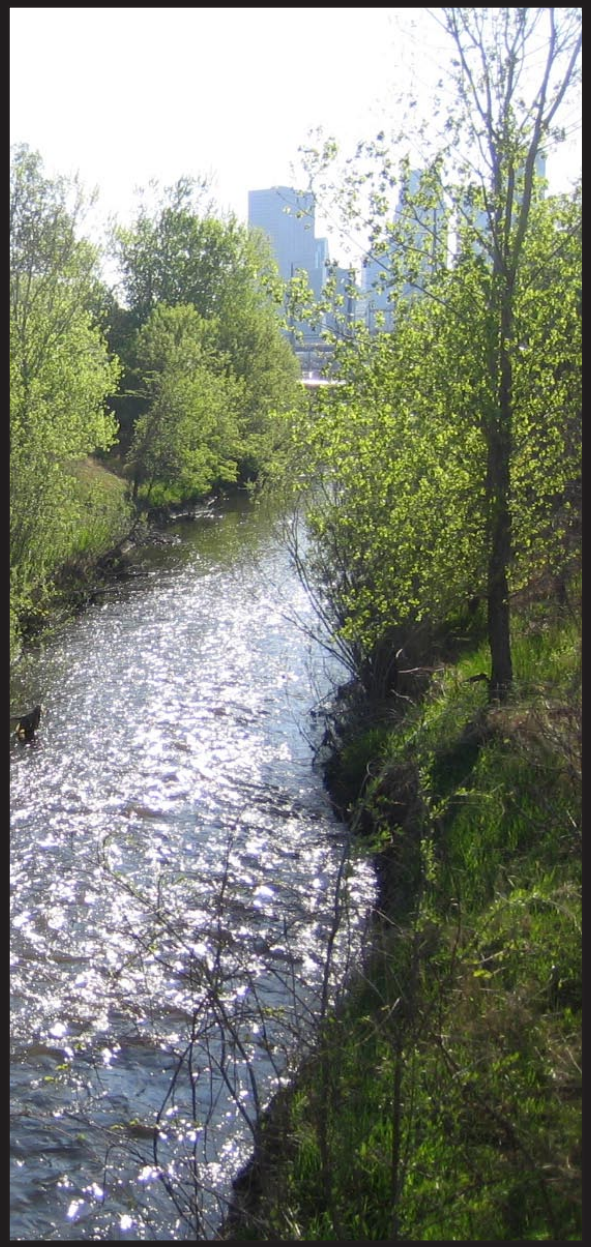

Bassett Creek Stream and Habitat Restoration
Implementation Plan

October, 2007

Acknowledgements

The evolution of the *Bassett Creek Stream and Habitat Restoration Implementation Plan* was guided by the Technical Advisory Committee and various City of Minneapolis and Hennepin County staff that provided valuable input and direction to the planning process. The Technical Advisory Committee was composed of Darrell Washington (Project Team Leader), Dan Cornejo (urban planning consultant retained by Hennepin County), Thomas Leighton and Beth Grosen of the Minneapolis Community Planning and Economic Development Department; Lois Eberhart, Rhonda Rae, Lane Christianson, and Bo Spurrier of Minneapolis Public Works; and Patrick Connoy, Joel Settles, John Evans, and Ali Durgunoglu from Hennepin County.

The project team also received significant assistance from Fred Campbell from the Minnesota Pollution Control Agency and Alexander Zachary, Tim Brown, Jennifer Ringold, and Paul Hokeness from the Minneapolis Park and Recreation Board. Lastly, the project staff would like to thank Bruce Chamberlain of the Hoisington Koegler Group for his time and special insights of the Bassett Creek Valley area.

In order to determine how residents felt about this area, the project team attended several Bassett Creek Valley Redevelopment Oversight Committee (ROC) meetings to informally discuss technical issues and provide updates on the planning process. In addition, project staff held two well-attended public meetings with neighborhood residents and businesses. At the first meeting, project staff introduced the project, discussed opportunities and constraints, and solicited comments regarding three conceptual stream alignment and open space configuration plans. At the second public meeting, project staff presented the preferred stream alignment and open space design along with the analysis used in selecting this design. The work produced by the project team would not be as complete without the input and feedback provided by the tireless work of those neighborhood members that comprised the BCV ROC.

top: Minneapolis Impound facility from future Van White Memorial Blvd.
middle: Bassett Creek looking west from future Van White Memorial Blvd.
bottom: Bassett Creek near tunnel inlet

Project Team

Minneapolis City of Lakes
Community Planning & Economic Development

Hennepin

BARR

CLOSE
LANDSCAPE ARCHITECTURE +

Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative Commission on Minnesota Resources (LCMR).

Additional funding was provided by Hennepin County Department of Housing, Community Works, and Transit.

October 2007

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top: Bassett Creek looking west from future Van White Memorial Blvd.
middle: Downtown Minneapolis from the City's vehicle impound lot
bottom: Stormwater inlet at 2nd Avenue North

figure 1.0
Project areas, including the Commons and Greenway, are shown overlaid as red dashed lines on an aerial photograph.

1. Introduction

Project background

Historic Bassett Creek Valley and its surrounding meadows, tributary streams, and flood plain forests were valued differently by the area's many inhabitants. The Dakota valued the creek and its adjacent habitat for its beauty and bounty in sustaining their way of living. Later, European settlers valued the creek and land for its ability to house immigrants and necessary, but unattractive, land uses such as rail yards, dump sites, and chemical and oil processing facilities. While clearly the once meandering Bassett Creek and nearby marshes have all but disappeared from the landscape, equally removed are the large number of medium and heavy industrial businesses and jobs that existed in the Valley. The purpose of this document is to identify a strategy for rediscovering Bassett Creek's ecological and aesthetic character and enhance its economic value for future generations.

The *Bassett Creek Valley Master Plan* (*BCV Master Plan*) serves as the community's long-range redevelopment framework. Completed in 2006 and adopted by the City of Minneapolis in 2007, the *BCV Master Plan* provides a sound development path for the largely industrial 230-acre site bounded on the north by Glenwood Ave., on the west by Cedar Lake Road, on south by I-394, and on the east by I-94. The plan establishes a "road map" for redevelopment and open space restoration over the next 25 years. It supersedes the previous *Bassett Creek Valley Master Plan* approved by the City of Minneapolis in 2000. That plan established a general vision for the area, strong land use framework, and broad implementation steps toward redeveloping the Valley. Major policies contained in the 2000 plan, including its overarching development principles, were transferred to the 2006 *Master Plan*.

With the adoption of the 2000 plan, the City established the Redevelopment Oversight Committee (ROC) to guide future planning and development activities. It requires the two neighborhoods in the Valley - Harrison and Bryn Mawr - along with local businesses, the affected City Council members and the Mayor to appoint representatives to this committee. Among ROC's various responsibilities, it reviews development applications and provide its recommendations to the respective neighborhood organization. They review City land disposition actions and provide a sounding board for new ideas or general concerns. One of ROC's functions integral to the Valley's future is its role in reviewing and recommending modifications to the *Master Plan*. The updated 2006 plan is a direct result of that responsibility as the committee desired plan modifications that provided for greater detail regarding development scenarios and design guidelines than those outlined in the 2000 plan.

The *BCV Master Plan* was developed in a truly collaborative manner between 2004 and 2006. ROC sought out private developers in 2003 to be an active partner in its planning process. Ryan Companies, a Minneapolis-based developer, was selected among a group of firms to be ROC's partner. In addition, Ryan Companies then added Hoisington Koegler Group, an urban design and planning consultant, SRF Consulting, Braun Intertec and Maxfield Research to assist in the task of modifying the existing plan to include

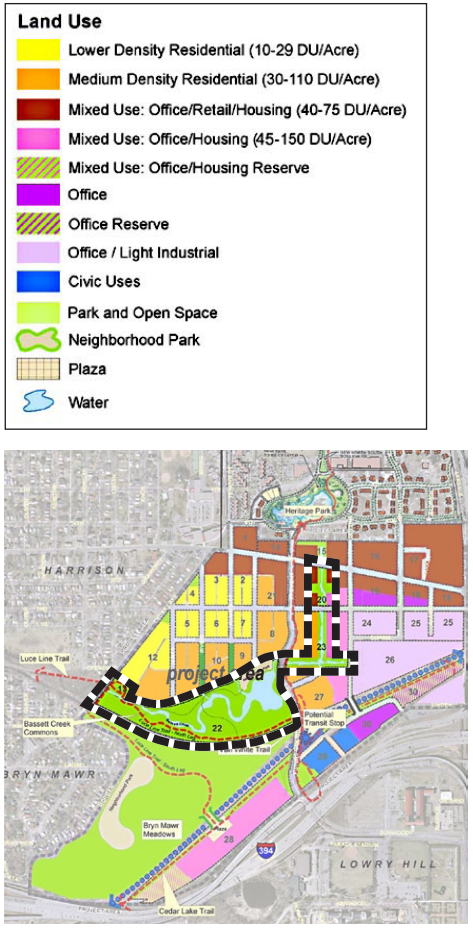


figure 1.1
The starting point for this implementation plan was the *Bassett Creek Valley Master Plan* (2006), which envisions a system of existing and proposed parks and open space integrated with a revitalized mixed-use urban village.

figure 1.2
The *Bassett Creek Valley Master Plan* (2006) called for creation of two large open spaces: the Commons and the Greenway.

greater specificity and thus providing developers and residents with clear knowledge of the community's vision and development intentions. City of Minneapolis staff also served as a resource to the ROC/Ryan Development collaboration.

Master plan elements

The *BCV Master Plan* outlines a well-defined land use vision, presents street and façade design guidelines, and tests several redevelopment alternatives against realities of infrastructure capacities, market conditions, and financing strategies. It proposes development of more than 3,000 housing units, 2.5 million square feet of commercial space, and the establishment of 45 acres of open space. In addition, the restoration of long-neglected Bassett Creek is envisioned as the amenity to allow the Valley's new urban fabric to successfully emerge.

As part of the restoration of Bassett Creek, the *BCV Master Plan* calls for the creation of two new open space areas: a 'Commons' located directly north of the existing Bryn Mawr Meadows Park (but physically separated by the BNSF railroad corridor), and an urban 'Greenway' along the Emerson Avenue alignment, between existing Dupont Avenue and Fremont Avenue (Fremont will be renamed Van White Memorial Boulevard in the Valley). The Commons, described in the plan as a primarily passive open space with the creek lying to the north, is envisioned as the central natural resource feature. The Greenway is envisioned to be a high-amenity public pedestrian promenade that will serve as a catalyst for redevelopment of adjacent properties.

Additionally, the *BCV Master Plan* suggests the following open space features:

- Enhancing and realigning Bassett Creek into a more natural streambed
- Creating water features and rainwater gardens adjacent to the creek which will add to the open space atmosphere while accommodating stormwater infiltration and storage.
- Preserving dramatic views of downtown Minneapolis for area residents
- Building a continuous trail connecting Luce Line Trail to the Van White Memorial Trail. The Luce Line Trail would also be extended south through Bryn Mawr Meadows to connect with the Cedar Lake Trail
- Building trails along the north side of Bassett Creek as well as a footbridge connecting those trails to the regional trail

The land slated to become the Commons is currently being used as the western half of the City of Minneapolis auto impound lot. Again, the *BCV Master Plan* expressed a preference for this new open space area to be a largely natural area without programmed recreational facilities. The plan did not include a specific design for the creation of the Commons, Greenway or restoration of the native and ecological habitat of Bassett Creek as this was beyond its scope to evaluate the possibilities. The large questions of how to incorporate a passive park with sustainable landscape features, reconstruct a meandering stream corridor, provide for stormwater management that also acts as a public amenity, and encourage native habitat development into the open space design are further pursued in this document.

Project scope

The City of Minneapolis identified several tasks to be completed for this *Implementation Plan*. One critical assignment was the expectation that the *Implementation Plan* build upon the large body of work already produced regarding the area's land use challenges, wetlands, stream hydraulics, and underlying geotechnical and soil contamination concerns to evaluate the feasibility of the recommendations put forth by the *BCV Master Plan*.

The tasks completed as part of this analysis include:

1. Developing a GIS geodatabase that incorporates existing data sources. The GIS geodatabase was used in site inventory and analysis, and presentation maps. It was also used to evaluate the conceptual plan for technical considerations, use patterns by residents and visitors, input from stakeholder meetings, and cost of construction.

2. Defining the desired location and geometry of stream, pond, and wetland features using available topography, soils, wetland, vegetation, and land-use information. Also, available site information and fluvial geomorphology design methods were used to define stream corridor location, buffer widths, and vegetation communities.

3. Creation of an open space and recreational use plan incorporating native and landscaped plant communities for habitat enhancement and ecological stability, trails for internal circulation and bike commuting, green streetscapes, and passive recreational uses.

4. Recommending a preferred design and including a discussion of:

a. Construction phasing and schedule
b. Environmental assessments and investigations
c. Cost estimates for:
   i. Final construction design and engineering
   ii. Excavation and soil disposal
   iii. Stormwater conveyance and treatment
   iv. Stream channel construction and shoreland stabilization
   v. Recreation and open space features
   vi. Vegetation and native habitat establishment (including establishment period maintenance)
d. Long-term maintenance costs and schedules
   i. Institutional roles – ownership and maintenance
e. Permitting considerations – identification of permits, permitting authorities and estimated costs for permit approval

Project goals

Several major goals have guided the creation of this Implementation Plan. Many were defined from the *BCV Master Plan* while others were added or refined based on public input.

- Support redevelopment envisioned in the *BCV Master Plan*
- Direct land uses and contribute to good public spaces
- Improve physical and visual connections to Bassett Creek and surrounding areas
- Remediate contaminated soils
- Cleanse stormwater and manage runoff rates
- Manage 100-year storm event within creek floodway
- Create and improve upland and riparian habitat
- Create a variety of public open-space amenities
- Expand passive recreation opportunities for

figure 1.3
Community input was gathered for this plan at two public meetings and at meetings of the Bassett Creek Valley Redevelopment Oversight Committee.

neighborhood residents and visitors
  - Connect to neighborhoods and existing public open-space systems
  - Identify sustainable maintenance and operations practices

Project organization

The design team of Barr Engineering Company and CLOSE Landscape Architecture + was retained by the City of Minneapolis Community Planning and Economic Development Department (CPED) to complete the *Implementation Plan*. Dan Cornejo of Cornejo Consulting was retained by Hennepin County to work with the design team on the Bassett Creek 'daylighting' concept.

A Technical Advisory Committee composed of staff from the City of Minneapolis (CPED and Public Works), Hennepin County, and the Minneapolis Park and Recreation Board (MPRB) worked closely with the design team on development of the implementation plan.

The ROC was also involved in the process through meetings with the design team. The Bryn Mawr and Harrison neighborhoods provided input to the project at two public meetings.

Project funding

Funding for this project was provided by the Legislative Commission on Minnesota Resources from the Minnesota Environment and Natural Resources Trust Fund. Additional funding was made available through Hennepin County's Department of Housing, Community Works, and Transit from its Daylighting Creeks initiative.

figure 2.0
Aerial view looking southwest. 2nd Avenue North is in the foreground and Bryn Mawr Meadows park is in the middle ground. This image, taken prior to the construction of Van White Memorial Boulevard, illustrates the mix of industrial uses, open spaces, and transportation systems.

2. Compilation of Existing Data

Land use history

The Bassett Creek Redevelopment project area is located in a primarily industrial corridor northwest of the I-394 and I-94 interchange. The Commons is currently occupied by the City of Minneapolis impound lot and Minneapolis Park and Recreation Board (MPRB) property. The Greenway runs north of the impound lot, crossing several industrial properties, including parcels owned by the City of Minneapolis and the Minneapolis Public School District.

The project area has a long history of commercial and industrial activities. Environmental investigations have confirmed the presence of soil and groundwater contamination within or near the project area. Notable current and historical land uses identified within the project area include an unlicensed dump, rail lines and associated storage yards, scrap metal recycling and processing, bulk petroleum and chemical storage facilities, warehouses, automobile storage, oil refining, mechanical and automobile repair, possible coal gas storage, and many other 'undesirable' but necessary businesses. These land uses present the potential for releases of hazardous substances and/or petroleum products.

As shown in Figure 2.3, a number of regulated environmental sites with known contamination exist within and in the vicinity of the project area. Several petroleum Leaking Underground Storage Tank (LUST), Voluntary Investigation Cleanup (VIC), state assessment, dump, and Permanent List of Priorities (PLP) sites are located onsite or within 1,000 feet of the project area.

Land ownership

Land within the Commons is publicly owned. The majority is occupied by the City of Minneapolis vehicle impound lot. Of the approximately 25 acres included in the Commons west of Van White Memorial Boulevard, 23 acres are the Impound Lot. A parcel owned by the Minneapolis Park and Recreation Board abutting Cedar Lake Road lies at the west end of the Commons and is 1.75 acres in size.

Within the southern half of the Greenway section, land ownership between 2nd Avenue North and the existing storm sewer inlet is divided between the City and the Minneapolis School District. To the north, between 2nd Avenue and Glenwood Avenue, three private parcels exist.

Previous environmental studies

Previous investigations completed in the project area include several Phase I Environmental Site Assessments, geotechnical investigations, and environmental investigations. Thirteen previous investigation reports and one Response Action Plan/Construction Contingency Plan were reviewed to assist in determining potential contaminants of concern. A general summary of significant results and conclusions of these previous investigation reports, including information on significant historical land uses, is included on the figures and tables in Appendix A.

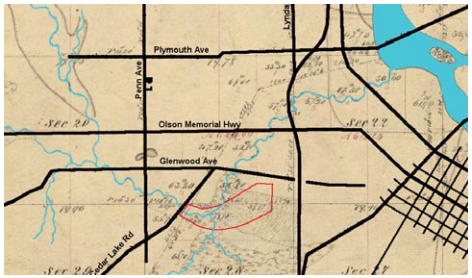


figure 2.1
A Public Land Survey map, dated 1854, showing the alignment of Bassett Creek and overlaid with the Commons project area and selected existing roads.

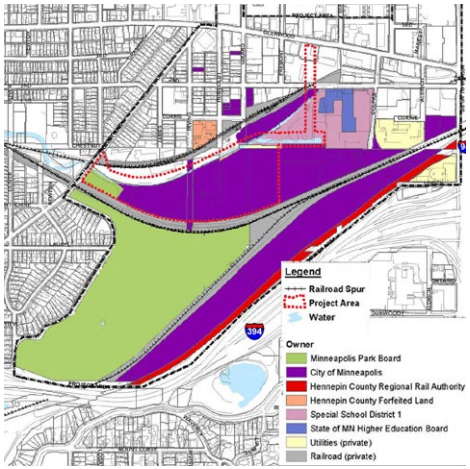


figure 2.2
Publicly-owned land accounts for nearly all of the parcels within the project area.

figure 2.3
Documented contaminated sites in the project area.

figure 2.4
Bassett Creek was channelized and set in its current alignment as part of the single-largest Works Progress Administration park project in the City of Minneapolis. WPA work also included the creation of Bassett's Creek Valley Park and recreation fields on the floodplains and terraces of the creek valley that today extends between Wirth Park and Bryn Mawr Meadows.

GIS database

Over the years, an extensive amount of data has been collected by public agencies for the Bassett Creek Valley. Much of this data is in electronic format that allows for easy compilation and analysis through the use of geographic information systems (GIS). A major component of the analysis and design completed for this work was done using GIS. A GIS geodatabase was created from existing data sources for the project areas and surrounding area. Some of the data categories included in the analysis are:

- Soils, geology, and geotechnical investigation data
- Past and present land cover and land use data
- Public and private land ownership information
- Topographic and survey information
- Soil boring and test-pit locations
- Public infrastructure
- Contaminated sites and pollution issues

The GIS database and models helped inform the design process and readily allow for the evaluation of various scenarios.

Pollution remediation, evaluation and investigation data

Environmental and geotechnical investigations report evidence of fill materials occupying a depth of up to 37 feet below grade in the Commons. Types of debris encountered in the fill layer include, but are not limited to, concrete, cinders, ash, brick, asphalt, stone, wood, glass, metal, organics and other demolition and domestic debris. Vinyl floor tile material (suspected to be asbestos-containing) and abandoned chemical containers have also been observed at nearby sites. According to previous investigations, polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals in excess of acceptable Minnesota Pollution Control Agency (MPCA) risk-based screening criteria levels may be present in soil and groundwater in the Commons. Specifically, hazardous levels of lead have previously been identified in the soil, and a flood control project resulted in the placement of several lead-contaminated stockpiles onsite. Low levels of volatile organic compounds (VOCs) have also been detected in samples from the Commons, and petroleum contamination has been identified at nearby sites. Refer to Appendix A for more information on the previous investigation reports, their results, and reported conclusions.

Data from soil borings taken within and surrounding the Greenway show elevated concentrations of diesel range organics (DRO), gasoline range organics (GRO), metals, cyanide, PCBs, PAHs, semi-volatile organic compounds (SVOCs), and petroleum and chlorinated VOCs. Concentrations of these contaminants vary throughout the sites surrounding the Greenway, with some concentrations exceeding acceptable risk-based screening criteria levels. There is a high probability of encountering contamination during redevelopment of the Greenway. Refer to Appendix A for additional details on previous investigations and land use.

Minneapolis storm and sanitary sewer

In Minneapolis, Bassett Creek receives stormwater runoff from surrounding streets and open spaces. Within the Commons, approximately 75 acres of watershed contribute direct runoff to the creek. This includes surface areas like the City of Minneapolis impound lot and storm sewer systems that serve the

surrounding neighborhood. A 66” storm sewer enters the creek from the south at approximately Morgan Avenue, draining a 325-acre subwatershed that includes Bryn Mawr and parts of I-394.

There are two existing sanitary sewers that cross the Commons and Greenway: a 52” sanitary sewer crosses the creek at Irving Avenue and another 72” sanitary sewer follows the Dupont Avenue alignment north of the new Bassett Creek tunnel. The 72” Dupont sanitary sewer then follows the old Bassett Creek Tunnel alignment north of Second Avenue.

Hydrology

Bassett Creek has a contributory drainage area of 43 square miles at the new tunnel entrance. Eighty-six percent of the Bassett Creek watershed is developed urban area. Historically, the Bassett Creek area of Minneapolis experienced extensive flooding. Much of the Commons and the surrounding area is floodplain. According to the Hennepin County Flood Insurance Study (FEMA, 2004), flood flows are as follows:

Bassett Creek Flood Flows	
storm event	*volume*
10-year	674 cfs
50-year	1,048 cfs
100-year	1,222 cfs
500-year	1,631 cfs

The neighborhood in the vicinity of the project area is vulnerable to flooding, but currently to a lesser degree than in the past due to the new Bassett Creek tunnel configuration. Redevelopment of the area will require raising new structures above the 100-year flood elevation.

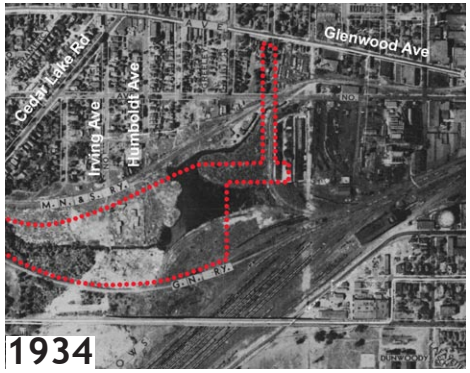
An agreement between the City of Minneapolis and the Bassett Creek Water Management Commission specifies that at least 50 cubic feet of water per second must be diverted from Bassett Creek to the old tunnel during a 100-year flood event. The construction of Van White Boulevard has altered the channel configuration to the old tunnel just west of Van White Boulevard, and the Greenway will be designed to convey this flow.

A flow monitoring station has been in place near the Irving Avenue Bridge since early 2000. The monitoring station, constructed by the Metropolitan Council Environmental Services (MCES) under the Watershed Outlet Monitoring Program (WOMP) and operated by MPRB, monitors stream discharge and water quality parameters. According to the WOMP flow data, the base flow of Bassett Creek varies, with a spring and summer base flow of 20 to 30 cubic feet per second and a fall and winter base flow of about 10 cubic feet per second.

Additional data needed

As stated previously, a large number of studies and reports have been completed on the Bassett Creek Valley over the years. As a result, there is an extensive amount of data for the site. The design team reviewed the existing data sources as part of the design development process and identified a number of data gaps.

- Based on the presence of known nonpetroleum contamination, the project area should be entered in MPCA’s Voluntary Investigation Cleanup (VIC) program and several steps need to be completed under the VIC Program.
- Although several Phase I Environmental Site Assessments (Phase I Assessments) exist for portions



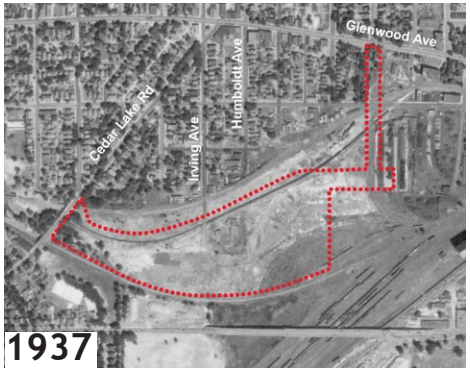


figure 2.3
Bassett Creek’s wetlands were used as an open dump for decades. The images above illustrate how existing wetlands were filled and the creek channelized. Fill materials included industrial waste, building and demolition materials, and domestic debris. Beneath the existing City of Minneapolis vehicle impound lot, much of what lies buried remains undocumented.

figure 2.5
A swale east of Van White Memorial Boulevard diverts excess stormwater runoff from the main channel to an older storm sewer inlet at 2nd Avenue North. To the right is a Minneapolis School Board vehicle fleet facility. The *BCV Master Plan* envisions mixed-use redevelopment in this area, including a high-amenity urban greenway.

of the project area, the entire project area has not been covered by these assessments. Additionally, not all of the historical assessments meet the current ASTM Standard or would have the potential to meet the "all appropriate inquiries" requirement to maintain the innocent landowner defense to liability under federal law. Additionally, Phase I Assessments have a limited time in which they can be relied upon without an update. For these reasons and to meet requirements of the VIC Program, a Phase I Assessment(s) meeting the current standard needs to be compiled for the project area.

- A significant amount of historical data exists for the project area. However, a finer resolution of the current contamination extent, magnitude, and characteristics should be obtained with an investigation along the proposed creek alignment to assist with redevelopment and design implementation plans. The investigation should specifically target areas that will be excavated during the redevelopment. Based on the documented presence of debris in the subsurface, the most effect method of investigation would be to complete a series of test excavations to document soil conditions and obtain samples for laboratory analysis. Parameters selected should consider known contaminants as well as any additional suspected contaminants. This investigation should also address any new issues identified in the Phase I Assessment(s).
- Previous studies in the project area did not investigate for the presence of Asbestos Containing Material (ACM). Based on the observation of potential ACM observed in debris in the vicinity of the project area, debris encountered should be inspected by a professional certified to identify and sample ACM. Samples of suspected ACM should be submitted for laboratory analysis.
- Toxic Characteristic Leaching Procedure (TCLP) samples for lead and possibly other contaminants should be collected from areas that have historically been classified as having hazardous concentrations of lead. Early studies in the vicinity of the project area used the EP toxicity leach test to evaluate the hazardous characteristics of soil samples. Although this was the appropriate test at that time, that testing method has since been replaced with the TCLP test protocol.
- Basset Creek surface water and groundwater in the project area have been evaluated and contamination has been identified. The effects of rerouting the creek on surface water and groundwater quality should be evaluated.

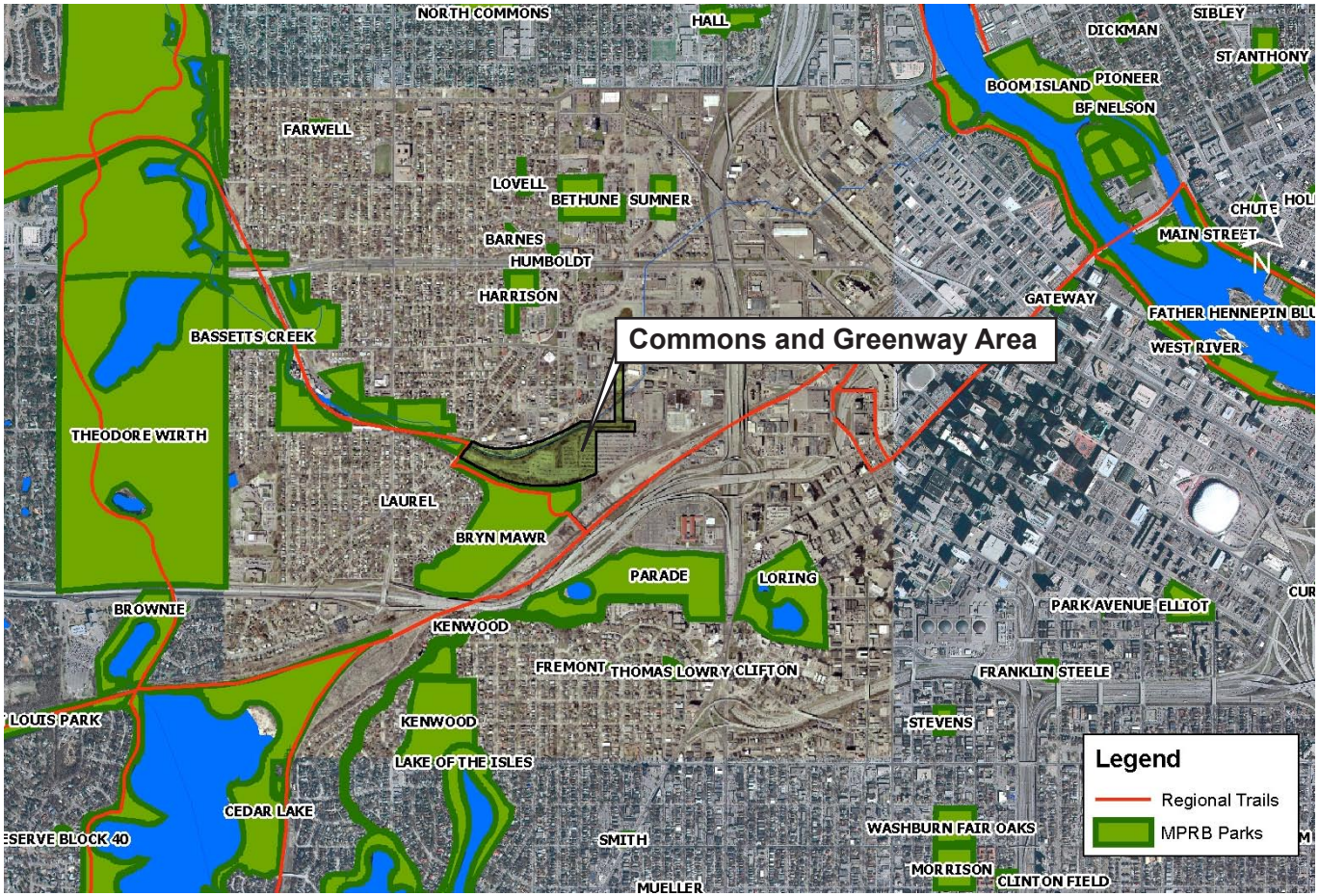


figure 3.0
The project area is located within a network of regional and local parks, representing a range of park types and recreational opportunities. It is also strategically located within established neighborhoods such as Bryn Mawr and emerging neighborhoods such as Harrison and Sumner-Glenwood.

3. Context and Physical Design Constraints

Hydrology and hydraulic modeling

Bassett Creek was extensively reconfigured in the 1980s as part of an effort to improve the hydraulic efficiency of the channel and reduce flood levels. The reconfigured stream channel was dredged into a trapezoidal shape and a new tunnel was constructed with a larger capacity than the old tunnel system. The new tunnel system conveys stream flows and stormwater to the Mississippi River more efficiently and reduces flooding in the lower valley. The original stormwater tunnel and the channel leading to it were maintained for large flood flow conveyance, and a weir was constructed to control the high flow bypass from the newly built channel. To construct the Greenway, the design will need to divert base flow from the main channel north and back into the old tunnel.

Topography

The project area is relatively flat with several important topographic features. The western end of the Commons is elevated relative to the rest of the site. The creek lies between steep slopes as it flows east from Cedar Lake Road. These banks reach as high as 30 feet and confine the channel but do overlook the rest of the valley toward downtown Minneapolis. The valley (and the impound lot) slope downward toward the east to the wooded rise in the middle of the impound lot (Figure 3.2). The new Van White Boulevard will be elevated above the existing topography as it crosses the valley from north to south. The steep creek banks just east of Cedar Lake Road and the wooded rise in the center of the impound both restrict the location of the new creek channel alignment.

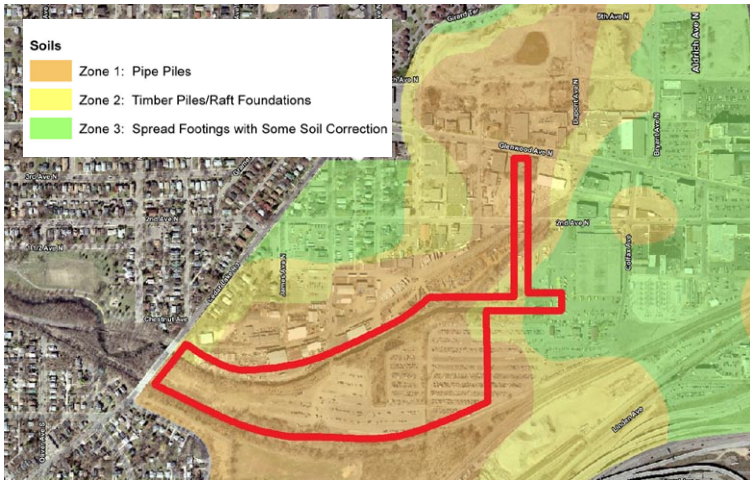


figure 3.1
Poor subsoils in the project area are based on an extensive and deep former wetland complex and present extreme constraints on structures of any kind.

figure 3.2
Topography within the future Commons is marked by two significant high points.

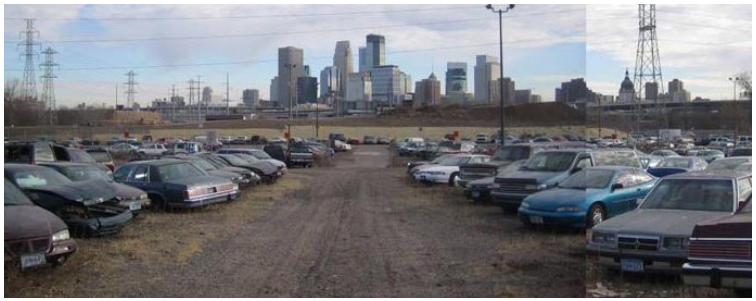


figure 3.3
The eastern existing high point affords spectacular views of downtown Minneapolis.

figure 3.4
Existing topography is most dramatic along Cedar Lake Road, where upland areas sit as much as 30 feet above the creek.

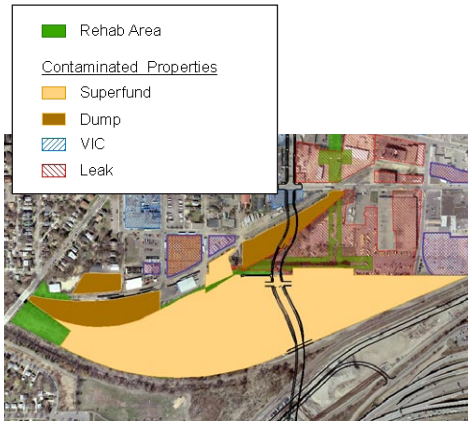


figure 3.5
The project area contains and is adjacent to many parcels documented to have or highly likely to have contaminated soils and groundwater. Superfund sites form the majority.

Soils

Prior to the late 1800s, the Commons was a swampy valley as a result of slow-moving Bassett Creek. It was occupied by a municipal dump beginning in the 1930s as well as by heavy industrial operations during the 1950s and 1960s. It was also used as a dump for construction debris and other waste from the 1960s forward. Soil borings have found debris and other fill material overlying soft peat and organic clay/silt to a depth of 15 to 37 feet below existing grade. Beneath the organic material, soft fat clay ranges from roughly 50 to 100 feet below the current surface. Underlying the fat clay, soils consisting of glacial clays and sands can be found from 50 to 130 feet below existing grade.

Existing soils contamination

As described in Section 2, the following contaminants have been identified in the soil within or in the vicinity of the project area: metals, semivolatile organic compounds (SVOCs), polyaromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), diesel range organics (DRO), gasoline range organics (GRO), cyanide, and polychlorinated biphenyls (PCBs). Several of these parameters were detected at concentrations that exceeded applicable risk-screening criteria. In the Commons, lead concentrations in some areas are present at concentrations that are considered to be characteristically hazardous. In addition to these contaminants, potential asbestos containing material (ACM) was also identified in the project area vicinity. See the tables and figures in Appendix A for a summary of previous studies in the vicinity of the project area. The effect of soil contamination on the project implementation is discussed in the remaining sections of this implementation plan.

Stream channel processes

The primary limitation of the existing channel is the absence of a natural floodplain in the project area. A natural floodplain is one that floods, on average, every one to two years, allowing the stream channel to maintain non-erosive velocities during flood events while maintaining adjacent wetlands. Another constraint is that the current Bassett Creek channel has been dredged, deepened, and straightened, and is essentially a deep ditch.

Existing and future land uses

The larger context of the project area includes an array of commercial destinations, schools, cultural institutions, parks, and parkways. The study area's immediate surroundings, however, are a mix of industrial and residential uses. Many parcels are underutilized, and access to the project area is difficult. Active freight rail separates the Commons from Bryn Mawr Meadows Park. Van White Memorial Boulevard will be a major connection between north Minneapolis, Heritage Park, and the parkways and neighborhoods to the south (expected completion in 2009). The Greenway is currently flanked by a few large parcels as well as an existing stormwater-conveyance channel. A triangular parcel at the southern end of the Greenway is owned by the Minneapolis Public School District and is used for school bus parking and maintenance.

The *BCV Master Plan* envisions the gradual transformation of a "relatively isolated, obsolete industrial area with pockets of residential and office uses" into a "vibrant urban village of mixed-use districts and quiet residential streets." Medium-density residential blocks (30-110 dwelling units (DU)/acre) will form an edge between the Commons and the existing pattern

of single-family housing. The Greenway is shown as a mid-block seam between a range of land uses: medium density housing; mixed-use office/retail/housing (40-75 DU/acre); and mixed-use office/housing (45-150 DU/acre).

Sustainable building practices will include systemic stormwater management, from green roofs to green streets and rain gardens in pocket parks. The Commons and Greenway will contribute to stormwater cleansing and management in this large urban watershed. Perhaps the most dramatic change envisioned is at the City of Minneapolis Linden Yards facility. Where today, piles of crushed pavement tower above the Cedar Lake Trail, the Master Plan shows an intense mixed-use, high-rise district centered on a station of the potential SW Transitway and linked to the study area by Van White Memorial Boulevard.

Anticipated timeline of land use changes

Clearly, such changes can only occur over many years. The *BCV Master Plan* is cast as a 25-year vision. This Implementation Plan is seen as one of several catalysts that may contribute to the Master Plan's implementation. In the short term, small improvements and key phases of the implementation plan can spur redevelopment in other areas (see Phasing Plan). In the long-term, the Commons and Greenway are crucial open-space amenities for attracting residents, employers, and workers to this urban village.

Water quality in Bassett Creek

The Bassett Creek watershed is comprised of 43 square miles of urban land use. Surface water runoff from upstream areas is primarily urban stormwater runoff. Bassett Creek is listed as an impaired water by the MPCA due to a fish consumption advisory. Since 1997, the Minneapolis Park and Recreation Board, Bassett Creek Water Management Commission, and Metropolitan Council Environmental Services have operated a water quality monitoring station on Bassett Creek at Irving Avenue. The Bassett Creek Water Management Commission has also undertaken studies of the ecological health of the stream using an Invertebrate Community Index.

A limited number of investigations have been completed on the groundwater - surface water interactions for Bassett Creek. Based upon review of the limited data available, Bassett Creek is both a losing and gaining stream, depending upon water levels. That is, the stream can discharge to groundwater when high and, during low flows, groundwater discharges to the stream.

figure 3.6
Major existing land uses within the future Commons include the City of Minneapolis vehicle impound lot and Pioneer Paper, which is served by commercial railroad. A Minneapolis Public School District bus parking lot exists at the south end of the future Greenway.

Evaluations of the limited surface water data showed no significant impacts to surface water from the soil contaminants present in the Bassett Creek Valley. The surficial groundwater quality and stream interactions will need a more complete study with regard to the stream restoration work proposed as part of implementation.

The ecological health of the stream, based upon the Invertebrate Community Index, was poor in the 1980s and has fluctuated between good and fair in the 1994 to 2003 time period. In the last 16 years for which data is presented, the ecological health of the stream in Minneapolis (as represented by the DuPont Avenue monitoring station) has changed only slightly since improving in the 1990s.

Water chemistry data that was collected at the Irving Avenue monitoring station was used to compare water quality parameters for base flow versus storm event flows. The following table is based on 2005 data:

Mean Concentrations	*Base flow*	*Storm events*
Chloride	147 mg/L	95 mg/L
Total Phosphorus	0.103 mg/L	0.305 mg/L
Nitrate – nitrogen	0.30 mg/L	0.41 mg/L
Total Suspended Solids	7 mg/L	102 mg/L

The 2005 data indicates that storm events have a negative impact on water quality for most parameters, and they also tend to dilute the stream chloride concentration. None of these measures are an indication of human health factors or concerns, but they do illustrate the impacts of urban stormwater on the stream.

Compared to other streams monitored in the Twin Cities in 2002, Bassett Creek falls in the middle range for water quality for urban streams. The large upstream watershed area and minimal area available for runoff treatment within the Commons limits the ability to make any significant water quality improvements to the creek from the project area alone.

Creek	*Watershed Load*			*Flow Weighted Mean Concentration*		
	TSS (#/acre)	TP (#/acre)	TN (#/acre)	TSS (mg/L)	TP (mg/L)	TN (mg/L)
Bassett Creek	**118**	**0.52**	**1.47**	**29**	**0.130**	**0.360**
Nine Mile Creek	253	0.68	1.44	74	0.200	0.420
Riley Creek	468	0.60	0.97	260	0.340	0.550
Battle Creek	174	0.38	1.07	66	0.140	0.400
Shingle Creek	62	0.87	---	25	0.123	---
Minnehaha Creek	28	0.18	0.66	12	0.080	0.280

TSS = Total Suspended Solids, TP = Total Phosphorus, TN = Total Nitrogen

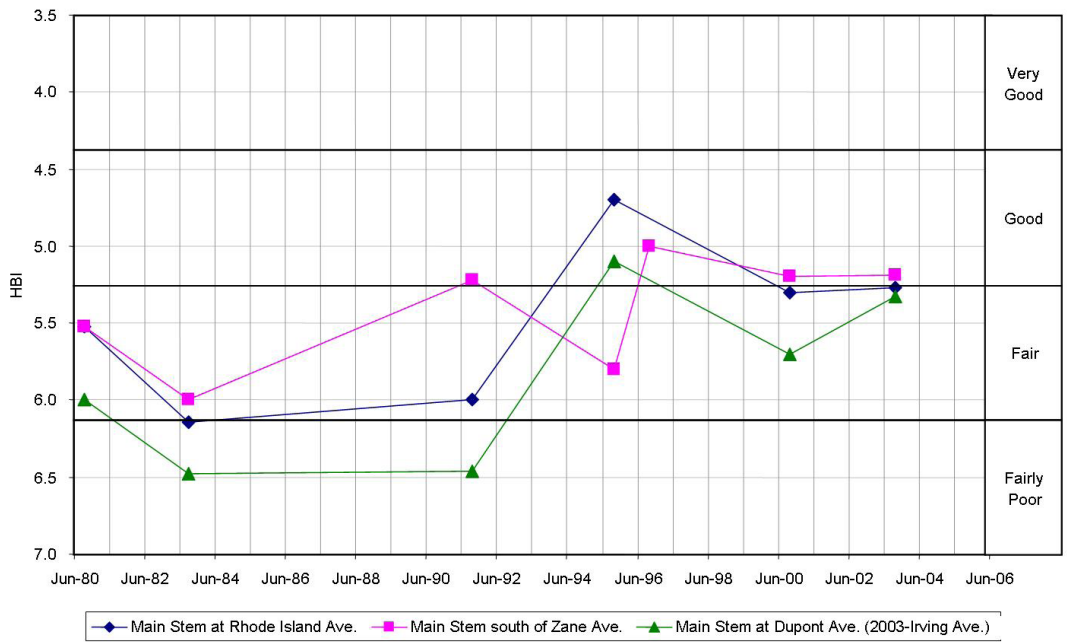


figure 3.7
Bassett Creek water quality based on biological indicators.

Stream alignment alternatives in the Commons

figure 4.0
Stream Alignment Concept A

In the interest of minimizing the costly displacement of potentially contaminated soils, Bassett Creek is shown in its current alignment. The engineered banks are reshaped and replanted to benefit creek ecological function and riparian habitat. The resulting open floodway manages stormwater runoff and allows better visual access to the creek. South of the creek, native plan communities are revitalized with extensive areas of upland prairie and tree canopy. Potential passive-recreation use areas are limited to the southern portion of the Commons and rely on bridges over the creek to link with the neighborhood to the north.

figure 4.1
Stream Alignment Concept B

Several large meanders are added to the creek's existing alignment. A wide floodway creates extensive riparian habitat and stormwater management potential, but limits the amount of space remaining for passive-recreation uses as well as revitalized upland prairie and tree canopy. While a significant volume of soil would be moved to create the meanders, this alignment intentionally avoids a large landform on the eastern portion of the Commons that was created partly by stockpiling lead-contaminated soils.

figure 4.2
Stream Alignment Concept C

Bassett Creek is set in a completely new alignment with a broad floodway and the option of an in-stream wetland or pond. Large areas for passive-recreation uses are available both north and south of the creek. In this concept, the creek runs through one of the highest existing points on the site and consequently requires significant displacement of soils known to be highly contaminated with lead and other hazardous materials. An in-stream pond is located at the east end of the Commons.

4. Bassett Creek Commons Design Alternatives

Project goals and values

Several goals guided the creation and evaluation of design concept alternatives for a rehabilitated Bassett Creek and new open space, the Commons. These goals mirror those described in the *BCV Master Plan*. Others were added or refined based on public input and conversations with various public entity staff.

- Support redevelopment goals envisioned in the *BCV Master Plan*
- Direct adjoining land use and public space development decisions
- Improve physical and visual connections to Bassett Creek and surrounding areas
- Remediate contaminated soils
- Cleanse stormwater and manage runoff rates
- Manage 100-year storm event within creek floodway
- Create and improve upland and riparian habitat
- Create a variety of public open-space amenities
- Expand passive-recreation opportunities for neighborhood residents and visitors
- Connect to neighborhoods and existing public open space systems
- Identify sustainable maintenance and operations practices

Stream corridor location

The three stream corridor designs that the *Implementation Plan* evaluates are based upon several sources. Concept A, uses the existing Bassett Creek alignment as its origin. Stream corridor Concept C is derived from the ideas brought forward in the *BCV Master Plan*. Concept B was developed to maximize in-stream and riparian habitat creation without the large pond shown in Concept C. Two alignments, Concepts A and C, were initially evaluated based upon excavation costs and habitat value. The existing topography of the Impound Lot dictates the soil quantities that would need to be moved for constructing the final stream realignment. Concept A requires minimal soil excavation, but provides for very limited habitat creation. Concept C requires the greatest soil excavation volumes, resulting in the highest construction costs, but also has the highest ecological value. The in-stream pond in Concept C also presents several problems, such as sedimentation that can lead to accelerated erosion downstream, that further diminish the feasibility of this stream alignment. Again, Concept B maximizes in-stream and riparian habitat creation without a pond, but excessive soil excavation quantities made this option very expensive as well. It did, however, help guide the final channel placement. These three options are further discussed in the following technical evaluation.

Hydraulic modeling

All of the stream options were modeled to determine the impact upon flood elevations. Hydraulic modeling considered the Van White Boulevard elevations and the impact of constructing a Greenway diversion weir just upstream of the tunnel with a crest elevation of 804. The 100-year flood levels are as follows:

807.4 at the new weir upstream of the new tunnel

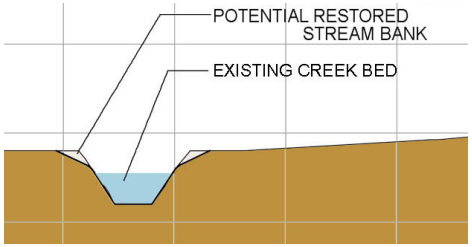


figure 4.3
Above: Stream alignment concept A shows Bassett Creek in its existing alignment but with a reconfigured stream bank, similar to the condition along Shingle Creek Parkway in Brooklyn Park, Minnesota.
(photo by Dan Cornejo for Hennepin County)

807.5 at the downstream side of Van White Blvd

807.6 at the upstream side of Van White Blvd

809 at Irving Avenue, and

812.7 at the downstream side of Cedar Lake Road.

The proposed flood levels will be three to six inches higher than existing flood levels due to the diversion weir and the longer meandering channel. However, any impacts can be largely mitigated with an appropriately designed floodway.

The riparian corridor and floodway will be quite wide in all of the scenarios evaluated, as the Commons will be primarily native vegetation. In this design alternatives phase, the floodway width and design were evaluated only from an excavation-quantity perspective.

Rainwater management systems

Maximizing the treatment of stormwater runoff is an important goal of the implementation plan. As the design process proceeded, it became obvious that site constraints and *BCV Master Plan* direction limited stormwater treatment options. To assist the efforts of this Implementation Plan, the proposed development occurring north of the Commons will need to incorporate multiple best practices, such as the use of rooftop storage, pervious surfaces, in-site biofiltration, and urban forest cover to reduce the rate and volume of stormwater runoff.

The soil conditions in the Commons, with regard to both soil contamination and geotechnical constraints, preclude the use of passive infiltration or large structural manhole systems for stormwater treatment. The location of the restored creek leaves little room for treatment of many areas draining from the north, except in the areas east and west of Irving Avenue within the Great Lawn.

Two locations within the Commons provide adequate room for the creation of lined filtration basins with under-drain tile systems, which will cleanse stormwater. Runoff from the areas south of Second Avenue North can be directed to these locations for treatment.

One objective identified in the *BCV Master Plan* is to establish native vegetation across the Commons to effectively eliminate runoff. Native plant communities, in conjunction with riparian corridor vegetation, cleanse runoff resulting from large rain events. Additionally, it is anticipated that impervious surfaces will drain to pervious areas in most cases.

Future land use

As described in the *BCV Master Plan*, the future Commons will be an important open space amenity for a thriving urban village. Land uses along the north edge of the Commons will be residential, including existing single-family and new medium-density along a proposed parkway road north of the creek. As land uses change from industrial to residential in this area, the railroad on the north edge of the Commons will no longer need track right-of-way or the underpass at Cedar Lake Road. To the east, a completed Van White Memorial Boulevard will provide access and will form an edge to the open space. This implementation plan assumes that the railroad south of the Commons will remain.

Technical evaluation of stream alignment concepts

Each of the three stream concepts is shown again at right. In addition to the core project goals of restoring true riparian function and habitat, the following evaluations focus on such technical issues as volume of excavated soils, location of known soil contamination, and stream stability.

Stream Alignment Concept A

Advantages

- requires the least amount of excavation
- relatively stable stream
- requires least floodway space

Disadvantages

- channel has little variety
- low ecological value

Stream Alignment Concept B

Advantages

- more natural, meandering channel
- significant wetland area
- higher ecological value

Disadvantages

- significant excavation of potentially contaminated soil and debris
- requires significant clean fill
- requires greater floodway space

Stream Alignment Concept C

Advantages

- more natural, meandering channel
- significant wetland area
- highest ecological value and diversity

Disadvantages

- greatest amount of excavation of potentially contaminated soil and debris
- requires most clean fill
- requires greatest floodway space
- pond sedimentation and downstream channel degradation

Open space concepts and evaluation

The stream alignment concepts suggests a distinct open space configuration within the Commons. The three concepts share some basic characteristics: extensive areas of low-maintenance naturalized plantings, stormwater management facilities, a hierarchy of trails, and areas for informal play and other passive uses. The open space concepts are described here in terms of advantages and disadvantages based on project values described previously.

Habitat/ecology

Each design alternative highlights how different types of plant communities can help organize the Commons and define different land uses. Mown turf is shown in active recreation areas, such as gathering spaces and areas for informal ball games. Woodland and prairie communities are used to varying degrees in each of the alternatives to illustrate how these plant communities can provide an "open" landscape (prairies/savanna) or an enclosed environment (woodlands).

Open space and recreational use

Each design concept explores the future Commons as a place primarily for passive recreational uses. Since much of the open space will be planted with naturalized prairie and woodland, recreational uses

Stream Alignment Concept A

Stream Alignment Concept B

Stream Alignment Concept C

figure 4.4
Alignment Concept A: Open Space

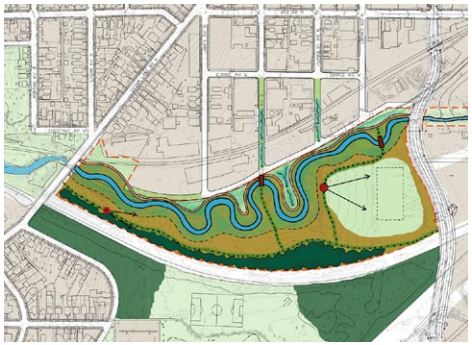


figure 4.5
Alignment Concept B: Open Space

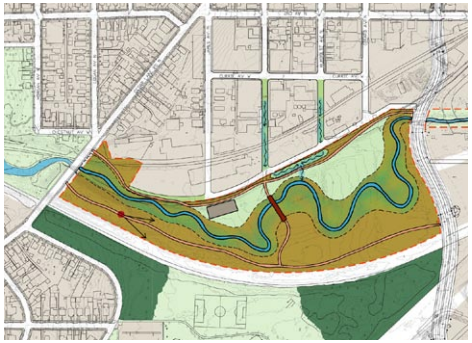


figure 4.6
Alignment Concept C: Open Space

are focused on key entrance points, trails, overlooks, and unprogrammed areas for informal gatherings. The only active recreation envisioned is the Luce Line Regional trail, which will traverse the site from Cedar Lake Road to Van White Memorial Boulevard.

This mix of uses is consistent with the vision articulated in the *BCV Master Plan* and was reinforced by stakeholder input during development of this implementation plan. Furthermore, technical constraints and soil contamination preclude typical active park uses. The site's deep, organic soils are poorly suited for park structures such as shelter buildings or premier ball fields which require irrigation and tall light standards for night time use. Additionally, the soil contamination identified in the Commons limits the affordability of active park uses due to the level of cleanup that would likely be required.

Alignment A: Open Space Concept

Because Bassett Creek is shown in its current alignment with an expanded floodway, nearly all open space elements are located across the creek to the south. Concept A divides the Commons into areas of use and habitat by extending the avenue pattern. Within large habitat zones of prairie and tree canopy, smaller areas of mowed turf support informal play, gatherings, and an overlook. Bridges at each avenue anchor views between the Commons and the neighborhood. Paths form walking and biking loops and connect to the Luce Line Regional Trail, shown along the site's southern edge.

Advantages

- strong parkway/creek edge
- strong connections to neighborhood and open space network
- series of iconic bridges
- most flexible open space
- maintenance efficiencies
- views from east hill

Disadvantages

- neighborhood connections to open space limited to bridges
- use areas adjacent to naturalized/habitat areas
- limited urban stormwater treatment areas

Alignment B: Open Space Concept

Several large meanders create stormwater management areas, and a paved trail follows the line of the creek and adjacent floodway. Bands of prairie and tree canopy are relatively continuous, with only two bridge crossings and minimal, low-impact trails south of the creek. A large sloping area of mowed turf provides space for informal play, gathering and an overlook.

Advantages

- creek meanders frame small neighborhood park and urban stormwater treatment areas
- open area for sledding hill and informal play field
- enhanced views from hill

Disadvantages

- limited connections to neighborhood and open space network
- use areas adjacent to naturalized/habitat areas
- tight meanders and large floodway limit types of uses

Alignment C: Open Space Concept

A centrally-aligned creek and floodway with a single

bridge crossing result in a Commons divided into two areas, one for small-scale, informal play and gatherings north of the creek and the other, south of the creek, for extensive prairie and a major trail connection. Of the three concepts, C provides greatest connection to neighborhoods and separation of manicured turf areas from natural areas.

Advantages

- most area for uses adjacent to residential neighborhood
- strong connections to neighborhood and open space network
- most opportunity for urban stormwater management from green streets
- use areas separated from naturalized/habitat areas by creek

Disadvantages

- central creek and floodway provide least opportunity for use areas
- significant grading for floodway limits potential to enhance views from hills

Stakeholder input

The alternative concepts were discussed at a public open house and at meetings with public agency staff (Minnesota Pollution Control Agency, City of Minneapolis Public Works, MPRB, and Hennepin County). In general, comments were consistent with the project values listed above. Specific comments included the following:

- Creation of habitat, both terrestrial and aquatic, is important
- Desire a strong connection of open spaces to surrounding community
- Prefer a mix of passive uses within open spaces.
- Create and improve visual and physical connections to creek
- Cleansing of stormwater should be a priority
- Pedestrian and bicycle connections to adjoining parks and bike trails should be pursued (Bryn Mawr Meadows, Bassett's Creek Valley Park and Luce Line Trail)

figure 4.7
At an open house, participants heard about opportunities and constraints and voiced their opinions about the three design concepts.
(photo by Dan Cornejo for Hennepin County)

figure 5.0
The preferred design concept for Bassett Creek Commons includes a rehabilitated Bassett Creek with functioning riparian habitat, an expanded floodway, and large meanders. Upland areas are converted to naturalized prairie, and a savanna extends from the existing tree canopy to the south. Open space components include a system of iconic bridges and internal trails with links to the neighborhood. The Luce Line Regional Trail enters the Commons via a railroad underpass (currently active) and links to Van White Memorial Boulevard. The primary use area is a great lawn which serves as an informal gathering place and leads to views of the revitalized creek and to a learning terrace with interpretive opportunities. Major entry points connect to Cedar Lake Road both north and south of the creek and to Van White Memorial Boulevard at a new parkway road.

5. Bassett Creek Commons Preferred Design

Preferred design

Based on public input, technical advisory committee discussions, and evaluation by the design team, Concept B emerged as the best framework from which a preferred stream corridor design can be developed. The creek alignment and open space components captured by Concept B provide the best balance of achieving project values, minimizing construction costs, and offering phasing implementation opportunities.

Beneficial elements of Concept B include the following:

- the re-use of sections of the existing stream alignment with improved stream banks and floodway in areas where existing steep banks would require extensive excavation for realignment;
- locating stream meanders at the Commons low points and away from areas with the highest concentrations of known soil contamination;
- development of active use areas, stormwater management features, and enhanced connections to adjacent neighborhoods;
- improved physical and visual access to the creek;
- creation of internal trail loops, two bridge crossings and regional trail connections south of the creek; and
- reintroducing extensive areas of prairie and tree canopy south of the creek.

Several aspects of Concept B were refined to produce the final preferred design for this implementation plan. Some of those refinements include:

- simplified stream meander alignments in response to topography and known soil contamination;
- introduction of a large, but unprogrammed, active use area north of the creek;
- future regional trail connection via existing railroad underpass at Cedar Lake Road;
- addition of a small pond added south of the creek between James and Irving Avenues;
- potential for public art infused with the construction of an overlook and entry to the Commons on Cedar Lake Road north and south of the creek; and
- creation of a "learning terrace" to allow for interpretive programs and direct contact with Bassett Creek.

The preferred design plan strongly suggests two significant refinements to the *BCV Master Plan*. First, the block pattern is adjusted where Van White Memorial Boulevard crosses the creek. In addition to facilitating safer vehicle turning and providing room for vertical transition to the roadway embankment, this is meant to ensure good public access to the Commons. The adjusted block pattern creates a gateway to the Commons from Van White Memorial Boulevard before the boulevard begins rising to cross the creek and railroad. See Figure 5.2.

The second proposed modification to the BCV Master Plan is to move the parkway road along the north edge of the Commons approximately 35 feet to the north. The preferred design reuses and expands portions of the existing creek alignment to create a true riparian edge. The road, paths, and plantings in conjunction with the creek form an essential public edge which requires additional space. This enhanced edge will allow users to experience the creek in ways

figure 5.1
Several key site issues that shaped the Commons preferred design, including steep slopes, high points, and known concentrations of contaminated soils are overlaid on the Concept B plan, which served as the basis for the preferred design.

figure 5.2
The block pattern near the intersection of Van White Boulevard and the parkway on the north side of the Commons was adjusted to facilitate safe vehicle turning and provide room for vertical transition to the roadway embankment. *Bassett Creek Valley Master Plan* alignment (left) and revised alignment (right).

figure 5.3
Channel meander and riparian wetland constructed in Minnehaha Creek near Cedar Avenue is comparable to the stream channel pattern and floodplain wetlands planned for the Bassett Creek Commons.

not possible today with the existing engineered stream banks. However, the combined width of the expanded riparian zone and parkway will require more land than is shown in the *BCV Master Plan*.

Although these modifications to the *BCV Master Plan* are likely to impact land-assembly strategies and infrastructure designs, the overall result benefits the BCV Master Plan concept and intent. These modifications have been supported consistently at public meetings and by public agency staff.

Environmental contamination

The presence of environmental contamination significantly impacts the design decisions, implementation schedule, and cost of a redevelopment project. The magnitude of its impact is largely dependent on the proposed future land use and the nature, extent, and magnitude of the contamination. As discussed in Section 2, the Commons has been a commercial and industrial area with restricted access and a documented history of widespread and variable environmental contamination. The redevelopment of this area into open space with virtually unrestricted access will require remediation of the site to meet more stringent criteria in order to be protective of human health and the environment.

Since the presence of environmental contamination can limit the future use of a property, it is appropriate to address contamination before or concurrent with redevelopment activities. The MPCA has land-use based rules that dictate acceptable concentrations and access controls for contamination at a site. These requirements can affect the design of the redevelopment project by requiring special handling or removal of contaminated media or creating infrastructure to be protective of human health and the environment. These constraints could result in adjustment of the approach to handling the physical attributes of the site (soil, groundwater, and surface water) during redevelopment, adjustment of the redevelopment design to include installation of special engineering controls (barriers and covers) to isolate contamination from the public, and possibly the implementation of institutional controls that limit future activity and use of the site.

Stream alignment

The preferred stream channel alignment in the Commons evolved through consideration of the following:

- physical site constraints
- public access to the open space
- public comments received
- likelihood of contaminated soils or debris
- stream hydraulic function

Physical site constraints include the presence of the Van White Memorial Boulevard stream crossing on the downstream end of the Commons and the Cedar Lake Road crossing on the upstream end. The north side of the current stream channel is bounded by industrial land use in the short term and a future roadway in the long term. An existing abandoned bridge at Irving Avenue will be removed. Less obvious site constraints include the site topography: a high ridge extends from Cedar Lake Road approximately 700 feet toward the east, which would make re-meandering the channel in this area very expensive. Similarly, high ground is present south of Girard Avenue and is known to contain lead-contaminated soils. Relatively low ground exists between the ridge and the hill, however, roughly between James Avenue and Hum-

boldt Avenue. This area was deemed to have the most potential and would require the least amount of earth moving to support channel re-meandering.

A large meander bend was included in this area in order to provide a large accessible space on the north side of the stream, which will serve as a public gathering space and an entrance to the Commons. The large meander will be complemented by smaller meanders to the west. An additional smaller meander will be incorporated a short distance upstream of Van White Memorial Boulevard in an area where the topography is relatively low.

The hydraulics and geomorphic characteristics of the preferred channel alignment were reviewed and determined to fall within acceptable ranges for maintenance of a stable channel that is able to convey flood flows.

Hydraulics

Utilizing the FEMA floodplain model, the hydraulics of the preferred stream alignment were compared with the existing channel. The preferred channel will be approximately 450 feet longer than the existing channel and will thus have a milder slope. While this would tend to reduce the flood carrying capacity of the channel, the enlarged floodway zone will provide an increased flow area and therefore compensate for any reduced efficiency of the new channel.

The proposed channel will also be more hydraulically stable than the existing channel. The floodway zone is designed to function as a natural stream floodplain and will flood in a one to two-year flood event. This "frequent flooding" of the overbanks will reduce velocities and erosive shear stress in the main channel, resulting in less channel erosion. Flow velocities in the floodplain will be lower than the main channel due to shallower depth and the presence of vegetation and will therefore be non-erosive as well.

The hydraulics will be affected to some degree by the presence of a proposed diversion weir to divert flow into the Greenway. The top-of-weir elevation is tentatively set at elevation 804.0 MSL (mean sea level) or about six feet above the existing channel bottom. It may be necessary to provide a sluice at the bottom of the weir in order to maintain sediment transport in the Bassett Creek channel during high flows and prevent upstream sediment accumulation. An automated sluice, to vary with flow elevations, would help to maintain the desired flood levels.

The diversion weir at the new tunnel outlet will divert flow north along the Greenway, and may impact groundwater-surface water interactions. The weir will effectively raise the normal level of Bassett Creek; this effect will extend approximately to Irving Avenue. The raised water level may result in the loss of stream water to the groundwater system, which would reduce potential migration of soil contaminants to the creek.

Geotechnical

Soil borings and test excavations have identified debris and other fill material with debris overlying soft peat and organic clay/silt to a depth of 15 to 37 feet below existing grade. Beneath the organic material, soft fat clay was encountered to depths ranging from 50 to 100 feet below existing grade. Underlying the fat clay, more substantial soils consisting of glacial

figure 5.4
Shingle Creek restoration at Zane Avenue and Brooklyn Boulevard, Brooklyn Park.
(photo by Dan Cornejo for Hennepin County)

clays and sands were encountered to the termination depths of the borings (typically ranging from 50 to 130 feet below existing grade). Limited information was available regarding the groundwater table, but it is assumed to be at an approximate elevation of 805, which is the same elevation as Bassett Creek in this area.

The following is a list of specific geotechnical concerns that will need to be considered as part of future design work:

1. Problems arising from fill placement, including:
   - Bearing capacity failure of the soft underlying soils due to large volume fill placement.
   - Long-term consolidation of the soft, underlying soils. The long term consolidation could take 10 to 50+ years to occur as a result of the significant quantity of fat and organic clay present at depth across the site. Additional measures, such as wick drains, could be implemented to expedite consolidation if long term settlement is a concern.
   - Potential slope failure if large quantities of fill are placed and/or moderately steep slopes are constructed.
2. Problems associated with soil removal (cut), including:
   - A combination bearing capacity and slope stability failure, depending on the geometry. This would need to be evaluated on a case-by-case basis.
3. Problems associated with foundation support of structures. The following information should be taken into consideration:
   - Shallow foundations should be avoided, if possible. In a limited number of cases, shallow foundations may be possible, but should be evaluated on a case-by-case basis and will likely need to meet the following requirements:
     - Foundation size is very small (i.e. spread footings four foot square or less and strip footings two feet wide or less).
     - Foundation bearing pressure is very low (i.e. less than 500-1000 psf).
     - Fill soils extend a minimum of 10 to 15 feet below existing grade and are deemed competent by a geotechnical engineer to support very lightly loaded foundations.
     - The owner understands and is willing to accept the risk of significant settlement occurring as a result of consolidation of soft soils at depth and/or compressibility of fill soils (i.e. settlement greater than one to two inches).
   - Deep foundations will likely be required for support of most structures. Based on the depth of competent soils (approximately 50 to 100 feet below existing grade), steel pipe piles are recommended for structural support. Additionally, due to the presence of soft compressible soils near the surface and at depth, the pile design will need to incorporate the effects of downdrag. The following types of structures will likely require a deep foundation system for support:
     - Buildings
     - Bridge abutments
     - Lamp posts or other isolated structures where settlement in excess of one inch is not tolerable

4. Problems associated with differential settlement. This is most commonly observed in areas where two elements with different foundation systems share an interface, such as the following:
    - The end of a bridge (supporting on piling) and the edge of a gravel or paved trail (supported on soil).
    - The edge of a stoop or slab associated with a building (structurally supported) and the edge of an adjacent slab, pavement, or gravel path (supported on soil).

5. The owner should be willing to accept the risk of differential settlement over time and should recognize the need for long-term maintenance.
    - To reduce the amount of long-term settlement (consolidation of soft subsurface soils), surcharging of areas for one to two years could be implemented. A slope stability analysis is recommended to evaluate the risk of slope failure from placement of the surcharge. Due to the fat clays at depth, wick drains will likely be required to accelerate drainage and consolidation of the soils.
    - In green areas, some settlement should be anticipated due to consolidation of the soft and organic soils at depth and compression of the overlying fill material. This is typically more pronounced in areas with fill and negligible in areas of cut. This settlement may be more of a concern in landscaped and mowed grassy areas and less of a concern in areas of native grasses requiring minimal maintenance and no mowing.

Slope Stability

Based on the proposed design for the Commons, there will be a large meander in the realignment of Bassett Creek. Along the east side of the meander, a hill was originally proposed in the assessed alternatives to incorporate an elevated view of downtown Minneapolis. A preliminary grading plan indicated that up to 10 additional feet of fill would be placed in the hill area. This would create a hill crest approximately 25 feet higher than the adjacent creek elevation. A general review of the Commons indicates that this area is the most critical section in terms of slope stability, and that 10 feet of additional fill would not be feasible.

The slope stability analysis was conducted using a computer modeling program, SLOPE/W (GEO-SLOPE International, Ltd.). SLOPE/W uses the limit equilibrium theory to compute a factor of safety on earth and rock slopes. It is capable of using a wide variety of methods to compute the factor of safety of a slope while analyzing complex geometry, stratigraphy, and loading conditions. The limit equilibrium method is usually carried out by establishing a grid and factors of safety are computed for concentric arcs at each point in the grid. When finished, the lowest overall factor of safety is reported (i.e. worst case scenario). The arc corresponding to this factor of safety is commonly referred to as the potential failure surface.

The existing conditions were modeled to get an estimate of the slope factor of safety prior to any cut or fill work. If a factor of safety is determined to be below 1.0 for the existing case, and no evidence of failure is observed in field, there are discrepancies between the actual field conditions and assumptions for geotechnical parameters, groundwater conditions,

geometry, or modeling technique. If the factors of safety indicate adequate stability, more confidence can be expressed in the model and its outputs.

The results of the slope stability analysis in the existing conditions (i.e. no cut for new Bassett Creek alignment and no fill for proposed "hill") indicate that the slope is stable with a factor of safety of 1.7. A factor of safety of greater than 1.5 is desirable for the long term stability of slopes. This is evidenced by field observations that no signs of slope failure are currently occurring in this area.

Proposed conditions that include re-grading the existing hill to provide a 5H:1V slope with a height increase of 10 feet, plus an eight foot cut at the base of the hill for the new creek alignment were modeled. The resulting factor of safety was found to be 1.0 in the undrained or short-term condition. This value is near the critical state for the slope, indicating that failure is imminent and the proposed slope geometry is unsafe. Typically, a factor of safety of at least 1.3 is recommended for slope design in the undrained condition.

Based on the near critical conditions that could occur given the originally proposed 10 feet of fill, a modified geometry was incorporated, consisting of all components of the proposed slope geometry but with no additional fill placed on top of the hill. Given the modifications to the proposed slope geometry, the resulting factor of safety was found to be 1.3 in the undrained or short-term condition. Given this factor of safety, the modified version of the proposed geometry should be sufficiently stable based on the available geotechnical information.

All of the proposed conditions analyses considered the placement of two to four feet of clean fill across the entire site. In the stream corridor, all excavations will include four feet of over-excavation and placement of four feet of clean fill to ensure proper separation.

The above analysis and recommendations are meant to provide a preliminary geotechnical assessment of the site based on the limited information available at the time of the development of this plan. Once final designs have been prepared, it is recommended that a geotechnical investigation and slope stability analysis be completed to more thoroughly evaluate the site and to develop a clearer understanding of the geotechnical limitations of the proposed construction.

Habitat/ecology

The preferred design for the Commons includes four main types of vegetation communities: cultivated turf in high use areas, a riparian corridor within the Bassett Creek floodway, prairie and savanna plantings over a vast majority of the site's interior, and woodlands along the southern edge of the Commons. The palette of plant communities and their layout stem from design strategies that included:

- limiting the size of areas that require high levels of ongoing maintenance,
- providing clear definition between restored plant communities and turf areas,
- incorporating plant communities that are appropriate to the area and specific site conditions,
- creating habitat,
- providing a range of outdoor opportunities for the immediate neighborhood,
- and complementing the types of surrounding active and passive open spaces.

Native plant communities

The Commons will be converted to native plant communities as part of each phase of the project implementation. As excavation of contaminated soils and debris, remediation of hot spots (if required), stream channel formation, and final grading are completed, the final step will be establishment of the native vegetation. The Commons will comprise two major plant communities – the stream riparian buffer and the upland prairie. The overall process will be similar for both areas: the weed seeds will be allowed to germinate for two to three weeks, the site will be treated with a herbicide to eliminate the weeds, and the soil will be prepared for seeding and planting of plants—plugs for grasses, sedges, and forbs followed by tree and shrub plantings. All native vegetation areas will have five years of establishment period maintenance to ensure that a high quality, weed-free plant community is established.

The riparian corridor will be re-vegetated in conjunction with the stream restoration activities to recreate an open floodplain forest community. Floodplain forest tree layer will include basswood, bur oak, swamp white oak, hackberry, black ash, black walnut, and silver maple. The canopy planting will be developed so that the final forest (in 20 years) is an interrupted to continuous (50–100%) cover of trees. Floodplain forest ground-layer cover is generally very sparse, but initial plantings will be designed to provide a more continuous ground cover. Climbing plants and vines are important in the floodplain forest and the shrub layer will be sparse. The groundlayer will be seeded and planted with a woodland edge mixture of forbs, grasses, and sedges. Within the riparian corridor, a small wetland will be constructed on the interior of the west meander. The wetland will be designed to flood during high creek flows and remain a wetland pool during other months of the year. Site characterization results obtained during Phase II Investigations may dictate that the wetland will need to be lined to prevent interaction with contaminants in the deeper soils. The wetland will be planted in an emergent marsh community. These sites are typically dominated by cattails after 5 – 10 years.

The upland areas of the Commons will be planted in a prairie-savanna plant community. Prairies typically have 0% to 10% tree cover, while savannas are less open with 10% to 25% tree cover spread among patches or groves of trees. Bur oak will be the most common tree planted along with northern pin oak, red oak and black cherry. Chokecherry, hazelnut, gray dogwood, and juneberries will be the predominant shrubs planted. All savannas and prairies are highly sensitive to fire suppression, quickly succeeding to woodland and eventually to forest in the absence of fire. The presence of woodland tree seedlings and saplings in savannas today reflects reduced fire frequency due to fire suppression, so prescribed burning will be a key component of the long-term management plan.

Open space uses

The preferred design shows the Commons as a public open space similar to a community park designation by the Minneapolis Park and Recreation Board. Typical uses within the Commons are passive and low-intensity and include walking, running, or biking on designated pathways; kayaking or canoeing on the creek itself; nature watching and interpretive programs; and small gatherings and informal ball games on the lawn. Uses that require dedicated athletic fields

figure 5.5
Prairie planting near Brownie Lake, Minneapolis, MN.
(photo: Metropolitan Design Center, University of MN)

figure 5.6
Small-scale native prairie planting in Mattocks Park, St. Paul.
(photo: Metropolitan Design Center, University of MN)

figure 5.7
Walking and biking paths figure prominently in the preferred design, including a connection of the Luce Line Regional Trail to Van White Memorial Boulevard and numerous biking and walking trails.
(photo *Bassett Creek Valley Master Plan*, 2006)

and lighting are not part of the preferred design. The *BCV Master Plan* and subsequent public input have strongly supported such a passive open space. Furthermore, given the contaminated soils, debris, and extremely poor sub-soil conditions, the construction and maintenance of structures typical of more intensively-used parks, such as shelters or even light pole bases, would be cost-prohibitive.

Ownership

Public ownership is key to the successful implementation and stewardship of the Commons. The policies, resources and oversight of public agencies such as the Minneapolis Park and Recreation Board and the City of Minneapolis will ensure that the Commons remains an integrated part of the world-class open space systems of the Twin Cities.

Nevertheless, partnerships will be a critical component in both the realization and the continued operation of the Commons. In assembling the necessary land and relocating existing uses, other public agencies such as the Hennepin Community Works, City of Minneapolis Department of Public Works and the Minneapolis Public School District will play critical roles. Discussions among major landowners should begin as soon as possible.

Private or non-profit partners could contribute to the operation of the Commons. Private developers, neighborhood associations, and park conservancies all could help support the completed Commons in ways ranging from volunteer clean-up to sponsored improvements and major capital campaigns.

Maintenance considerations

The Commons' preferred design makes extensive use of native plant communities to provide wildlife habitat, reduce potential soil contamination contact issues, and reduce overall maintenance costs. The MPCA has participated in and advised the design process with regard to addressing contamination and potential health issues. Their direction has been that the use of native vegetation on the site will allow the depth of clean cover to be two feet, whereas on the turf areas of the Commons, four feet of clean cover is required to provide separation of users from the underlying contaminated soils. All other open space and use elements have been designed to provide access to and through the site but in a manner that minimizes the maintenance costs.

The use of extensive areas of native vegetation is designed to reduce maintenance costs. In a traditional park-like open space landscape that is primarily turf grass, the frequency and intensity of mowing, sod-maintenance, weed and compaction control, and plantings replacement initially keeps costs in the same general area as the new native landscape. However, after about five years, the stresses of use, shrub and tree mortality, and other aging syndromes of a non-renewable landscape result in greater maintenance costs than for sustainable landscapes. In a new native landscape, the first four to five years are fairly intensive because a balance is being established between the native and non-native plants. After approximately five years, the natural system begins to depend upon its own internal self-renewing capacities, needing only the addition of increased species richness in areas where annual monitoring dictates.

The first five full growing seasons after installation are crucial to the establishment of the native landscape. The native species are intended to reproduce and fend for themselves in a habitat designed to suit them. The landscape must look planned and well-cared for. So, while the landscape is lower maintenance, it is still not a "no maintenance" landscape. Responding properly to these concerns requires close monitoring and attention to early developments so that suitable management is prescribed and administered. Key elements of maintenance success include flexibility of approach, knowledge of native plant communities, and training in management techniques.

The native landscape installation and maintenance is, over the long-run, less expensive than traditional turf-based open space landscape. Native landscape has natural diversity that enables seasonal renewal and expansion by seed and rhizome, which is essentially an internal repair system. As the initial implementation and establishment programs phase out, the only significant management expense is annual burning. The most significant "downside" of a native landscape is that it cannot achieve the "instant look" characteristic of a newly installed traditional landscape.

After the five-year establishment period, the development of native landscapes should be well underway, with monitoring and controlled burns being the principle expenses. There will still be a need for some species enhancement and client contact.

Rainwater management systems

The soil conditions in the Commons—contamination and geotechnical conditions—that exist on most of the site preclude the use of infiltration or large structural manhole systems for stormwater treatment. The preferred location of the restored creek leaves little room for treatment of many areas draining from the north, except in the areas east and west of Irving Avenue within the Great Lawn. Two locations within the Commons provide adequate room for the creation of filtration basins. These basins will cleanse stormwater via lined filtration basins with underdrain tile systems. Runoff from the areas south of Second Avenue North can be directed to these locations for treatment.

The establishment of native vegetation across nearly all of the Commons will effectively eliminate runoff from the area currently occupied by the impound lot. The native plant communities on the upland areas, in conjunction with the riparian corridor vegetation, will effectively cleanse runoff occurring from large rain events. All impervious surfaces within the Commons except the bridge crossings will drain to pervious areas.

Input from stakeholder meetings

The preferred design was extensively discussed and modified based upon input from the technical advisory committee during the design refinement process. The preferred design was presented for feedback and comment at a public meeting on June 5, 2007. Comments made on the plan by ROC and community members present at the meeting was positive.

Cost of construction

Construction costs were estimated for the Commons based upon a phased approach for implementation. The construction costs are detailed in Appendix B and the phasing is discussed in Section 10 of this report.

As discussed previously, the bulk of the costs associated with construction of the Commons project

are directly related to managing contaminated soil and debris during redevelopment. The construction cost estimates were prepared using a cost bracketing approach. Cost estimates are contingent on volume of contaminated soil and debris present, and these volumes are not yet completely defined. The costs consider three levels of effort (and costs) associated with soil and debris disposal.

Conceptual Cost Estimate Commons	Total Cost 2007 Dollars	Total Cost[1] Adjusted for Inflation
No Hazardous Soil	$ 10,900,000	$ 13,300,000
15% Hazardous Soil	$ 16,900,000	$ 20,600,000
30% Hazardous Soil	$ 22,200,000	$ 27,000,000

[1] Total cost adjusted for inflation was calculated using a 3% inflation rate and assuming a phased project schedule with a two-year construction schedule for each reach.

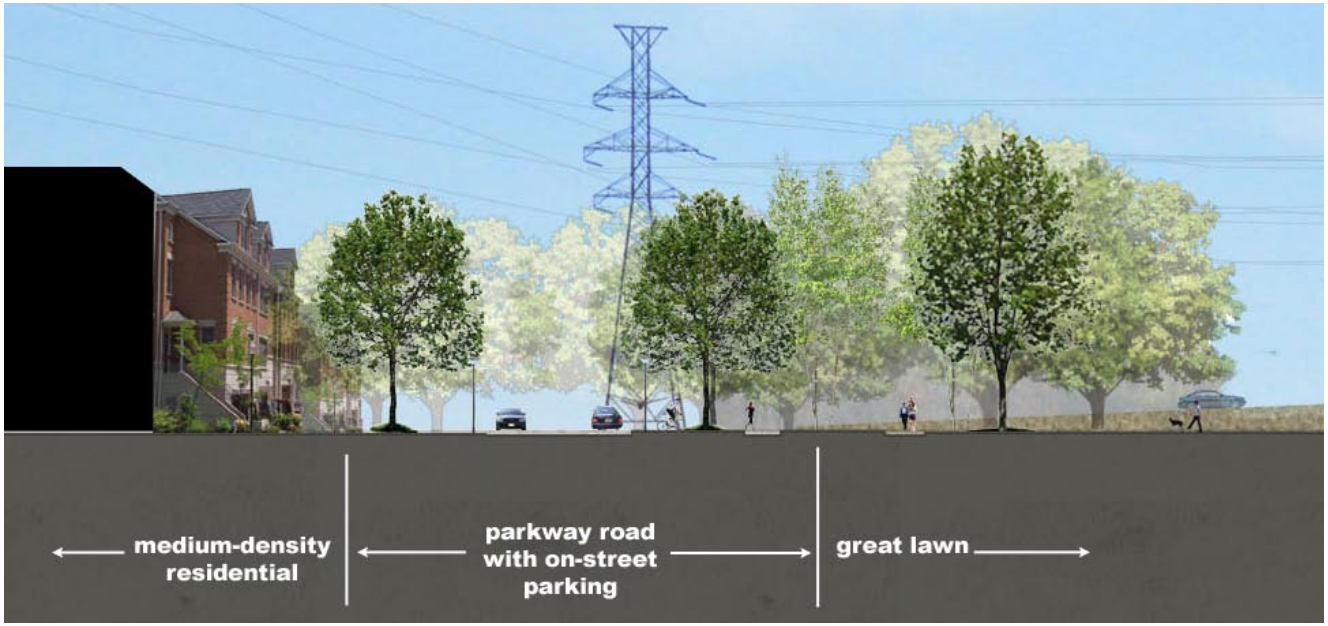
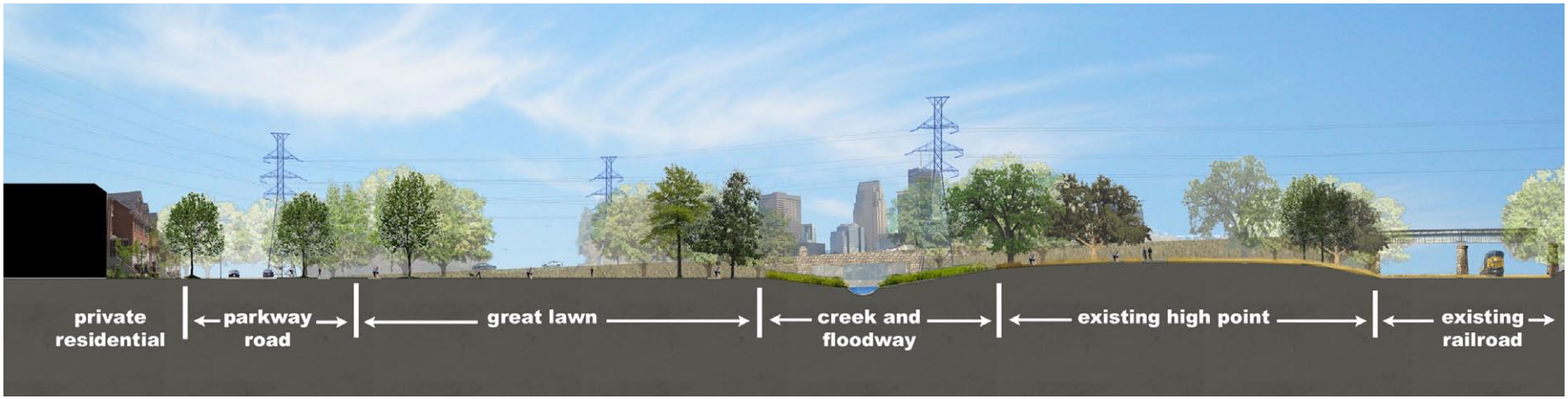


figure 6.0
Most of the north edge of the Commons is defined by a parkway-like road. As is typical of parkways in Minneapolis, this road features a generous boulevard with street trees, walking and biking paths, and on-street parking. On-street parking would accommodate the parking needs of park users.



6. Bassett Creek Commons Implementation

Design guidelines

The illustrative plan for the Commons (figure 5.0) captures a general vision meant to be flexible through design and implementation. However, even as the final design will need to respond to such variables as soil contamination, funding availability, and parcel assembly opportunities, there are several design goals or elements that will be key to realizing the intent of the plan. Design guidelines for the Commons should:

- extend public access
- ensure public road access from north and east
- connect to neighborhood streets, parks, and regional trails
- create clear entrance areas
- adhere to principles of Crime Prevention Through Environmental Design (CPTED)
- restore true creek function
- create a 100-year floodway
- allow for dynamic riparian edges
- create a variety of passive recreation opportunities
- create internal trail loops
- focus most active uses on lawn north of creek
- open and preserve views to creek, neighborhood, and downtown
- create interpretive and learning opportunities
- manage stormwater quality
- create visible management elements in active use areas
- promote integration with upstream management
- minimize excavation of contaminated materials and debris
- test soils and debris and adjust the plan in response
- consolidate contamination where possible and construct engineered barriers
- design for sustainable maintenance needs
- minimize input needs in active use areas
- create extensive naturalized areas
- implement any required institutional controls due to the presence of contamination

Institutional roles—ownership and maintenance

Currently, the proposed Commons area is largely owned by the City of Minneapolis and operated as an automobile impound lot by the Minneapolis Public Works Department. Upon converting parts of the impound lot to open space, the City of Minneapolis will—at least initially—continue to control the property. Management and maintenance of the open space is anticipated initially to be the responsibility of the City. Even though the Minneapolis Park and Recreation Board acknowledges that small area plans like the *BCV Master Plan* may contain recommendations for parks and open space in the city, such plans do not authorize transfer of ownership or provide funding. While this plan will be key to creating future park development in these areas, further negotiation among public agencies will be needed to determine final ownership as well as funding for capital and operations responsibilities within the Commons.

Estimated maintenance costs are identified to the

figure 6.1
Implementation of the Commons could be broken into a series of manageable phases.

degree possible to provide a basis for such discussions. Alternative funding schemes may need to be investigated to properly fund the open space if public funding cannot meet the anticipated costs. Park conservancies or other not-for-profit entities may provide alternative strategies to fund open space maintenance activities.

Permitting considerations

Permitting activities related to stream construction work will require cooperation and close communication with the US Army Corps of Engineers, the Minnesota Department of Natural Resources, the Bassett Creek Water Management Commission, and the City of Minneapolis during the design development phases. As the Commons design moves into the implementation phase, it will be important to keep permitting agencies involved in all design discussions to ensure that project designs can be permitted by these agencies.

Phased approach to construction

The sheer size of the project implementation requires segmentation of work into phases. The phasing approach breaks the work into a series of manageable cost bundles for budgeting, allows sections of the new stream to be constructed off-line, and allows public access to some areas of the Commons early in the implementation. The overall Commons implementation budget is estimated to be between $13,300,000 and $27,000,000, depending upon the levels of soil contamination and debris encountered (see summary tables 6-1 and 6-2). Phasing recommendations were designed to create smaller project areas with costs that could be funded, and built, over a two-year cycle. Appendix B sets forth detailed budgets and a proposed implementation timeline for each of the implementation phases. The phasing costs incorporate an inflation factor of 3% per year, calculated based upon the proposed construction schedule.

The first phase of the Commons, Phase C1A, provides immediate public access to the western end of the Commons on current MPRB property and utilizes one of the two high points in the Commons. This phase allows for easy public access to Cedar Lake Road and is the segment with minimum reworking of the stream channel. Phases C2A and C2B involve major alterations to the stream channel. This work will benefit from being constructed off-line from the creek flow, allowing excavation and channel construction to be completed without direct impacts upon the creek. Additionally, these segments of the creek and riparian buffer can be allowed to stabilize before creek flow is introduced and the existing channel is filled. Phase C3 will require extensive work in the creek and also has the greatest amount of upland work.

Cost estimates and construction schedule for project

The redevelopment project and realignment of the creek will be completed in several phases; however, for the purposes of estimating, we have assumed that one Phase I Assessment and one Phase II Investigation can be completed for the project area as a whole prior to implementation of the redevelopment activities. This assumes concurrent access to all properties within the project area. Completing these tasks in one phase provides a cost savings by eliminating repetition of tasks and reports. For this reason, we have estimated the cost to include the entire project area. As the redevelopment schedule is more fully defined,

it may become apparent that the Phase I Assessment and Phase II Investigation will need to be completed in phases according to the availability of portions of the project area for investigation. Segmenting the work into several Phase I Assessments and Phase II Investigations will increase the cost of the work. If segmenting the work becomes necessary, new cost estimates will need to be compiled.

1. Investigations and Assessments

The limited geotechnical information currently available was collected throughout the past 25+ years at the site. During this period of time, the site conditions may have changed such that the soil borings are not an accurate representation of the subsurface profile. During the final design of the project, soil borings should be completed and a geotechnical analysis completed.

Previous investigations at the Commons have identified a variety of contaminants and fill material. Investigations have included placing a number of borings and wells; test excavations; and collecting and analyzing soil, sediment, groundwater, and surface water samples. Since the site has been used as an unpermitted dump, it is possible that fill material and contamination may vary widely across the site. Therefore, a Phase II Investigation should be performed along the proposed stream alignment to better characterize areas that will be excavated during redevelopment. Based upon the known presence of demolition debris, an appropriate Phase II Investigation would include completing several test excavations along the construction alignment and collecting select analytical samples. This is also an appropriate method for investigating the Greenway. The scope and cost of the investigation can be generally estimated; however, until a final stream alignment is completed and the final scope of the work is approved by the MPCA, the final scope and cost of the investigation cannot be definitively set.

The estimated cost range for a Phase II Investigation of the Commons and the Greenway (calculated using 2007 rates) is listed in the table below. These costs include up to 25 test pits excavated to five to 15 feet below grade. Soils and debris encountered will be logged and screened for field evidence of contamination, and debris will also be inspected for potential asbestos-containing material (ACM). Soil and debris analytical samples will be selected based on the field screening results and submitted to a laboratory for analysis. The detailed list of assumptions for the Phase II Investigation cost estimate is provided in Appendix C. The costs include preparation of a work plan and investigation results report as well as coordination with the MPCA for approval of plans and reports.

Phase II Environmental Investigation	
Tasks	**Cost Range (2007 Rates)**
Labor & Expenses	$35,000 - $42,000
Excavation Subcontractor	$10,000 - $12,000
Laboratory Analytical	$14,000 - $17,000
Total:	$59,000 - $71,000

Prior to the Phase II Investigation, a current Phase I Assessment should also be compiled for the entire project area in order to refine the scope of the investigation and identify any additional data gaps that may need to be investigated prior to redevelopment. This is also a requirement of the VIC Program. It is possible that the results of the Phase I Assessment may alter

the scope of the Phase II Investigation. The costs of a Phase I Assessment (at 2007 rates) could range from $29,000 - $37,000. This cost range is dependent upon the rates used and the assumptions listed in Appendix C.

The Phase II Investigation is targeted toward assessing the areas that will be excavated as part of the redevelopment. It is possible that additional investigation would be required by the MPCA outside of the excavation limits, since the land use of the entire site is changing. The need for additional investigation may also be determined during the Phase I Assessment process if data gaps are identified. Additionally, the necessity for groundwater and surface water sampling may need to be assessed. The scope and cost associated with additional investigation has not been estimated.

2. Excavation and soil disposal costs

i. Response Action Plan, Emission Control Plan, and Construction Contingency Plan costs

Contaminated soil and debris material in the Commons will need to be managed during the redevelopment in a manner that is protective of human health and the environment and in accordance with the MPCA's Voluntary Investigation Cleanup (VIC) Program requirements. Once the Phase I Assessment(s) and Phase II Investigation(s) have been completed, the next step under the VIC Program is to develop a Response Action Plan (RAP) to address identified contamination at the site. The RAP will need to describe the methods for identifying, handling, and managing known impacted soil and debris encountered during the redevelopment construction. The RAP will also include instructions for addressing onsite contamination outside of construction limits, which are also required based on the future land use.

The scope of the RAP will need to be closely linked to the redevelopment activities, and the details will need to be negotiated with and approved by the MPCA prior to implementation. Included in the RAP will be a Construction Contingency Plan (CCP) that will outline construction and management practices for handling and managing unexpected contamination encountered during the RAP implementation and site redevelopment. An Emission Control Plan (ECP) will also be compiled as part of the RAP to address the potential risks associated with potential ACM that may be encountered when excavating buried dump material. The cost to develop and negotiate appropriate response actions and compile the RAP, CCP, and ECP will likely range from $40,000 to $45,000, based on 2007 fee schedules. Both the Commons and the Greenway will be included in the RAP, CCP, and ECP.

ii. RAP Implementation Costs

As described in the preceding sections, the Commons development will be implemented in four phases and the Greenway will be implemented in three phases. Based on the current design, each phase will require excavation of the stream channel and floodway to the required specifications as well as management of the excavated material. For the purpose of estimating RAP implementation costs, several assumptions have been made. The geotechnical limitations of the underlying soils limit onsite materials management; therefore, the first assumption is that all excavated material must be disposed offsite. Since the contaminants of concern at the site are not easily detected by field screening methods, the general approach for management of excavated material will be to assume that all soil and debris is contaminated until analytical

tests prove otherwise. Therefore, all excavated material will be temporarily stockpiled onsite to allow for laboratory sampling and subsequent offsite disposal. The disposal location will be determined based on the laboratory sampling results.

It is assumed that an engineered barrier consisting of four feet of soil will be constructed in public use areas and within the stream channel and floodway, and an engineered barrier consisting of two feet of soil with a vegetated cover will be constructed across the balance of the project area. These are assumptions that can be revisited once negotiations with the MPCA around the scope of the RAP begin and additional information is gathered during the proposed Phase II Investigation(s).
The estimated cost range for implementing the RAP in the Commons and the Greenway was calculated using 2007 costs and developed based on the general assumptions described above and specific assumptions listed in Appendix B.

Three cost estimates were calculated based on the broad assumption of the level of contamination that may be encountered:

RAP Implementation Costs	
all excavated material is contaminated but non-hazardous	$10,200,000
all excavated material is contaminated with 15% qualifying as characteristically hazardous	$18,900,000
all excavated material is contaminated with 30% qualifying as characteristically hazardous	$27,300,000

These are preliminary estimates and include excavation of material, creation of stockpiles, loading and hauling of stockpiled material to the landfill, disposal of material, import and placement of clean fill to construct engineered barriers across the site, engineering oversight, sampling and laboratory analysis, and reporting for each of the seven phases of implementation. A detailed breakdown of these costs is provided in Appendix B. Cost savings could be achieved by managing material onsite or by reducing the volume of clean cover import soil brought onsite. The RAP implementation costs are driven by the volume of material excavated and the contaminant concentrations of the excavated material. These cost estimates should be revised following completion of the Phase I Assessment(s) and Phase II Investigation(s) and after key uncertainties, such as the level of soil contamination and type and quantity of buried debris located on site, are more clearly defined.

3. Stormwater conveyance and treatment system costs
The stormwater treatment and conveyance systems for the Commons include changes to the storm sewer system to redirect stormwater from the Girard Avenue system to treatment areas adjacent to the Great Lawn. Rainwater treatment on this site is proposed to be lined filtration basins – rain water garden-type systems with drain tiles. The potential for soil contamination will require that treated stormwater not be allowed to infiltrate.

Estimated costs for stormwater treatment in the Commons are $165,000.

4. Stream channel construction and shoreland stabilization costs
The stream reconfiguration and floodplain development for the Commons will include construction of a new channel configuration, over excavation of

contaminated soils and replacement with clean soil, installation of bioengineered stream channel protection, and establishment of riparian vegetation in the floodway. Costs for the stream are independent of the soil remediation costs.
Costs specific to the stream restoration and riparian corridor plant communities are detailed in the table below and also in Appendix B.

5. Recreation and park feature costs
The recreation and park features for the Commons are designed to provide access through the area and to the connecting regional trail systems as well as to provide opportunities for park users to enjoy the natural areas and restored stream. Costs for the recreation features are not impacted by the soil remediation costs, as all associated work will be completed prior to and independent of work on open space features.

The open space and recreation features in the Commons will include bridge crossings of the creek, an internal trail system that connects to the regional Luce Line Trail and neighborhoods, an informal turf gathering area on the north side of the creek, overlooks, and a learning terrace that provides access to the creek. Most of the Commons will be planted in native prairie and savanna, with riparian forest in the floodplain and native wetland vegetation in the floodway wetland.

Costs specific to the recreation and park features is detailed in the table below and also in Appendix B.

6. Vegetation and native habitat establishment costs (including establishment period maintenance)
The vegetation for most of the Commons is native vegetation composed primarily of prairie and savanna species. The Great Lawn is the only large expanse of turf grass within the Commons. The native vegetation establishment costs are detailed by phase in the table below and in Appendix B. The costs provided here do not include engineering and design or inflationary adjustments. Both of these fixed costs are included in the overall costs estimates but as these costs are relatively small, they have been omitted here.

Long-term maintenance costs

Long-term maintenance costs are an important consideration, as over time these costs can exceed the capital costs of an open space system. Long-term maintenance considerations were a key factor in the design development process. Estimated annual maintenance costs for the Commons are provided below and further detailed in Appendix E.

Estimated Annual Maintenance Costs* Bassett Creek Commons	
Phase C1A	$27,500
Phase C2A	$35,000
Phase C2B	$87,500
Phase C3	$70,100
Total annual	**$220,100**

* Annual costs are shown in 2007 dollars.

Institutional Controls

Institutional controls will be placed on the property to ensure that the environmental response actions completed on the Commons continue to be protective

of human health and the environment. Institutional controls may involve restrictive covenants that will be filed with the County to document the remaining areas of impacted media (the restricted area). The institutional controls may also include provisions for long-term maintenance of the engineered barriers and document additional MPCA requirements and involvement for planning appropriate safety and soil management measures if excavation is required into the restricted area at some point in the future.

Table 6-1
Bassett Creek Commons Implementation
Conceptual Cost Estimate
Excavation and Soil Disposal
Costs include soil excavation, remediation and disposal costs, laboratory costs, design fees and contingency.

Conceptual Cost Estimate	Soil Excavation & Remediation Costs	Laboratory and Consultant Costs	Subtotal 2007 Dollars	20% Contingency	10% Design Fees	Total Cost 2007 Dollars[2]	Total Cost[1] Adjusted for Inflation
No Hazardous Soil	$ 5,000,000	$ 580,000	$ 5,600,000	$ 1,100,000	$ 600,000	$ 7,300,000	$ 8,800,000
15% Hazardous Soil	$ 9,600,000	$ 710,000	$ 10,200,000	$ 2,000,000	$ 1,000,000	$ 13,300,000	$ 16,100,000
30% Hazardous Soil	$ 13,700,000	$ 730,000	$ 14,300,000	$ 2,900,000	$ 1,400,000	$ 18,600,000	$ 22,500,000

Conceptual Cost Estimate by Phase								**Implementation Year**
No Hazardous Soil								
Reach C1A	$ 1,100,000	$ 112,000	$ 1,200,000	$ 240,000	$ 120,000	$ 1,600,000	$ 1,700,000	2008
Reach C2A	$ 1,000,000	$ 118,000	$ 1,100,000	$ 220,000	$ 110,000	$ 1,400,000	$ 1,600,000	2012
Reach C2B	$ 1,400,000	$ 179,000	$ 1,600,000	$ 320,000	$ 160,000	$ 2,100,000	$ 2,600,000	2014
Reach C3	$ 1,500,000	$ 175,000	$ 1,700,000	$ 340,000	$ 170,000	$ 2,200,000	$ 2,900,000	2016
15% Hazardous Soil								
Reach C1A	$ 2,100,000	$ 135,000	$ 2,200,000	$ 440,000	$ 220,000	$ 2,900,000	$ 3,000,000	2008
Reach C2A	$ 2,000,000	$ 143,000	$ 2,100,000	$ 420,000	$ 210,000	$ 2,700,000	$ 3,200,000	2012
Reach C2B	$ 2,700,000	$ 216,000	$ 2,900,000	$ 580,000	$ 290,000	$ 3,800,000	$ 4,700,000	2014
Reach C3	$ 2,800,000	$ 212,000	$ 3,000,000	$ 600,000	$ 300,000	$ 3,900,000	$ 5,200,000	2016
30% Hazardous Soil								
Reach C1A	$ 3,300,000	$ 140,000	$ 3,400,000	$ 680,000	$ 340,000	$ 4,400,000	$ 4,600,000	2008
Reach C2A	$ 2,600,000	$ 148,000	$ 2,700,000	$ 540,000	$ 270,000	$ 3,500,000	$ 4,100,000	2012
Reach C2B	$ 3,700,000	$ 224,000	$ 3,900,000	$ 780,000	$ 390,000	$ 5,100,000	$ 6,400,000	2014
Reach C3	$ 4,100,000	$ 219,000	$ 4,300,000	$ 860,000	$ 430,000	$ 5,600,000	$ 7,400,000	2016

[1] Total cost adjusted for inflation was calculated using a 3% inflation rate and assuming a phased project schedule with a two-year construction schedule for each reach. The phased sequence order is: Reach C1A (2008), Reach C2A (2012), Reach C2B (2014) and Reach C3 (2016).

[2] Total cost figures may not exactly equal component costs due to rounding of cost estimates.

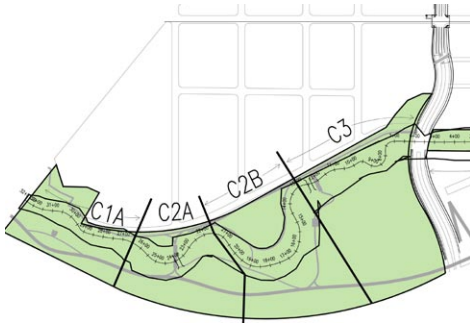


Table 6-2
Bassett Creek Commons Implementation
Conceptual Cost Estimate
Open Space/Recreation, Stream Corridor and Vegetation

Costs include open space features - pathways, lighting, pedestrian bridges, site furnishings, signage and plantings; stream channel includes streambank stabilization/restoration and plantings.

Conceptual Cost Estimate	Lineal Feet of Channel	Cost per Foot[2]	Stream Channel Restoration Costs[2]	Riparian Corridor Restoration Costs[3]	Open Space Recreation Costs	Subtotal 2007 Dollars	20% Contingency	10% Design Fees	Total Cost 2007 Dollars[4]	Total Cost[1] Adjusted for Inflation	
	2,650	---	$ 265,000	$ 169,400	$ 2,348,000	$ 2,800,000	$ 560,000	$ 280,000	$ 3,600,000	$ 4,500,000	
Conceptual Cost Estimate by Phase											**Implementation Year**
Reach C1A	600	$ 100	$ 60,000	$ 16,500	$ 453,000	$ 500,000	$ 100,000	$ 50,000	$ 650,000	$ 700,000	2008
Reach C2A	500	$ 100	$ 50,000	$ 79,700	$ 441,000	$ 600,000	$ 120,000	$ 60,000	$ 780,000	$ 900,000	2012
Reach C2B	850	$ 100	$ 85,000	$ 53,100	$ 776,000	$ 900,000	$ 180,000	$ 90,000	$ 1,170,000	$ 1,500,000	2014
Reach C3	700	$ 100	$ 70,000	$ 20,100	$ 678,000	$ 800,000	$ 160,000	$ 80,000	$ 1,040,000	$ 1,400,000	2016

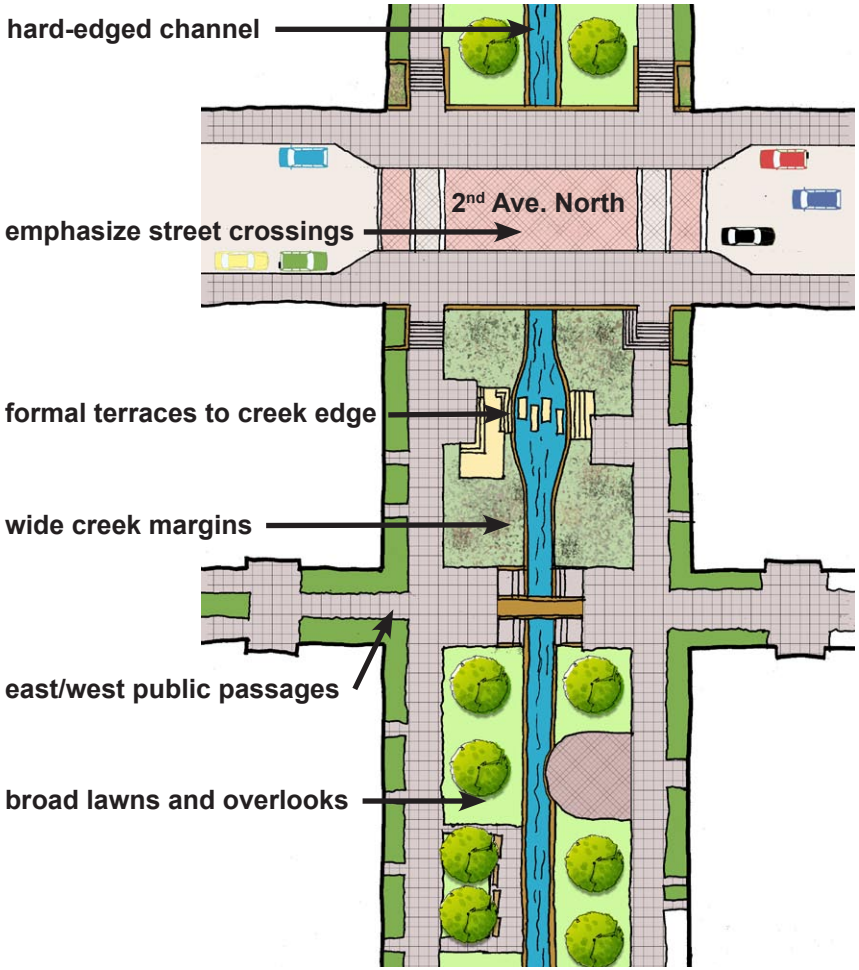
[1] Total cost adjusted for inflation was calculated using a 3% inflation rate and assuming a phased project schedule with a two-year construction schedule for each reach. The phased sequence order is: Reach C1A (2008), Reach C2A (2012), Reach C2B (2014) and Reach C3 (2016).

[2] Includes bank stabilization measures and bank plantings.

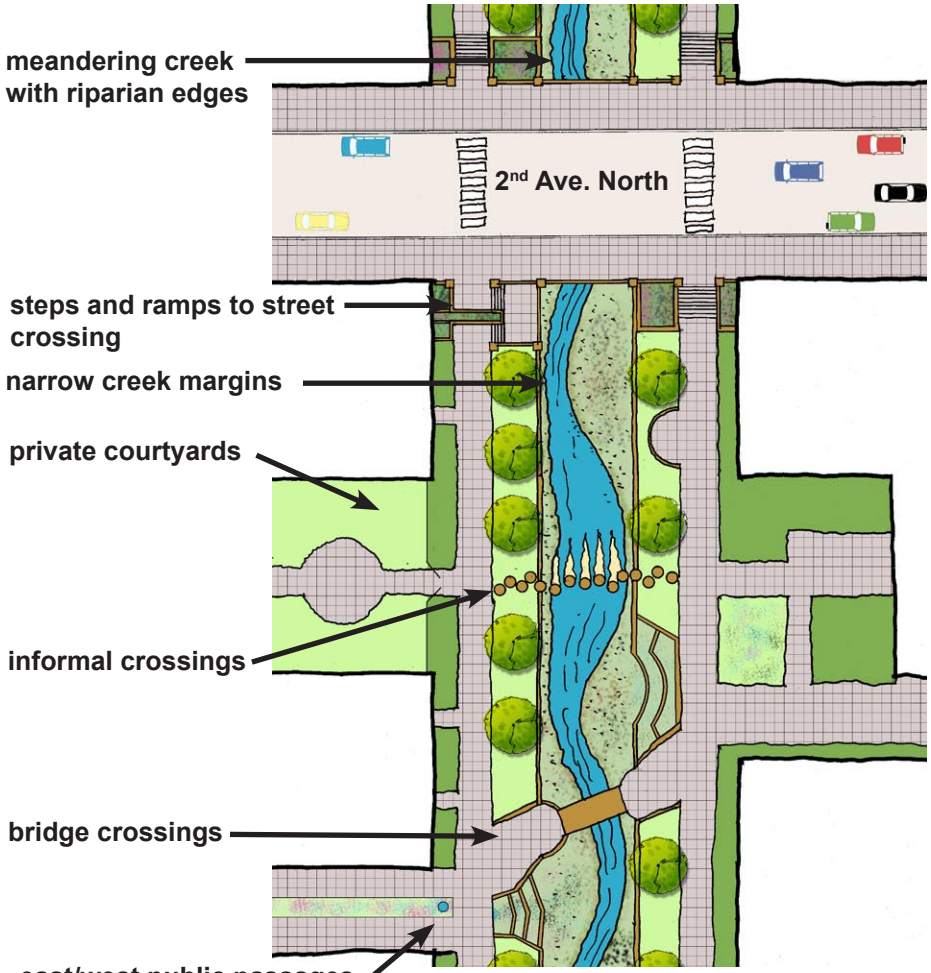
[3] Includes plant community restoration within the riparian (floodway) corridor of the natural stream channel in the Commons area; $6,500/acre plus five years of establishment maintenance - $1,500/ac/yr.

[4] Total cost figures may not exactly equal component costs due to rounding of cost estimates.

Greenway design alternatives



Urban Channel



Urban Meander

figure 7.0
Greenway design alternatives include a hard-sided urban channel (left) and a meandering creek and riparian vegetation contained within walls that define the 100-year floodway (right). Both alternatives highlight a variety of ways to cross and access the creek—bridges, stepping stones, turf and paved terraces, and overlooks. In addition to the public greenway space that includes the creek and landscaped spaces, the scenarios show how private land uses along the Greenway (mixed-use and residential) might engage and add to the Greenway through the use of private courtyards and east/west passages through or between structures.

7. Greenway Design Alternatives

Project goals and values

Several goals guided the creation and evaluation of design concepts for the Greenway. These goals mirror those described in the *BCV Master Plan*. Others were added or refined based on public input and conversations with various public entity staff.

- Support redevelopment goals envisioned in the *BCV Master Plan*
- Contribute to usable and attractive public spaces
- Connect to neighborhoods and existing public open-space systems
- Provide urban design guidelines for the public-private spaces
- Identify sustainable maintenance and operations practices

The areas surrounding the Greenway include land within two districts identified in the *BCV Master Plan* – Glenwood Avenue District and Van White District (figure 7.1). The Van White District is proposed to be an area of significant residential development connected to Van White Memorial Boulevard and office/housing mixed use to the east. Land uses along Glenwood Avenue are envisioned to be a vertical mix of uses including housing, office, and retail. The Bassett Creek Commons, together with the Greenway, create an open space amenity for future residential and commercial development. The Greenway is also envisioned in the plan as an opportunity to restore a portion of the historical alignment of Bassett Creek.

Stream corridor location, buffer widths, and stream configurations

Two stream channel configurations were assessed in the design alternatives – a relatively straight urban channel and a meandered stream channel. In all cases, the Greenway stream corridor design is required to convey 50 cubic feet of flood flow per second through the Greenway to the old Bassett Creek tunnel during a 100-year flood event. This flood conveyance requirement was a controlling factor for the channel and corridor configurations as well as the street crossing designs. Both configurations provide an urban stream setting that conveys the base flow of Bassett Creek (~5 – 10 cubic feet per second). Construction of a diversion weir at the new tunnel inlet will redirect stream flows north through the Greenway. The size of the inlet pipe to the old tunnel at the north end of the Greenway will control the flood flows. The height of the diversion weir at the old tunnel is limited by the resulting elevation changes in the creek during flood flows.

Rainwater management systems

The *BCV Master Plan* envisions the use of innovative approaches to stormwater infiltration and treatment that include rainwater gardens, pervious pavement, rooftop gardens, and native vegetation buffers. In addition, private redevelopment should be expected to treat and infiltrate up to a 10-year rainfall event on-site. The constraints placed on the Greenway design by underlying soil conditions, potential contamination, conveyance of flood flows, and topography limit the treatment of stormwater within

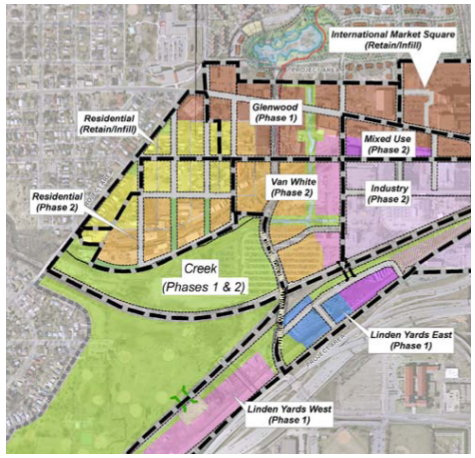


figure 7.1
The *BCV Master Plan* divided the Bassett Creek Valley into subdistricts.
(diagram *Bassett Creek Valley Master Plan*, 2006)

figure 7.2
Examples of urban creeks and greenways: Arhus River, Denmark (top); Lourdes Square, Minneapolis (middle); and Loring Greenway, Minneapolis (bottom).

the Greenway. As a result, upstream use of pervious pavement, rooftop gardens, and rainwater gardens will be necessary to provide a significant level of stormwater treatment within the districts immediately adjacent to the Greenway.

The potential for soil contamination will require that all stormwater treatment systems be designed to prevent both the infiltration of stormwater into the underlying soil and groundwater movement into stormwater treatment systems. All rainwater basins will need be lined with an impermeable layer overlain with filter media (soil) and use a underdrain tile system to move filtered stormwater to receiving waters. Filtration systems will provide adequate stormwater cleansing while prevent the mobilization or movement of contaminants from the soil.

Open space

Whereas the Commons is primarily a landscape of native plantings that accommodates passive and low-intensity uses, the Greenway will be an intensively used and managed landscape. As described above, the creek itself could take a variety of forms, two of which are illustrated in the alternatives. Narrowing the channel, as illustrated in the Urban Channel alternative, allows more space for landscape features such as terraces, lawns, and gardens. Alternatively, the Urban Meander illustrates how riparian vegetation can be a central feature of the Greenway. However, as the width of the creek channel increases, space for other uses such as lawns and terraces decreases.

The ways in which adjacent properties interface with the Greenway will also play a key role in its design. Private courtyards and terraces adjacent to the Greenway, as illustrated in the Urban Meander alternative, expand the amount of "green" within the Greenway, providing areas for additional activity to enliven the Greenway and a buffer between public and private spaces.

The Greenway alternatives illustrate a variety of ways in which the creek can be accessed both physically and visually. Formal bridge crossings and terraces provide a more accessible way to experience the creek while informal crossings of stepping stones provide access for children or the adventurous. See Figure 7.0 for a comparison of the two alternatives.

Streets and internal circulation

Public passages running east/west create "porous" blocks in both alternatives. These passages enhance access to the Greenway, creating a very public space that would not be possible if access to the Greenway was limited to the south end of the Greenway, 2nd Avenue N, and Glenwood Avenue. In addition to pedestrian access, these passages could potentially be used as areas for rainwater infiltration or access routes for public safety and service vehicles.

Mid-block street crossings at 2nd Avenue North are shown in both alternatives. Steps from the Greenway would provide access to the crossing. In the Urban Channel alternative, 2nd Avenue North is narrowed and distinct paving creates a plaza-like crossing. Striped crosswalks are included in the Urban Meander alternative.

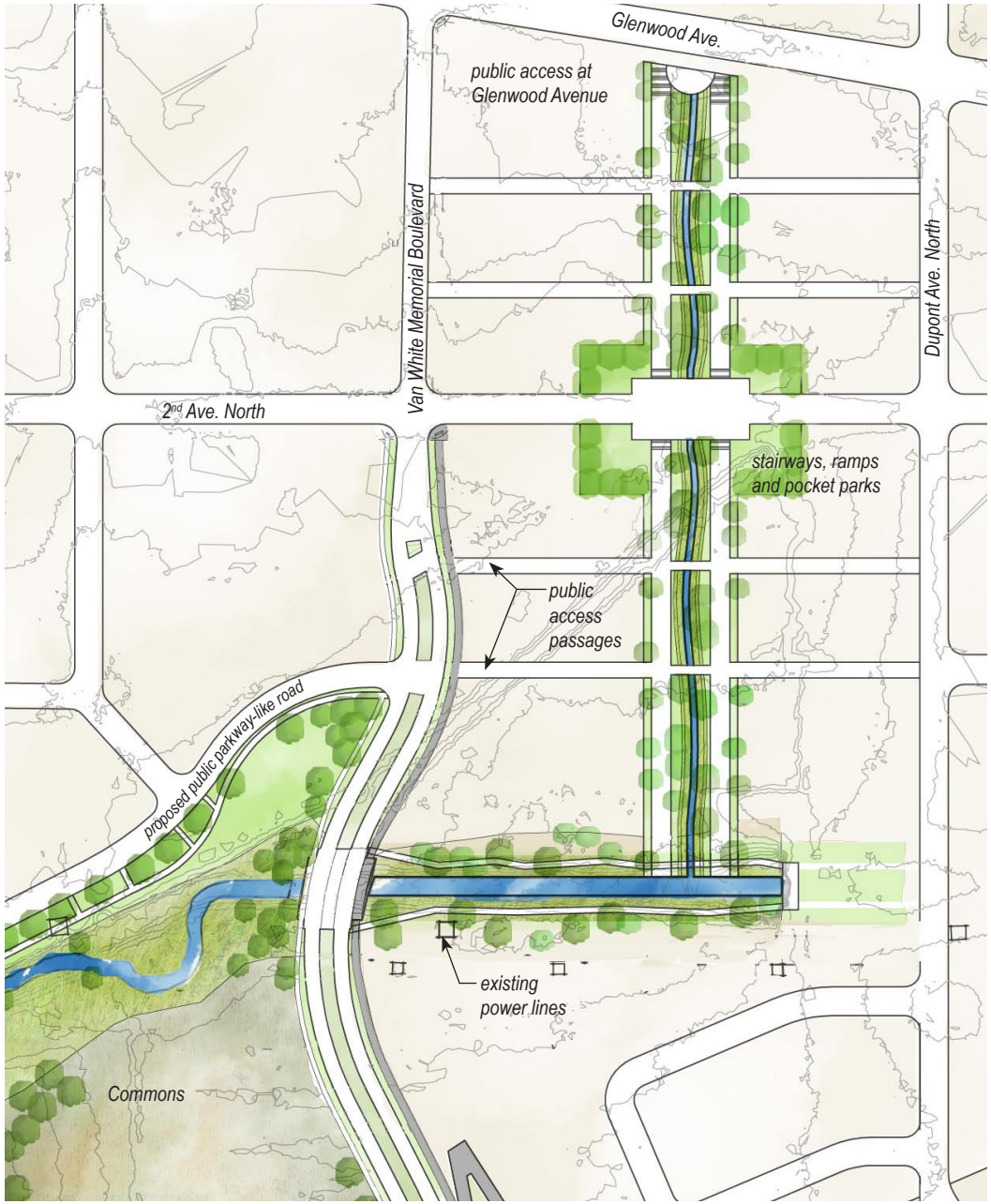


figure 8.0
The preferred design concept for the Greenway includes a gently meandering creek set within a 50' wide 100-year floodway. Buildings step back at 2nd Avenue North, creating space for steps and ramps as well as creating a very visible Greenway presence at the street level. Two east/west access passages on each block provide multiple pedestrian access points to the Greenway.

8. Greenway Preferred Design

Design criteria

The Greenway design alternatives were tested by the design team, public open house attendees, and the technical advisory committee based upon four criteria:

1. technical considerations
2. use patterns by residents and visitors
3. input from stakeholder meetings
4. cost of construction

Technical considerations impacting the Greenway design include environmental contamination, stream alignments, hydraulics, geotechnical issues, and ecological habitat considerations. Use patterns and ownership issues are also important considerations. Cost was not a major consideration when comparing the initial Greenway designs, as the differential was small between the two options. However, the overall cost of construction and the impact of those costs was considered in the development of the preferred design.

Environmental contamination

The Greenway has a long history of commercial and industrial use with restricted public access. As with the Commons, the Greenway and its vicinity also have a documented history of widespread and variable environmental contamination. The redevelopment of this area into passive park space with less restricted access will require meeting more stringent risk-based criteria in order to be protective of human health and the environment during implementation and after completion of redevelopment.

Since it has been established that the presence of environmental contamination can limit the future use of a property, it continues to be appropriate to address contamination before or concurrent with redevelopment activities. The regulations that dictate acceptable amounts and accessibility of contamination at a site based on the land use will have a similar effect on the Greenway redevelopment plan as on the Commons.

Stream Alignment

The stream channel alignment in the Greenway will be relatively straight, running south to north from Bassett Creek to the old stormwater tunnel near Glenwood Avenue (figure 8.0). The channel alignment will largely be defined by the width of the Greenway and the anticipated heavy public use of the corridor. The Greenway will be more urban in character than the Commons and will have more public amenities adjacent to the channel. The creek will occupy an approximately 50-foot wide corridor within the Greenway.

Hydraulics

The proposed Greenway will be designed to accommodate the agreement between the City of Minneapolis and the Bassett Creek Water Management Commission, which specifies that at least 50 cubic feet per second (cfs) must be diverted from Bassett Creek to the old tunnel during a 100-year flood event. Currently, this flow is conveyed through a swale on the east side of Van White Boulevard. It is assumed that conveyance through this swale would be relocated to the Greenway channel, and therefore the Greenway channel will accommodate 50 cfs of flow during a 100-year flood event. An inlet structure will be constructed at the north end of the Greenway which

figure 8.1
Examples of urban greenways from across the country were used to illustrate the variety of urban greenways types. This artist's rendering of Strawberry Creek in Berkeley, CA was often selected as representative of how many envisioned the completed Greenway should look.

will allow up to 50 cfs of inflow from the Greenway to the old tunnel during a 100-year flood event.

Flow will be diverted from Bassett Creek to the Greenway channel via a diversion weir located a short distance upstream of the new tunnel entrance (in the Bassett Creek channel). Because of the weir, the Greenway will have flowing water on a daily basis. It may be necessary to provide a sluice at the bottom of the weir in order to maintain sediment transport in the Bassett Creek channel during high flows, and prevent upstream sediment accumulation. A sluice would also help to maintain desired flood levels. The sluice would be automated and would vary with the flow elevation.

During a 100-year flood event, flow in the Greenway will reach an elevation of approximately 807.4, which is similar to the existing 100-year flood elevation. Flow in the Greenway channel would be a maximum of 5 feet deep, but velocities would be quite low.

The Greenway channel will be approximately 14 feet wide at the top of the banks and two feet deep. It will convey a normal base flow of five to ten cfs, which will occupy only the lower foot of channel depth. By comparison, typical Bassett Creek summer flows are on the order of 50 cfs. The slope of the Greenway channel will be sufficiently mild (approximately 0.0013 feet of drop per foot of channel length) to maintain low channel velocities. When Bassett Creek is flooding, flow in the Greenway will be restricted to 50 cfs, with average velocities under 0.5 feet per second (see Appendix F).

Geotechnical

The Greenway will consist of an urban park centered around Bassett Creek and surrounded by mixed-use development. The park will generally consist of concrete sidewalks and slabs extending from the nearby buildings to the vicinity of the proposed creek realignment. The creek itself may have a hard or soft bottom, with small pedestrian bridges, ponds, and wetland areas. The adjacent structures will likely be multi-story buildings, with retail at grade and condominiums or office space above.

Following is a list of geotechnical concerns that the designer should be aware of during construction of the Greenway (this does not include the adjacent buildings that are also part of this proposed redevelopment):

1. Construction timing. Depending on the type of construction of the adjacent buildings, it may be beneficial for building and Greenway construction to coincide with one another. If a large excavation is required for building construction, the excavation will likely extend into the Greenway. If done simultaneously, this may reduce the volume of excavation required in the Greenway. However, the estimated soil profile in the area indicates that the buildings may be supported on a deep foundation system such as driven piling, which may result in little to no excavation.
2. Problems arising from fill placement in areas adjacent to the creek. Structures supported on the fill may experience significant settlement as a result of long term consolidation of the soft underlying soils or fill material. Depending on the nature of the soils, it may take more than 10 years for the soils to consolidate (settle).

3. Depending on how much cut is required along the proposed creek alignment, there may be potential for slope stability failure along new creek banks. This will need to be evaluated on a case-by-case basis once the design has been developed.
4. Shallow foundations may be possible for some lightweight structures, such as sidewalks and lamp posts, if grade is lowered such that there is no net load increase on the soil from the structures. In this case, the owner would have to assume the risks associated with potential bearing capacity failure of the foundations and excessive settlement.
5. For support of larger structures, or if settlement is not tolerable, deep foundations will likely be required. Pile lengths could vary from 50 to 100 feet, depending on the soil profile and design load.
6. Due to the fill material and soft natural soils at depth, there is an increased risk for differential settlement. Depending on the type of foundation or soil correction used, the risk of differential settlement along exterior slabs could be reduced.

Land use

The *BCV Master Plan* calls for a mix of medium density residential (30-110 DU/acre); mixed-use—office and housing (45-150 DU/acre); and mixed-use—office/retail/housing (40-75 DU/acre). Cafe seating, temporary merchandise displays, awnings, and cantilevered facade signs are encouraged.

Building detail and organization of uses is critical to ensure that the Greenway is a dynamic public space. Structured parking and other uses that result in windowless facades should be avoided along the Greenway. Rather, active uses with large windows should face the Greenway. Coffee shops, cafes, retail establishments, and office spaces are appropriate uses. Amenities such as outdoor terraces, rooftop terraces, balconies, and gardens are especially encouraged.

Ownership, assembly and easements

The Greenway site is owned by a combination of public and private entities. The two "superblocks" of the Greenway (bounded by Bassett Creek to the south, Van White Memorial Boulevard to the west, a proposed reconstruction of Dupont Avenue to the east, and Glenwood Avenue to the north) are characterized by very different ownership patterns. The block from Bassett Creek north to 2nd Avenue North is largely owned by public entities. The City of Minneapolis, Special School District 1, and the State of Minnesota Higher Education Board hold a large portion of this area. A small portion of this block is currently owned by Soo Line Railroad. In contrast, the block north of 2nd Avenue is entirely privately owned.

Land assembly for the two blocks poses unique challenges for each block. Currently, the land held by the school district and higher education board is used to store buses when they are not in use. An alternative location for bus storage will have to be secured before this use can be moved. Use of the Soo Line railroad that crosses the northwest corner of the same block is currently limited; vacating this portion of the line seems a likely possibility. In contrast, over half of the land north of 2nd Avenue North is held by one land owner while the remaining parcels are owned by several others. Redevelopment of this block will depend on willing owners or condemnation.

figure 8.2
Rainwater is creatively and visibly handled at this ATD Headquarters building in South Carolina. Captured roof water is directed to open drain channels and to stormwater ponds. (photo: Nelson Byrd Woltz)

Maintenance

The Greenway is a highly urbanized open space setting and will require a high level of maintenance to ensure usability and safety. All of the Greenway features within the floodway need to be "hardened" in order to withstand temporary inundation during high flows. The design minimizes the need for maintenance following high flows by stressing a configuration that conveys flow without impacting infrastructure. The materials selected for the public walkways, steps, terraces, street crossing, and landscaping should all be chosen with maintenance in mind.

Rainwater management systems

The constraints placed on the Greenway design by the narrow corridor and highly urbanized environment will require an approach emphasizing pervious pavement, rooftop gardens, and rainwater gardens (filtration basins only) in the adjoining watershed to cleanse stormwater prior to discharge to the Greenway.

Open space

The Greenway is comprised of two major landscape spaces—(1) the 100-year floodway that includes the creek, riparian vegetation, and possibly some gardens or other "cultivated" landscape features, and (2) the public walkways which include not only walkways but steps, terraces, and landscape amenities.

The 100-year floodway is defined by walls that step down to the creek. In some places, the floodway is designed to be planted with riparian vegetation while in other areas lawns, terraces, and gardens provide gathering spaces. During large rain events these gathering areas could flood so they must be designed to withstand such conditions.

On either side of the creek corridor, turf, shade trees, and gardens provide a high amenity landscape for actively used areas. These landscaped areas will be more highly managed than the stream corridor, providing a contrast to the naturalistic riparian plantings. Set within a series of walks, terraces, and steps, the panels of lawn provide areas to gather while canopy trees provide shade. Gardens, hedges, and shrub plantings will be used strategically to provide landscape "features" within the Greenway.

In the *BCV Master Plan,* a pocket park is located mid-block between 2nd Avenue North and Glenwood Avenue. In the preferred design, this greenspace has been moved to 2nd Avenue North to provide space for ramps and steps from the Greenway to street level. Also, moving this feature from a mid-block position to the street helps to enhance the Greenway presence at the street level.

Input from stakeholder meetings

While most discussion at the two public open houses focused on the Commons, participants did offer insights regarding their vision for the Greenway. In general, participants favored broad public walks with a substantial "green" component—the creek, riparian vegetation, lawns, gardens, or shade trees. Active uses in the surrounding buildings were deemed integral to the success of the Greenway. Access to the creek, both physical and visual, was deemed very important, as was public access at street crossings and mid-block pedestrian passages.

Cost of construction

Construction costs were estimated for the Greenway based upon a phased approach for implementation. The construction costs are detailed in Appendix B and

the phasing is discussed in Section 10 of this report.

The bulk of the costs associated with construction of Greenway Phase 1B are directly related to managing contaminated soil and debris during redevelopment. The two main phases of the Greenway (G1 and G2) have costs more heavily weighted toward the open space features that surround the stream. The construction cost estimates were prepared using a cost-bracketing approach. Cost estimates are contingent on volume of contaminated soil and debris present, and these volumes are not yet completely defined. The costs consider three levels of effort (and costs) associated with soil and debris disposal.

The conceptual level costs for the Greenway are summarized as follows:

Conceptual Cost Estimate Greenway	Total Cost 2007 Dollars	Total Cost[1] Adjusted for Inflation
No Hazardous Soil	$ 9,600,000	$ 12,000,000
15% Hazardous Soil	$ 12,000,000	$ 14,800,000
30% Hazardous Soil	$ 15,200,000	$ 18,600,000

[1] Total cost adjusted for inflation was calculated using a 3% inflation rate and assuming a phased project schedule with a two-year construction schedule for each reach.

figure 9.0
Within the 120' Greenway right-of-way, public walks and terraces step down to meet a 50' corridor that includes the creek, riparian vegetation, and terraces. Walks and ramps provide access from the Greenway to street level above.

9. Greenway Implementation

Design guidelines

The Greenway is intended to be a powerful public amenity that will attract and guide private development. Materials and maintenance should be of high quality. Successful implementation will depend on many partners and will require careful stewardship. As with the Commons design, variables such as soil contamination, funding availability, and parcel assembly may affect the design. Design guidelines for this signature public space should:

- provide a continuous flow of water in the Greenway
- create and preserve public connections
- provide gracious steps and ramps at all public streets
- create frequent through-block walkways
- create clear, gracious public-private edges
- orient private entrances and windows toward the Greenway
- create a rich variety of public spaces
- manage stormwater responsibly
- maintain 50 cubic feet per second of water conveyance per City/Bassett Creek Water Management Commission agreement
- provide for service and safety
- allow for maintenance and emergency vehicle access
- maintain sight lines into, out of, and within the Greenway
- ensure adequate, even lighting throughout
- preserve visual access to creek extension
- institute design oversight and operations partnerships
- ensure adequate, high-quality maintenance
- test soils and debris and adjust the plan in response
- consolidate contamination (where possible and appropriate) and construct engineered barriers
- implement any required institutional controls due to the presence of contamination

Institutional roles – ownership and maintenance

The Greenway site is currently owned by the City of Minneapolis, the Minneapolis School District, and several private land owners. Assembly of these parcels for future development will be critical to the development of the Greenway. Managing development of this area can be led by private entities, the City of Minneapolis through its Community Planning and Economic Development Department, or through a joint public-private venture.

Permitting considerations

Permitting activities related to Greenway construction will require cooperation and close communication with the US Army Corps of Engineers, the Minnesota Department of Natural Resources, the Bassett Creek Water Management Commission, and the City of Minneapolis during the design development phases.

Phased approach for construction and development

Project implementation requires segmentation of work into phases. The phasing approach breaks the

figure 9.1
Well-designed urban greenways are public amenities that provide linear connections, often to other public features, and become a place unto themselves.
(photo by Dan Cornejo for Hennepin County)

figure 9.2
Many of the parcels within the Greenway are owned by public agencies. Those parcels are highlighted in red.

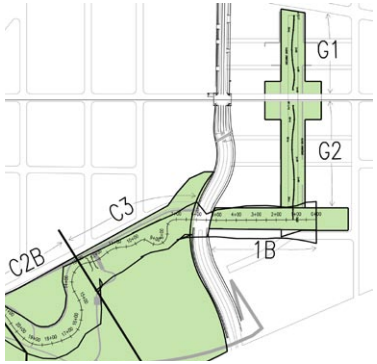


figure 9.3
Construction and development of the Greenway could be phased over time.

work into a series of manageable cost bundles for budgeting, and depends upon close cooperation with the developers of the adjoining parcels. The overall Greenway implementation budget is estimated to be between $12,000,000 and $18,600,000, depending upon the levels of soil and debris contamination encountered (see summary tables 9-1 and 9-2). The implementation phasing recommendations were designed to create smaller project areas with costs that could be implemented as development occurs. Appendix B sets forth the detailed budgets and a proposed implementation timeline for each of the implementation phases. The phasing costs incorporate an inflation factor of 3% per year calculated out based on the proposed construction schedule.

The first phase of the Greenway, Phase 1B, provides immediate public access to the eastern end of the Commons on current city property and utilizes the area around the new tunnel. It is the segment with minimum reworking of the stream channel. This phase is independent of the private development in phases G1 and G2. Phases G1 and G2 require close coordination with the developers of the area and would be implemented as part of development plans for these areas.

Cost estimates and construction schedule for project, including:

1. Investigations and Assessments

The limited geotechnical information currently available was collected throughout the past 25+ years at the site. During this period of time, the site conditions may have changed such that the soil borings are not an accurate representation of the subsurface profile. During the final design of the project, soil borings should be completed and a geotechnical analysis completed.

Previous investigations have identified a variety of contaminants in the vicinity of the Greenway. To better characterize areas that will be excavated during the redevelopment, a Phase II Investigation should be performed along the Greenway alignment and in areas that will be excavated. The test excavation approach described for the Commons in Section 6 is also appropriate for this portion of the project area, and costs for investigating the Greenway were included in the cost estimate. As described in Section 6, the costs for the Phase II Investigation of the entire project area are estimated to range from $59,000 to $71,000 and are based on the assumptions in Appendix C. Additionally, the Greenway will also need an updated Phase I Assessment. The estimated fees for this service are included with the estimated costs for the Commons ($29,000 to $37,000), and the associated assumption in Appendix C apply.

2. Excavation and soil disposal costs

i. RAP, ECP, and CCP

As with the Commons, contaminated soil and debris material in the Greenway will need to be managed during the redevelopment in a manner that is protective of human health and the environment and in accordance with VIC Program requirements. This requires the same approach under the VIC Program of compiling a RAP, CCP, and ECP after completion of the Phase I Assessment(s) and Phase II Investigation(s). One RAP, CCP, and ECP should be completed for the entire project area, as described in Section 6. The cost range provided in Section 6 ($40,000 to $45,000) includes the Greenway.

ii. RAP Implementation Costs
The cost estimate options for implementing the RAP are also described in Section 6, as the RAP will cover both the Commons and the Greenway.

iii. Cost and Design Implications
The design implications are the same as those discussed for the Commons in Section 6.

3. Recreation and park feature costs
The recreation and stream features for the Greenway are designed to provide access through the developed area and to the connecting trail systems as well as to provide opportunities to enjoy the daylighted stream. Costs for the recreation features are not impacted by the contaminated soil and debris handling, as all associated work will be completed prior to and independent of work on recreation features.

For the existing channel east of Van White Memorial Boulevard (Phase 1B) it is anticipated that bituminous paths and ramp connections to Van White Memorial Boulevard will be constructed. Amenities such as lighting, plantings, and an overlook are also anticipated. Constructing these features will cost approximately $500,000 (2007 dollars).

For Phases G1 and G2, landscape features include cast-in-place walls, walks, lighting, steps down to the 100-year flood plain, canopy trees, amenity plantings such as gardens, and street furnishings. Pocket parks on both sides of 2nd Avenue North that include steps and ramps that provide access between the street and Greenway are also anticipated. Landscape features for Phase G1 and Phase G2 will cost approximately $4,500,000 (2007 dollars).

Additional detail for the above cost estimates is provided at the end of this section and in Appendix B.

Long-term maintenance costs

Long-term maintenance costs are an important consideration, as over time these costs can exceed the capital costs of an open space system. Long-term maintenance considerations were a key factor in the design development process. Estimated annual maintenance costs for the Greenway are provided below and are further detailed in Appendix B.

The Greenway will likely require the establishment of a special service district or some type of private management structure for the maintenance. Special service districts are defined areas within the city where special services are rendered such as would be for maintenance of the Greenway. Costs of the services would then be paid from charges to the surrounding benefiting area. State law mandates the creation of advisory boards through city ordinance for each special service district to advise the city on services within the district. Such a board would need to be developed as part of the development agreement.

Estimated Annual Maintenance Costs*	
Greenway	
Phase G1 and G2	$51,000
Existing channel east of Van White Memorial Blvd.	
Phase 1B	$18,000
Total annual	**$69,000**

* Annual costs are shown in 2007 dollars.

Institutional Controls

Institutional controls will be placed on the property to ensure that the environmental response actions completed on the Greenway continue to be protective of human health and the environment. Institutional controls may involve restrictive covenants that will be filed with the County to document the remaining areas of impacted media (the restricted area). The institutional controls may also include provisions for long-term maintenance of the engineered barriers and document additional MPCA requirements and involvement for planning appropriate safety and soil management measures if excavation is required into the restricted area at some point in the future.

Table 9-1
Bassett Creek Greenway Implementation
Conceptual Cost Estimate
Excavation and Soil Disposal
Costs include soil excavation, remediation and disposal costs, laboratory costs, design fees and contingency.

Conceptual Cost Estimate	Soil Excavation & Remediation Costs	Laboratory and Consultant Costs	Subtotal 2007 Dollars	20% Contingency	10% Design Fees	Total Cost 2007 Dollars[2]	Total Cost[1] Adjusted for Inflation
No Hazardous Soil	$ 2,000,000	$ 210,000	$ 2,300,000	$ 500,000	$ 200,000	$ 3,000,000	$ 3,800,000
15% Hazardous Soil	$ 4,000,000	$ 240,000	$ 4,200,000	$ 800,000	$ 400,000	$ 5,400,000	$ 6,600,000
30% Hazardous Soil	$ 6,300,000	$ 250,000	$ 6,600,000	$ 1,300,000	$ 700,000	$ 8,600,000	$ 10,400,000

Conceptual Cost Estimate by Phase								**Implementation Year**
No Hazardous Soil								
Reach 1B	$ 1,000,000	$ 102,000	$ 1,100,000	$ 220,000	$ 110,000	$ 1,400,000	$ 1,600,000	2010
Reach G1	$ 600,000	$ 53,000	$ 700,000	$ 140,000	$ 70,000	$ 900,000	$ 1,200,000	2015
Reach G2	$ 430,000	$ 57,000	$ 500,000	$ 100,000	$ 50,000	$ 700,000	$ 1,000,000	2017
15% Hazardous Soil								
Reach 1B	$ 2,000,000	$ 123,000	$ 2,100,000	$ 420,000	$ 210,000	$ 2,700,000	$ 3,000,000	2010
Reach G1	$ 1,200,000	$ 64,000	$ 1,300,000	$ 260,000	$ 130,000	$ 1,700,000	$ 2,200,000	2015
Reach G2	$ 750,000	$ 57,000	$ 800,000	$ 160,000	$ 80,000	$ 1,000,000	$ 1,400,000	2017
30% Hazardous Soil								
Reach 1B	$ 3,300,000	$ 128,000	$ 3,400,000	$ 680,000	$ 340,000	$ 4,400,000	$ 4,900,000	2010
Reach G1	$ 1,900,000	$ 67,000	$ 2,000,000	$ 400,000	$ 200,000	$ 2,600,000	$ 3,300,000	2015
Reach G2	$ 1,100,000	$ 59,000	$ 1,200,000	$ 240,000	$ 120,000	$ 1,600,000	$ 2,200,000	2017

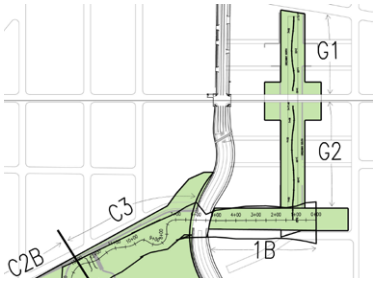
[1] Total cost adjusted for inflation was calculated using a 3% inflation rate and assuming a phased project schedule with a two-year construction schedule for each reach. The phased sequence order is: Reach 1B (2010), Reach G1 (2015), and Reach G2 (2017).
[2] Total cost figures may not exactly equal component costs due to rounding of cost estimates.

Table 9-2
Bassett Creek Greenway Implementation
Conceptual Cost Estimate
Open Space/Recreation, Stream Corridor and Vegetation
Costs include open space features - pathways, lighting, pedestrian bridges, site furnishings, signage and plantings; stream channel includes streambank stabilization/restoration and plantings.

Conceptual Cost Estimate	Lineal Feet of Channel	Cost per Foot[2]	Stream Channel Costs[2]	Stream Corridor Costs[3]	Open Space Recreation Costs	Subtotal 2007 Dollars[4]	20% Contingency	10% Design Fees	Total Cost 2007 Dollars[2]	Total Cost[1] Adjusted for Inflation
Greenway and Phase 1B	4,125	---	$ 290,000	$ 42,100	$ 4,753,000	$ 5,100,000	$ 1,020,000	$ 510,000	$ 6,630,000	$ 8,200,000

Conceptual Cost Estimate by Phase											**Implementation Year**
Reach 1B	525	$ 100	$ 52,500	$ 20,100	$ 529,000	$ 600,000	$ 120,000	$ 60,000	$ 780,000	$ 800,000	2010
Reach G1	450	$ 250	$ 112,500	$ 12,000	$ 2,060,000	$ 2,200,000	$ 440,000	$ 220,000	$ 2,860,000	$ 3,400,000	2015
Reach G2	500	$ 250	$ 125,000	$ 10,000	$ 2,164,000	$ 2,300,000	$ 460,000	$ 230,000	$ 2,990,000	$ 4,000,000	2017

[1] Total cost adjusted for inflation was calculated using a 3% inflation rate and assuming a phased project schedule with a two-year construction schedule for each reach. The phased sequence order is: Reach 1B (2010), Reach G1 (2015), and Reach G2 (2017).
[2] Includes bank stabilization measures and bank plantings.
[3] Total cost figures may not exactly equal component costs due to rounding of cost estimates.
[4] Costs not impacted by amount of hazardous soils.



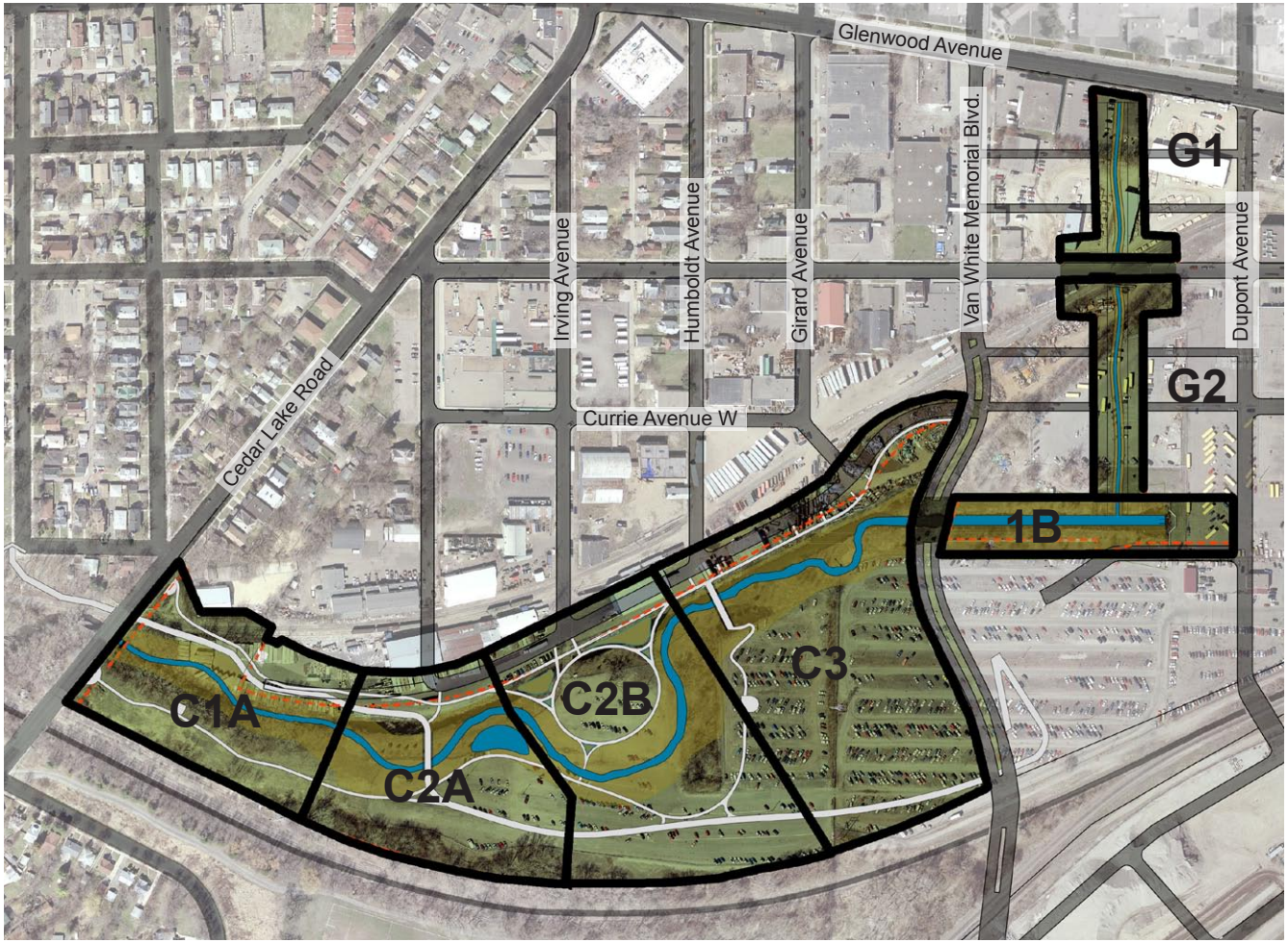


figure 10.0
The implementation of the *BCV Master Plan* vision for open space will need to occur in incremental phases over time. Land assembly and current uses allow some of these sites to be easily developed as open space without interfering with current uses.

10. Phasing and Next Steps

Implementation phase components

As discussed in earlier sections, the focus of early phasing is on lesser-used portions of publicly owned parcels and unused public areas. The publicly owned parcels are the Minneapolis Park and Recreation Board parcel on Cedar Lake Road, the impound lot, and the City-owned area surrounding the new tunnel inlet. Land assembly and current uses allow these sites to be most easily developed as open space without interfering with current uses. The need to make connections to both the Luce Line Regional Trail and Van White Memorial Blvd. are also key drivers of early development stages. The proposed public road at the north edge of the Commons and Cedar Lake Road are important to the functionality of the Commons and should be high priorities for early development. The table below summarizes the proposed phasing scheme shown in figure 10.0.

Throughout the development process, it will be extremely important to forge broad public-private partnerships. Clarification of the open-space role of selected master developers is needed. The City should immediately engage Hennepin County in capital funding for the project and begin discussions with Minneapolis Public Schools as to the disposition of the their parcel needed for Phase G2. The pursuit of additional funding sources should also be accelerated to not only help fund but to build implementation energy for the *BCV Master Plan* vision. The phasing timeline envisions a 10 to 20 year time horizon.

The incremental implementation proposed here also has some very key construction-related elements. Construction of the new creek alignments "offline" from creek flow will ensure the success of the stream and habitat improvements. The introduction of open-space uses on available land as soon as it is available will be important, as it provides access to the site by the public and thus continues to build broad-based support for the project. The incremental vacation of

figure 10.1
The project implementation phases have segmented the project into smaller project that can be more easily funded and constructed.

Location	Phase	Implementation Year
West end of Commons - MPRB	Reach C1A	2008
New tunnel inlet corridor	Reach 1B	2010
West end of impound lot	Reach C2A	2012
Center of impound lot	Reach C2B	2014
North end of Greenway	Reach G1	2015
Area of impound lot west of VMWB	Reach C3	2016
South end of Greenway	Reach G2	2017

the impound lot in stages from west to east will also help ease the loss of this facility and should help transition this use to other locations.

Next steps

This plan sets forth the implementation strategies for the long term implementation of the open space components of the *BCV Master Plan*. Within this larger framework for action, there are a number of tasks that can be immediately initiated by the City to ensure that momentum is maintained.

- Continue targeted testing for contamination on the site in both the Commons and Greenway, in particular within the proposed stream alignment to allow for further definition of soil costs and scope. Additionally, the need for addressing potential surface and groundwater contamination should be assessed.
- Continue land assembly, pursue relocation options for the impound lot, and initiate conversations with property owners and developers.
- Pursue funding strategies and cultivate partnerships with stakeholders.
- Focus on early implementation opportunities—in particular, the MPRB property on Cedar Lake Road, the new tunnel inlet corridor, and the west end of the impound lot.
- Work with other groups to fully define implementation roles and responsibilities.

11. Appendices

Appendix A:
Previous investigations – summary and maps

Appendix B:
Construction costs

Appendix C:
Environmental investigation assumptions

Appendix D:
Geotechnical analysis

Appendix E:
Maintenance costs

Appendix F:
Hydraulics