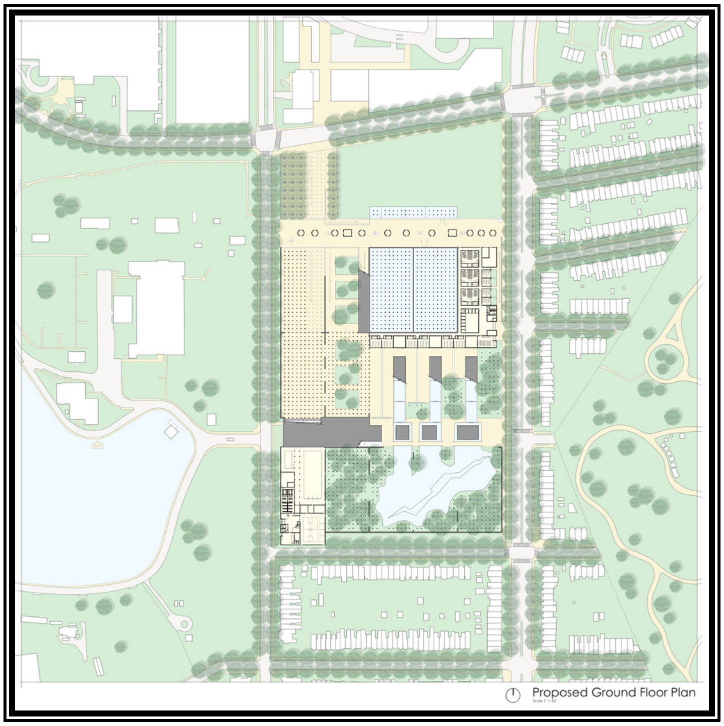

Fig.57	Proposed Ground Floor Plan, Author	

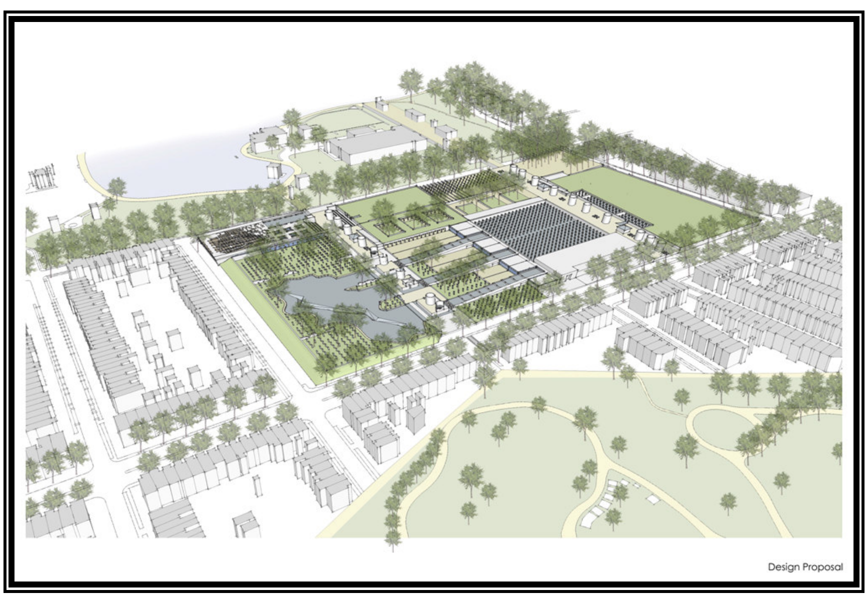

Fig.58	Design Proposal, Author	

Fig.59	Program, Author	

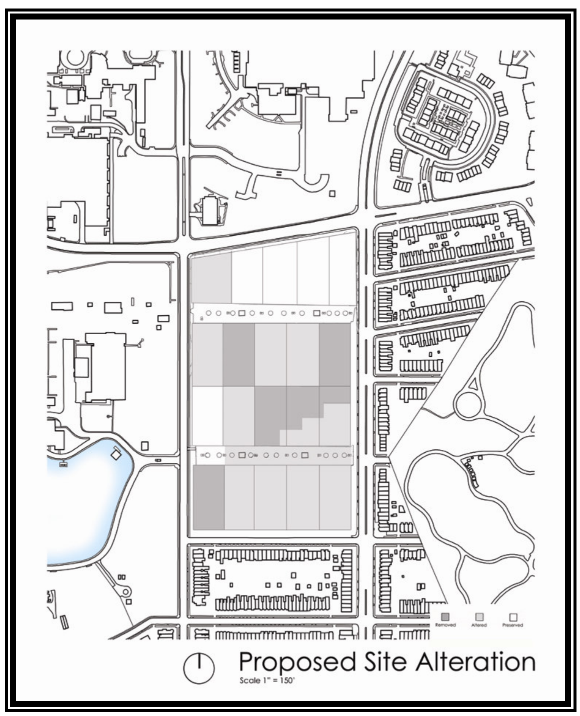

Fig.60	Proposed Site Alteration, Author	

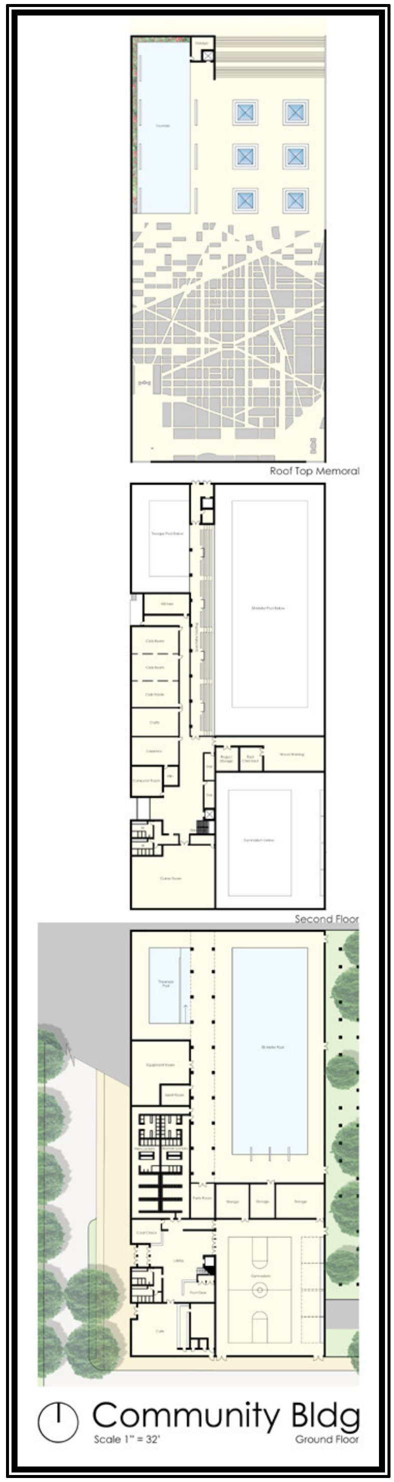

Fig.61	Community Building Plans, Author	

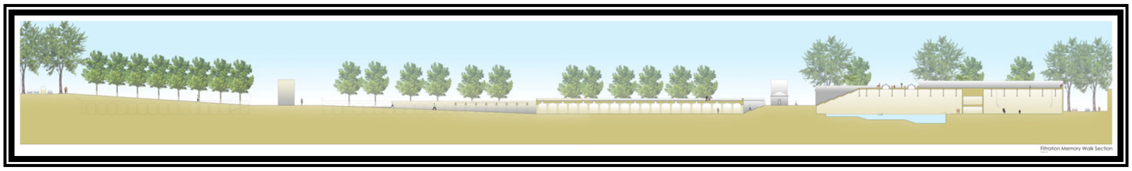

Fig.62	Memory Walk Site Section, Author	

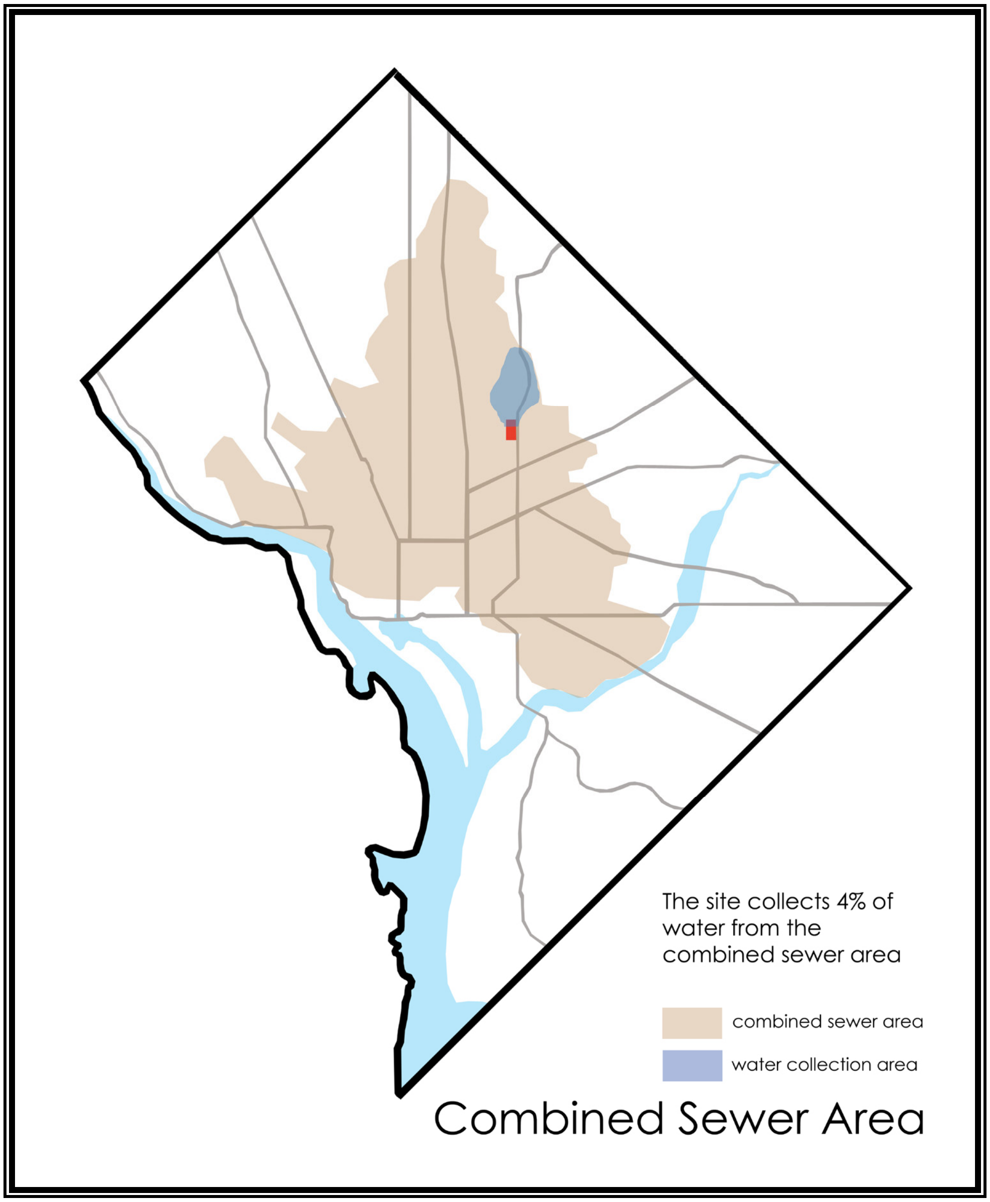

Fig.63	Combined Sewer Area, Author	

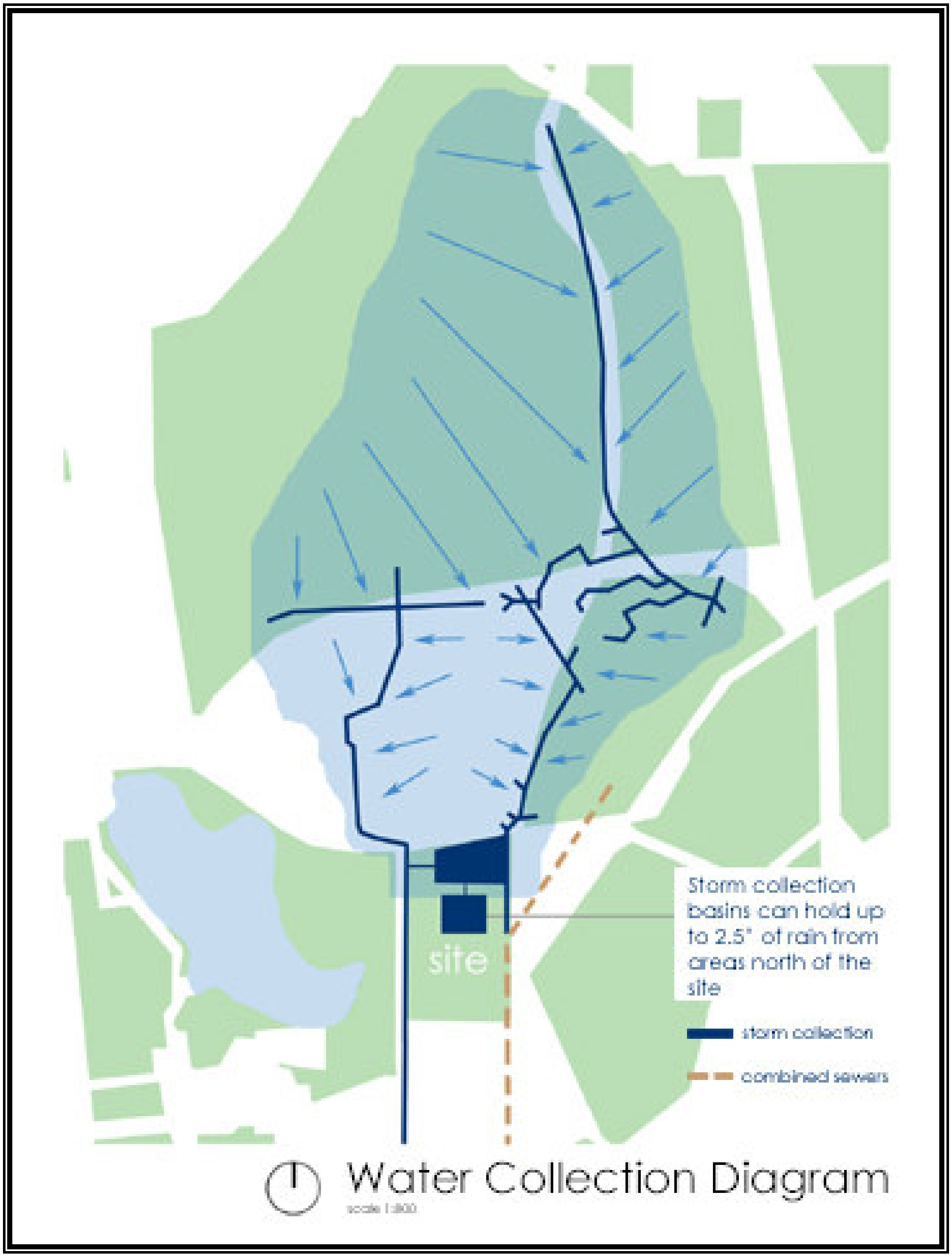

Fig.64	Water Collection Diagram, Author	

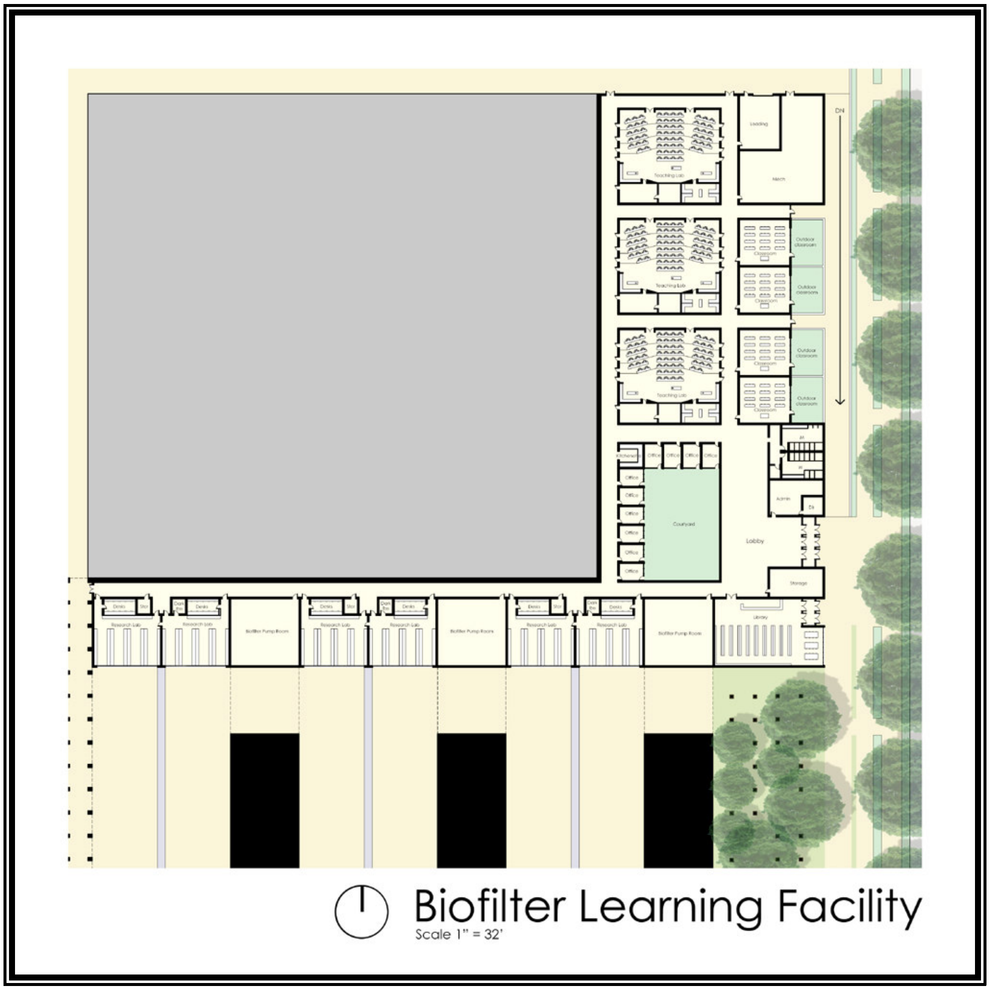

Fig.65	Biofilter Learning Facility, Author	

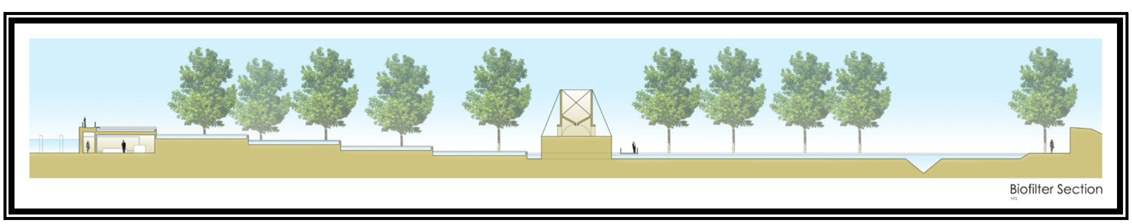

Fig.66	Biofilter Section, Author	

Fig.67	Filtration Garden Perspective, Author	

Chapter 6: Design Conclusions

This abandoned water works site in Washington D.C. is an important asset not only to its neighboring communities, but also to the city as a whole. The site should be adaptively re-used in a way that honors the symbolic value of the site, while also building upon the functional value inherent in its existing structures. The site should be returned as an amenity to the people rather than given over to a developer for profit. This thesis proposes a solution seen both as a national treasure as well as a place for promoting community health and well-being.

This thesis evolved a great deal throughout the design process. It was through the discovery of the hidden narratives of the site that played a role in the outcome of the design proposal. It initially focused on the aesthetic value of the existing structures. Then through revealing the history of the place and analysis of the site and its context, the proposal shifted to the weaving of the different narratives, while adaptively reusing the existing structures.

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