June 6, 2013
Project No. 3199-301-32-01

Midlothian Creek Green Infrastructure Preliminary Design Report

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ENGINEER CERTIFICATION

I hereby certify that this report has been prepared in accordance with sound engineering practices.

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1. INTRODUCTION

1.1 Project Overview

Weaver Boos Consultants North Central, LLC (Weaver Boos) has prepared this report on behalf of the City of Blue Island ("City"). Weaver Boos has identified various locations along Midlothian Creek through the Cargo-Oriented Development (COD) area that are recommended targets for green infrastructure. A summary of the existing conditions, design parameters, preliminary costs, and regulatory parameters of various green infrastructure Best Management Practice (BMP) is detailed in this report. The future improvements the City anticipates, such as the extension of 137th Street and new Firehouse, will be addressed, as will how green infrastructure can be implemented as part of these projects. Additionally, green opportunity concepts will be explored for two existing active industrial sites along the Midlothian Creek COD corridor, referred to as the "Acme Property" and the "Libby Property."

This document is structured for ease of reference by task:

1. The *Introduction* provides an overview and a summary of the project.

2. The *Midlothian Creek Sediment Analysis* section will summarize the properties of sediment taken from various locations within Midlothian Creek and provide a summary of the analysis.

3. The *Additional Background Information – Site 5 & 6* section will summarize the findings in the Comprehensive Site Investigation Report prepared by V3 Companies and how it relates to BMP implementation.

4. The *Preliminary Design Parameters* section discusses the existing conditions of the COD corridor and the methodologies behind identifying green infrastructure opportunities.

5. The *Green Infrastructure Opportunities* section summarizes the various green infrastructure opportunities throughout the COD corridor. This section will include preliminary design calculations and the benefits the recommended BMPs may provide.

6. The *Green Concept Plans* section provides descriptions of the active industrial sites along the COD corridor, Acme and Libby. Green opportunities for these areas will presented at a conceptual level.

7. The *Regulatory Parameters* section details any Federal, State, or other regulatory agency's compliance issues.

8. Lastly, a *Conclusion* section presents a brief summary of the plan.

1.2 Study Area

The study area of this report will be in the COD district of Blue Island particularly the areas that are tributary to Midlothian Creek. The COD district is and always has been a vital component of economic growth for the City of Blue Island. There are many active industrial sites that utilize the several rail lines in this area and its proximity to the Cal-Sag Channel has also been a critical part of its success.

The study area lies along approximately 8,000 linear feet of Midlothian Creek starting at the intersection of 139th Street & Kedzie Avenue to the west and Chatham Street to the east (See **Sheet 1 Midlothian Creek Existing Conditions**). About 2,600 linear feet of this corridor lies within the Village of Robbins located directly west. The creek runs under the Metra Rail Line, CN & IHB Rail Line, Western Avenue, and Chatham Street. The northern and southern limits of the target area are Broadway Street and 139th Street, respectively.

Many industrial and commercial sites that lie within the COD district have existed for decades and were constructed when stormwater management and water quality techniques were not held to the standards as they are today. It is suspected that a large volume of stormwater runoff within the study area flows directly into Midlothian Creek untreated. This leads to a high level of pollutants related to industrial and urban development entering the creek. Midlothian Creek is listed on the Illinois Environmental Protection Agency's (IEPA) 303(d) list of impaired waters. The City's objective is to increase the water quality of Midlothian Creek and Cal-Sag Channel that will also attract developers by implementation of various green infrastructure BMPs.

2. MIDLOTHIAN CREEK SEDIMENT ANALYSIS

On March 7, 2013, Weaver Boos advanced hand augers for sediment sample collection within Midlothian Creek in Blue Island, Illinois. The purposes of these sediment sample collection activities were intended to evaluate the potential presence of impacts as a result of industrial operations at the property adjoining the creak to the north. The analytical results were compared to the 35 Ill. Adm. Code 742 Tiered Approach to Corrective Action Objectives (TACO) for Industrial/Commercial Properties.

2.1 Sampling Activities

Areas of Exploration

A total of five hand augers were advances in the vicinity of Midlothian Creek. Four hand augers, SS-1 through SS-4, were advanced within various locations in the creek (see **Sheet 1** for sediment sample locations). The fifth hand auger, SS-5 was advanced within a small drainage ditch extending to Midlothian Creek from the Acme Refining (Acme) property. The drainage ditch is located approximately 75 feet east of the western property boundary of Acme.

Sampling Methodology

Sediment samples were collected in the creek by a Weaver Boos representative using a three-inch diameter stainless steel hand auger. In general accordance with USEPA Field Sampling Guidance Document #1215, the auger was hand-driven into the undisturbed sediment at an approximate 45 degree angle. The auger was driven to depths of approximately 8-12" below the sediment surface (bss). The samplers were decontaminated before each sample was collected. The decontamination process consisted of an initial wash with an Alconox/water solution, followed by a water rinse.

Upon retrieval, sediment samples were described and logged by the Weaver Boos representative. Samples were screened for the presence of volatile organic compounds (VOCs) using a photoionization detector (PID) equipped with a 10.6 eV lamp. The PID provides a qualitative field measurement of VOCs contained in the sample. The field screening process involved placing a portion of the sediment sample in a zip-lock plastic bag. The headspace was then sampled and sediment-gas VOC concentrations were measured and recorded. In addition to PID screening, visual and olfactory observations were used to assess sediment conditions during the field activities. Field screening results were used to assess the presence of impacted sediment prior to laboratory analysis.

Sediment samples from hand augers were placed into pre-cleaned, laboratory supplied sample containers preserved as necessary for subsequent laboratory analysis. Sediment samples were obtained as quickly as practicable upon removal of the auger from the subsurface. The samples with chemical preservative were the sediment samples collected for VOC analysis, which were collected using SW-846 Method 5035. The sample containers were tightly capped, labeled, and placed in a cooler and surrounded with ice in order to maintain their temperature near 4o C. Each sample was logged onto a chain of custody form, which is used to track the samples from the point of collection to receipt by the laboratory.

Sample Analysis

Samples were submitted to STAT Analysis Corporation in Chicago, Illinois, which is certified under the National Environmental Laboratory Accreditation Program (NELAP). Sampling and laboratory analysis were performed in general accordance with approved techniques and methods as outlined in USEPA SW-846, Test Methods For Evaluating Solid Waste, Third Edition, and other published sources. Select sediment samples were submitted for analysis as follows:

- Benzene, Toluene, Ethylbenzenes, and Xylenes (BTEX) (USEPA Methods 5035 and 8260B) - – Six (6) sediment samples;
- Semivolatile Organic Compounds (SVOCs) (USEPA Method 8270C) – Six (6) sediment samples;
- RCRA Metals USEPA Methods 6020 and 7471A) – Six (6) sediment samples;
- Total Petroleum Hydrocarbons (TPH) (USEPA Method 8015) – Four (4) sediment samples;
- Polychlorinated Biphenyls (PCBs) (USEPA Method 8082) – Six (6) sediment samples; and
- pH (USEPA Method 9045C) – Six (6) sediment samples.

The laboratory analytical report, including the chain of custody form, is provided in **Appendix A**.

2.2 Analytical Results

Samples submitted for laboratory analysis were analyzed for BTEX, SVOC, RCRA Metals, TPH, PCB and pH constituents. Analytical results were compared to the IEPA TACO 35 IAC Section 742, Appendix B, Table B and MSAs listed in 35 IAC Section 742, Appendix A, Tables G and H. The following includes a summary of the analytical results.

2.2.1 BTEX

Six sediment samples were submitted for analysis of BTEX. No sediment samples had detections of BTEX above laboratory reporting limits.

2.2.2 RCRA Metals

Six sediment samples were submitted for analysis of RCRA metals. Each sample analyzed exhibited concentrations of arsenic, barium, chromium, and lead above laboratory detection limits. Sediment sample SS-1 / 0-3" exhibited a concentration of arsenic (14 mg/kg) above the Tier 1 SRO for the Ingestion Exposure Route at Industrial/Commercial Properties (13.0 mg/kg). Sediment sample SS-1 / 0-3" also exhibited a concentration of chromium (18 mg/kg) above background concentrations for Metropolitan Statistical Areas (MSAs) as presented in listed in 35 IAC Section 742, Appendix A, Table H.

Sediment sample SS-5 / 0-4" exhibited a concentration of mercury (0.34 mg/kg) above Tier I SROs for the Inhalation Exposure Route for the Construction Worker Scenario (0.1 mg/kg). SS-5 / 0-4" also exhibited a concentration of chromium (21 mg/kg) above background concentrations for Metropolitan Statistical Areas (MSAs) as presented in listed in 35 IAC Section 742, Appendix A, Table H.

2.2.3 SVOCs

Six sediment samples were submitted for analysis of SVOCs. Each sample exhibited concentrations of select SVOCs above laboratory detection limits.

Sediment samples SS-1 / 0-3", SS-2 / 6-12" and SS-4 / 0-6" exhibited concentrations of benzo(a)pyrene (1.1 mg/kg, 0.91 and 0.91 mg/kg, respectively) above Tier 1 SROs for the Ingestion Exposure Route at Industrial/Commercial Properties (0.8 mg/kg). These results however are also below concentrations of benzo(a)pyrene (2.1 mg/kg) in background soils for Metropolitan Statistical Areas (MSAs) as presented in listed in 35 IAC Section 742, Appendix A, Table H.

Sediment sample SS-2 / 0-6” exhibited concentrations of benzo(a)pyrene (3.8 mg/kg) and dibenz(a,h)anthracene (1.3 mg/kg) above Tier 1 SROs for the Ingestions Exposure Route for Industrial/Commercial Properties (0.8 mg/kg for both constituents). Sediment sample SS-2 / 0-6” also exhibited concentrations of benz(a)anthracene (4.1 mg/kg) above Tier 1 SROs for the Soil Component of the Groundwater Ingestion Exposure Route (2 mg/kg). These results are also above concentrations of benzo(a)pyrene (2.1 mg/kg) and dibenz(a,h)anthracene (0.42 mg/kg) in background soils for MSAs as presented in listed in 35 IAC Section 742, Appendix A, Table H.

Sediment sample SS-5 / 0-4” exhibited concentrations of benzo(a)pyrene (2.2 mg/kg) above Tier 1 SROs for the Ingestion Exposure Route at Industrial/Commercial Properties (0.8 mg/kg). These results are also above concentrations of benzo(a)pyrene (2.1 mg/kg) in background soils for MSAs as presented in listed in 35 IAC Section 742, Appendix A, Table H.

2.2.4 PCBs

Six sediment samples were submitted for analysis of PCBs. No PCB sediment samples results were above laboratory reporting limits.

2.2.5 TPH

Four sediment samples were submitted for analysis of TPH. Four sediment samples had detections of TPHs above laboratory reporting limits, which ranged between 33 mg/kg and 620 mg/kg. However, each concentration of TPH was below the Soil Attenuation Capacity of 6,000 mg/kg for soils within three feet bgs.

2.2.6 pH

To assist in developing site-specific remediation objective for the Soil Component of the Groundwater Ingestion Exposure Route for inorganic constituents, pH analysis was performed on all six sediment samples. By calculating the concentration of hydrogen ions and averaging this concentration, the soil analyzed exhibited an average pH of 7.88.

2.3 Findings

Various SVOCs and metals were detected in the sediment samples in excess of Tier 1 SROs for Industrial/Commercial Properties. Based on our past experience, these constituent concentrations appear to be representative of typical urban fill material. Mercury was detected in excess of the Soil Inhalation Exposure Route for the Construction Worker Scenario. It has also been our past experience that it is common to detect relatively low concentrations of mercury in the urban fill material that would exceed the Tier I SRO for the Inhalation Exposure Route for the Construction Worker Scenario in fill material.

Weaver Boos does not anticipate that additional sampling will be necessary based on the data available to date. In addition, these results only represent a sampling of site conditions. Because we have not conducted an exhaustive investigation of the Property, the possibility of encountering isolated zones of impact(s) in the future can not be completely eliminated based on these results. It is not anticipated that these findings will impact proposed green infrastructure strategies for this corridor.

3. ADDITIONAL BACKGROUND INFORMATION – SITE 5 & 6

Weaver Boos reviewed a Comprehensive Site Investigation Report (CSIR) prepared by V3 Companies dated September 2012, revised February 2013. The study area consists of four parcels that were referred to as Site 5 and Site 6 (See **Sheet 1** for the location of Site 5 & 6). This Section summarizes the findings in that report and how they might relate to proposed BMP implementation.

3.1 Existing Conditions

Site 5 & 6 consists of approximately 3.18 acres of a recently vacated automotive junkyard. It is located along Midlothian Creek south of the Acme Property and adjacent Sediment Samples discussed in the previous Section (See **Sheet 1**). These sites have been occupied by an automotive repair and junk yard from as early as the 1970s. These sites are primarily unpaved with heavily vegetated areas along the north and southwest portions of the property. There are three dilapidated structures located on site: a wooden garage, a shed, and an unoccupied residential home with a crawl basement. Field assessment noted staining of soils, pooling of automotive fluids, and dumping of automotive parts and debris throughout the sites.

3.2 Site Recognized Environmental Conditions

For the purpose of the CSIR, the Phase I ESA Recognized Environmental Conditions (REC) were grouped on the basis of their operational, historic, and or physical nature. The below were identified as potential RECs requiring further site evaluation:

3.2.1 REC 1 – Historical Junk Yard Operations

The REC includes former junk yard operation on Site 5 & 6 and the potential presence of automotive-related chemicals and petroleum products. Open dumping was also observed.

3.2.2 REC 2 – Site-Wide Fill and Debris

This REC includes site-wide fill, as a result of historical redevelopment as man-made land and historical operations. The fill material is from an unknown location.

3.2.3 REC 3 – Apparent Petroleum Pipeline Release

This REC includes identified soil and groundwater petroleum impacts at a depth or below buried petroleum pipeline that transects Site 5.

3.3 Findings

As part of the above RECs, the following Constituents of Concern (COCs) were identified in the soils: Benzene, Xylenes, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Arsenic, and Mercury. The following COCs were found in the groundwater: Benzo(a)anthracene, Benzo(b)fluoranthene, Benzene, Aluminum, Iron, and Lead. All identified COCs were above one or more of the following Tier I Remediation Objectives (ROs): industrial-0commercial ingestion and inhalation, construction worker inhalation, Class II soil component of the groundwater ingestion, and Class II groundwater ingestion pathway ROs.

3.4 Possible Remediation Strategies

Included in the CSIR were recommendations on remediation strategies. Below summarizes these recommendations:

3.4.1 REC 1 – Historical Junk Yard Operations

Impacts of the COCs appear to be isolated and can be resolved via the development of site-specific Tier 2 ROs and or by the installation of engineered barriers or by hotspot removal. Hotspots can be removed and disposed as certified non-special, or special waste.

3.4.2 REC 2 – Site-Wide Fill and Debris

Additional characterization of the debris area is needed to further evaluate the potential presence of deleterious material that may represent a source of COCs in the area. A temporary well or permanently installed well should be sampled using low-flow techniques if possible to determine if dissolved phase PCBs are actually present in the groundwater. If it's confirmed that PCBs and or other potential COCs are not present at risk levels in soil or groundwater, then no environmental concerns will require further assessment or remediation. However, should COCs at risk levels be found within the debris, one solution may be the engineered encapsulation of the debris slope along Midlothian Cree and the surface capping of the construction/debris fill area to minimize rain water infiltration and the potential leaching of COCs to the creek.

3.4.3 REC 3 – Apparent Petroleum Pipeline Release

If the pipeline in question is exposed and confirmed to be the source of the release, the apparent Responsible Party would presumably be accountable for cleaning up the release. It is unclear how the discovery and cleanup process would take if the Responsible Party performs the work.

3.5 Impact on Development

Weaver Boos understands that the City plans to use portions of this site to construct a new road extending 137th Street to the Acme Property north of Midlothian Creek. The information found in the CSIR provides insight into remediation strategies that may require implementation before any construction can take place. This provides the City with opportunity to convert the contaminated, environmentally hazardous parcels into remediated sites prime for green infrastructure BMPs. Green infrastructure BMPs specific to this site will be discussed in more detail in Section 5.

4. PRELIMINARY DESIGN PARAMETERS

Selection of proper green infrastructure BMPs is critical to project success and improving water quality in area waterways. This section summarizes the fundamental design parameters used to evaluate green infrastructure opportunities for this report. We will then detail the existing conditions of target areas in the COD corridor. From this information, we are able to develop a set of design parameters used to guide the decision-making process for what green infrastructure opportunities are the most feasible.

4.1 Design Parameter Considerations

Understanding design constraints is one of the most essential parts of this project. By properly evaluating the each target area's existing conditions, we can make the most logical green infrastructure BMP recommendations. The below lists design parameters used when examining the existing conditions of the through the corridor:

- Enhance available drainage features on site to minimize cost;
- Maintain existing drainage patterns;
- Treat as much runoff as possible to promote water quality and bioremediation;
- Identify naturally low areas that may be converted to areas of detention;
- Focus on areas that can also serve as demonstration sites to increase community awareness of environmental and water quality issues;
- Incorporate BMPs in areas that could also positively impact adjacent properties and Right-of-Ways; and
- Provide alternatives that are flexible enough to allow for future commercial and or industrial site developments, while still allowing for green solutions.

4.2 Existing Conditions

Weaver Boos has completed extensive analysis of the existing conditions of the corridor based on data gathered from various available resources including the City of Blue Island, the South Suburban Mayors and Managers (SSMMA), Cook County, the Illinois Environmental Protection Agency (IEPA), Federal Emergency Management Agency (FEMA), and the U.S. Fish and Wildlife Service. Additionally, Weaver Boos conducted several site visits as part of our due diligence in understanding the study area. This information and input has resulted in a fairly solid understanding of the existing conditions and the opportunities for sustainable stormwater management and water quality solutions available within the corridor. See **Sheet 1 Midlothian Creek Existing Conditions** for reference.

Most of the parcels adjacent to Midlothian Creek are considered to be in the 100-year floodplain according to FEMA records. Areas that are in floodplains are often the lowest point within a drainage area. In the City of Blue Island, the floodplain corridor is relatively narrow and confined to the overbanks of Midlothian Creek. Further upstream and to the west, in the Village of Robbins, the floodplain is drastically larger encompassing over one hundred parcels, mostly residential. The area is referred to as “The Bottoms” and has had a history of flooding issues.

Similarly, the U.S. Fish and Wildlife Service National Wetland Inventory (NWI) delineate areas considered to be wetlands along the Midlothian Creek COD corridor. Most of these wetlands lie within the floodplain as well. There is a well-defined delineation of wetland located adjacent to Midlothian Creek between the Metra Rail Line and CN & IHB Rail Line. This area is particularly low-lying and shows significant inundation from the floodplain. There is no development within this ‘triangle’ parcel and it likely experiences extended times of saturated conditions.

5. GREEN INFRASTRUCTURE OPPORTUNITIES

Weaver Boos has reviewed the existing conditions of the COD corridor study area and has prepared green infrastructure BMP recommendations (See **Sheet 2 Midlothian Creek Green Infrastructure Opportunities**) that account for these conditions. These BMPs are presented in order of our recommended schedule of implementation. This implementation strategy is based on a series of factors including: ease of construction, location of BMP, impact to water quality, runoff volume control, approximate cost, and benefit to the community. See **Appendix C Green Infrastructure BMP Benefits Matrix** for a table of water quality benefits for each of the below green infrastructure BMPs. Please note the section number below corresponds to locations on **Midlothian Creek Green Infrastructure Opportunities Sheets 3 and 4**.

5.1 Midlothian Creek Green Corridor

Restoring the water quality and ecology of Midlothian Creek is a primary goal of this project. The proposed Midlothian Creek Green Corridor would be a 100' wide corridor stretching the entire length of the study area with a vegetative buffer on both sides of the creek **(See Midlothian Creek Green Corridor Typical Section on Sheet 3 & 4**). Invasive species would be removed along the banks and in the vegetative buffer zones. Areas of steep slopes would be regarded to allow for more native plants and limit erosion. Native trees, bushes, grasses, and wildflowers would be established in the vegetative buffer. This task can be done in smaller sections of the creek in anticipation or during the construction of other BMPs being implemented. Restoration of this corridor can be phased as resources allow.

5.2 137th Street Extension

The Acme property is a flourishing industrial site along Midlothian Creek that contributes greatly to the economy of Blue Island. It is proposed to extend 137th Street approximately 600' east and across Midlothian Creek in order to provide another access point to the Acme property (See **Sheet 3 Midlothian Creek Green Infrastructure Opportunities – West BMP Details**). This extension would be accompanied by a bioswale to control runoff and remove pollutants. It is likely that compensatory storage would need to be provided to offset the impacts to the wetland. Given the amount of land in the area, significant reduction of runoff and additional wildlife and plant life habitat could be provided in this area. Based on the CSIR discussed in Section 3, additional soil investigation and possible remediation may be necessary for wetland construction.

5.3 Wetland Restoration and Expansion

In close proximity to the proposed 137th Street Extension are wetlands delineated by the U.S. National Fish and Wildlife National Wetland Inventory within former industrial sites (See **Sheet 3 Midlothian Creek Green Infrastructure Opportunities – West BMP Details**). Invasive species of plants would be removed and native plantings would be established. Excavation for expanding the wetlands would follow the natural topography of the land to minimize earthwork. The expanded areas would be planted with native vegetation. These expanded wetlands would be capable of volume control and may mitigate some of the flooding issues nearby and possibly further upstream. Based on the CSIR discussed in Section 3, additional soil investigation and possible remediation may be necessary for wetland construction.

5.4 Green Development Area

The 'triangular' parcel located north along Midlothian Creek and bound between Metra Rail and CN & IHB Rail Lines is over 21 acres of vacant, open space with areas of delineated wetlands. It is relatively flat and likely susceptible to frequent flooding given its location within the floodplain. This land is currently under development and the developer has been encouraged to enhance and utilize existing wetlands (See **Sheet 3 Midlothian Creek Green Infrastructure Opportunities – West BMP Details**).

5.5 Demonstration Park

The site for a public Demonstration Park is a 14.3 acre open space that will incorporate green infrastructure BMPs and provide the community with a recreational space (See **Sheet 3 Midlothian Creek Green Infrastructure Opportunities – West BMP Details)**. Based on the existing drainage patterns of the site, installing bioswales along the perimeters and excavating for a natural detention basin is recommended. Both of these BMPs will provide runoff control, sediment and pollutant removal, and promote groundwater recharge. A trail system in the park will have educational signage detailing the benefits of green infrastructure BMPs and the impacts of water quality on its residents.

5.6 Complete Streets Corridor

Existing and proposed bike routes can be converted into a Complete Streets Corridors that accommodate multi-modal use and provide for some stormwater treatment, wildlife, and plant habitat. The concept behind a Complete Street is to utilize the existing Right-Of-Way to install green infrastructure BMPs and promote non-vehicular traffic (See **Typical Section for Complete Streets Corridor Concept on Sheets 3 & 4)**. Typical Complete Streets have medians in the center lanes that act as bioswales, painted lanes designated only for bikes or buses, and landscaping along the sidewalks between the street and pedestrians. Complete Streets Corridor encourages biking, walking, or public transit while reducing vehicular traffic, essential for decreasing carbon emissions and increasing air quality. A Complete Street Corridor can be done in simple phases such as delineating bike lanes or installing planters along the sidewalk. Streets that are good candidates for these improvements are:

- W. 139th Street
- S. Clair Boulevard
- Broadway Street
- Chatham Street
- S. Kedzie Avenue
- Western Avenue
- Old Western Avenue

5.7 Complete Rail Corridor

Railways are prevalent throughout the COD area, they include: Metra commuter line and the CN & IHB and CSX rail lines. Rail traffic has always been critical to the development of industry and economic growth for the City. Rail Rights-of-Way are usually not well drained with little to no stormwater management infrastructure and not well maintained with invasive species taking over. This contributes to the poor water quality and poor community aesthetics. A Complete Rail Corridor will remove invasive species and create a well-defined bioswale to capture and treat stormwater runoff (See **Typical Section for Complete Rails Corridor on Sheets 3 & 4)**. In most situations, there is ample buildable area adjacent to the tracks to accommodate the BMP improvements.

5.8 "Bottoms" Open Space Restoration

The "Bottoms" is an area located west of Blue Island in the Village of Robbins (See **Sheet 3 Midlothian Creek Green Infrastructure Opportunities – West BMP Details)**. This area has several vacant parcels that have been overgrown with invasive species and has a history of flooding issues. The objective is to remove the invasive species and implement BMPs that could help mitigate the flooding and increase the water quality of Midlothian Creek. Native plantings, bioswales, rain gardens are all feasible in this area. The beautification of the "Bottoms" would help draw homebuyers to the area and possibly commercial developers. In advance of development, floodplain issues would need to be addressed. Another alternative might be a joint stormwater detention area/habitat restoration park that could mitigate flooding, allow for wildlife habitat, as well as a much-needed park area.

5.9 Rain Gardens

Various locations have been identified along Midlothian Creek near Western Avenue and Chatham Street that would be ideal for Rain Garden construction. (See **Sheet 4 Midlothian Creek Green Infrastructure Opportunities – East BMP Details).** All areas are already open space and would treat runoff before it enters Midlothian Creek. The Rain Gardens would be planted with native plantings to reduce sediment and pollutants entering the stream and provide some level of volume control. Some of the Rain Gardens would be located along heavily traveled roads; these would have education signage as well as provide aesthetic improvements for the neighborhood.

6. GREEN CONCEPT PLANS

Various development opportunities, existing and proposed, lend themselves to green redevelopment and retrofitting. We have presented examples using existing facilities, the Libby Property, the Acme Facility, and the proposed Firehouse. These *Green Concept Plans* are based on discussions we have had the City and how their future vision can incorporate green infrastructure BMPs. This section will discuss green concepts that apply throughout the COD district of Blue Island. These concepts have been developed more fully on **Sheet 5 Green Infrastructure Concept Plans**.

6.1 Future Green Firehouse

The City of Blue Island intends to relocate their existing firehouse along Western Avenue directly south of Midlothian Creek to better serve its community. When developing new municipal buildings, multiple opportunities for energy efficiency, improved multi-modal transportation access, and green stormwater management strategies present themselves. Given the location of this site along a high-traffic corridor we recommend implementing several "green concepts," including: bioswales, natural detention basins, permeable pavement capable of heavy truck loads, and solar panels on the roof the new firehouse. Educational signage should be erected along Western Avenue to explain the importance of sustainability and how green infrastructure BMPs contribute to the community.

6.2 Acme Property Concept Plan

The Acme Property is an active industrial site with a rail yard through the property that abuts Midlothian Creek. It is approximately 34.5 acres and its main entrance is located at 135th Street & Mozart Street. The Acme property is a flourishing industry and could be a model for other similar sites in the COD district and the region on how to incorporate green infrastructure BMPs. The Concept Plan for the Acme Property would build off the BMPs discussed previously in this report. Opportunities for this site are discussed in more detail below:

6.2.1 137th Street Extension BMPs

The extension of a green 137th Street will create a new access point at the southwest corner of the property. This will be constructed through a wetland and provides opportunity to restore and expand wetlands within the site. This BMP will provide some storage capacity and water quality improvements to accommodate stormwater runoff.

6.2.2 Complete Rails Integration

The Complete Rails Corridor will create a bioswale that runs along the west of the property. This bioswale will treat pollutants that are attributed with industrial developments. It will tie into the proposed wetland expansions to further increase the water quality of any discharge to Midlothian Creek.

6.2.3 Rain Garden Frontage

A residential neighborhood is located directly north of the Acme Property. Constructing Rain Gardens in existing green space along this frontage will greatly improve aesthetics for the residents. By utilizing the existing green space, this will not have a detrimental effect on the day-to-day operations of the facility.

6.2.4 Vertical Wind Turbines

Vertical Wind Turbines works similar to a typical wind turbine in using wind to generate energy. Vertical Wind Turbines however are more relevant to the Acme Site because they take up less space than a typical wind turbine. This would allow for the traffic movements of the site to remain relatively unchanged. The goal is for the Vertical Wind Turbines to be erected adjacent to buildings to decreasing their energy consumption.

6.3 Libby Property Concept Plan

The Libby Property is a 21 acre trucking depot located along Western Avenue and runs next to Midlothian Creek. Demonstration Sites are typically a high priority when applying for grant monies to fund green infrastructure BMPs. The Libby Property's location along Western Avenue, a major travel way, would be a highly visible green infrastructure opportunity and important tool for community education. Various green businesses have shown interest in locating here, making it an ideal site for green infrastructure demonstration projects.

6.3.1 Solar Panels

Solar Panels in parking lots are growing more and more common. They provide an economic benefit by maximizing the parking lots capability of erecting Solar Panels over the lot that will generate power. These canopies in the parking lot will also reduce the heat-island effect caused by parking lot absorbing and reflecting the heat of the sun. These Solar Panel canopies could also provide a station for wearing electric cars can recharge their battery. Solar Panels can be installed on the roof of the building as well.

6.3.2 Permeable Pavement

Permeable Pavement allows stormwater runoff to be infiltrated through either open spaces in a series of interlocking paver system or by asphalt or concrete with the mixture properties to allow water to pass through it. The runoff would then enter a subbase that is used to retain and infiltrate the water into the soil. Permeable Pavement is capable of being designed to withstand heavy loading from industrial sites.

6.3.3 Green Roof

The Green Roof plan envisioned would be similar to that on the City of Chicago City Hall building located in The Loop. A series of gardens and planters would be installed on the roof of the Libby building to retain stormwater and act as natural filters for any runoff. This also would reduce the heat-island effect generated from a typical roof and similarly help moderate the temperature within the building. Green Roof can reduce sound attenuation. The aesthetically pleasing Green Roofs could be used as an amenity for workers to spend their lunch or allow the public to access.

6.3.4 Complete Streets Integration

Western Avenue is a target for the Complete Streets Corridor concept. Educational signage would be erected along the Libby Property on the Western Avenue Complete Street detailing the benefits of all the BMPs. Implementation of the innovative BMPs discussed above will continue to build off the City's green infrastructure goals.

7. REGULATORY PARAMETERS

Given the broad scope of this report, several regulatory agencies may be involved depending on the type of improvements and green infrastructure BMPs being implemented. This section will focus on the agencies that are most closely related to improvements along Midlothian Creek, the U.S. Army Corps of Engineers (ACOE), IEPA, the Metropolitan Water Reclamation District of Greater Chicago (MWRD), and the Illinois Department of Transportation (IDOT). These agencies are being considered for one of the following reasons:

- Regulatory permitting requirements;
- Reduced flooding or other improvements that align with the mission of the agency; or,
- Land ownership impacts, e.g. state transportation routes.

7.1 U.S. ACOE Eng Form 4345

The U.S. ACOE requires a permit when working within wetlands, particularly with construction projects. The extension of 137th Street would require an ACOE permit since it lies within a delineated wetland. The ACOE would likely require compensatory storage to mitigate the loss of wetlands. This requirement would align with the City's green infrastructure BMP objective of further expanding the wetlands around the proposed road.

Additionally, the new road would require a culvert to be placed within Midlothian Creek to allow for water to continue flowing. Detailed hydraulic and hydrology calculations of the culvert would be required and potentially analysis of the impacts further upstream. The ACOE publishes software to be used in these types of applications: HY-8 models the hydraulics and hydrology of a channel with the proposed culvert; HEC-HMS models the hydraulics and hydrology of the entire watershed upstream.

7.2 IEPA General NPDES Permit No. ILR10

The IEPA General National Pollutant Discharge Elimination System (NPDES) Permit for Storm Water Discharges from Construction Site Activities, or General NPDES Permit No. ILR10, is required for construction projects that impact more than one (1) acre. Its purpose is to minimize pollutants from stormwater runoff that result from construction sites. The extension of 137th Street would require this permit. A detailed Storm Water Pollution Prevision Plan (SWPPP) is required to fulfill this permit.

Key areas of focus for a SWPPP are Sediment Control, Storm Water Management, and Erosion Prevention. Careful construction phasing is necessary to be as efficient as possible and reduce costs. Using the areas the will be expanded wetlands for temporary sediment basins, is an example of how to plan properly. Also, erosion control materials around the banks of Midlothian Creek would be needed to prevent sediment or pollutants from entering the creek. Silt fencing and temporary ditch checks would help satisfy the requirements.

7.3 Metropolitan Water Reclamation District of Great Chicago

The MWRD is the regulatory body within Cook County responsible for water quality, including storm and sanitary discharge. The MWRD has established regulatory requirements and green infrastructure goals to reduce flooding and improve water quality. The suggestions outlined within this report help to meet those goals. In addition, MWRD must issue permits to allow for development and redevelopment on various properties.

7.4 Illinois Department of Transportation

The primary engagement points for IDOT are the ownership of proposed complete streets routes and the introduction of BMPs along existing rights-of-way. IDOT will need to be consulted for improvements on various corridors throughout this plan.

8. CONCLUSIONS

The Blue Island COD District possesses opportunities for green infrastructure implementation that can contribute to the vitality of Blue Island's community. The suggested BMPs range from small to large scale and include concepts for future developments the City envisions. Small scale BMPs such as Rain Gardens and Bioswales will improve water quality of Midlothian Creek. Large scale BMPs can mitigate major areas of flooding issues within the COD and further upstream. Large scale BMPs also may attract additional developments within the City as part of a broader goal. The locations of the suggested green infrastructure BMPs adhere to the existing drainage pattern of the study area resulting in saving in construction costs as much as possible. Conceptual plans for the Acme and Libby Properties have integrated the surrounding suggested BMPs to help complete bigger picture.

It should be noted, however, that green infrastructure BMPs may require modified versions of what has been presented. Some accommodations should be allowed for site uses and existing development needs. Nevertheless, green infrastructure solutions should be sought wherever and whenever possible. As this report illustrates, there are multiple benefits using a green infrastructure approach. The COD district of Blue Island is capable of being transformed into the regional model of how existing and new industry and green infrastructure BMPs can efficiently coexist.