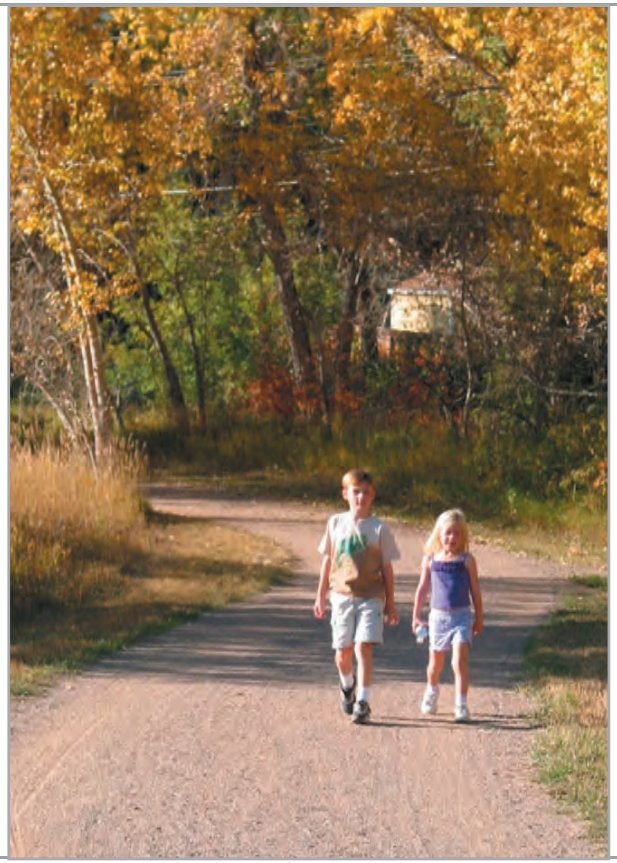

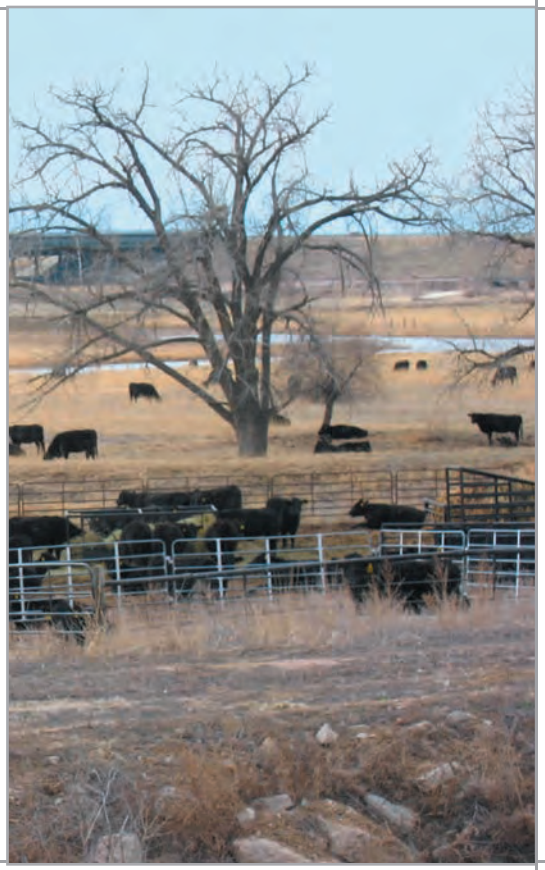

Second Creek Greenway

Autumn 2005 Master Plan

Prepared for the Win-Win Coalition
by The Greenway Team
Urban Edges Inc. | DHM Design

Acknowledgements

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Great Outdoors Colorado.

The Win-Win Trails and Open Space Coalition

- City of Aurora
- City of Brighton
- City of Commerce City
- City and County of Denver
- Adams County
- Denver International Airport
- Sand Creek Regional Greenway Partnership
- US Fish and Wildlife

Urban Drainage
Colorado Division of Wildlife

Contents

Purpose of this Document

This document is intended to guide the development of a multi-use trail and greenway along the length of Second Creek through the Northeastern Metro Area—linking The Platte River Greenway to the Highline Canal Trail.

This 17.3 mile link adds to a remarkable network of bike trails and greenways that already stretch over 500 miles within five counties. This network, which generally follows canals, creeks and rivers, makes Colorado's Front Range from Chatfield Reservoir on the South to Brighton and beyond on the north a national showcase for sustainable transportation and recreation planning.

This document provides planning and design standards, trail layout, cross sections, component details, maintenance procedures and cost estimates. It reflects detailed study, community and stakeholder input and the consensus of the Win-Win Coalition—a group of communities, agencies and other partners in promoting a trail and greenway along Second Creek. The overall purpose of this plan is to reflect consensus about layout and design, determine specific rights-of-way to be acquired, set budgets and phasing schedules, raise funds, and guide the preparation of construction documents.

Project Description and Study Area

This master plan envisions a continuous, 10'-wide shared use trail—portions of which will be paved and part will be soft surface, potentials for alternative and dual hard surface trails, trail access, trailheads and other trail amenities. The trail system will link parks, feature areas, neighborhoods and a number of connecting trails including major regional trails as well as local trails providing access to activity centers and neighborhoods.

Second Creek defines the spine of the rapidly developing Northeast Metro Area. Due in part to the development of Denver International Airport and other economic activities this area is being quickly transformed from rural agricultural to planned mixed-use communities to include thousands of new residences.

As the major natural amenity and a conduit for storm water, Second Creek is becoming increasingly important to people in the communities that make up its watershed. With its attractive scenery, new parks and open spaces, it will become an increasingly popular destination and a key non-motorized corridor for moving through the heart of the Northeast area. Trail use is very popular with people in the communities that make up the Second Creek corridor—a physically active population. As a readily accessible amenity, a key link and integral component in the Greater Metro Area trail network, the Second Creek Trail and Greenway will draw bicyclists, hikers, walkers, joggers and other outdoor enthusiasts from both the local neighborhoods as well as throughout the metro region.

Traffic on many of the main roads in that area makes walking and bicycling difficult and less pleasant. This trail will also offer an alternative mode of movement.

About the Win-Win Coalition

In 2000, in pursuit of these goals and to address the opportunities and challenges anticipated for future growth in the region, a number of communities and agencies joined together to form the Win-Win Coalition.

The Win-Win Coalition and this planning process grew in part out of planning for the Rocky Mountain Arsenal National Wildlife Refuge, *The Commerce City Northern Range Prairieways Master Plan, The Brighton Trails Master Plan, The Adams County Open Space Master Plan* and similar planning in Denver and Aurora. This informal coalition has been pursuing optimal, interconnected trails and open space and the renovation and enhancement of the Rocky Mountain Arsenal National Wildlife Refuge as well as other transportation and drainage improvements. The coalition supported an application by Commerce City, which received a planning grant from the Great Outdoors Colorado Trails Program to prepare a master plan for the Second Creek Corridor.

Commerce City retained The Greenway Team (DHM Design Corporation and Urban Edges, Inc.) to prepare this master plan. This plan is built out of the groundwork and vision laid by the previous planning mentioned above.

The proposed creek side trail will be designed to accommodate walkers, bicyclists, joggers, and people in wheelchairs and other appropriate non-motorized uses. The plan also proposes enhancement of the creek environment, where feasible, with wildlife-friendly vegetation and reshaping of the channel to a more natural appearance.

The project will also help set the tone and shape the character of the Northeast area—an important component and gateway to the Greater Metro Region. The improvements will, hopefully, make people aware of the creek, its floodplain and wetlands as a resource, and in turn, help build support for its continued preservation and stewardship.

In addition to Great Outdoors Colorado, this plan was funded by cash contributions from Denver, Aurora and Adams County as well as staff time and input from the members of the Win-Win Coalition.

Once the plan is approved, the next step will be to raise funds, secure rights-of-way and complete the Second Creek Trail and Greenway in its entirety in a timely manner.

Guiding Principals & Design Standards

Second Creek corridor is one of the fastest developing areas in the Metro region. Most of the new development is characterized by planned mixed use, predominantly residential communities. There are also employment areas and lodging where the corridor passes in the vicinity of Denver International Airport.

As evidenced by a number of national studies, home buyers, especially in newer planned communities, place a high value and priority on accessible amenities such as trails, open space and wild lands. Indeed, Second Creek is becoming the major natural feature of the area helping to give the communities along its 17-mile length their identity and special character.

Typically home buyers and workers in planned communities are also physically active—interested in bicycling, walking and other outdoor activities. People are also seeking alternative modes of travel including by bicycle and foot. The Second Creek Trail and Greenway can help facilitate these modes and become an important thread weaving parks, homes, schools and businesses in this area together.

Prior to development, Second Creek was a fairly minor drainage way. More development has brought more run-off changing the character of the creek and its associated wetlands. Because of this, Second Creek is becoming an important focal point. To fully benefit from these changes and opportunities, the trail, trail amenities and re-shaping of the creek must be a net improvement to the community. That is, the trail improvements should enhance the character of the Second Creek corridor and the neighborhoods that abut it. The trail should also be a safe, enjoyable, functional and convenient amenity.

To achieve this, the guiding principles and design standards presented below must be followed closely in the planning and design of all projects along Second Creek. These principles grew out of consultations with citizens, property and business owners, public meetings and the recommendations of the design consultants.

1. Pursue trail safety consistent with Nationally accepted standards such as the *AASHTO Guide to the Development of Bicycle Facilities*, the *Manual of Uniform Traffic Control Devices* and other guidelines. There must be effective user education and enforcement that treats very seriously bicycle, skate and pedestrian violations that endanger people or property.

2. The trail must meet state-of-the-art design standards including a minimum trail width of 10' wherever feasible and/or heavily traveled. It should accommodate multiple uses including walking, jogging, bicycling, equestrian use and skating and be accessible to people with disabilities.

3. Pedestrian spans and underpasses should be of adequate width and have adequate capacity for traffic loads including maintenance and emergency vehicles. Underpasses and tunnels should be well lit, not have blind spots or hiding places and have clear lines of sight on the entries and throughout, in accordance with the *AASHTO Guide to the Development of Bicycle Facilities*.

4. The trail should have attractive fixtures, furnishings and an integrated information/interpretive/wayfinding system. All furnishings should be compatible with, and reflect the character of the area with highly durable materials. Exotic elements that are difficult to repair or replace should be avoided.

5. The trail should run through pleasant settings offering a variety of experiences as well as connecting to other local and regional walkways, trails, and places of interest including historic sites, parks, shops, restaurants, overlooks, and surrounding open spaces.

6. Wherever feasible, trails should be separated from street traffic using

a minimum 5'-wide buffer zone, grade separation or a 44" -high safety railing or barrier.

7. Where the Second Creek Trail intersects existing streets and sidewalks, planning should also take into account on-street bicycling and pedestrian/sidewalk movement. Workable existing systems should be preserved and enhanced promoting safe on-street bicycling and pedestrian movement through and around the region. On-street systems should meet *American Association of State Highway Transportation Officials (AASHTO), Manual of Uniform Traffic Control Devices* and *Colorado Department of Transportation (CDOT)* standards.

8. The trail and trail facilities should not adversely impact or be adversely impacted by places of business, homes, roads, the floodplain or the natural environment. This includes designing the trail to preserve privacy of nearby residences, and mitigating, where feasible, parking and restroom needs that can be directly attributable to trail usage.

9. Any and all adverse impacts of the trail on the creek environment or the adjacent properties should be resolved through mitigation, repair or restoration. Construction specifications, maintenance procedures and supervision must adhere to best practices and all permit requirements to avoid habitat and resource damage. Structures including bridges and underpasses must not impede flood flows or raise flood level. Maintenance activities including snow removal must be clean without harmful chemicals.

10. Avoid degradation of the creek by the trail users. Do this by designing and regulating users to less vulnerable places along the creek, including vegetative buffers. Also, buffer the creek from the trail, parking lots and other potential contaminant sources.

11. Where appropriate, the trail and greenway should serve multiple objectives in addition to recreation including drainageway maintenance, wildlife movement and non-motorized transportation.

12. The trail system shall be properly designed and adequate to avoid user conflict including separating, where feasible, bicycle and pedestrian traffic and encouraging higher speed road bicyclists to use the on-street system.

13. The Second Creek Trail shall be affordable to build and maintain.

Trail Improvements

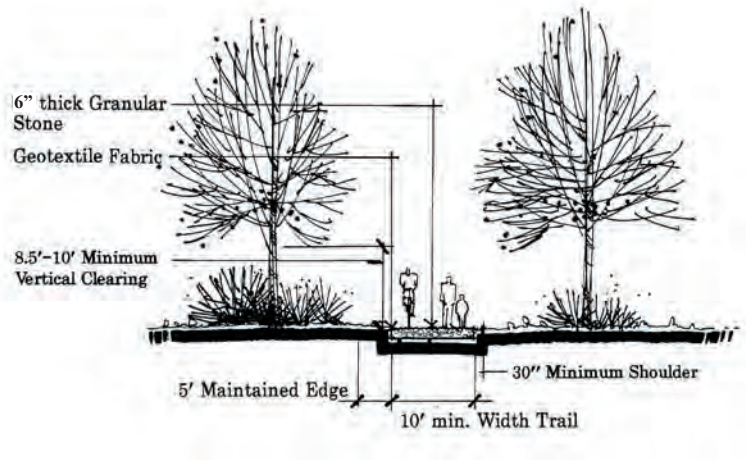
Trail Surface And Cross Sections

To best meet the range of predicted trail users, the trail cross-sections and surfaces should meet the following design criteria:

- Minimum 10'-wide trail tread with 2 ½' to 5' (minimum 2 ½') graded and mowed shoulders except along steep embankments. In these areas, or anywhere else that a shoulder cannot be provided, a 44" -high handrailing should be installed—54" with more dangerous drop offs. (See hand railing specification below.)

- For paved surfaces a warm tone concrete surface is recommended using a concrete coloring agent such as Frank Davis Omaha Tan. It should be broom finished to avoid slipping, and have smooth (saw cut) joints. A minimum 5"-thick, 4000 psi concrete is recommended.

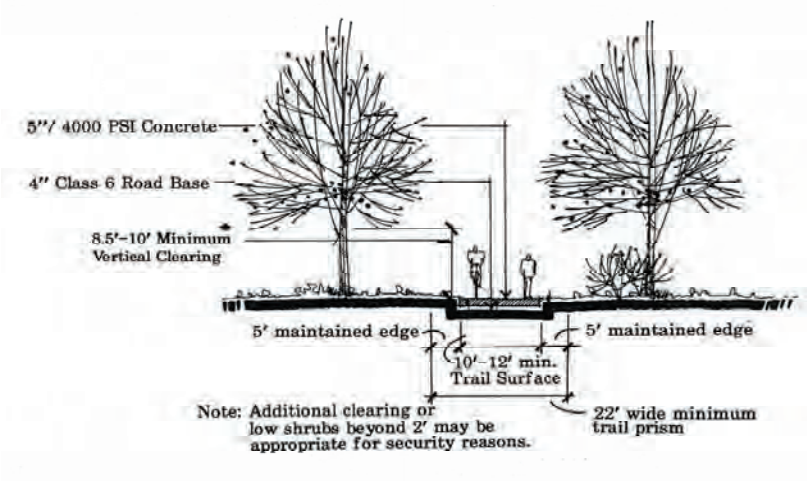
- For crusher fine surfaces, a compacted 6 " thick layer of 3/8-minus rock material is recommended laid to withstand erosion. Sub-grade should be properly prepared with a ¼ -inch- per- foot cross slope. Geo-textiles and soil sterilent may be required depending on conditions. Do not build crusher fine trails in flood-prone and washout-prone areas.



- Proper sub-grade and base preparation should be provided to ensure the surface is stable. Use geo-textile on unstable or soft soils.

- The trail wearing surface should support use by walkers, joggers, bicyclists, roller-skates, wheelchairs, and disabled people as well as maintenance and emergency vehicles (except for short sections of decking where vehicle use may not be feasible.)

- Minimum head clearance of 8.5' should be provided for bicycle use and 10' for equestrian use.



- The trail should have good surface drainage to minimize puddles and washouts, including 1% to 2% trail cross slopes and inlets and drainage swales where necessary to collect water and carry it away from the trail. Note: Wherever possible, uniform sheet flow of run-off water across vegetated slopes should be promoted to minimize erosion problems. Proper street drainage should be maintained where trail construction impacts adjacent streets or parking areas.

- All primary trail surfaces, access ramps, bridges, boardwalks and other structures must be strong enough to carry a 12,000-pound

emergency vehicle except certain short sections of decking where this load capacity is not feasible and alternative emergency and maintenance access is available. These short deck sections must, however, accommodate a live loads bicycle, pedestrian traffic and small maintenance vehicles.

- There may be places where a deck or boardwalk trail surface is required. Instances include where the trail goes through a wetland area or along an embankment that is too steep for a standard trail. Concrete, wood, recycled plastic decking or other structural systems might be employed.

- Lines of sight, grades and other design elements must conform to engineering standards for bicycle speeds per *American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities* (1999 edition or later) or warning signs compatible with the *Manual of Uniform Traffic Control Devices* must be provided where standards absolutely cannot be met.

- All facilities should strive to support universal access and use by the disabled in accordance with The Americans With Disabilities Act. This includes no extended grades in excess of 5% with no grades in excess of 8.33%, no cross slopes in excess of 2%. On extended grades, there should be adequate (5'x 5') level resting points for every 30" of vertical rise and a minimum 36" passageway around any obstacles. Provide trail accessibility and difficulty information including grades and distances between rest areas and trailheads.

- The trail system should be designed to withstand flooding.

- In certain locations such as where the trail intersects with or runs parallel with intensive pedestrian uses, it is advisable to provide a special textured surface such as colored concrete or pavers to identify these special areas and promote slower speeds. Specially scored concrete may also be used for bicycle speed reduction areas.

- In general, bicyclists and roller-skaters should be encouraged to reduce speed when entering congested areas, by using signage and other "bicycle traffic calming" cues such as gateway elements that suggest a transition from rural trail to a more urban mixed-use trail/ walkway.

Pedestrian Spans, Decks, Underpasses, Tunnels and Low Areas

Bridge spans must meet the following criteria:

- They should be able to carry weight of maintenance and emergency vehicles (12,000 pounds) unless alternative access is available.

- They should be wide enough to accommodate both through trail traffic and people who may want to linger on the span to enjoy the view. Absolute minimum width should be 10' but 12' is preferable both to accommodate those who linger and possible future trail widening.

- All railings should be at least 44"- high (54" on highly elevated decks and bridges.)

- It is recommended that only clear-span crossings be utilized as opposed to low-water crossings. This will avoid wash out and sediment build-up problems. Clear spans should be placed above the 100-year flood level wherever possible, but in some instances may be lower, provided the structure will not raise the 100-year flood level (a hydraulic engineer should be consulted.)

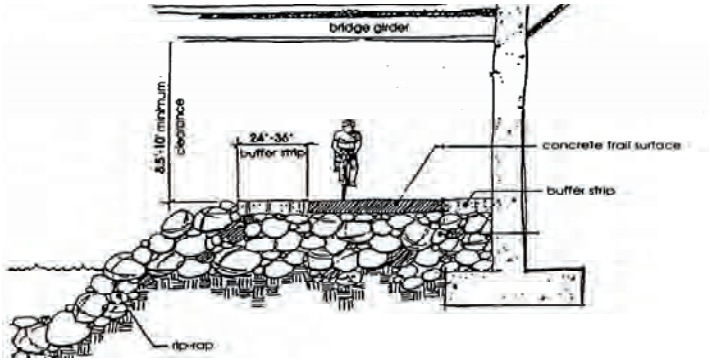
- In some locations, the trail will go under bridges or through low areas subject to flooding. In these cases, the trail should be substantially anchored (with concrete, rock, *Geoweb* or similar system) and armored with rock to prevent wash out. A hydraulic engineer should be consulted to ensure the underpass is durable and will not adversely impact flood conveyance.

Tunnels and underpasses must meet the following criteria:

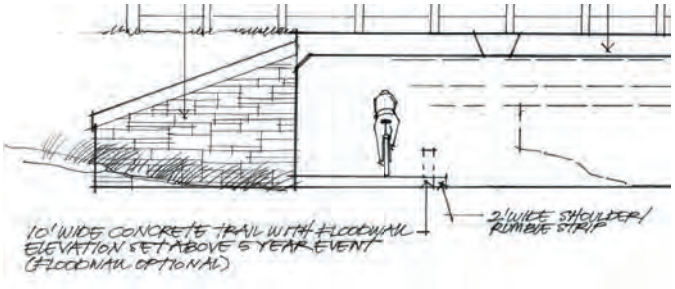
- Adequate lines of sight upon approaching and passing through the underpass. (See *AASHTO* standards). Provide appropriate safety signage and cautions as outlined in the *Manual of Uniform Traffic Control Devices MUTCD*. Provide lane striping where appropriate.
- Open, wider underpasses and tunnels are preferred to the narrow box-culvert type. In no instance should the dimensions of the underpass be less than 10'-high by 12'- wide unless flood levels prohibit. In this instance 8'6" is the minimum head clearance.

- Generally, design underpasses to be above the 5-year flood but design to minimize need for at-grade street crossings during high water. Design at-grade crossings to minimize hazards including warning signage to motorists, barriers to dangerous crossings and leading trail users to safe intersections to cross (See Ramps and High-Water Bypasses below).

- Consult a hydraulic engineer to minimize risks to users during high water and storm events. Provide escape routes that are ADA accessible and warning signs where appropriate. Avoid any unseen or dangerous storm water outlets impacting the trail.



- Provide floodwalls where high water requires it to allow minimum head clearance. Provide drainage for nuisance water that may collect in the underpass.



- Provide decorative, attractive headwalls on entries into tunnels and underpasses.

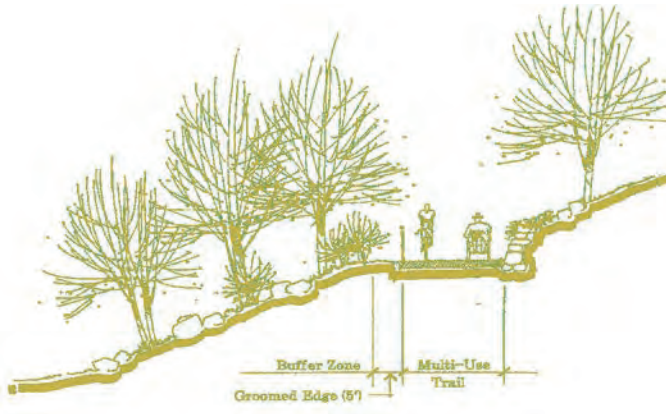
Ramps and High-Water Bypasses

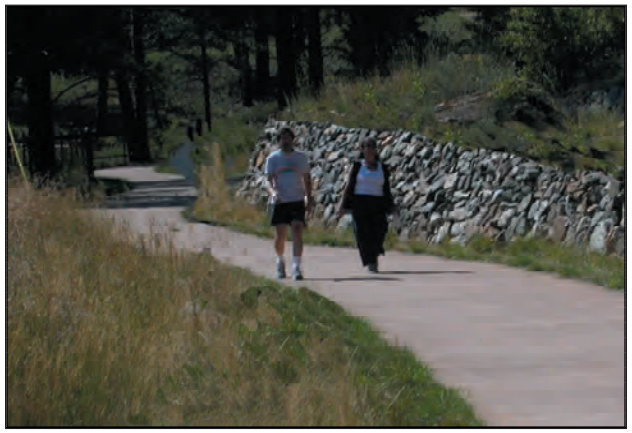
Provide alternate routes for use during high water. These include ramps and alternative on-street routes that allow trail users to detour. Ramps and on-street routes should meet the following standards:

- Achieve ADA criteria for disabled users.
- Utilize, where necessary, on-street routes and crossings suitable for bicycle and pedestrian travel to avoid leading users into potentially hazardous situations.
- Have clear, easy to follow signage depicting alternative routes and how to follow them to trail destinations.
- Have appropriately engineered intersections with the main trail that avoid traffic conflicts.
- Have clear lines of sight per *AASHTO* and caution signage as approapriate.

Retaining Wall Slope Stabilization

In general, any slope in excess of 3:1 grade will require stabilization or retention to control erosion. Where possible, it is desirable to keep wall heights less than 4'. On very steep slopes this may require "splitting" a wall with half of the height on the uphill side of the trail and half on the downhill side. Walls can be constructed of concrete, anchored block system, wood, stone or other appropriate material. Generally, a 44"-high (54" on highly elevated decks and bridges) hand railing should be placed on the downhill side if the drop-off exceeds 18" in height and there is less than a 5-buffer zone.





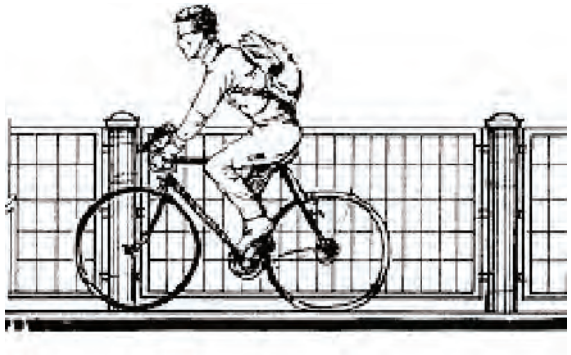
Hand railing/Bike Guardrails

Hand railing and/or bike guardrails will be required in a number of locations including bridges and decks as well as places where a drop-off or other hazard exists and adequate shoulders cannot be provided. Handrailing and bike guardrails should meet the following criteria (See also AASHTO guide).

- The hand railing/bike guardrail should be 44"-high (54" on highly elevated decks and bridges.) If there is a drop-off in excess of 18" or other hazardous openings and local codes or conditions require it, the rail should not pass a 4" sphere. To reduce costs, consider using woven wire mesh with vinyl coating combined with wood railings.

- The rail should withstand a 250 lb. load with 1/2" deflection with a w=50 pound per linear foot transverse and vertical load capacity.

- Rails should not present sharp or protruding edges and ends should be flanged and marked with MUTCD-specified hazard panels to reduce the chance of injury from collision.



Trails Access Points/Trailheads and Parking

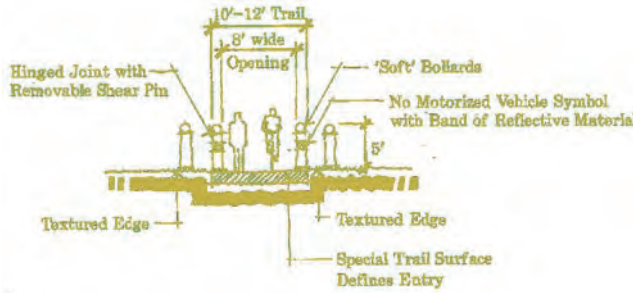
Two types of access points are recommended in this plan: intermodal and ride/walk-up.

- An intermodal access point serves automobiles, bicycles, pedestrians, wheelchairs, equestrians and other users seeking access to the trail system. The facility is designed to accommodate users arriving by auto as well as those who arrive on foot, bike or other means. An intermodal access area offers adequate parking (15-to-50 or more spaces depending on location), possibly rest rooms, informational signage, and other amenities such as benches, bike racks, emergency phones, picnic tables, drinking fountains and trash receptacles. It should accommodate vans, buses and horse trailers as well as cars and should include at least one parking and loading space adequate for disabled users (12.5'- wide with disabled parking symbol.)

- Intermodal access points may be combined with parks, shared commercial parking lots, park-n-rides and other facilities. They should be carefully planned and sighted with landscaping and buffering, if necessary, from adjacent uses. They should not be located directly adjacent to residences or other uses where there might be a conflict or security problem.

- Ride-up/walk-up access points are locations where people from local neighborhoods, employment centers or other adjacent areas can access the trail corridor on foot, bicycle or wheelchair. Auto parking is not provided. There should be adequate informational signage and minimal amenities such as benches and trash receptacles.

- Generally, all types of access points should include access for maintenance and emergency vehicles but not other motorized vehicles. The access point should have a trailhead sign with a system map, you are here marker, degree of difficulty, disabled access and distance information, and a list of trail user responsibilities. All facilities must be designed to accommodate users with disabilities. To discourage unauthorized motor vehicle access a defining entry feature using bollards, pavement texturing and signage per *MUTCD* should be used. Bollards or posts in the center of the entry should not be used because the posts may be hard to see and may create an obstacle for bicyclists.



Rest Areas/Overlooks/Amenities

Rest areas and overlooks should be provided at regular intervals along the trail. Several kinds of rest areas could be offered including rest pads, standard rest areas, overlooks, and trail pavilions. All rest areas and overlooks should be designed to move users off the main trail to eliminate any possible traffic hazard.

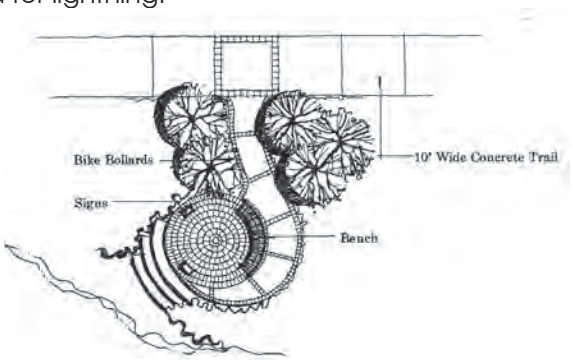
- Rest pads can consist of a 10' x 10' (minimum 5'x5') stopping point just off the trail with a simple bench and perhaps informational or donor credit signage. These should be located every 1/4-to-1/2 mile depending on grade.

- Standard rest areas should be located every one-to-two miles and should include a crushed stone or concrete pad with benches, an informal bike rack, informational signage and, perhaps, a drinking fountain.

Trail Rest Area Concept

- An overlook is a special kind of rest area tied to a view of special interest such as a wildlife area. In addition to the standard rest area features, an overlook would likely include interpretive signage describing the area being viewed.

- Consider a storm shelter and sunshade structure appropriately grounded for lightning.



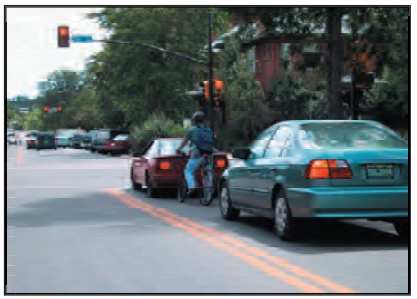
On-Street Bicycling

While this is not an on-street bicycling plan, standards are included here as an aid in planning an integrated system where off-street and on-street elements interface. Note that on-street standards are subject to change and will vary depending upon factors such as traffic speeds and volume. A traffic engineer with expertise in bicycle facilities design must be consulted for bike facility projects and all street design must be in conformance with current local, county and state agency design standards:

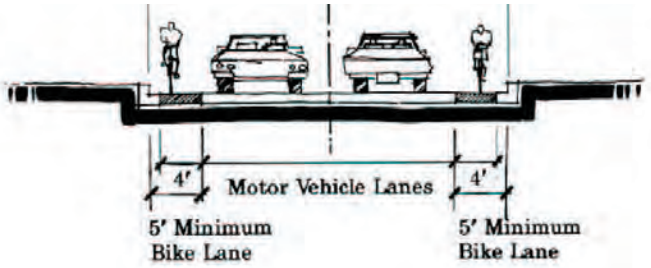
- Pavement should be smooth and free of ruts, holes, debris or other obstructions or hazards including storm grates with openings perpendicular to the direction of bicycle traffic. All joints and edges must be maintained in smooth condition to avoid catching a bicycle tire or causing it to swerve. Ramps to on-street routes should meet both AASHTO and ADA standards of width, grade and line of sight.

- For a shared traffic lane with parking—narrower lane—Provide merge lanes for bicycles at either end of this type of corridor with "Bike Lane Ends" black and white regulatory sign and yellow diamond-shaped "Share the Road signage" at either end and in the middle of the corridor.

- For a shared lane with curb and parking—wide lane— Provide a demarcated 13'-to-14' wide parking/bicycle lane defined with a 150mm (6") wide solid white stripe leaving a 12'-wide lane for traffic. Delineate 8' x 25' parking stalls with solid white lines. Provide "bike route" and "share the road" signs at appropriate locations through town.



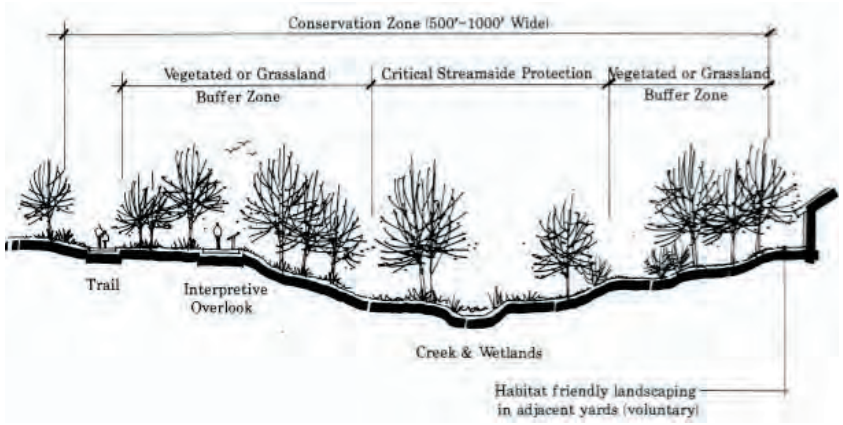
- Shared lane with a shoulder and/or guardrail—Provide a demarcated bike lane that is at least 5'-wide (Assumes a 12'-wide traffic lane, total 17' width in addition to the width of the gutter pan.) The painted demarcation line should be a 150 mm (6") wide solid white line.



Stream Corridor Stewardship

The Second Creek channel should be kept in optimal condition as a riparian habitat and scenic corridor. The following steps should be taken:

- Pursue the creation of a stepped or terraced channel cross-section in pursuit of a natural-appearing stream corridor.

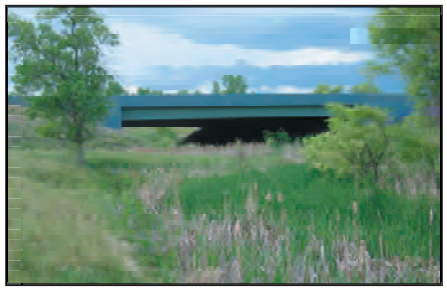


- Use natural appearing drop structures instead of a concrete or rock channel bottom to create a more natural, meandering low-flow channel.

- Minimize tree and vegetation removal for trail construction or other objectives.

- Promote indigenous trees and plants such as cottonwood, willow and other appropriate species. A plant ecologist or biologist should be consulted in the selection of plant species and when trees are thinned for flood hazard reduction.

- Plantings and vegetation management should also be compatible with stormwater conveyance. The local flood plain administrators should be consulted in the planting and maintenance of riparian species.



- Disturbed and denuded stream banks should be re-graded, replanted and restored.

- Avoid filling of the creek corridor or building structural walls or paving along the creek edge. A vegetated edge should be maintained along the entire length of the creek corridor.

- Regularly remove trash and litter from the stream corridor.

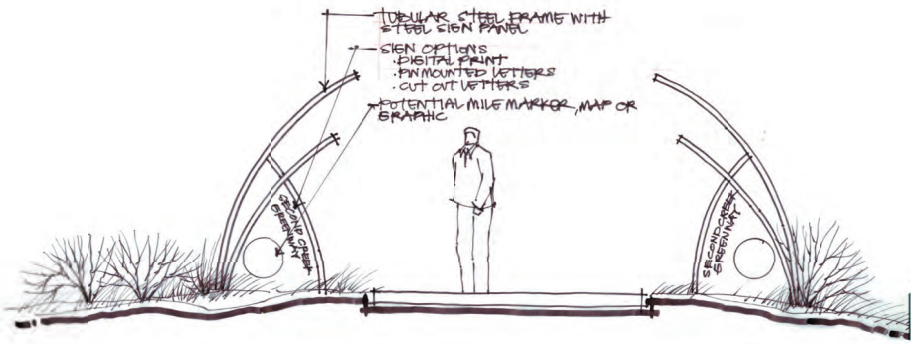
- Maintain rough edges along the channel banks with nooks and crannies for wildlife and fish.

- Maintain the aquatic habitat in the creek for minnows and other fish with maintenance of overhanging vegetation, protecting the creek from contaminates from street and property run-off and monitoring the condition of the stream. Extra care must be taken to avoid sediment from getting into the creek during construction.

- Promote a citizen volunteer program to annually plant, clean up and restore creek banks.

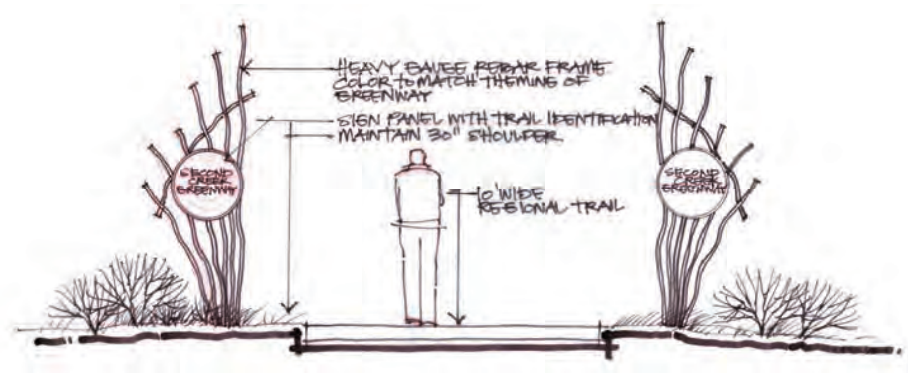
Signage, Wayfinding and Interpretive Elements

The informational system includes entry monuments, gateway signs, information signs with maps, directional signs, traffic and safety signage, mile markers, interpretive signs, displays, artistic/sculptural elements and artifacts.

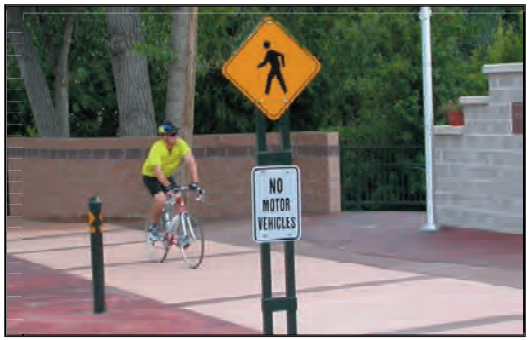


The informational system should have the following qualities:

- The signage and way-finding system should be an attractive, distinct, uniform system of signs, displays and possibly artistic elements that guides and informs both local and out-of-town users.



- Bicycle and traffic signage should conform to the Federal Manual of Uniform Traffic Control Devices (MUTCD) guidelines.



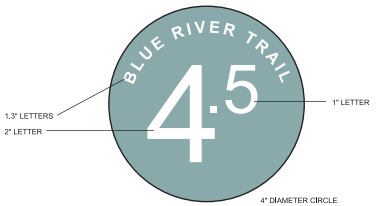
- A consistent style and information system should be provided for all greenways, trails and parks throughout the community.

- Key gateway signs should be provided at major entry points that include a map of the system, accessibility information, estimated travel time, user safety guidelines, emergency contact and user feedback telephone numbers, leave no trace information, code of conduct and other pertinent information.

- Structures should be designed for easy repair and maintenance.

- Signs and other structures should be set back from the trail at least 30" (or properly marked or protected when setback is not feasible) to avoid hazards to trail users.

- Mile markers should be provided every ¼ mile for user guidance, maintenance and emergency reporting.



- The systems should be managed and maintained by local or regional park agencies.

- Signs, displays, mileposts, and artifacts should be kept in excellent condition.

- Text and content should be kept current.

- Detailed records should be kept of maintenance, safety and security conditions and remedies.

- Informational and interpretive displays are encouraged along the trail. Important themes include the Colorado High Plains's history, geology, and ecology. Displays could include waysides, sculptural elements and artifacts.

Design Character

The historic identity and character of the Second Creek corridor should be reflected in the furnishings, fittings and trim elements of the trail and trail components. Landscaping should also reflect the natural and traditional look of the High Plains. The community should be consulted during each step of the design process to assure compatibility of appearance. Furnishings such as benches and light fixtures should also be compatible with the surrounding structures and setting. Lighting of the corridor is generally not recommended, but if and where used, should be low-level to avoid adverse impact on adjacent residences, business or wildlife.

Recommended Improvements

Second Creek Trail and Greenway includes six segments and runs approximately seventeen miles along the length of the creek through the Northeast Metro Area. The recommended improvements program includes four major elements:

1. Share Use Path: Completion of a continuous shared-use pathway running the length of the corridor from the South Platte River to the Highline Canal. The trail in Segments 1 and 2 within the City of Brighton shall be paved with concrete. Segments 3 through 6 of the trail corridor will be crusher fines.

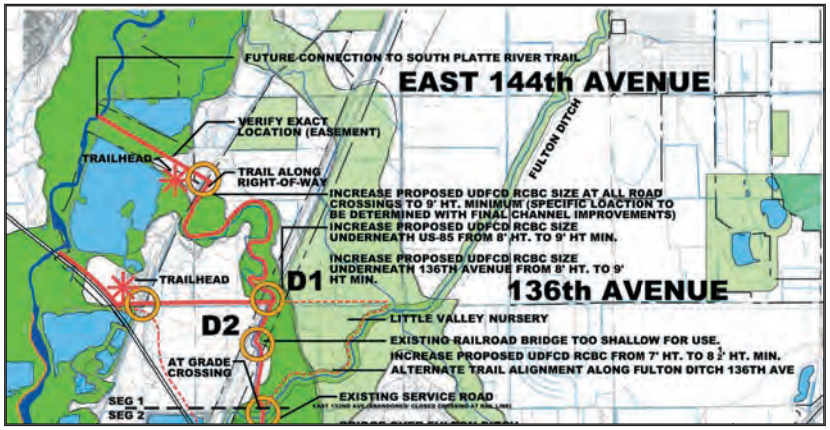
2. Amenities: Installing associated trail amenities such as rest areas, trailheads, wayfinding signage and other trail-related improvements.

3. Creek Resource Enhancement: Promoting over time the adaptive reshaping of the Second Creek channel and floodplain into a natural-appearing, terraced corridor with appropriate trees, shrubs and other vegetation and a meandering low flow channel.

4. Alternative Soft Surface Trail: Over time, the completion of an alternative soft surface or crusher fine trail serving pedestrians and equestrians but restricting bicycles through the more heavily used segments of the corridor. (This element is not specifically laid out or priced in this plan.)

Following are the recommended improvements—segment by segment (See also the layout plan included in this document):

Segment 1:
"The Confluence" South Platte River to Fulton Ditch



- Construct a 350' pedestrian bridge across the South Platte, linking the Second Creek Trail, South Platte River and E-470 Trails. Provide a connecting trail along the South Platte from E-470 to the intersection Second Creek Trail.

- Create a rest area and information/wayfinding kiosk at this intersection.

- Incorporate trail into an expanded floodplain park with access to the existing lakes and natural wildlife-friendly landscaping.

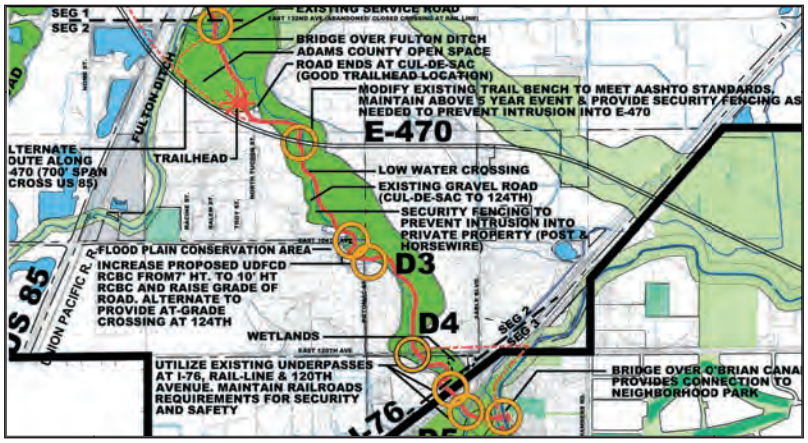
- Preserve the Second Creek floodplain through this reach with a terraced, natural-appearing, indigenous landscaped channel throughout.

- Provide trail underpasses beneath Brighton Road, Highway 85, and the Union Pacific Railroad (with protective cover as specified by railroad), with wide, open passageways preferred throughout.

- Link to the Fulton Ditch Trail at 132 nd Avenue and the future roadside pathway along 132nd.

- Consider alternative or interim trail routing of the trail along E-470 pending funding or development of the adjacent properties along this segment. Also consider alternative routing via the Fulton Ditch to 136th Avenue and then to the South Platte River via the 136th Avenue Corridor.

Segment 2:
"Adams Crossing" Fulton Ditch to Second Creek Park



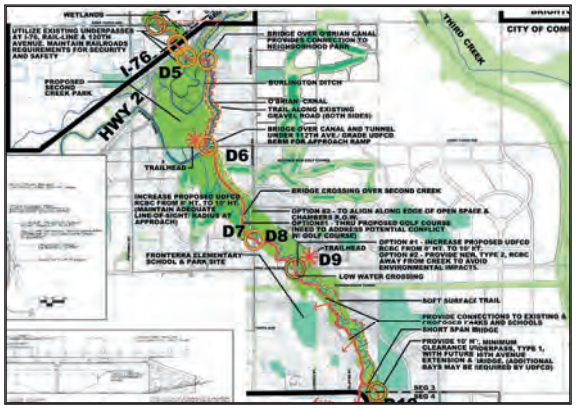
- Construct a pedestrian bridge across the Fulton Ditch.

- Create a passive park with loop trails, picnic areas and a trailhead with parking for 25 to 50 cars including equestrian and wheelchair access at the Adams County Open Space parcel east of the Fulton Ditch.

- Provide a shelter and trail information kiosk at the Adams County Open Space park trailhead.

- Preserve the Second Creek floodplain through this reach with a terraced, natural-appearing, indigenous landscaped channel throughout.
- Use the existing underpass to go under E-470.
- Cross to the east bank of the creek upstream of E-470 on a carefully designed low water crossing that minimizes the potential for washout and disruption due to flooding. Consider an elevated span over the floodway.
- Provide wide, open underpasses with trail above the 10-year flood Elevation at 124th, Potomac and 120th.
- Modify the existing trail underpass at E-470 moving the trail to the west bank of the creek above the 10-year flood level. Restore this segment of the channel to a more natural appearing, terraced look.
- Work cooperatively with property owners to provide security fencing to protect livestock and other agricultural activities.
- Utilize existing underpasses to go under I-76, I-76 Ramps, and service road.
- Construct a protective cover under the railroad track mainline.
- Provide safety and security fences and barriers as appropriate to prevent trail users from entering highways or railroad corridor.
- Preserve and enhance wetlands and provide interpretive overlooks and signage.
- Connect to the O'Brian Canal Trail where this segment intersects the canal trail.
- Provide a trailhead with shelter, kiosk and Wayfinding information at Second Creek Park with trail parking combined with parking for the park.

Segment 3:
"Second Creek Floodplain Park"
Second Creek Park to Arsenal Wildlife Refuge at 96th Avenue



- Identify and enhance the length of the creek through this reach as a flood plain preserve and neighborhood "commons" linking Second Creek Park to the Arsenal Wildlife Refuge.

- Preserve the Second Creek floodplain through this reach with a terraced, natural-appearing, indigenous landscaped channel throughout.

- Continue trail along both sides of the O'Brien Canal through Second Creek Park.

- Provide wide, open underpasses with trail above the 10-year flood elevation at 112th, Chambers, Potomac and 104th and 96th

- Provide a 100' pedestrian span over the O'Brien Canal at 112th.

- Re-Configure proposed detention basins at 112th Avenue, Chambers Avenue and 88th Avenue to set dam back from the road to allow an adequate incorporation of the trail and underpass with safe lines of sight.

- Provide parallel non-bicycle soft surface paths on opposite sides of the creek.

- Provide low water or short span bridges buttressed to avoid wash outs to connect pathways and neighborhoods on both sides of the creek.

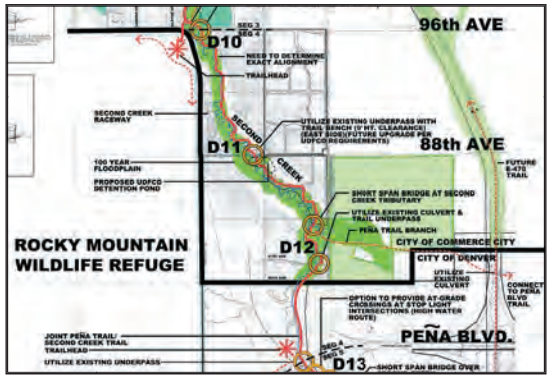
- Provide stubs and links to the local neighborhoods, schools and other activity centers.

- Provide walk-up neighborhood trailheads with gateway and wayfinding signage.

- Provide a major trailhead with parking for 50 cars, shelter, toilets, drinking water, gateway and interpretive signage at 96th Avenue.

- Provide an underpass beneath Buckley Road and a link to the Arsenal Wildlife Refuge Trail.

Segment 4:
"The Refuge" 96th Ave/Wildlife Refuge to Pena Boulevard



- Preserve the Second Creek floodplain through this reach with a terraced, natural-appearing, indigenous landscaped channel throughout.
- The Second Creek trail joins the Pena Trail at the confluence with the Second Creek Tributary. The trail is paved at this point and two trails share the pathway and corridor to Pena Boulevard.

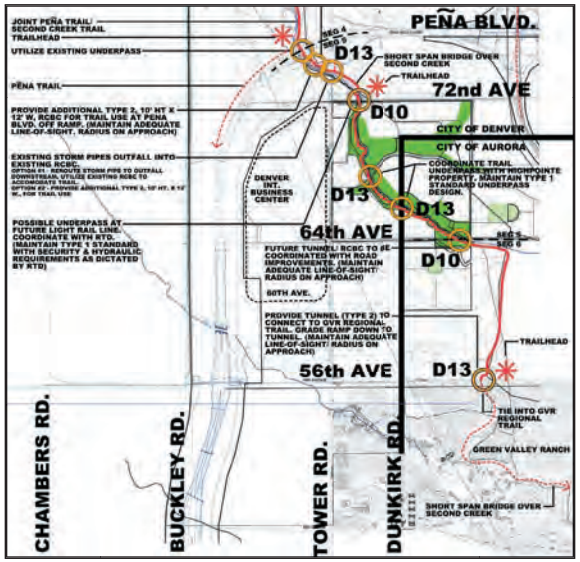
- Construct a 150' pedestrian crossing over the Second Creek Tributary.

- Create rest areas at both junctures (the Second Creek Tributary and near Tower Road) with the Pena Trail with benches and wayfinding information.

- Provide wide, open underpasses at 88th, 81st and Pena.

- Work with the Urban Drainage and Flood Control District to stabilize and enhance creek banks and wetland areas along the creek just south of Pena Boulevard.

Segment 5:
"High Point Greenbelt" Pena Boulevard to 64th Avenue



- Preserve the Second Creek floodplain through this reach with a terraced, natural-appearing, indigenous landscaped channel throughout.

- Provide a 10' x 12' trail underpass beneath the Pena Boulevard off-ramp south of Pena Boulevard.

- Provide a separate trail underpass above the storm inlets along Tower Road.

- Provide an alternative crossing of Tower Road at the intersection with the Pena on-ramp and Tower Road utilizing the traffic light. Provide adequate width and design standards for the side path along Tower from the proposed under pass to the traffic light.

- Construct a 150' pedestrian bridge across Second Creek from the east bank to the west bank.

- Work with the Regional Transportation District (RTD) to create an underpass beneath the proposed light rail line where it will cross Second Creek.

- Create a Trailhead/access point in conjunction with a future RTD stop at Tower Road.

- Coordinate with High Point developers to provide wide, open underpasses at all cross streets per design standards and guiding principles in this plan.

- Provide a trailhead with parking, wayfinding information, shelter and other amenities in the future park along Second Creek planned for High Point.

Segment 6:
"The High Line Link" 64th Avenue to High Line Canal

- Preserve the Second Creek floodplain through this reach with a terraced, natural-appearing, indigenous landscaped channel throughout.

- Provide a 10' x 12' underpass beneath 56th Avenue

- Tie into the trail system in Green Valley Ranch linking to the High Line Canal Trail. The trail link in this segment should meet all design standards and guiding principles in this plan.

- Provide a rest area and trailhead at the juncture with the High Line Canal Trail with wayfinding and other amenities.

Organizational Structure

Implementation of the Second Creek Trails and Greenway will be a significant multi-year effort. It will require continued planning, right-of-way acquisition, the preparation of construction documents, permitting, fundraising, construction and community participation. There will also be budget management, grant administration and inter-jurisdictional coordination activities.

Experience on similar projects in other communities has demonstrated that designating a Project Coordinator is an effective way to carry out the necessary implementation functions and to oversee design and construction. There are several suggested options for accomplishing this including:

- A lead agency such as one of the Win-Win Coalition's key jurisdiction's parks and recreation departments oversees the project designating a committed staff person or consultant to serve as project coordinator.

- A community entity is created and incorporated (such as a non-profit entity) to oversee the project. This entity hires either a staff person or a consultant to oversee and coordinate the project. The community entity works in cooperation with a public entity such as one of the lead jurisdictions. The South Suburban Park Foundation, Inc. in Littleton is a good example of this (Developed Platte River Mary Carter Trail and Greenway).

- An existing non-profit entity takes on the coordination of the effort in cooperation with the Win-Win Coalition's participating jurisdictions.

Under any of these scenarios several elements are vital. These include:

- A partnering lead public entity able to make grants, receive grants, accept and hold rights-of-way and take ownership responsibility for project construction and management.

- A designated individual with the skills, time commitment and authorization to manage the project. This project will likely require an annual commitment of 400 to 600 hours or more over a period of several years.

- A review committee such as the Win-Win Coalition to represent and advocate local interests (please see Community Participation below.)

Community Participation and Review

Second Creek is an important community asset. Successful implementation of the trail and greenway project calls for effective community involvement including review and participation in design of the trail and the associated fixtures and furnishing. Long-term care and stewardship of the Second Creek Trail and corridor will also be vital to the success of this endeavor.

To accomplish this there should be an effective mechanism for enduring community oversight and advocacy. To that end the formation of a Second Creek Trail and Greenway Advisory Committee is recommended. This group (perhaps an expansion of the Win-Win Coalition) should include, in addition to jurisdictional staff and elected officials, representatives of adjacent property owners, homeowner associations, developers, users, community leadership, businesses, environmental advocates and other stakeholders willing to share their knowledge and wisdom.

The Advisory Committee would review trail plans, construction schedules and construction impact mitigation strategies, and component designs during the construction phase. Over the long term the group should review proposed public and private sector projects impacting the creek as well as maintenance activities with the mission of protecting and enhancing the character of both the creek and the surrounding neighborhoods.

The Committee should identify guidelines for reviewing projects and advise local jurisdictions and stakeholders on actions—in both the public and private sectors—affecting the corridor. The Committee can also help advocate projects through fundraising, volunteer programs and special events.

This group may want to consider incorporating as a non-profit entity (or working in cooperation with an existing non-profit organization), enabling it to raise and hold funds, accept grants of right of way and hire professional services to coordinate trail and greenway development efforts.

Right-of-way Acquisition

Right-of-way acquisition will be the next key step once this Master Plan is approved. Rights-of-way can be acquired through fee simple grants, easements, long-term leases, developer dedication or other techniques. Second to developer dedication, easement acquisition for trail, conservation and floodway maintenance purposes is the preferred technique. Where possible owners should be encouraged to grant right-of-way in return for the value of the trail enhancements, stream maintenance and other non-cash benefits, though in some cases a cash payment may be required.

Right-of-way acquisition will require negotiation, surveys, legal descriptions, conveyance documents, appraisals and environmental investigations where applicable and other real estate and legal services. For each project segment, right-of-way should be secured before construction documents are prepared.

Fundraising Strategy and Cost Estimates

The total package of improvements for the Second Creek Trail and Greenway is estimated to cost approximately $15 million not including road underpasses likely to be funded by others. Design and construction will take place in several phases over a three to five-year period with completion projected for 2011. The potential principle public-sector contributors include: Adams County Open Space Program, City of Brighton, Commerce City, City of Denver, City of Aurora, Great Outdoors Colorado—both State Trails Funding and Large Scale Project Program, and the Urban Drainage and Flood Control District. Federal funds might be available under the Transportation Enhancements Program (SAFE-TEA) arranged through the Denver Regional Council of Governments (DRCOG.)

The major private sector source would most likely be right-of-way donations, dedications and improvements by developers and homeowner associations. The project might also receive in-kind contributions of land and volunteer labor resources.

Table 4.1 summarizes the estimated costs for planning, project development services, engineering and construction. Estimates are based on 2005 prices. (See Appendix A for a more detailed cost breakdown.)

Table 4.1 Estimates: Segments 1-5 (Segment 6 by Others)

Estimates do not include land acquisition. Indirect costs such as coordination, legal fees, etc. are included in the engineering costs.

Project Planning and Development

Item	Cost
Master Plan and Development	
• Survey and base mapping	
• Trail layout and alignment	
• Preliminary engineering	
• Flora and fauna investigation	
• Secure permits & rights of way	
• Refined cost estimates/ funding	
Planning/Development Sub-Total (3% of total):	$750,000

Item	Cost
Segment 1: Platte River to Fulton Ditch	
Construction Sub-Total:	$3,201,300
Engineering @ 20%	$640,260
Mobilization Costs @ 5%	$160,065
Contingency @ 15%	$480,195
Total Seg 1	$4,481,820

Item	Cost
Segment 2: Fulton Ditch to Second Creek Park	
Construction Sub-Total:	$4,423,000
Engineering @ 20%	$884,600
Mobilization Costs @ 5%	$221,150
Contingency @ 15%	$663,450
Total Seg 2	$6,192,200

Item	Cost
Segment 3: Second Creek Park to 96th/Arsenal Refuge	
Construction Sub-Total:	$3,505,500
Engineering @ 20%	$701,100
Mobilization Costs @ 5%	$175,275
Contingency @ 15%	$525,825
Total Seg 3	$4,907,700

Item	Cost
Segment 4: 96th/Refuge to Pena Boulevard Trail	
Construction Sub-Total:	$2,231,300
Engineering @ 20%	$446,260
Mobilization Costs @ 5%	$111,565
Contingency @ 15%	$334,695
Total Seg 4	$3,123,820

Item	Cost
Segment 5: Pena Boulevard Trail to 64th Avenue	
Construction Sub-Total:	$3,370,900
Engineering @ 20%	$674,180
Mobilization Costs @ 5%	$168,546
Contingency @ 15%	$505,635
Total Seg 5	$4,719,260

Item	Cost
Segment 6: 64th to High Line Canal (by others)	

Grand Total (Including Road Underpasses & Tunnels): $23,424,800

Note: Total cost may range from $15 million to $23 million based upon funding sources for road underpasses and tunnels.

Project Phasing

Project phasing will be tied to several considerations:

- Acquisition of rights-of-way
- Agreements with developers and homeowner associations
- Identifying sufficient funds to build and maintain facilities
- Completing logical segments that link populated areas
- Completing logical segments that can stand on their own
- Completing segments that reflect community priorities

Based on these considerations the recommended phasing priorities are:

1. Immediately pursue right-of-way agreements and permits for all segments.

2. Coordinate with infrastructure agencies such as Urban Drainage and Flood Control, highway and road departments, utilities, ditch companies and railroads to facilitate compatible improvements consistent with the goals of this plan.

3. Complete Segment 3: Linking the Arsenal Wildlife Refuge to Second Creek Floodplain Park and the communities in between.

4. Complete Segments 5 and 6: linking the Green Valley Ranch and High Point communities to the Wildlife Refuge and to Second Creek Floodplain park.

5. Complete Segment 1: Linking the Platte River Trail to the Fulton Ditch Trail.

6. Complete Segment 2: Linking the Fulton Ditch Trail to Second Creek Floodplain Park.

Maintenance Activities and Costs

The plan anticipates annual maintenance costs of $5,000 to $10,000 per mile for the reach of the Second Creek Trail from the Platte River Confluence to the High Line Canal—approximately 16.7 miles. This includes maintenance of the paved trail, maintenance of unpaved or gravel surface or side trails, care of fixtures and amenities and upkeep of the floodplain corridor. It does not include maintenance of active parks and other facilities not directly tied to the trail or the undeveloped floodplain corridor.

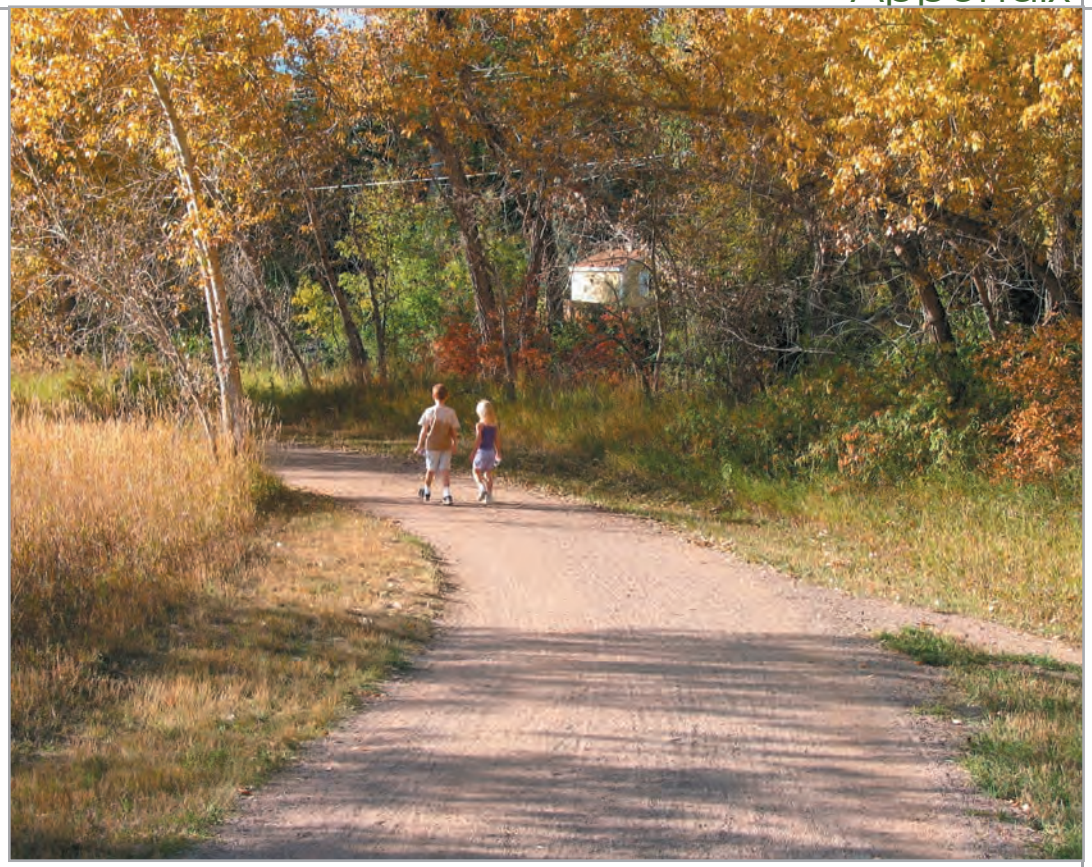
Actual cost will depend on the level of maintenance desired and the level trail use. Volunteers and community businesses might also provide some services and assistance including a possible "Adopt-a-Trail" program for litter pick-up, minor sweeping and reporting maintenance problems. The respective jurisdictions and property owner associations might take responsibility for their respective reaches of the corridor. Urban Drainage and Flood Control District will also likely assist with certain functions to the extent they are directly tied to flood hazard reduction and drainage objectives.

Alternatively, the various jurisdictions and participants may choose to establish a combined maintenance agreement with a single entity, and contract with the other partners for maintenance of the entire corridor. The local police departments and fire and rescue entities will patrol their respective segments although a coordination plan among the jurisdictions is recommended to promote better user safety and security.

Table 4.2: Estimated Annual Maintenance Costs

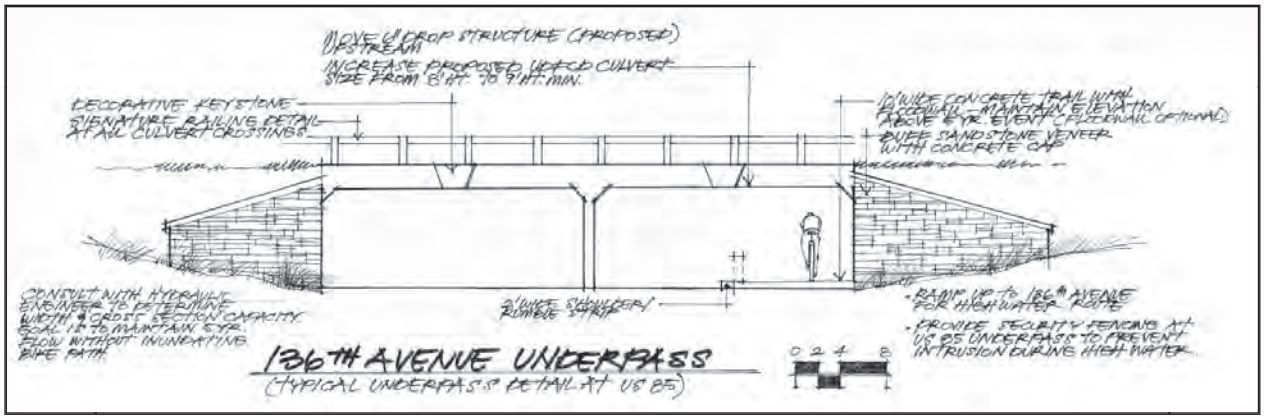
Maintenance Function	Frequency	Per Mile Cost
Routine Maintenance		$ 5,000 to $10,000
• Trail Sweeping	Bi-weekly	
• Plowing in winter	As needed	
• Litter and Debris Pick-up	Bi-weekly	
• Weed/Vegetation Trimming	2 per year	
• Minor Repair/Graffiti Removal	As required	
• Stream Channel Maintenance	As required	
• Patrol	Daily	
Remedial Maintenance		
• Major Remedial Repairs (50 to 100-year life) Capital Item—not an annual cost	50-100 yrs	Capital Cost
All-Terrain Trail Maintenance (Soft Surface)		$ 1,000 to $ 2,000
• Erosion repair	As-required	
• Litter and Debris Pick-up	Bi-weekly	
• Weed/Vegetation Trimming	2 per year	

Appendix

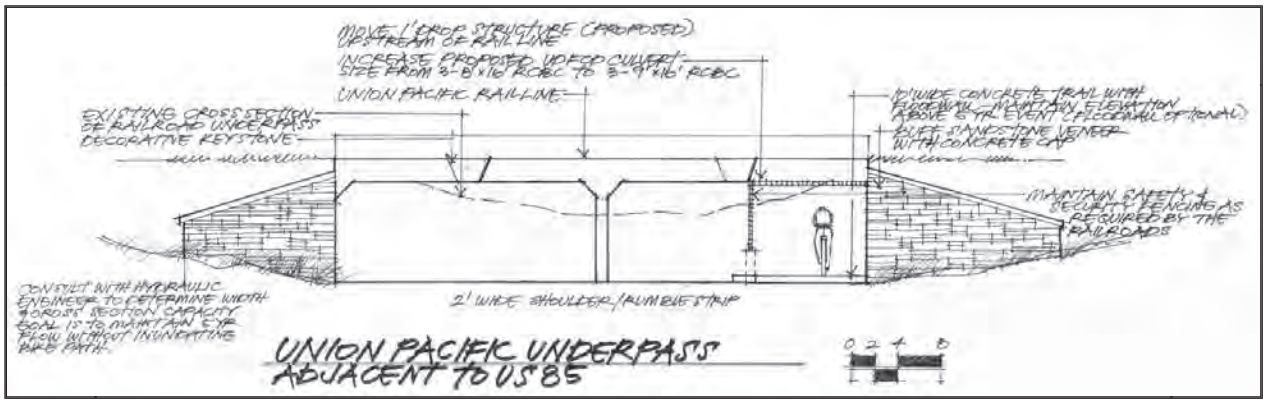


Appendix A: Cost Estimates Spreadsheet

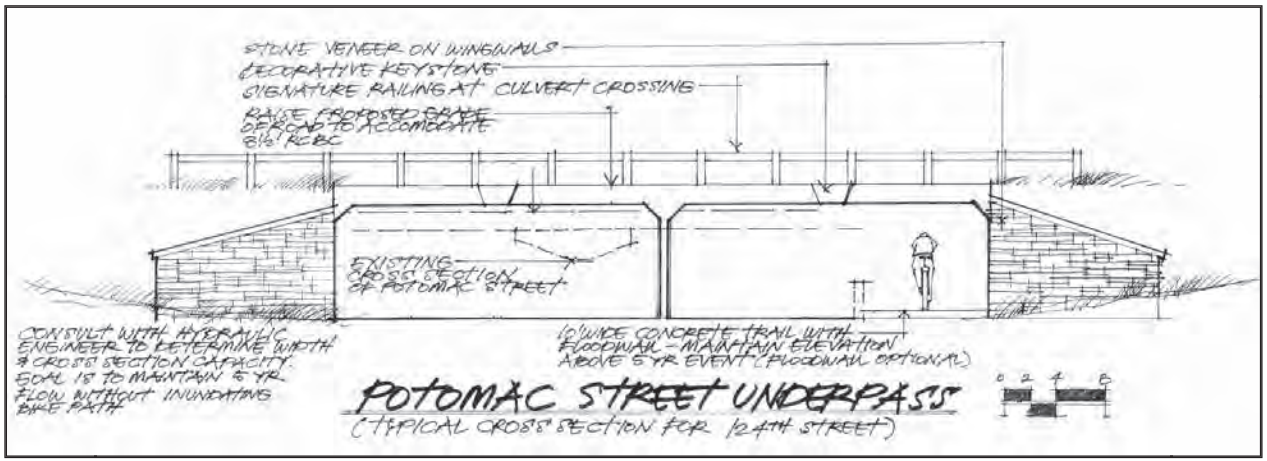
D1


MOVE U/STREAM DROP STRUCTURE (PROPOSED)
INCREASE PROPOSED U/ROAD CULVERT SIZE FROM 8' HT. TO 9' HT. MIN.
DECORATIVE KEYSTONE
SIGNATURE RAILING DETAIL AT ALL CULVERT CROSSINGS
10' WIDE CONCRETE TRAIL W/ FLOODWALL - MAINTAIN ELEVATION ABOVE 5 YR. EVENT (FLOODWALL OPTIONAL)
BUFF SANDSTONE VENEER WITH CONCRETE CAP
CONSULT WITH HYDRAULIC ENGINEER TO DETERMINE WIDTH & CROSS SECTION CAPACITY GOAL IS TO MAINTAIN 5 YR. FLOW WITHOUT INUNDATING BIKE PATH.
2' WIDE SHOULDER/RUMBLE STRIP
• RAMP UP TO 136th AVENUE FOR HIGH WATER ROUTE
• PROVIDE SECURITY FENCING AT US 85 UNDERPASS TO PREVENT INTRUSION DURING HIGH WATER
136TH AVENUE UNDERPASS
(TYPICAL UNDERPASS @ RETAIL AT US 85)
0 2 4 8

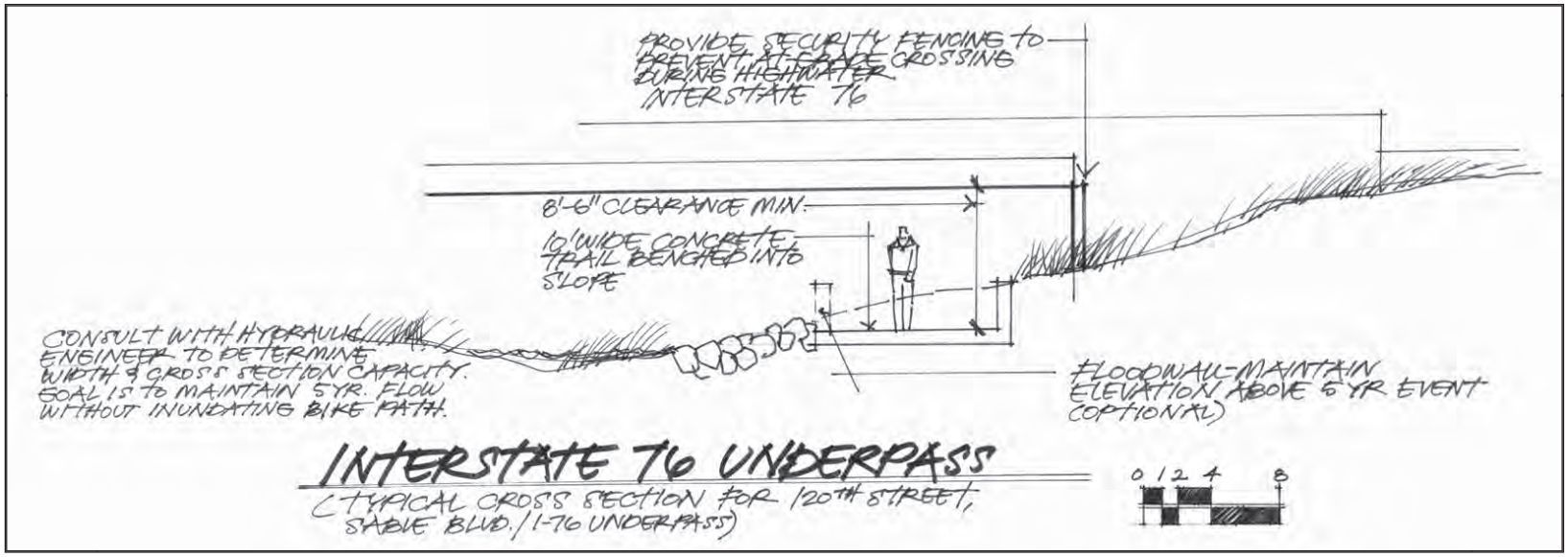
D2


MOVE U/STREAM DROP STRUCTURE (PROPOSED)
INCREASE PROPOSED U/ROAD CULVERT SIZE FROM 3-8'x10' RCBC TO 3-9'x10' RCBC
UNION PACIFIC RAILLINE
EXISTING CROSS SECTION OF RAILROAD UNDERPASS
DECORATIVE KEYSTONE
10' WIDE CONCRETE TRAIL WITH FLOODWALL - MAINTAIN ELEVATION ABOVE 5 YR EVENT (FLOODWALL OPTIONAL)
BUFF SANDSTONE VENEER WITH CONCRETE CAP
MAINTAIN CLEARANCE & SECURITY FENCING AS REQUIRED BY THE RAILROADS
CONSULT WITH HYDRAULIC ENGINEER TO DETERMINE WIDTH & CROSS SECTION CAPACITY GOAL IS TO MAINTAIN 5 YR. FLOW WITHOUT INUNDATING BIKE PATH.
2' WIDE SHOULDER/RUMBLE STRIP
UNION PACIFIC UNDERPASS ADJACENT TO US 85
0 2 4 8

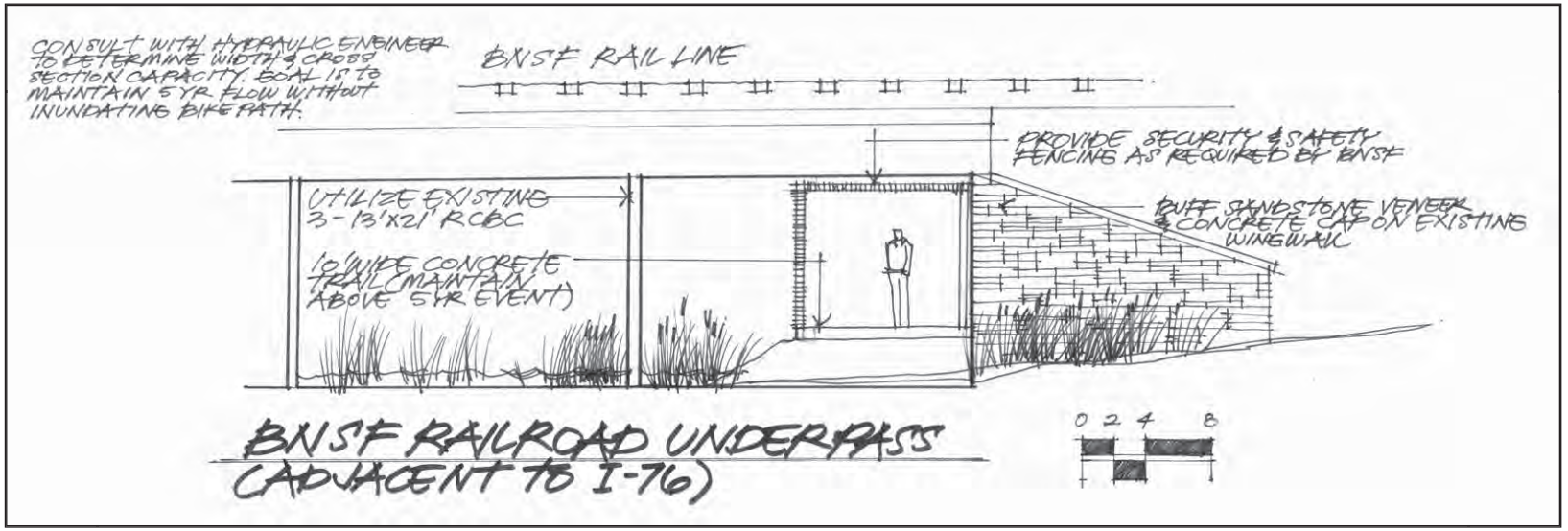
D3


STONE VENEER ON WINGWALLS
DECORATIVE KEYSTONE
SIGNATURE RAILING AT CULVERT CROSSING
RAISE PROPOSED GRADE OF ROAD TO ACCOMODATE 8'x6' RCBC
EXISTING CROSS SECTION OF POTOMAC STREET
CONSULT WITH HYDRAULIC ENGINEER TO DETERMINE WIDTH & CROSS SECTION CAPACITY. GOAL IS TO MAINTAIN 5 YR. FLOW WITHOUT INUNDATING BIKE PATH
10' WIDE CONCRETE TRAIL WITH FLOODWALL - MAINTAIN ELEVATION ABOVE 5 YR EVENT (FLOODWALL OPTIONAL)
POTOMAC STREET UNDERPASS
(TYPICAL CROSS SECTION FOR 124TH STREET)
0 2 4 8

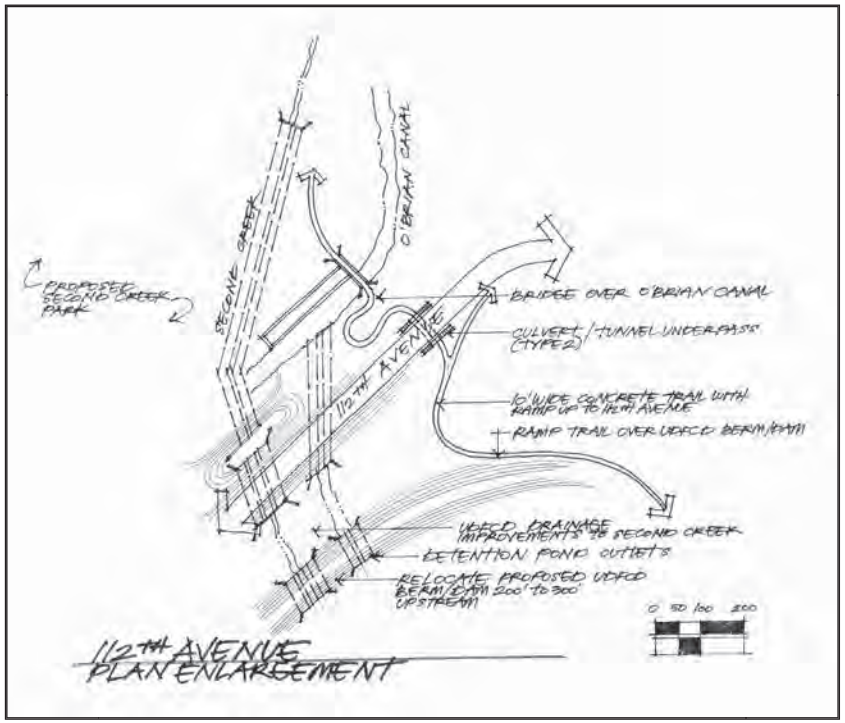
D4


PROVIDE SECURITY FENCING TO PREVENT AT-GRADE CROSSING DURING HIGHWATER
INTERSTATE 76
8'-6" CLEARANCE MIN.
10' WIDE CONCRETE TRAIL BENCHED INTO SLOPE
CONSULT WITH HYDRAULIC ENGINEER TO DETERMINE WIDTH & CROSS SECTION CAPACITY. GOAL IS TO MAINTAIN 5YR. FLOW WITHOUT INUNDATING BIKE PATH.
FLOODWALL-MAINTAIN ELEVATION ABOVE 5 YR EVENT (OPTIONAL)
INTERSTATE 76 UNDERPASS
(TYPICAL CROSS SECTION FOR 120TH STREET, SABLE BLVD./I-76 UNDERPASS)
0 1 2 4 8

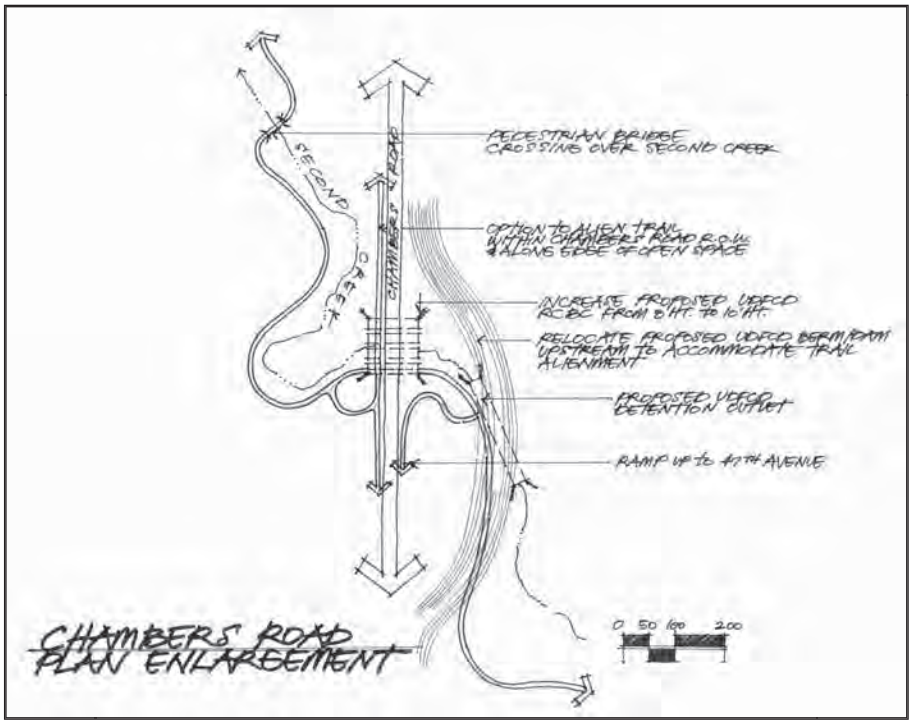
D5

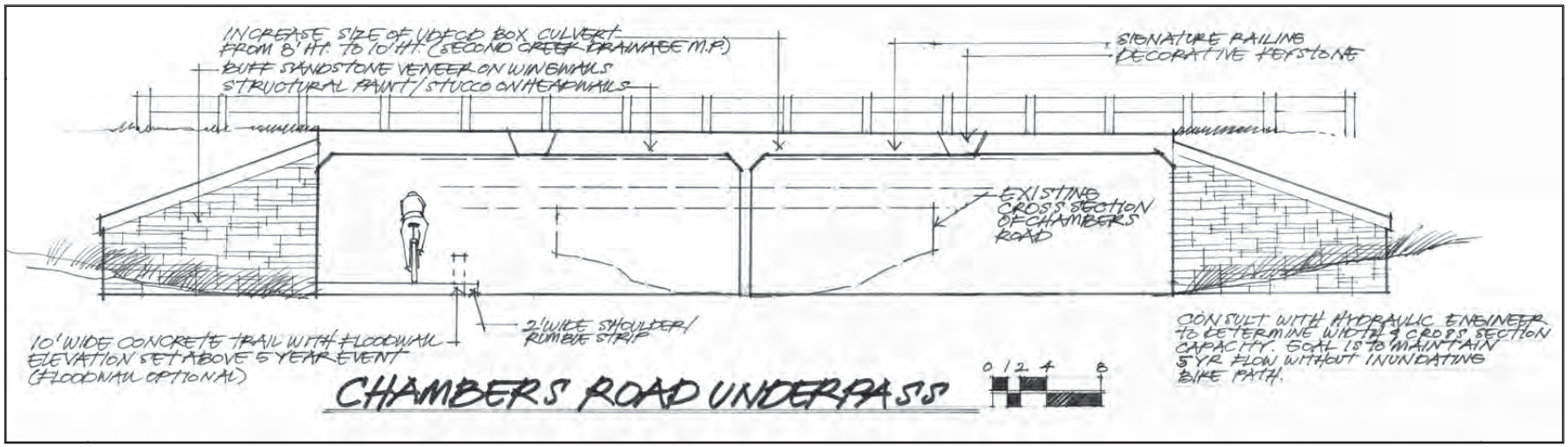

CONSULT WITH HYDRAULIC ENGINEER TO DETERMINE WIDTH & CROSS SECTION CAPACITY. GOAL IS TO MAINTAIN 5 YR. FLOW WITHOUT INUNDATING BIKE PATH.
BNSF RAIL LINE
PROVIDE SECURITY & SAFETY FENCING AS REQUIRED BY BNSF
UTILIZE EXISTING 3 - 13'X21' RCBC
10' WIDE CONCRETE TRAIL (MAINTAIN ABOVE 5 YR EVENT)
BUFF SANDSTONE VENEER & CONCRETE CAP ON EXISTING WINGWALL
BNSF RAILROAD UNDERPASS
(ADJACENT TO I-76)
0 2 4 8

D6


SECOND CREEK
O'BRIAN CANAL
112TH AVENUE
PROPOSED SECOND CREEK PARK
BRIDGE OVER O'BRIAN CANAL
CULVERT (TYPE 2) / TUNNEL UNDERPASS
10' WIDE CONCRETE TRAIL WITH RAMP UP TO 112TH AVENUE
RAMP TRAIL OVER UDFCD BERM/DAM
UDFCD DRAINAGE IMPROVEMENTS TO SECOND CREEK
DETENTION POND OUTLETS
RELOCATE PROPOSED UDFCD BERM/DAM 200' TO 300' UPSTREAM
0 50 100 200
112TH AVENUE PLAN ENLARGEMENT

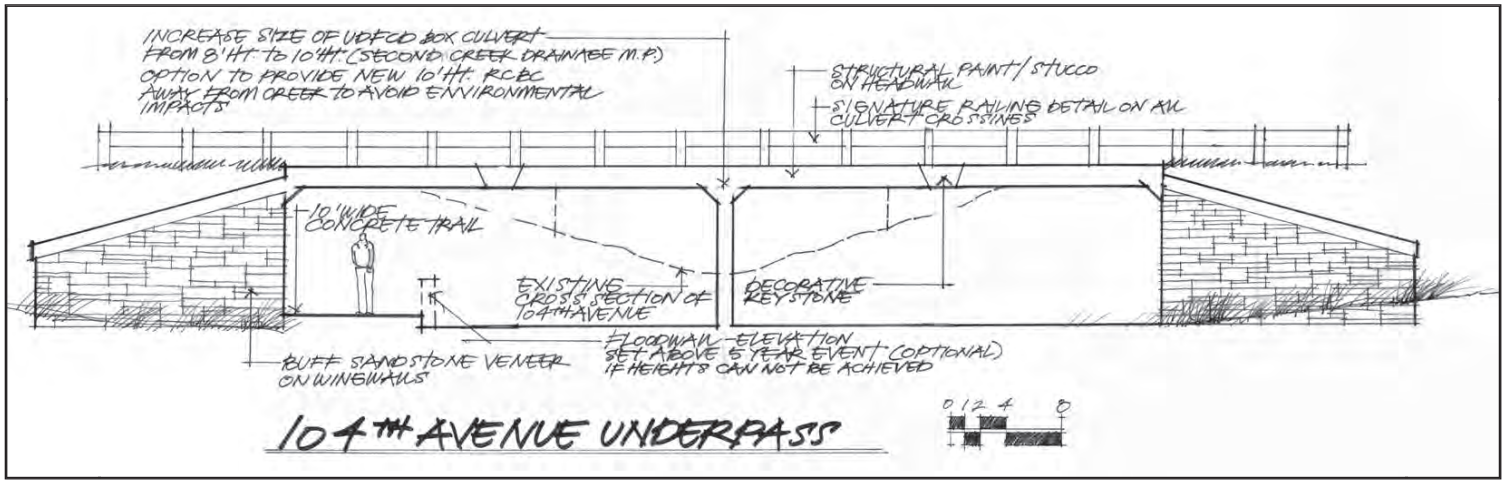
D7


SECOND CREEK
CHAMBERS ROAD
PEDESTRIAN BRIDGE CROSSING OVER SECOND CREEK
OPTION TO ALIGN TRAIL WITHIN CHAMBERS ROAD R.O.W. ALONG EDGE OF OPEN SPACE
INCREASE PROPOSED UDFCD RCBC FROM 8' HT. TO 10' HT.
RELOCATE PROPOSED UDFCD BERM/DAM UPSTREAM TO ACCOMMODATE TRAIL ALIGNMENT
PROPOSED UDFCD DETENTION OUTLET
RAMP UP TO 112TH AVENUE
0 50 100 200
CHAMBERS ROAD PLAN ENLARGEMENT

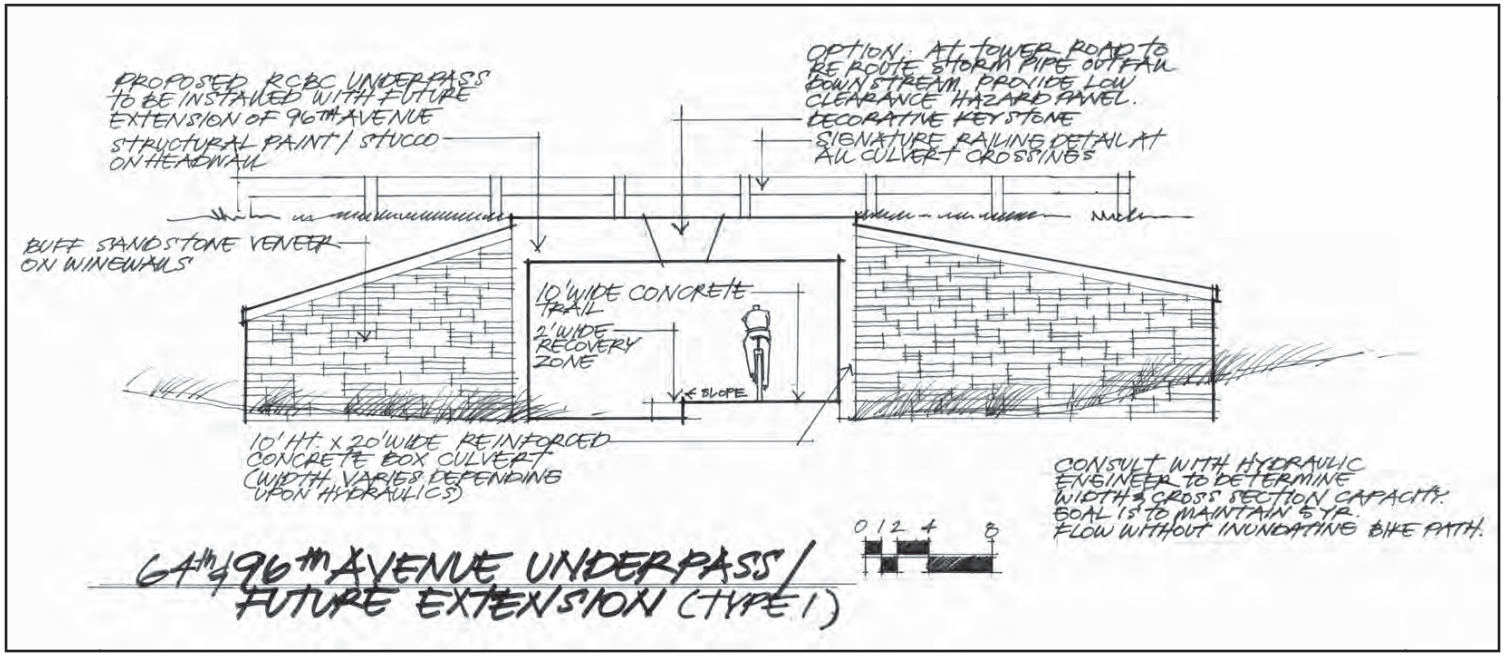

INCREASE SIZE OF UDFCD BOX CULVERT FROM 8' HT. TO 10' HT. (SECOND CREEK DRAINAGE M.P.)
BUFF SANDSTONE VENEER ON WINGWALLS
STRUCTURAL PAINT/STUCCO ON HEADWALLS
SIGNATURE RAILING
DECORATIVE KEYSTONE
EXISTING CROSS SECTION OF CHAMBERS ROAD
10' WIDE CONCRETE TRAIL WITH FLOODWALL ELEVATION SET ABOVE 5 YEAR EVENT (FLOODWALL OPTIONAL)
2' WIDE SHOULDER/ RUMBLE STRIP
CONSULT WITH HYDRAULIC ENGINEER TO DETERMINE WIDTH & CROSS SECTION CAPACITY. GOAL IS TO MAINTAIN 5YR FLOW WITHOUT INUNDATING BIKE PATH.
0 1 2 4 8
CHAMBERS ROAD UNDERPASS

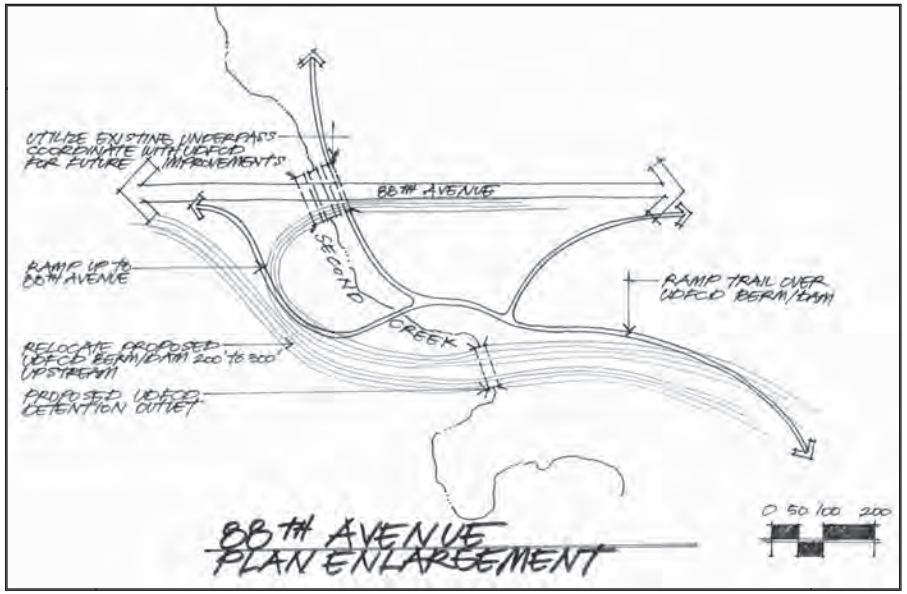
D8

D9

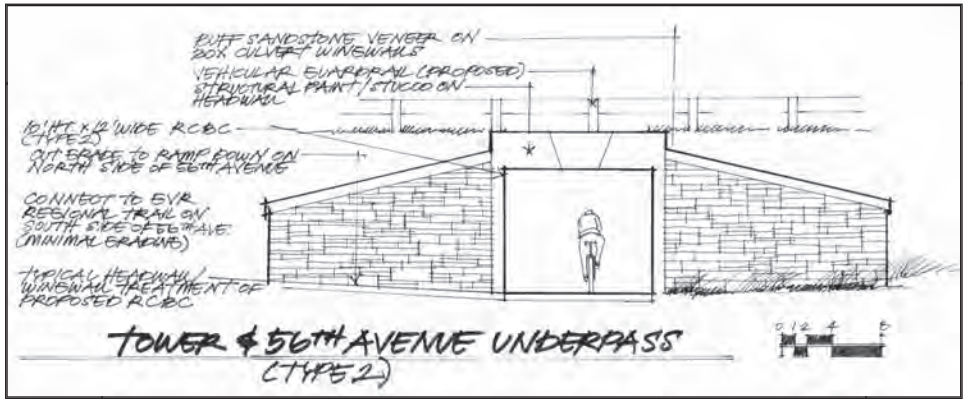

INCREASE SIZE OF UDFCD BOX CULVERT FROM 8'HT. TO 10'HT. (SECOND CREEK DRAINAGE M.P.) OPTION TO PROVIDE NEW 10'HT. RCBC AWAY FROM CREEK TO AVOID ENVIRONMENTAL IMPACTS
STRUCTURAL PAINT/ STUCCO ON HEADWALL
SIGNATURE RAILING DETAIL ON ALL CULVERT CROSSINGS
10' WIDE CONCRETE TRAIL
EXISTING CROSS SECTION OF 104TH AVENUE
DECORATIVE KEYSTONE
FLOODWALL ELEVATION SET ABOVE 5 YEAR EVENT (OPTIONAL) IF HEIGHTS CAN NOT BE ACHIEVED
BUFF SANDSTONE VENEER ON WINGWALLS
0 1 2 4 8
104TH AVENUE UNDERPASS

D10


PROPOSED RCBC UNDERPASS TO BE INSTALLED WITH FUTURE EXTENSION OF 96TH AVENUE
STRUCTURAL PAINT / STUCCO ON HEADWALL
OPTION: AT TOWER ROAD TO RE ROUTE STORM PIPE OUTFALL DOWNSTREAM, PROVIDE LOW CLEARANCE HAZARD PANEL.
DECORATIVE KEYSTONE
SIGNATURE RAILING DETAIL AT ALL CULVERT CROSSINGS
BUFF SANDSTONE VENEER ON WINGWALLS
10' WIDE CONCRETE TRAIL
2' WIDE RECOVERY ZONE
4:1 SLOPE
10' HT. X 20' WIDE REINFORCED CONCRETE BOX CULVERT (WIDTH VARIES DEPENDING UPON HYDRAULICS)
CONSULT WITH HYDRAULIC ENGINEER TO DETERMINE WIDTH & CROSS SECTION CAPACITY. GOAL IS TO MAINTAIN 5 YR. FLOW WITHOUT INUNDATING BIKE PATH.
0 1 2 4 8
64TH/96TH AVENUE UNDERPASS/ FUTURE EXTENSION (TYPE I)

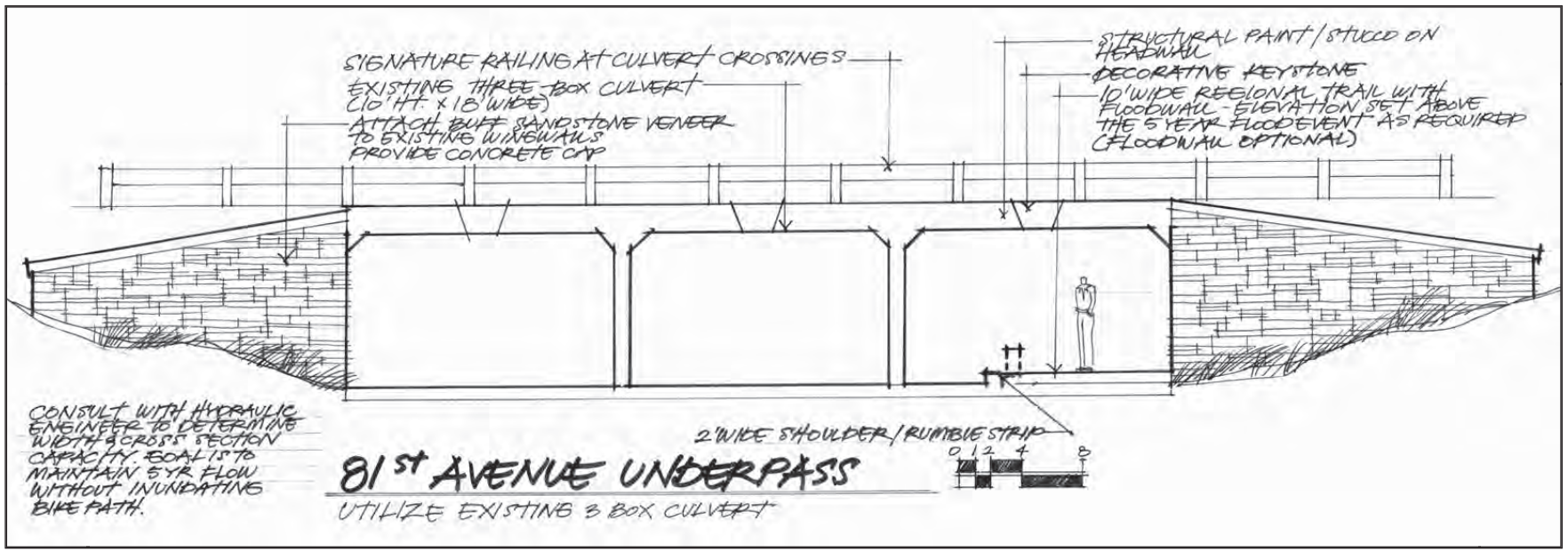

UTILIZE EXISTING UNDERPASS COORDINATE WITH UDFCD FOR FUTURE IMPROVEMENTS
88TH AVENUE
SECOND
CREEK
RAMP UP TO 88TH AVENUE
RAMP TRAIL OVER UDFCD BERM/DAM
RELOCATE PROPOSED UDFCD BERM/DAM 200' TO 300' UPSTREAM
PROPOSED UDFCD DETENTION OUTLET
0 50 100 200
88TH AVENUE PLAN ENLARGEMENT

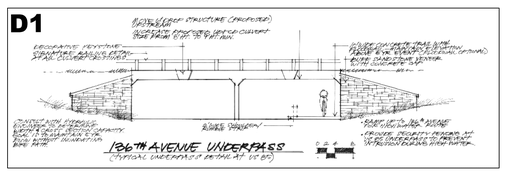
D11

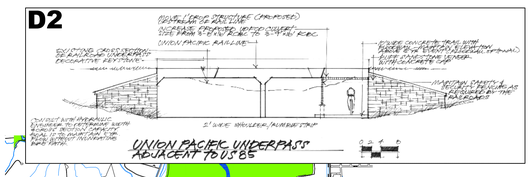

BUFF SANDSTONE VENEER ON BOX CULVERT WINGWALLS
VEHICULAR GUARDRAIL (PROPOSED) STRUCTURAL PAINT/STUCCO ON HEADWALL
10'HT X 12'WIDE RCBC (TYPE 2)
CUT GRADE TO RAMP DOWN ON NORTH SIDE OF 56TH AVENUE
CONNECT TO EVR REGIONAL TRAIL ON SOUTH SIDE OF 56TH AVE (MINIMAL GRADING)
TYPICAL HEADWALL/ WINGWALL TREATMENT OF PROPOSED RCBC
0 1 2 4 8
TOWER @ 56TH AVENUE UNDERPASS (TYPE 2)

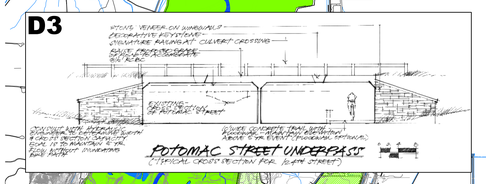
D13

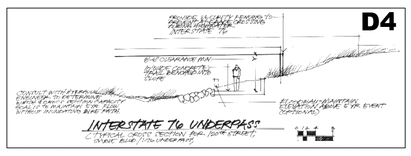
D12

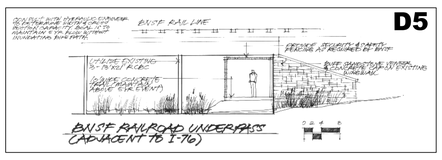

SIGNATURE RAILING AT CULVERT CROSSINGS
EXISTING THREE BOX CULVERT (10' HT. X 18' WIDE)
ATTACH BUFF SANDSTONE VENEER TO EXISTING WINGWALLS PROVIDE CONCRETE CAP
STRUCTURAL PAINT/STUCCO ON HEADWALL
DECORATIVE KEYSTONE
10' WIDE REGIONAL TRAIL WITH FLOODWALL - ELEVATION SET ABOVE THE 5 YEAR FLOOD EVENT AS REQUIRED (FLOODWALL OPTIONAL)
CONSULT WITH HYDRAULIC ENGINEER TO DETERMINE WIDTH & CROSS SECTION CAPACITY. GOAL IS TO MAINTAIN 5 YR FLOW WITHOUT INUNDATING BIKE PATH.
2' WIDE SHOULDER/RUMBLE STRIP
0 1 2 4 8
81ST AVENUE UNDERPASS
UTILIZE EXISTING 3 BOX CULVERT

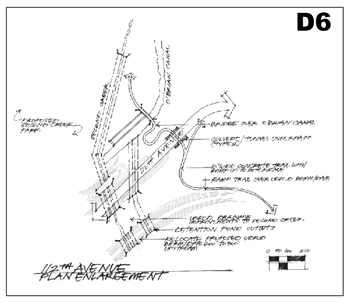


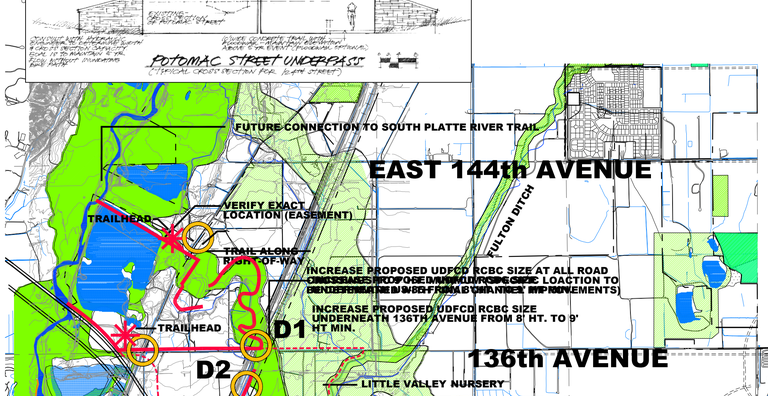


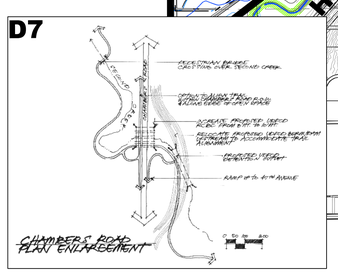


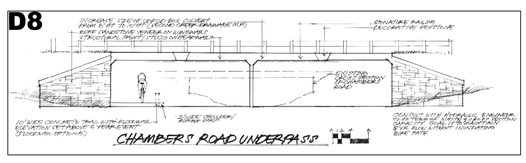


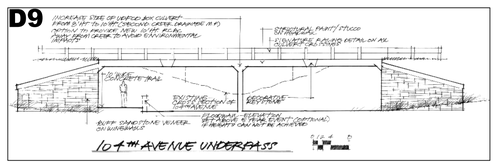


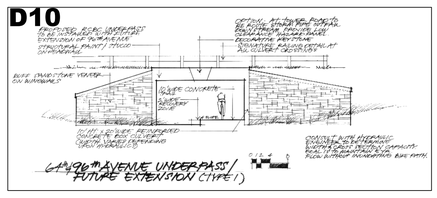


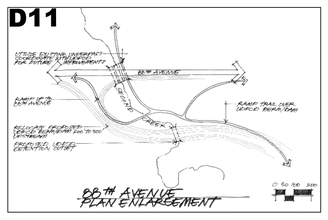


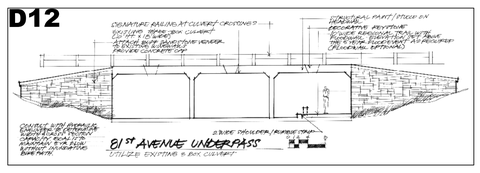


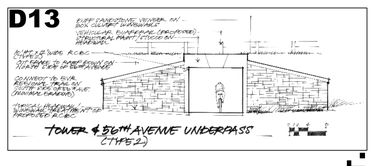












TYPE 1 RCBC = 10' HT. X 20' WIDTH

TYPE 2 RCBC = 10' HT. X 12' WIDTH (DOES NOT CONVEY WATER)

Second Creek Master Plan

TRAILS MASTER PLAN

0 500 1000 2000

SCALE 1"=1,000'-0"

THE GREENWAY TEAM:

DHM DESIGN CORPORATIC