

# Conceptual Review Agenda

Schedule for 05/19/22

Meetings hosted via Zoom Web Conferencing

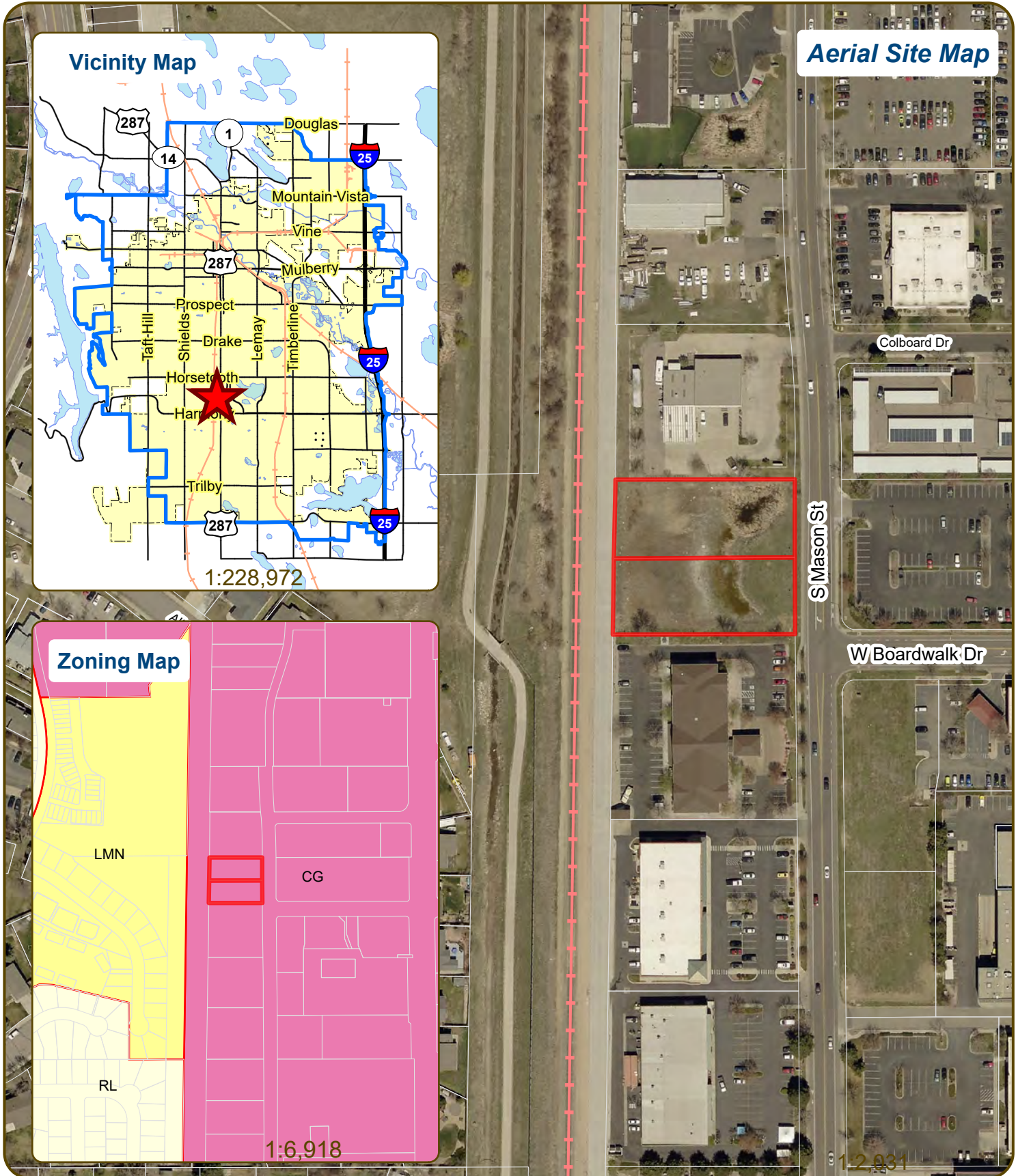
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## Thursday, May 19, 2022

Time	Project Name	Applicant Info	Project Description	
10:15	3915 & 3935 S Mason St. – Parking Lot  CDR220041	Steve Steinbicker 970-207-0424 Steve@ArchitectureWestLLC.com	This is a request to develop a parking lot at 3915 & 3935 S Mason St. (parcel # 9735118001, 9735118002). The applicant is requesting to develop a parking lot on vacant wetlands as support for a proposed theater events center on an adjacent parcel. Both sites are infill Mason Street sites. Request any clarifications on use, development criteria, wetlands/stormwater limitations, clarification of Larimer 'G&D emissions', access, and limitations for the parking lot. Access would be taken from S Mason St directly to the east. The site is located directly NW of the intersection of S Mason St and W Boardwalk Dr. The property is within the General Commercial District (C-G) zone district and is subject to Planning & Zoning Commission (Type 2) Review	<b>Planner: Pete Wray</b> <b>Engineer: Tim Dinger</b> <b>DRC: Brandy Bethurem Harras</b>

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# 3915, 3935 S Mason St. #9735118001, 9735118002 Parking Lot



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CONCEPTUAL REVIEW: APPLICATION

General Information

All proposed development projects begin with Conceptual Review. Anyone with a development idea can schedule a Conceptual Review meeting to get feedback on prospective development ideas. At this stage, the development idea does not need to be finalized or professionally presented. However, a sketch plan and this application must be submitted to City Staff prior to the Conceptual Review meeting. The more information you are able to provide, the better feedback you are likely to get from the meeting. Please be aware that any information submitted may be considered a public record, available for review by anyone who requests it, including the media. The applicant acknowledges that they are acting with the owner's consent.

Conceptual Reviews are scheduled on three Thursday mornings per month on a "first come, first served" basis and are a free service. One 45 meeting is allocated per applicant and only three conceptual reviews are done each Thursday morning. A completed application must be submitted to reserve a Conceptual Review time slot. Complete applications and sketch plans must be submitted to City Staff on Thursday, no later than end of day, two weeks prior to the meeting date. Application materials must be e-mailed to currentplanning@fcgov.com. If you do not have access to e-mail, other accommodations can be made upon request.

At Conceptual Review, you will meet with Staff from a number of City departments, such as Community Development and Neighborhood Services (Zoning, Current Planning, and Development Review Engineering), Light and Power, Stormwater, Water/Waste Water, Advance Planning (Long Range Planning and Transportation Planning) and Poudre Fire Authority. Comments are offered by staff to assist you in preparing the detailed components of the project application. There is no approval or denial of development proposals associated with Conceptual Review. At the meeting you will be presented with a letter from staff, summarizing comments on your proposal.

\*BOLDED ITEMS ARE REQUIRED\* \*The more info provided, the more detailed your comments from staff will be.\*

Contact Name(s) and Role(s) (Please identify whether Consultant or Owner, etc) \_\_\_\_\_

Business Name (if applicable) \_\_\_\_\_

Your Mailing Address \_\_\_\_\_

Phone Number \_\_\_\_\_ Email Address \_\_\_\_\_

Site Address or Description (parcel # if no address) \_\_\_\_\_

Description of Proposal (attach additional sheets if necessary) \_\_\_\_\_

Proposed Use \_\_\_\_\_ Existing Use \_\_\_\_\_

Total Building Square Footage \_\_\_\_\_ S.F. Number of Stories \_\_\_\_\_ Lot Dimensions \_\_\_\_\_

Age of any Existing Structures \_\_\_\_\_

Info available on Larimer County's Website: http://www.co.larimer.co.us/assessor/query/search.cfm
If any structures are 50+ years old, good quality, color photos of all sides of the structure are required for conceptual.

Is your property in a Flood Plain? [ ] Yes [ ] No If yes, then at what risk is it? \_\_\_\_\_

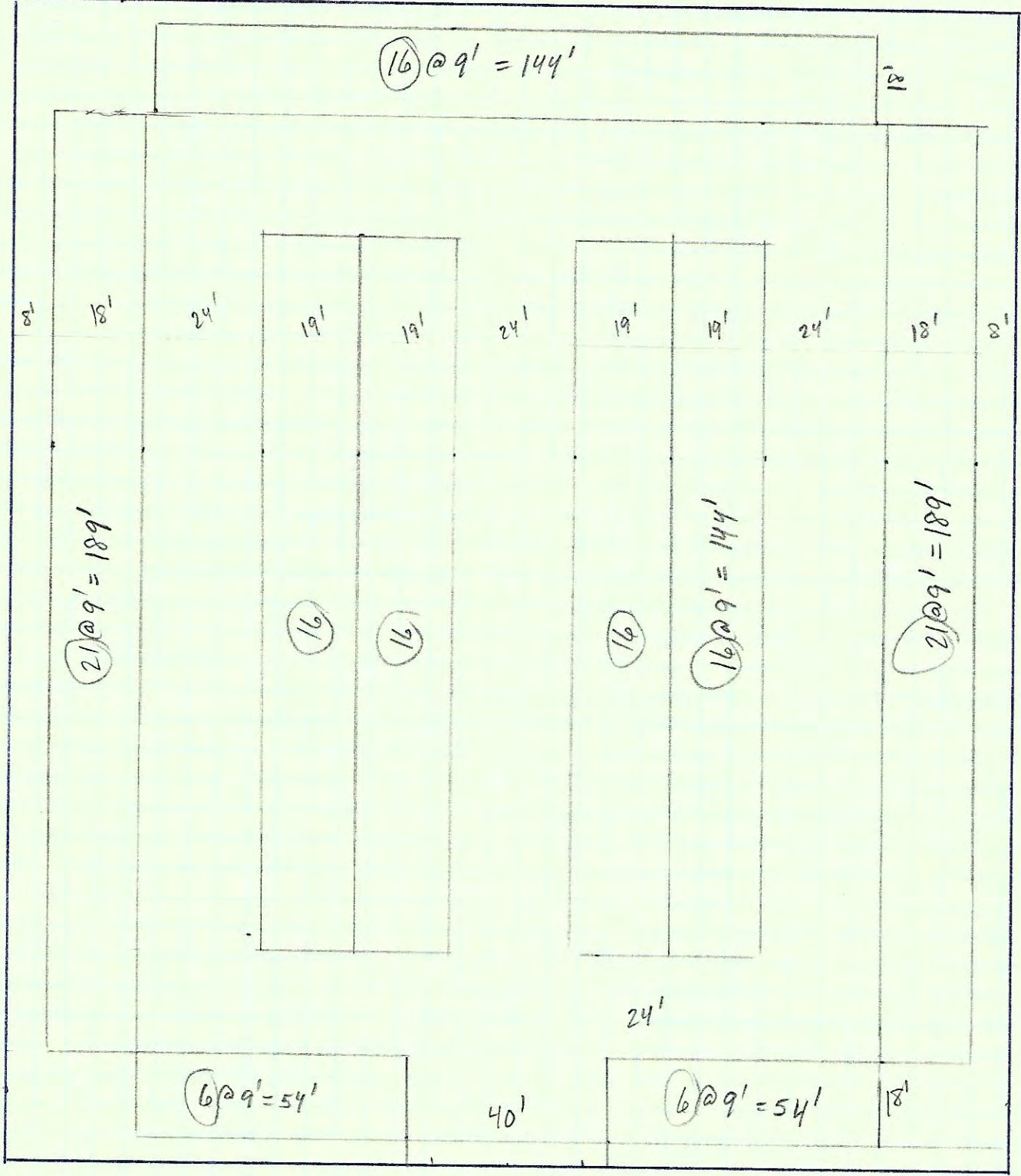
Info available on FC Maps: http://gisweb.fcgov.com/redirect/default.aspx?layerTheme=Floodplains.

Increase in Impervious Area \_\_\_\_\_ S.F.
(Approximate amount of additional building, pavement, or etc. that will cover existing bare ground to be added to the site)

Suggested items for the Sketch Plan:

Property location and boundaries, surrounding land uses, proposed use(s), existing and proposed improvements (buildings, landscaping, parking/drive areas, water treatment/detention, drainage), existing natural features (water bodies, wetlands, large trees, wildlife, canals, irrigation ditches), utility line locations (if known), photographs (helpful but not required). Things to consider when making a proposal: How does the site drain now? Will it change? If so, what will change?





$16 * 5 = 80$   
 $21 * 2 = 42$   
 $6 * 2 = 12$   
134

$1'' = 30'$



Community Development  
and Neighborhood Services  
281 North College Ave.  
P.O. Box 580  
Fort Collins, CO 80522-0580  
970.221.6750  
970.224.6134 - fax  
[fcgov.com/currentplanning](http://fcgov.com/currentplanning)

December 7, 2011

Willis Wetzler  
P.O. Box G  
Berthoud, CO 80513

RE: Lots 1 and 2, South College Investments Subdivision (Vacant Land)  
Assessor's # 97351-18-001 and 97351-18-002

Dear Mr. Wetzler,

This letter is in reference to our meeting regarding your property held on Oct 24, 2011. The attendees at that meeting were Mike Morgan, a right-of-way consultant on the City's BRT Project, Glen Schlueter of City Stormwater, you, and me. As you recall, we discussed what might be involved in the development of your two lots.

At this meeting, I informed you of the wetland delineation that was conducted in August of 2010, which determined that a significant portion of your property contained wetlands. In this report, it states the wetland is 0.84 acres in size. As your two lots are approximately 1.08 acres (based on my GIS calculations), this means that ~77.8% of your property has been delineated as a wetland. Please see the enclosed wetland delineation document provided to the City of Fort Collins by Michael Baker Jr., Inc, the environmental consulting firm that conducted the study, for more details on the ecological values and functions the wetland provides to our community and region.

When a parcel goes through the development review process, applicants are required to follow the City of Fort Collins Land Use Code. In this code, Section 3.4.1 addresses "Natural Habitats and Features," and has the following general standard:

*To the maximum extent feasible, the development plan shall be designed and arranged to be compatible with and to protect natural habitats and features and the plants and animals that inhabit them and integrate them within the developed landscape of the community by: (1) directing development away from sensitive resources, (2) minimizing impacts and disturbance through the use of buffer zones, (3) enhancing existing conditions, or (4) restoring or replacing the resource value lost to the community (either on-site or off-site) when a development proposal will result in the disturbance of natural habitats or features.*

Thus, the Land Use Code strongly emphasizes the protection of a parcel's natural habitat or features in their current state. In addition, a buffer zone of 100' (based on the size of the wetland) would be required on your property to enhance the function of the wetland and to minimize disturbance of the resource. However, as this property is significantly encumbered, during the development review process, staff would work with you to identify if development in the buffer zone or the wetland could be an option. If development within the wetland and/or the buffer zone would occur, the following Land Use Code standard would apply:

*(b) If the development causes any disturbance within the buffer zone, whether by approval of the decision maker or otherwise, the applicant shall undertake restoration and mitigation measures within the buffer zone such as regrading and/or the replanting of native vegetation. The applicant shall undertake mitigation measures to restore any damaged or lost natural resource either on-site or off-site at the discretion of the decision maker. Any such mitigation or restoration shall be at least equal in ecological value to the loss suffered by the community because of the disturbance, and shall be based on such mitigation and restoration plans and reports as have been requested, reviewed and approved by the decision maker. Unless otherwise authorized by the decision maker, if existing vegetation (whether native or non-native) is destroyed or disturbed, such vegetation shall be replaced with native vegetation and landscaping.*

Given the site's significant amount of wetlands (again, almost 78% of the site), it appears difficult to accommodate both development and habitat protection. Given that, it is likely that some level of off-site mitigation would occur, should the property develop.

As I mentioned in our meeting, the determination of all of this is based on going through the entire development review process, which would include the completion of an Ecological Characterization Study to determine if the ecological values or functions provided by said wetland could be replaced through wetland mitigation. If a rare or sensitive species was found on the site, mitigation may not be an option for your parcels. Again, all of this would be evaluated through the development review process. Recall that if mitigation is an option, that you will be responsible not only for the design and construction costs for the created wetland, but also for the monitoring costs to ensure that mitigation is successful.

I hope this provides clarity as to how the City views our natural habitats and features. Should you choose to develop your property, please do not hesitate to contact me so we can begin discussing the entire requirements of the Land Use Code, and not just those in Section 3.4.1 that I have outlined here.

Sincerely,



Lindsay Ex  
Environmental Planner  
970.224.6143  
lex@fcgov.com

**Encl:** August 2010 memo re: wetland delineation

**\* The City of Fort Collins will make reasonable accommodations for access to City services, programs, and activities and will make special communication arrangements for persons with disabilities. Please call 970.221.6750 for assistance.**



APPROVED JURISDICTIONAL DETERMINATION FORM  
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

**SECTION I: BACKGROUND INFORMATION**

**A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):** June 8, 2012

**B. DISTRICT OFFICE, FILE NAME, AND NUMBER:**

Denver Regulatory Office, Wetzler wetland, NWO-2012-1170-DEN

**C. PROJECT LOCATION AND BACKGROUND INFORMATION:**

State: Co County/parish/borough: Larimer City: Fort Collins

Center coordinates of site (lat/long in degree decimal format): Lat. 40.533070 N; Long. -105.080107 W

Universal Transverse Mercator:

Name of nearest waterbody: New Mercer Ditch and adjacent wetlands

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: N/A

Name of watershed or Hydrologic Unit Code (HUC): 10190007

Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.

Check if other sites (e.g., offsite mitigation sites, disposal sites, etc...) are associated with this action and are recorded on a different JD form.

**D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):**

Office (Desk) Determination. Date: May 10, 2012

Field Determination. Date(s): May 7, 2012

**SECTION II: SUMMARY OF FINDINGS**

**A. RHA SECTION 10 DETERMINATION OF JURISDICTION.**

There **Are no** "navigable waters of the U.S." within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [Required]

Waters subject to the ebb and flow of the tide.

Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.  
Explain:

**B. CWA SECTION 404 DETERMINATION OF JURISDICTION.**

There **Are no** "waters of the U.S." within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [Required]

**1. Waters of the U.S.**

**a. Indicate presence of waters of U.S. in review area (check all that apply):<sup>1</sup>**

- TNWs, including territorial seas
- Wetlands adjacent to TNWs
- Relatively permanent waters<sup>2</sup> (RPWs) that flow directly or indirectly into TNWs
- Non-RPWs that flow directly or indirectly into TNWs
- Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
- Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
- Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
- Impoundments of jurisdictional waters
- Isolated (interstate or intrastate) waters, including isolated wetlands

**b. Identify (estimate) size of waters of the U.S. in the review area:**

Non-wetland waters: linear feet: width (ft) and/or acres.

Wetlands: acres.

**c. Limits (boundaries) of jurisdiction based on: Pick List**

Elevation of established OHWM (if known):

**2. Non-regulated waters/wetlands (check if applicable):<sup>3</sup>**

Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: The Wetzler wetland is an isolated wetland with no nexus to interstate commerce.

**SECTION III: CWA ANALYSIS**

**F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):**

<sup>1</sup> Boxes checked below shall be supported by completing the appropriate sections in Section III below.

<sup>2</sup> For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).

<sup>3</sup> Supporting documentation is presented in Section III.F.



- If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
- Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
  - Prior to the Jan 2001 Supreme Court decision in "SWANCC," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).

The Wetzler wetland is located approximately 140 feet east of the New Mercer Ditch, a seasonal RPW, and is not surface connected to a waters of the US. The wetland is separated from the ditch by a railroad berm and two other wetlands, one of which is a non-jurisdictional preamble waterbody. As such, the Wetzler wetland is a wetland adjacent to other wetlands, and not adjacent to a waters of the US. 33 CFR 328.3(a)7, specifically precludes wetlands adjacent to wetlands from the definition of "waters of the United States".

"33 CFR 328.3(a) the term waters of the United States means (7) wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1) through (6) of this section."

These resources are not used by interstate or foreign travelers for recreational or other purposes, do not support fish or shellfish, and are not used for industrial purposes by industries in interstate commerce [33 CFR 328.3(a)(i)(i-iii)].

- Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain:
- Other: (explain, if not covered above):

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

- Non-wetland waters (i.e., rivers, streams):
- Lakes/ponds:            acres.
- Other non-wetland waters:            acres. List type of aquatic resource:
- Wetlands: 0.67 acre

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

- Non-wetland waters (i.e., rivers, streams):            linear feet,            width (ft).
- Lakes/ponds:            acres.
- Other non-wetland waters:            acres. List type of aquatic resource:
- Wetlands:            acres.

#### **SECTION IV: DATA SOURCES.**

**A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):**

- Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: Mike Morgan
- Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - Office concurs with data sheets/delineation report.
  - Office does not concur with data sheets/delineation report.
- Data sheets prepared by the Corps:
- Corps navigable waters' study:
- U.S. Geological Survey Hydrologic Atlas:
  - USGS NHD data.
  - USGS 8 and 12 digit HUC maps.
- U.S. Geological Survey map(s). Cite scale & quad name: 1:24000, Fort Collins
- USDA Natural Resources Conservation Service Soil Survey. Citation:
- National wetlands inventory map(s). Cite name:
- State/Local wetland inventory map(s):
- FEMA/FIRM maps:
- 100-year Floodplain Elevation is:            (National Geodetic Vertical Datum of 1929)
- Photographs:  Aerial (Name & Date):  
or  Other (Name & Date): Wetzler wetland
- Previous determination(s). File no. and date of response letter:
- Applicable/supporting case law: Rapanos and Carabell cases.



- Applicable/supporting scientific literature:
- Other information (please specify):

**B. ADDITIONAL COMMENTS TO SUPPORT JD:**





**DEPARTMENT OF THE ARMY**  
CORPS OF ENGINEERS, OMAHA DISTRICT  
DENVER REGULATORY OFFICE, 9307 SOUTH WADSWORTH BOULEVARD  
LITTLETON, COLORADO 80128-6901

June 8, 2012

Western States Land Services, Inc.  
Attn: Mr. Michael Morgan  
505 N. Denver Avenue  
Loveland, CO 80537

**RE: Approved Jurisdictional Determination for the Wetzler Wetland, Fort Collins, Mason Street  
Corps File No. NWO-2012-1170-DEN**

Dear Mr. Morgan:

Reference is made to the Wetzler Wetland located at 40.533070; -105.080107, Larimer County, Colorado.

The Wetzler Wetland has been reviewed in accordance with Section 404 of the Clean Water Act under which the U.S. Army Corps of Engineers regulates the discharge of dredged and fill material and certain excavation activities in waters of the United States. Waters of the U.S. includes ephemeral, intermittent and perennial streams, their surface connected wetlands and adjacent wetlands and certain lakes, ponds, drainage ditches and irrigation ditches that have a nexus to interstate commerce.

An approved jurisdictional determination (JD) has been completed for this wetland. The JD is attached to this letter. If you are not in agreement with the JD decision, you may request an administrative appeal under regulation 33 CFR 331, by using the attached Appeal Form and Administrative Appeal Process form. The request for appeal must be received within 60 days from the date of this letter. If you would like more information on the jurisdictional appeal process, contact this office. It is not necessary to submit a Request for Appeal if you do not object to the JD.

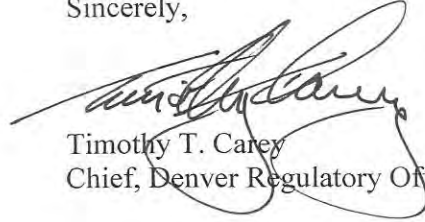
The Wetzler Wetland was determined to be non-jurisdictional and is not regulated under Section 404 of the Clean Water Act. A Department of the Army (DA) Permit will not be required for work in the Wetzler Wetland. Although a DA Permit will not be required for work in the Wetzler Wetland, this does not eliminate the requirement that other applicable federal, state, and local permits be obtained as needed.

This JD is valid for a period of five years from the date of this letter, unless new information warrants revisions of the JDs before the expiration date, or unless the Corps has identified, after a possible public notice and comment, that specific geographic areas with rapidly changing environmental conditions merit re-verification on a more frequent basis.

The Omaha District, Regulatory Branch is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete our Customer Service Survey found on our website at <http://per2.nwp.usace.army.mil/survey.html>. If you do not have Internet access, you may call and request a paper copy of the survey that you can complete and return to us by mail or fax. (Completing the survey is a voluntary action)

If there are any questions call **Mr. Terry McKee** of my office at **303-979-4120** and reference **Corps File No. NWO-2012-1170-DEN**.

Sincerely,

A handwritten signature in black ink, appearing to read "Timothy T. Carey". The signature is fluid and cursive, with a large loop at the end.

Timothy T. Carey  
Chief, Denver Regulatory Office

tm



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Attachment B Construction Cost Worksheet

Attachment C Model Results for the Selected Plan

Attachment D Field Notes for Lower Mail Creek HQI



## 1.1 OVERVIEW

The Selected Plan (Plan) documents improvements chosen to address the major potential flooding problems in the Mail Creek Basin. The Mail Creek Basin does not have a history of large floods, but there are local flooding problems.

Improvements included in the Plan were selected by representatives of various departments within the City of Fort Collins (the City), and Larimer County. In February of 2003 URS Corporation (URS) completed a feasibility analysis of conceptual alternatives developed for mitigating flood damages within the Mail Creek Basin. The City reviewed the Feasibility Design Alternatives Analysis Report for Mail Creek Basin (URS, 2003) and the following alternatives were selected for inclusion in the Plan.

- A preliminary alternative to eliminate flooding resulting from the New Mercer Ditch overflow and spill at Burlington Northern railroad (BNRR) grade just south of Horsetooth Road.
- Land acquisition at the property just west of the BNRR railroad grade and south of Harmony Road.
- Local drainage improvements to mitigate flooding at Imperial Estates.

The purpose of the Plan section of the Mail Creek Master Plan is to fully document the chosen improvements. Modeling, calculations, cost estimating and economic evaluation were conducted as part of the Feasibility Design Alternatives Analysis Report for Mail Creek Basin (URS, 2003). Results in that report were for selecting improvements for inclusion in the Plan. The Plan is designed to serve as a first resource for stormwater planning for the Mail Creek Basin.

## 1.2 POLICY

The Plan also includes recommendations for improvements to stabilize the channels and increase the habitat rating for channels within the basin. Floodplain regulations and adherence to the City's development requirements are part of the overall plan for the basin.

The 100-year storm is the design storm event for protection from flooding. Most of the stormwater facilities were designed and built under the City development drainage criteria in use at the time a particular development was approved. Most of the flooding problems result from the revised 100-year rainfall criteria increasing from 2.89 inches to 3.67 inches. The current estimate for the 50-year storm rainfall is 2.91 inches. The previous estimate for runoff resulting from the 100-year rainfall is very close to discharges estimated for runoff resulting from the present estimate for the 50-year rainfall.

URS confirmed that the existing stormwater facilities within the basin provide protection for the 50-year storm with the exception of a few locations documented in the Feasibility Design Alternatives Report (URS 2003). Nine houses in Imperial Estates Subdivision (located in Larimer County) sustain flood damage during the 100-year storm.

### 1.3 DEFINITION OF COMPONENTS

There are several components related to the Plan. These components are divided into six separate categories and include: structural improvements; non-structural improvements; water quality, habitat enhancement and groundwater; stream stability; development criteria; and floodplain criteria. A description of each component and the Plan elements that pertain are described in the following sections.

#### 1.3.1 Structural Improvements

Structural improvements for the Plan include those items that must be constructed to specifically mitigate flood damages and/or bring stream crossings into compliance with City criteria. The projects proposed for the Plan are discussed in Section 2.

There are other improvements that are presented as part of the Plan that are structural in nature, but not considered under this component. These improvements include items such as grade control and channel grading to improve the habitat rating or stabilize the channels. These items are described in other components of the Plan.

#### 1.3.2 Non-Structural Improvements

Non-structural components can include a variety of different scenarios that may be as simple as purchasing flood insurance for individual structures that are subject to flooding, or as complex as a flood warning system. Section 3 includes a discussion of non-structural improvements.

The City of Fort Collins currently has a citywide flood warning system that consists of precipitation and streamflow gages to monitor rainfall and runoff. New gaging station locations have been suggested for warning of flood conditions within the Mail Creek Basin for existing conditions.

#### 1.3.3 Water Quality / Habitat Enhancements / Water Quality Benefits

Habitat enhancement, stream stability improvements and water quality benefits are all components of the Plan and consistent with the City's Watershed Approach to stormwater quality. This includes managing each basin in the City with consideration of the ecological effects of providing drainage services. Primary objectives include:

- Controlling and protecting watershed from flood waters
- Promoting clean water in lakes, creeks, and wetlands
- Providing lakes, creeks, and wetlands that support a variety of wildlife throughout the City

Poor riparian habitat and stream instabilities are not independent problems, and the solution to one of these problems often involves the other. Projects to upgrade habitat must consider the potential migration (vertical or horizontal) of the stream. Similarly, a stream stabilization, project may eliminate the cause of low habitat ratings, and minor embellishments could have significant benefits to the habitat and water quality.

## 1.3.4 Stream Stability

A stream stability assessment was performed 10 years ago for lower Mail Creek between College Avenue, and the confluence with Fossil Creek. The assessment identified minor bank stream instability in the existing Mail Creek Channel.

Channel improvements should maintain or increase the existing sinuosity in order to create diverse habitat and fauna associated with pools created by outside bends and pool riffle sequences. Meanders can also dissipate energy created during high water events and reduce bank erosion.

The Plan proposes channel improvements to improve habitat ratings, stream stability and water quality. Improvements include grading to flatten out steep bank slopes, the creation of pools and riffles, and vegetation.

## 1.3.5 Habitat Enhancements

Water quality and habitat quality will not change with implementation of the Plan for tributaries of Mail Creek west of College Avenue. The benefits to habitat quality are discussed in Section 4.7.

## 1.3.6 Water Quality Benefits

The Plan for the Mail Creek Basin appear to possess minimal opportunities for increasing pollution control within the basin. Extended detention capability is not recommended in the detention basins that do not create flooding problems. In order to extend detention outflow must be reduced. By reducing the outflow a given detention pond must then store more water, which for the present design storm criteria may result in pond overtopping.



## 2.1 NEW MERCER DITCH IMPROVEMENTS

The problem of the New Mercer Ditch spilling over approximately 600 feet (ft) of the BNRR railroad grade (at a maximum depth of 0.36 ft) in the Mason St. area and impacting four properties (3761, 3801, 3847, and 3901 Mason Street) during the 100-yr storm is caused by several factors:

- A low point in the railroad grade located just south of Horsetooth Road.
- Downstream control in the New Mercer Ditch resulting from the existing pipe crossing under Harmony Road.
- Shallow grade of the New Mercer Ditch.
- Excessive stormwater discharge originating from the Mail Creek Basin that reaches the ditch during the 100-year storm event.

Currently the New Mercer Ditch has an estimated irrigation base flow of 80-cfs. Storm runoff within the Foothills Basin contributes an additional 100-cfs. This results in a total combined flow of 180 cfs in the ditch as it enters the Mail Creek Basin under Harmony Road during the 100-year storm.

The existing New Mercer Ditch follows an alignment parallel to, and just west of the BNRR railroad. The ditch crosses southeast under Harmony Road, and the BNRR railroad track, through a 54-inch diameter Reinforced Concrete Pipe (RCP). The outlet is just west of the Wal-Mart shopping center. During extreme floods, the New Mercer Ditch collects stormwater runoff from several locations as it flows south to Harmony Road. In addition, the ditch has been realigned and straightened by placing it in a cut bounded by the BNRR railroad track on the east, and residential housing on the west. Based on field observations, review of MODSWMM for Mail Creek, and review of the HEC-RAS model for the ditch, it appears that the pipe crossing under Harmony Road may back up the ditch to the extent that it, coupled with the factors listed above, causes excess runoff from the 100-year storm to overtop the BNRR railroad into the Mason Street area to the east (just east of the Manhattan Pond). Figure 1 shows the proposed New Mercer Ditch improvements and the estimated flooding area east of the railroad and west of Mason Street.

Prior to the evaluation and consideration of any improvement in this area, interaction with other potential projects including the Mason Street Transportation Corridor and the widening of Harmony Road at the BNRR railroad Crossing is required. Specifically, a pedestrian underpass is being contemplated that would link Troutman Parkway, under the BNRR railroad, to transportation facilities available on the Mason Street Transportation Corridor. Recently a meeting with city personnel resulted in a preferred improvement as described below; however due to the developed condition of this basin, this improvement, as with all Mail Creek improvements, should be considered opportunistic – when other City departments or outside agencies are considering a project, it may be possible to incorporate these improvements with those projects.

The New Mercer Ditch will be increased in size to convey the 100-year flow without overtopping its banks for the existing slope. The proposed ditch cross section would have 2.5H:1V side slopes and a bottom width of 12 ft upstream of the Manhattan Pond outfall and a

bottom width of 18 ft below the outfall. The proposed ditch will follow its current alignment to just north of the Pond #102 outlet at Troutman Parkway. At this location the ditch alignment will shift to the east, flowing south between the BNRR tracks and the lumberyard warehouse. The ditch will be replaced by a new 6 ft x 12 ft Concrete Box Culvert (CBC) that will cross under Harmony Road and connect into the lower reach of Mail Creek south of Harmony Road east of the BNRR railroad. This improvement should allow the Mason Street Transportation Corridor bike path travel over the New Mercer ditch and under the BNRR railroad. The proposed access road/future bike path will follow along the existing NMD access road to Harmony Road.

The enlarged New Mercer Ditch will be maintained at its existing slope to the outlet of Pond #102. Existing detention ponds between Horsetooth Road and Harmony Road (MODSWMM Pond #102 [Troutman Parkway pond], MODSWMM Pond #103 [Manhattan Pond]) will discharge directly into the enlarged New Mercer Ditch without any changes in pond outlet capacity or configuration.

Construction of this improvement will require:

- A construction easement behind the lumberyard and warehouse for the construction of the CBC.
- Additional drainage easement area where necessary along the new corridor.
- Crossing Harmony Road east of the BNRR railroad will involve either tunneling under the road or surface excavation and temporary traffic re-routing.
- Crossing under the BNRR railroad at Troutman Parkway may involve tunneling and coordination with the railroad.
- Slope stabilization may be required in the construction corridor on either side of the New Mercer Ditch, particularly in areas where the ditch is significantly below grade.

Based on resources currently available to URS, the following utility conflicts have been identified and are shown on Figure 2:

- A 12-inch diameter Sanitary Sewer Line,
- A 15-inch diameter Sanitary Sewer Line,
- A 10-inch diameter Sanitary Sewer Line, and
- A Sanitary Sewer Manhole.

URS recommends that prior to implementing improvement solutions, that a more detailed and thorough investigation into utilities in the area be conducted. It is also recommended that the Utility Notification Center of Colorado be contacted at (800) 922-1987 prior to construction.

## **2.2 ACQUISITION OF THE PROPERTY SOUTH OF HARMONY AND JUST WEST OF THE BNRR TRACKS**

URS analyzed the results of the existing Mail Creek Basin MODSWMM model. Local flooding occurs at this location because of the limited capacity of Mail Creek at this location. The channel capacity is limited because of landscaping, and a sump used to collect water potentially for irrigation. Flooding problems could be corrected by improving the short reach of Mail Creek

at this location, or increasing the capacity of the culvert carrying Mail Creek under the BNRR railroad tracks. Since there were no damages resulting from flooding at this location, URS gave different consideration to the Harmony/BNRR Property because of its location in the Mail Creek Basin. The Harmony/BNRR Property is shown on Figure 1 and Figure 3.

All of the runoff from the main tributary of Mail Creek runs through the site, and runoff from the north tributary combines with runoff from the main tributary on the east side of the BNRR railroad track just east of the Harmony/BNRR Property. This area may be attractive for purchase by the City for creating a stormwater control facility if needed. Such a facility could receive and potentially attenuate runoff, and redirect stormwater flows that would normally be carried in the New Mercer Ditch (assuming stormwater flows that normally flow in the New Mercer Ditch are redirected and conveyed under Harmony Road as discussed in the Feasibility Design Alternatives Analysis (URS, 2003)). Given the potential that Harmony Road could be widened at this location, the Mason Street Transportation Corridor, and the hydraulic impacts to the New Mercer Ditch if a pedestrian underpass is constructed at Troutman Parkway, this site may be attractive for City acquisition for uses described above or other stormwater management considerations. The major cost may be in land acquisition due to its location along Harmony Road frontage.

The City may wish to either maintain the Harmony/BNRR property in its existing configuration, or improve the property and integrate it with New Mercer Ditch designs if needed. As the transportation planning for the Mason Street Corridor progresses, the City may wish to reevaluate potential beneficial uses of the Harmony/BNRR property.

Constructability aspects include construction easements associated with the BNRR railroad, and land acquisition costs and negotiations.

Based on resources currently available to URS, the following utility conflicts are identified and are shown on Figure 3:

- A 12-inch diameter Sanitary Sewer Line,
- A 15-inch diameter Sanitary Sewer Line,
- A 10-inch diameter Sanitary Sewer Line, and
- A Sanitary Sewer Manhole.

URS recommends that prior to any further implementation of improvement solutions that a more detailed and thorough investigation into utilities in the area be conducted prior to construction. It is also recommended that the Utility Notification Center of Colorado be contacted at (800) 922-1987.

## 2.3 LOCAL FLOODING IMPROVEMENTS

Several local flooding areas were identified in the Mail Creek Basin. During the conceptual and feasibility alternatives analysis no corrective measures were identified for these areas since they could be mitigated as minor capital projects in the selected plan of improvements. URS made recommendations for these improvements assuming the modifications to these areas could be implemented by the City, at their discretion, as a minor capital improvement and as such may not



require extensive additional feasibility or in-depth engineering analysis. Locations of local flooding improvements are shown on Figure 1.

In the Feasibility Design Alternatives Analysis Report for Mail Creek Basin (URS 2003), flooding in Imperial Estates was classified as a local flooding issue. Based on planning meetings held by the City, continued interest in correcting flooding at Imperial Estates was expressed by Larimer County staff. Hence, flood mitigation improvements at Imperial Estates were included in the Selected Plan.

### 2.3.1 Imperial Estates

There is flooding and street overtopping within the Imperial Estates neighborhood located northeast of the intersection of Harmony and Taft Hill. Potential causes of flooding include a lack of storm drainage conveyance facilities in this neighborhood and runoff going through Imperial Estates that originates from upstream drainage areas. The recommended improvements, to potentially mitigate flood damages, can be implemented in two steps.

In step 1, the runoff that collects at the intersection of CR38E and Taft Hill Rd will be collected and routed due east in a pipe to approximately Goodell Lane where it will discharge into a proposed channel. This channel will be constructed along the utility corridor that borders the south edge of Imperial Estates. This channel will be trapezoidal with a bottom width of 5 feet, a depth of 2.5 feet, 0.5 feet of freeboard and 4:1 side slopes. The freeboard used for feasibility design is less than the City criteria of 1 feet. The longitudinal slope will be approximately 0.011 feet/foot over a length of approximately 2100 feet. The channel will then empty into a pipe that connects to an existing storm sewer system at Westfield Park between Seneca Street and Imperial Estates. However, there is a 54-inch diameter steel water line within this utility corridor that could result in construction difficulties since its alignment would parallel the proposed channel and buried depth to pipe crown is unknown. The freeboard for this proposed channel can be increased to City criteria depending on the depth of cover over the water line.

In step 2 a storm sewer system will be constructed in Imperial Estates to drain runoff originating in this neighborhood. This system could begin at the intersection of Westfield and Goodell Lane in Imperial Estates. The storm sewer system could then run north along Goodell Lane to Westfield Drive where it will turn east and run along Westfield Drive to an outlet point at the east edge of Imperial Estates. Lateral channels parallel to existing streets can be modified and constructed to convey street runoff north and south to the trunk line along Goodell Lane, Lynda Lane, Capitol Drive, Royal Drive, and Crescent Drive. Additional area inlets could be constructed where necessary to further drain the subbasin. During the Problem Identification flood damages were estimated for this area. Based on resources currently available to URS, utility conflicts have been identified and are shown on Figure 4. URS did not prepare a construction cost estimate for Imperial Estates since it was originally classified as a local flooding issue. Finally, additional feasibility design may be required to confirm the effectiveness and cost of these improvements. The location of these improvements are shown on Figure 1, and Figure 4.

### 2.3.2 Other Areas of Local Improvements

There are several minor local flooding areas within the Mail Creek Basin. The local flooding areas and recommended improvements for alleviating the local flooding problems within the Mail Creek Basin include:

1. Surface flooding at the intersection of CR38E and Taft Hill Road (also located in Larimer County):

There is local street flooding at the intersection of CR38E and Taft Hill Road. It appears that this issue can be remedied through improvement of the roadside ditch capacity on both roads. Additionally runoff could be routed to a proposed detention pond located at the northeast quadrant of the intersection.

2. Four Seasons Pond overtopping near Wabash Street:

There is local street flooding near Wabash Street that appears to be caused by the outlet of the Four Season Pond (MODSWMM Pond #412). Currently the outlet of this pond drains/spills directly into the street. The pond has a 4 inch outlet pipe that connects into a 15-inch diameter pipe that discharges into the street. The pond also has a concrete weir emergency spillway on its south edge. A suggested remedy for this problem is constructing a storm sewer system and connecting the outlet of the Four Seasons Pond. This system is intended to convey water from the pond, as well as collect runoff from local streets to an existing detention pond (Four Seasons Filing 9 MODSWMM Pond #104) located approximately 1500 ft to the east.

3. Manhattan Avenue surface flooding:

There is local street flooding at Manhattan Avenue, just west of the inlet to the Manhattan Pond, that appears to be caused by undersized culverts that cross under the street above MODSWMM Pond #103 (Manhattan Pond). Two alternative solutions to this problem are to increase the size of the culverts under Manhattan Avenue, or to raise the grade of Manhattan Avenue.

4. Detention pond overflow (MODSWMM Pond #321) – in the neighborhood to the northeast of the intersection of Shields and Harmony; the area just north of Larkbunting Drive, between Goldeneye and Blue Mountain:

Upon review of the MODSWMM model output URS confirmed this detention pond overflows. The additional estimated volume needed to mitigate potential overflow during the 100-year storm is approximately 0.06 acre-feet. Given that the pond area is approximately 18,000 square feet, URS estimated that excavating to a depth of 0.25 feet may result in enough additional storage volume to potentially eliminate detention pond overflowing.

Table 2-1 presents areas of flooding and road overtopping.

**Table 2-1  
Summary of Road Overtopping Depths and Other Identified Local Flooding Areas**

Location	Existing Conditions, 100-year Storm				Selected Plan	
	SWMM Node	Water Surface Elevation (ft)	Flow Depth (in)	Discharge (cfs)	Flow Depth (in)	Discharge (cfs)
Westbury Drive	Pond 189	5085.22	2.6	14.2	2.6	14.2
Seneca Street	Pond 279	5107.05	0.6	116	0.6	116
N/a – d/s swale	Pond 321	5055.13	1.6	119.6	1.6	119.6
Wabash Street	Pond 412	5075.07	0.8	1.6	0.8	1.6
N/a – d/s swale	Pond 104	5058.99	0	44	0	44
Seneca Street	Pond 230	5115.88	0	242.2	0	242.2
Crest Road	CE 16	5042.88	7.6	468.1	7.6	468.1
Hinsdale Drive	CE 17	5054.82	5.5	346.7	5.5	346.7
Hummingbird Drive	CE 35	102.6	10	314.1	10	314.1
Warbler	CE 35	104.81	10.3	314.1	10.3	314.1
Manhattan Avenue	CE 38	106.59	7.5	218.6	7.5	218.6
Royal Drive	CE 49	5120.59	13.1	329.3	13.1	329.3
Crescent Drive	CE 49	5116.38	11.4	329.3	11.4	329.3
Taft Hill Road	CE 200	5151.56	9.7	190.8	9.7	190.8
Goodell Lane	CE 200	5139.09	15.5	190.8	15.5	190.8
Lynda Lane	CE 200	5132.29	8.8	190.8	8.8	190.8
Capitol Drive	CE 200	5125.61	16.1	190.8	16.1	190.8
Moss Creek	CE 366	102.06*	0	124.2	0	124.2
Benthaven Street	CE 366	103.00*	0	124.2	0	124.2
Dennison Avenue	CE 369	104.6*	0	114.6	0	114.6
Larimer Canal Company Ditch Spill	CE 291		2.4	196.6	2.4	196.6
New Mercer Ditch Spill over BNSF Railroad	CE 301	5039.36	0.36	354.5	0	0
Nordick Property	Pond 15	5035	(Level pool detention storage)	469.7	(Level pool detention storage)	469.7
Woodridge Pond	Pond 230	5115.8	(Level pool detention storage)	242.2	(Level pool detention storage)	242.2
Harmony Road	CE 318 N CE 17 S	SWMM output shows minor surcharge	Normal depth calculation shows road ditches at capacity	96.9 346.7	Normal depth calculation shows road ditches at capacity	96.9 346.7

\*these are relative elevations.

Non-structural components can include a variety of different scenarios that may be as simple as purchasing flood insurance for individual structures that are subject to flooding, or as complex as a flood warning system.

The Plan provides flood mitigation for all the structures estimated to sustain some economic damage, within the City, for the 100-year storm based on a structural approach. While the proposed improvements mitigate flood damages, flood insurance is always an important consideration for the interim period prior to implementation of the Plan or for financial protection from floods larger than the 100-year event.

The City of Fort Collins currently has a citywide flood warning system that consists of precipitation and streamflow gages to monitor rainfall and runoff.

The following locations have been selected for gaging stations and early warning of extreme flood conditions in the Mail Creek Basin.

- Front Range Community College; early warning for areas downstream and along Mail Creek on the south side of Harmony. This gage is not associated with a capital project but is recommended as an addition to the current flood warning gage system.
- Imperial Estates – pond at Westfield Park on west side of Seneca Street; early warning for downstream areas.
- Manhattan pond; as so much drains to this in Mail Creek, it would provide early warning for surrounding areas, railroad, Mason Street area, and areas along New Mercer Ditch and downstream.

These gages would be installed as part of the selected plan of improvements described herein. As the improvements are constructed, the gages would be included as part of the capital project costs and construction effort. URS recommends that gages installed prior to completion of Plan improvements be retained if improvements are made. Maintaining these gages can provide early warning for floods larger than the 100-year event. Gaging stations are shown on Figure 1.



#### 4.1 ON-SITE DETENTION REQUIREMENTS

Since the Mail Creek Basin is considered “built out” minimal new development is anticipated. According to the City of Fort Collins Storm Drainage Criteria Manual, new developments must provide on-site detention that release at the 2-year historic peak discharge from the development during a 100-year storm event, unless otherwise specified in the Master Plan. There are a few areas within the Mail Creek Basin where new development opportunities exist. The City must enforce their development criteria as a component of the Plan. The mitigation of flooding hazards were evaluated based on existing conditions, therefore, it is imperative that new development does not cause an increase in stormwater runoff peak discharge that may in turn increase the potential for flooding or flood damages.

Given the development potential remaining within the Mail Creek Basin, development regulations for new construction must minimize the impacts to existing development and the stream or drainage corridors. The regulations should require on-site detention to offset the impacts of increased discharge peaks and volumes and decreased travel times, and limit new development within the floodplain.

The City should maintain its current criteria for this basin. More specific regulations for the Lower Mail Creek Basin are discussed below.

The 2-year historic peak discharge is determined on a basin-by-basin basis since subbasins may be completely undeveloped or partially developed and vary by slope and ground cover. The 2-year historic peak discharges can be found in the existing 2-yr MODSWMM results located in Feasibility Design Alternatives Analysis Report for Mail Creek Basin (URS 2003). On-site detention requirements were estimated for identified areas where future development would be required to release the estimated runoff from the 100-year storm at a rate equal to or less than the runoff discharge estimated for the 2-year storm. Subbasins were evaluated for on-site detention using the following criteria:

- Subbasin area is greater than 20 acres,
- Subbasin is currently less than 70% developed, and
- On-site detention is not currently provided.

**Table 4-1  
Recommended Release Rates for Undeveloped Subbasins in the Mail Creek Basin**

Subbasin MODSWMM ID.	Area (ac)	2-year Peak Discharge (cfs)	Unit Discharge (cfs/ac)
402	16.1	27.5	1.7
164	29.2	36.2	1.2
84	19.2	15.0	0.8
76	32.5	27.3	0.8
73	10.6	9.4	0.9

Finally, the following City criterion should be adopted in Mail Creek Basin. It is recommended that developers provide on-site detention for future development based on the 2-year historic

release rates or show that the development can release stormwater from the area into the larger system without increasing the peak discharge in the large system thereby complying with FEMA's No Adverse Impact policy.

## 4.2 EXTENDED DETENTION FOR WATER QUALITY TREATMENT

No regional detention is proposed for the Lower Mail Creek Basin. It is assumed that the City's water quality criteria will be followed for construction of future detention ponds if needed. The structural improvements included in the Plan for the Mail Creek Basin appear to possess minimal opportunities for increasing pollution control and improving water quality within the basin. None of these improvements include significant increase in detention time. These structural improvements may provide intangible benefits to water quality by keeping flood runoff in defined flood control channels and other facilities, in lieu of having uncontrolled flood water flowing through urbanized areas on the east side of the BNRR railroad (resulting from the New Mercer Ditch spill), and in Imperial Estates. The water quality capture volume (wqcv) for future development will be considered during development review.

## 4.3 STORM DRAINAGE DESIGN STANDARDS

The proposed drainage channel that was described in Section 2.3.1, for mitigating flooding in Imperial Estates, has less than the City's minimum freeboard criteria of 1 foot. Potentially, this freeboard could be increased depending on clearance with the existing waterline sharing the same proposed alignment.

## 4.4 EROSION BUFFER LIMITS

URS was also required to evaluate erosion buffer zones and make management recommendations for Mail Creek from College Avenue to the confluence with Fossil Creek. This reach of Mail Creek is approximately 1.7 miles long and in addition to stormwater runoff this reach receives seasonal irrigation flows from the New Mercer Ditch and the Larimer County Canal No. 2. This reach of Mail Creek has been identified by the City as an area where buffer limits apply. Buffer limits are established for those streams that are subject to severe erosion hazards. Erosion hazard areas occur where the channel bed and banks are unstable, and are moveable. If development is kept back from these unstable areas the impacts to permanent structures can be minimized.

The most recent stability analysis of this reach of Mail Creek was completed by TST, Inc., and Lidstone & Anderson. This analysis is described in their Preliminary Design Report, Mail Creek Stability Study, January 1993. This report documented field observations and slope stability analysis that advanced the historic database to 1991. Observations documented in this report state that since 1969 this reach of Mail Creek has increased its sinuosity and, hence, meanders more than the straight incised channel observed prior to 1969.

The buffer limits established by TST, Inc., and Lidstone & Anderson recommended a minimum setback of 25 feet from the outside waters edge on both sides of the channel for all lots and watered lawns. Their recommendation was that lands within this setback be left in native grasses and not be irrigated. For permanent structures, an additional setback was added to the buffer limits based on the failure plane of the existing channel bank. Therefore, two feet of additional

horizontal setback, for each vertical foot of bank, was added to the minimum setback of 25 feet. Then, TST, Inc., and Lidstone & Anderson, superimposed the limits of the 100-year floodplain over the minimum buffer limits as described above. In locations where the 100-year floodplain exceeded the erosion buffer limits the 100-year floodplain became the controlling factor for buffer limit delineation. These limits were plotted and presented on Plates 4 and 5 of the Mail Creek Stability Study.

Using the existing HEC-RAS input file for this reach of Mail Creek, the 100-year floodplain was plotted on an aerial photo base map. This existing HEC-RAS input file was originally prepared by TST, Inc., and Lidstone & Anderson and consisted of HEC-2 cross sections developed by Cornell Engineering Company for the original Mail Creek Master Plan prepared in December, 1980.

URS compared the 100-year floodplain documented in the Mail Creek Basin Master Drainage Plan Hydraulic Technical Appendix to the buffer limits plotted by TST, Inc., and Lidstone & Anderson. At most locations, the revised 100-year floodplain was well within the existing buffer limits. However, URS identified three locations where the revised 100-year floodplain exceeded the buffer limits plotted by TST, Inc. URS recommends that the buffer limits be revised by the estimated dimensions listed at the locations described below:

1. Extending the existing buffer limit by approximately 25 feet for approximately 125 feet along the left side of Mail Creek just upstream and north of Passway Drive.
2. Extending the existing buffer limit by approximately 20 feet for approximately 410 feet along the left side of Mail Creek just upstream of Mail Creek Lane.
3. Extending the existing buffer limit by approximately 30 feet for approximately 470 feet along the left side of Mail Creek beginning at a location approximately 500 feet upstream of the confluence with Fossil Creek, along the Mail Creek thalweg.

The buffer limits and 100-year floodplain are shown on Figure 5. In addition, URS recommends that known areas of headcutting and bank erosion be monitored for increasing problems that could impact utilities, and infrastructure, crossing and adjacent to this reach of Mail Creek.

The last stability investigation of this reach of Mail Creek was conducted almost 10 years ago by TST, Inc. Additional stability analysis could be conducted in the future to determine, in greater detail, the erosion issues and possible solutions.

#### 4.5 FLOODPLAIN REGULATIONS

Enforcement of floodplain regulations promotes the health and welfare of the community by reducing the risk of flood-related damages and potential loss of life. As part of the selected plan of improvements, it is recommended that floodplain regulations commensurate with Chapter 10 of the City of Fort Collins Code be enforced in the Mail Creek floodplain.

#### 4.6 FLOODPLAIN STORAGE

A significant aspect of floodplain regulation is preserving the existing floodplain storage. The storage of floodwater within the system can have a dramatic impact on the peak discharge. The elimination of existing storage can increase the peak discharge and increasing storage can decrease the peak discharge. Storage can be created by excavation below the water surface

elevation or by raising the water surface elevation. Lower Mail Creek, between College Avenue, and the confluence with Fossil Creek, is the reach of Mail Creek with an identified floodplain. This reach also contains two ponds created by embankments across Mail Creek. The larger pond is known as Fairview Estates Reservoir. Runoff from upper Mail Creek Basin flows through these ponds providing some storage in the floodplain due to increase in pond surface elevation. None of the improvements presented in the Plan create a change in floodplain storage. In addition, the Plan does not include a recommendation for acquiring any homes or properties and removing them from the floodplain.

## 4.7 HABITAT ENHANCEMENT

### 4.7.1 Water Quality Components

It is the City's policy to incorporate the Water Quality Control Volume (WQCV) into detention basin designs so that the most frequent storm flows are drained slowly from the basin for pollutant removal and water quality improvement. Detention basins should be designed to limit the frequently inundated area to the WQCV area and use the higher stages of the basin for detaining larger floods. These areas of infrequent inundation can be used for other purposes such as recreational facilities. Also, wetland habitat is often critical to the design, therefore habitat improvements to the stream corridor are realized through their use.

### 4.7.2 Stream Stability

Habitat enhancement, stream stability improvements and water quality benefits were considered in the development of the selected plan. The initial stream stability assessment was completed by Sear-Brown (2002). Poor riparian habitat and stream instabilities are not always independent problems, and mitigation of one problem often involves the improvement of the other. Projects to upgrade habitat must consider the potential vertical and horizontal stability of the stream. Similarly, a stream stabilization project may mitigate causes for poor stream habitat. Minor improvements to the stream channel can have significant benefits to riparian habitat and water quality.

A common element to both riparian habitat quality and lateral stream stability is bank steepness. Decreasing bank slopes helps to stabilize the reach as well as improve habitat. Minimum recommended bank slopes are 2 horizontal to 1 vertical for areas where maintenance is not expected and 4 horizontal to 1 vertical for maintained areas. Flat areas or low terraces adjacent to the active channel also are desirable for enhancing habitat where space is available. In areas where vertical instability or channel degradation is a potential problem, improvements such as grade control structures and/or low flow drop structures can add channel stability and help limit erosion. This in turn provides water quality benefits downstream.

Figure 6 presents recommended typical modifications to a steep-banked natural channel section. Steep banks are not generally a problem in Mail Creek upstream of Mail Creek Lane. Figure 6 shows a typical grade control structure detail that can be used to stabilize steep channel segments. Figure 7 presents a typical rock riffle drop structure that could be used for stabilizing erosive streambeds. As the name implies, this structure provides riffles in a low flow channel and provides growing sites for macroinvertebrate fauna to enhance stream community diversity.



Smaller drop structures placed more frequently are more desirable than larger drops. Rock grade control structures are assumed to provide a maximum of 2 feet of vertical degradation. Riffle drop structures were assumed to provide a maximum of 3 foot of degradation. Both types of structures should be spaced such that the future channel gradient of the streambed is at the equilibrium slope. Neither of these structures are proposed to be used in the Mail Creek Basin; however, future enhancements require the use of structures such as these.

### 4.7.3 Aquatic Habitat Enhancement

An aquatic habitat assessment of the lower Mail Creek stream corridor was performed by the City using the procedures documented in Zuellig (2001). This assessment resulted in the designated grades for the lower main stem below Fairview Estates Reservoir. This habitat exercise was performed to document existing aquatic resources in the basin. The rapid bioassessment results or habitat quality ratings are presented on Figure 8. Aquatic habitat ratings were completed for the reach below Palmer Drive and the Fairview Estates Reservoir to the confluence with Fossil Creek. The Mail Creek channel above the reservoir is generally small and not well defined, and an assessment was not performed in these upper basin areas. The New Mercer Ditch is a major drainage path that traverses the Mail Creek basin. It is generally poor in habitat potential; however, improvement potential is discussed below.

Aquatic Habitat in the Mail Creek Basin will not change dramatically with the selected Plan. Several existing detention structures will provide water quality enhancements to storm runoff with the potential of establishing small wetlands within the detention area. These wetlands will provide limited potential improvements to overall habitat quality along the lower Mail Creek channel. Other potential improvements not included in the Plan are discussed below. Table 4-2 shows current habitat quality index (HQI) ratings for reaches in Mail Creek (Zuellig, 2001) along with HQI ratings as they are projected to exist if potential improvements were made. Field notes are included in Appendix 1. The following discussion of stream habitat quality addresses two levels of action for each reach:

- improvements that will be included in the Plan, and
- improvements that may possibly be implemented in addition to the Plan.

#### *Reaches 1 and 2 – Fossil Creek to Mail Creek Lane*

These lowest reaches of Mail Creek from Fossil Creek to Mail Creek Lane are deeply incised, and banks are actively eroding in several areas. However, the stream has been incised long enough so that the channel has begun to stabilize itself within the overall channel bottom, and the channel bottom has gradually widened with time. The Mail Creek stream channel tends to meander through the widened channel bottom. The reach is in good condition with respect to habitat and this is reflected in a Grade A habitat rating for 2100 of the 2800 feet in the reach. The lower 700 feet is rated as a Grade B. The high banks of the overall channel are composed of bare, fine-grained material. The erosion rates must be relatively low because the bank erosion is apparently not entering the stream and degrading the stream habitat.

There are no channel improvements proposed for this reach and no habitat enhancements and channel stability improvements are planned for this reach. The vertical slopes of some of the high banks are bare of vegetation and the slopes could be reduced by laying back slopes to allow

revegetation. These measures could be beneficial for reducing sediment sources to the creek and providing a wider cross-section for channel habitat. Aquatic habitat on the outside of meander bends where cutbanks exist could benefit most from these improvements. The ratings shown in the table on Figure 8 (and Table 4-2) compare existing ratings with those that might exist if improvement activities were undertaken. These potential improvements would not greatly improve the rating of these reaches.

#### *Reaches 3, 4, and 5 - Mail Creek Lane to Passway Drive*

Most of these reaches have been previously reconstructed and channel stability measures have been installed. These reaches were rated as Grade D in two segments and Grade C. Apparently, habitat enhancements were not a primary focus of the earlier channel reconstruction project. Bare riprap was installed on the outside of channel bends and this is one of the main reasons why the habitat rated somewhat low. If the riprap zones were improved, such as covering the riprap with soil and geofabric for erosion control, and then planting riparian vegetation, habitat improvements on the outside of meander bends could be realized in the reaches where riprap has been installed. Once vegetation is established on the soil-riprap, habitat would be improved on the meander bends. There are no improvements planned for the three reaches between Mail Creek Lane and Passway Drive, but these measures could be implemented if project funds become available.

#### *Reaches 6 and 7 - Passway Drive to Fairway Estates Reservoir*

Similar to the previous discussion, there are no improvements planned for these reaches. The two segments of this reach were rated as Grade B. Because these reaches have a relatively high rating, only minor improvements to the bank stability are proposed if project funds become available.

#### *Upper Drainage Basin*

The Mail Creek channel in the upper basin is generally small and low flows are very small. A habitat assessment (and ratings) was not performed for the small channels and ponds in the upper basin. There is, however, some limited aquatic habitat in the small channel that parallels Harmony Road west of the BNRR railroad crossing. Wetlands in the form of dense cattails currently exist in the channel above New Mercer Ditch to and around Front Range Community College. The channel has a very simple trapezoidal cross-section, and wetland plants clog the full bottom width of the channel. There are no channel improvements anticipated for this reach, but clearing of some of the vegetation and excavating a few pools along the length of the channel could help improve aquatic habitat variability.

#### *New Mercer Ditch*

The New Mercer Ditch is a large drainage feature bisecting the upper basin and paralleling the BNRR railroad crossing. The ditch may be realigned in the future. In general the ditch does not have much potential for aquatic habitat establishment due to the seasonal nature of flow in the ditch and the concrete ditch lining. However, if the ditch is relocated or changes are made to the channel (e.g., remove the concrete lining), the ditch is wide enough that some habitat

enhancements could be implemented. A compound cross-section with a low flow channel could be constructed. Sinuosity could be added to the channel alignment if additional right-of-way is required. Also, pools could be constructed in the channel bottom so that if baseflow were established in the channel, new aquatic habitat and wetland areas could be established.

# SECTIONFOUR

**Table 4-2. Habitat Quality Index (HQI) ratings for Mail Creek\*\***

Habitat Parameter	REACH											
	Reach 1		Reach 2		Reach 3				Reach 5		Reach 6	
	Fossil Creek to 700 ft U/S		700 ft U/S to Mail Creek Lane		Mail Creek Lane to Passway Drive Lower 400 ft		Mail Creek Lane to Passway Drive Middle 400 ft		Mail Creek Lane to Passway Drive Upper 500 ft		Passway Drive to Reservoir Lower 800 ft	
	Possible improvements, none anticipated		Possible improvements, none anticipated		Possible improvements, none anticipated		Possible improvements, none anticipated		Possible improvements, none anticipated		No improvements anticipated	
	Existing	Improved	Existing	Improved*	Existing	Improved	Existing	Improved	Existing	Improved*	Existing	Improved
1. Channel flow status	20		20		20		20		15		15	
2. Channel sinuosity	15		20		10		10		10		15	
3. Frequency of riffles	20		20		10		15		10		15	
4. Embedd- edness	10		10		10		10		5		10	
5. Available habitat	15		20		5		10		5		15	
6. Pool substrate character- ization	10		15		0		10		10		15	
7. Pool variability	15		15		0		10		5		15	
8. Bank stability												
Score Left	2.5	7.5	5	10	10		5	10	7.5	10	5	

# SECTIONFOUR

## Development Criteria

Habitat Parameter	REACH											
	Reach 1		Reach 2		Reach 3				Reach 5		Reach 6	
	Fossil Creek to 700 ft U/S		700 ft U/S to Mail Creek Lane		Mail Creek Lane to Passway Drive Lower 400 ft		Mail Creek Lane to Passway Drive Middle 400 ft		Mail Creek Lane to Passway Drive Upper 500 ft		Passway Drive to Reservoir Lower 800 ft	
	Possible improvements, none anticipated		Possible improvements, none anticipated		Possible improvements, none anticipated		Possible improvements, none anticipated		Possible improvements, none anticipated		No improvements anticipated	
	Existing	Improved	Existing	Improved*	Existing	Improved	Existing	Improved	Existing	Improved*	Existing	Improved
Bank												
Score Right Bank	2.5	7.5	5	10	10		5	10	7.5	10	5	
9. Vegetative protection												
Score Left Bank	2.5	7.5	7.5	10	5	7.5	7.5		5	7.5	7.5	
Score Left Bank	2.5	7.5	7.5	10	5	7.5	7.5		5	7.5	7.5	
10. Riparian vegetative zone width												
Score Left Bank	7.5	10	7.5		2.5	5	5		2.5	5	5	
Score Right Bank	7.5	10	7.5		2.5	5	5		2.5	5	5	
<b>Total Score:</b>	130	155	160	180	90	100	120	130	90	105	135	135
<b>Habitat Rating</b>	B	A	A	A	D	C	C	B	D	C	B	B

Notes: \*ratings based on potential improvements not in the selected plan.

\*\*ratings for the enhanced conditions are assumed to be equal to existing conditions if the cell is blank



The Selected Plan improvements, will require operation and maintenance to the same extent as similar facilities within the City. Buried facilities, such as concrete box culverts and pipes, will be more difficult to inspect and clean. Some maintenance responsibilities, such as those in Imperial Estates may be the responsibility of the County or District, or a neighborhood association if one exists. Finally, an operation and maintenance agreement with the New Mercer Ditch Company may be required since stormwater flows and irrigation flows will be conveyed in the proposed buried concrete box culverts located east of the BNRR railroad, and south of Harmony Road.

Mail Creek east of College Avenue consists of several locations where erosion hazard potential exist and buffer limits apply. URS recommends that known areas of headcutting and bank erosion be monitored for increasing problems that could impact utilities, and infrastructure, crossing and adjacent to this reach of Mail Creek.

6.1 ESTIMATE OF DIRECT AND INDIRECT FLOOD DAMAGES FOR EACH FREQUENCY EVENT

The flood related damages resulting from the 100-year storm in the Mail Creek Basin were estimated using the damage analysis spreadsheet provided by the City. The damage analysis spreadsheet estimates direct damages as structural and contents damages. Structural damages are calculated by estimating flood depth for each flood event evaluated and using the depth percent damage curves developed by the FIA multiplied by current market value of each structure. Content value is assumed to be 50% of the structure value. Content damage is also estimated based on FIA depth-damage curves developed for content. Indirect damages are estimated to be 15% of the total direct damages (structure and content damages) as was used in the damages estimated for existing conditions. It is based on the average percent of total direct damages estimated for other benefit cost analysis around the country and used for estimating indirect damages in the Dry Creek and Foothills Basins. Average Annual Damages are calculated in 2002 dollars. The Average Annual damages were calculated using the damage analysis spreadsheet provided by the City. The Present Worth of the project damages is based on a project life of 50 years at 5% per annum interest rate. Project benefits (direct damages) for each improvement are estimated by subtracting direct and indirect damages resulting from the proposed improvement from existing condition direct and indirect damages for the 100-year storm. Exclusive of the Imperial Estates neighborhood, it should be noted that no flood damages were reported for problem areas with the basin at more frequent flood events. Attachment D in the Feasibility Design Alternatives Analysis Report for Mail Creek Basin (URS 2003) contains the spreadsheets used for damage calculations.

**Table 6-1  
Summary of Existing Conditions Damages**

Improvement	Direct Damages (\$)	Indirect Damages (\$)	Total Damages (\$)
New Mercer Ditch	\$32,933	\$4,940	\$37,873
Harmony/BNRR Property	\$0	\$0	\$0
Imperial Estates (1)	\$506,289 (2)	\$75,943	\$582,232

Notes:

1. Damages shown for Imperial Estates include damage to nine homes during the 100-year storm.
2. Direct damage calculations for Imperial Estates can be found in Attachment D in the Feasibility Design Alternatives Analysis Report for Mail Creek Basin (URS 2002).

## 6.2 DISCUSSION OF INTANGIBLE BENEFITS INCLUDING FLOOD REDUCTION, HABITAT ENHANCEMENT, AND HEALTH AND SAFETY ISSUES

The intangible benefits for these improvements include reduction of flood impacts at specific areas where problems have been identified within the Mail Creek Basin. Each of these areas is somewhat independent of the entire basin in that feasibility alternatives for mitigating specific flooding areas, or areas where damages can be calculated, can be corrected without significant impacts to other areas of the Mail Creek Basin. Intangible benefits include flood reduction, habitat enhancement, and health and safety issues.

The Mail Creek Basin does have local flooding issues where problems have been identified, yet no significant direct or indirect damages can be identified. In these areas the total direct damages are \$0 dollars. Eliminating the local flooding at these locations may potentially improve emergency access, and reduce the perceived nuisance impacts by local residents. Finally, the Plan mitigates flood damage resulting from existing facilities. The potential for improving habitat enhancement is minimal, and the habitat potential of existing facilities should remain unchanged.

## 6.3 BENEFIT-COST RATIOS

### 6.3.1 Benefits

A benefit-cost analysis was conducted for the Selected Plan based on improvements designed to eliminate estimated damages for the 100-year frequency storm event. The purpose of the benefit-cost analysis is as a decision making exercise for comparing the economic acceptability of a project. A project may be considered acceptable if the ratio equals or exceeds one, specifically, if the ratio of the present worth of all benefits, divided by the present worth of all costs, is one or greater.

The tangible benefit of an improvement is the potential to eliminate some or all of the estimated flood damages that may occur during a given flood event. However, problem flooding at the Harmony/BNRR Property did not create tangible or quantifiable property damages. The project benefits for each improvement were then estimated by subtracting the present worth of the annual direct and indirect damages from the present worth of the annual direct and indirect damages for the existing conditions (i.e., residual damages).

The damages due to flooding assuming existing conditions were estimated using the damage analysis spreadsheet described in detail in the Problem Identification and Economic Damage Analysis Appendix. This spreadsheet is included in the Plan as Attachment A. The damages associated with each of the improvements were estimated based on flooding depth at residential structures. Average Annual Damages were based on 2001 dollars. The equation to determine Average Annual damages is shown below and described in detail in the Problem Identification and Economic Damage Analysis Appendix.

Equation for estimating annual damages:

$$(\text{MailCreek})D_{aa} = 0.005 \cdot D_{100} + 0.045 \cdot D_{50}$$

The Present Worth of the project damages was based on a project life ( $n$ ) of 50 years at 5-percent per annum interest rate ( $i$ ). The equation to calculate the Present Worth of the Average Annual damages is shown below and described in detail in the Problem Identification and Economic Damage Analysis Appendix.

The equation for estimating present worth of average annual damages is:

$$D_{pw} = \left[ \frac{(1+i)^n - 1}{i(1+i)^n} \right] \bullet D_{aa}$$

### 6.3.2 Costs

The total project cost of each improvement was estimated using unit costs developed for the improvement evaluation for both the Dry Creek Basin and the Foothills Basin. The unit costs used for this analysis are for benefit-cost purposes only. They are not to be used for condemnation estimates. Costs include right-of-way costs, construction costs, construction contingencies, engineering/ project management, City project management, and present worth operation and maintenance costs. Total project costs were calculated using the following formula:

Right-of-way Costs = A

Construction Costs = B

Construction Contingency = 40%(B) = C

Engineering/Project Management = 20%(B + C) = D

City Project Management = 5%(B + C + D) = E

**Total Project Cost = A + B + C + D + E**

Construction costs were estimated using unit costs presented to the City by URS and revised by the City's Capital Projects group. The unit costs used for this analysis are shown on Tables 7-2 and 7-3. The spreadsheets used to calculate construction costs for each improvement are included in Attachment D the Feasibility Design Alternatives Analysis Report for Mail Creek Basin (URS 2003), and also as Attachment B in the Plan. A summary of construction costs for each improvement is presented in Table 6-4.

The estimated total project costs for each improvement, including contingencies are in Table 7-4. URS did not estimate a project cost for Imperial Estates because mitigation of flooding in this area was originally considered a local flooding issue.

**Table 6-2  
Estimated Unit Construction Costs**

Item	Units	Cost
Excavation	CY	\$6
Installation of curb and gutter (existing road, no curb and gutter)	LF	\$18
Installation of concrete drainage swales along existing paved road	SF	\$10
Installation of 24" Diam. RCP (place under existing paved road)	LF	\$90
Installation of 36" Diam. RCP (place under existing paved road)	LF	\$100
Installation of 48" Diam. RCP (place under existing paved road)	LF	\$173
Installation of 60" Diam. RCP (place under existing paved road)	LF	\$230
Installation of 72" Diam. RCP (place under existing paved road)	LF	\$320
Installation of 78" Diam. RCP (place under existing paved road)	LF	\$350
Installation of 96" Diam RCP (place under existing paved road)	LF	\$390
Installation of 108" Diam. RCP (place under existing paved road)	LF	\$460
Placement of 3'Hx7'W RCP Box Culverts	LF	\$350
Placement of 4'Hx8'W RCP Box Culverts	LF	\$380
Inverted siphons (4'Hx10'W) Concrete	LF	\$1,500
Installation of 5'Hx15'W RCP Box Culverts	LF	\$800
Installation of 5'Hx7'W RCP Box Culverts	LF	\$600
RipRap for channel and embankment protection	CY	\$50
Asphalt replacement	SY	\$23
Structure Floodproofing	EA	\$10,000
Fill Material Installed	CY	\$10
Placement of 4'Hx12'W RCP Box Culverts	LF	\$920
Placement of 4'Hx6'W RCP Box Culverts	LF	\$320
Revegetation	LS	\$1,000
Placement of 6'Hx12'W Box Culverts	LF	\$1,080
Placement of 6'Hx12'W Box Culverts under BNSF Railroad	LF	\$2,000
Placement of 6'Hx12'W Box Culverts under Harmony Road	LF	\$2,000

**Table 6-3  
Estimated ROW and Easement Unit Costs**

Item	Units	Cost
RL - Low Density Residential	SF	\$0.50
C - Commercial District	SF	\$10
LMN - Low Density Mixed Use Neighborhood District	SF	\$0.50
MMN - Medium Density Mixed Use Neighborhood District	SF	\$2
E - Employment District	SF	\$11
Quasi governmental Agency Agreement	LS	\$5,000

**Table 6-4**  
**Mail Creek Cost Estimate**  
**Selected Plan**

Description	Total Cost
Construction Costs	
New Mercer Ditch Improvements	
Channel Excavation	\$107,770
Box Culvert Installation	\$2,230,750
<b>Total Construction Costs</b>	<b>\$2,338,520</b>
<b>Construction contingency (40%)</b>	<b>\$935,410</b>
<b>Engineering/Project Management (20%)</b>	<b>\$654,790</b>
<b>City Project Management (5%)</b>	<b>\$196,440</b>
Right of Way Costs	
New Mercer Ditch	\$925,000
Harmony/BNRR Property	\$375,000
<b>Total ROW Costs</b>	<b>\$1,300,000</b>
<b>Total Improvement Costs</b>	<b>\$5,425,160</b>

Where:

- Construction Contingency = 40% (Construction Costs)
- Engineering/Project Manager = 20% (Construction Costs + Construction Contingency)
- City Project Management = 5% (Construction Costs + Construction Contingency + Engineer/Project Management)
- Total Project Cost = Right-of-Way Costs (ROW) + Construction Costs + Construction Contingency + Engineering/Project Management + City Project Management)

### 6.3.3 Benefit-Cost Analysis

The benefit cost ratios were estimated using residual damages for the 100-year frequency storm event and the total costs for each improvement as summarized in Table 6-4. Total costs include total construction and right-of-way costs, construction, and engineering and project management contingencies.

There are also the intangible benefits that add to the benefits of the improvements and would increase the benefit-cost ratio if it were possible to represent them in actual dollar amounts. The summary of the benefit-cost ratios is presented on Table 6-5.

**Table 6-5**  
**Summary of Improvement Benefit-Cost Ratios**

Improvement	Benefits \$	Costs \$	Ratio (B/C)
New Mercer Ditch	\$37,873	\$5,050,160	0.007
Nordick Property	\$0	\$375,000	0
Imperial Estates	\$582,232	(1)	(2)

Notes:

1. Project Costs were not estimated in the Feasibility Design Alternatives Analysis Report for Mail Creek Basin (URS 2003) as flooding in this area was initially considered a local flooding issue.
2. No benefit cost ratio could be calculated.



The Selected Plan Improvements show a benefit cost ratio less than one, or a benefit cost ratio of zero. However, these improvements may result in intangible benefits such as health and safety issues, emergency access through flooded streets, and eliminating the inconvenience of residential access during flooded conditions. Further investigation into mitigating flood damage in Imperial Estates should be conducted by Larimer County. URS recommends this improvement be included in the Selected Plan since these improvements may eliminate up to 9 residential structures from flood damage. Eliminating extensive street flooding in Imperial Estates may provide significant intangible benefits.

There are several minor local flooding areas within the Mail Creek Basin. The local flooding areas and recommended improvements for alleviating the local flooding problems within the Mail Creek Basin include:

1. Surface flooding at the intersection of CR38E and Taft Hill Road (also located in Larimer County)
2. Four Seasons Pond overtopping near Wabash Street
3. Manhattan Avenue surface flooding
4. Detention pond overflow (MODSWMM Node 321) – in the neighborhood to the northeast of the intersection of Shields and Harmony; the area just north of Larkbunting Drive, between Goldeneye and Blue Mountain.

These improvements may be implemented through the Capital Improvements Plan based on estimated cost, public interest, or as opportunities arise with other City departments or outside agencies.

Mail Creek, east of College Avenue, has been identified by the City as an area where buffer limits apply. Buffer limits are established for those streams that are subject to severe erosion hazards. Erosion hazard areas occur where the channel bed and banks are unstable, and are moveable. If development is kept back from these unstable areas the impacts to permanent structures can be minimized. As of the writing of this report, the City is working to formalize requirements for development within the erosion buffer limits. URS identified three locations where the revised 100-year flood plain exceeded the buffer limits plotted by TST, Inc. These locations are shown on Figure 5. URS recommends that the buffer limits be revised by the estimated dimensions listed at the locations described below:

1. Extending the existing buffer limit by approximately 25-feet for approximately 125-feet along the left side of Mail Creek just upstream of Passway Drive.
2. Extending the existing buffer limit by approximately 20-feet for approximately 410-feet along the left side of Mail Creek just upstream of Mail Creek Lane.
3. Extending the existing buffer limit by approximately 30-feet for approximately 470-feet along the left side of Mail Creek beginning at a location approximately 500 feet upstream of the confluence with Fossil Creek, along the Mail Creek thalweg.

In addition, URS recommends that known areas of headcutting and bank erosion be monitored for increasing problems that could impact utilities, and infrastructure, crossing and adjacent to this reach of Mail Creek.

The last stability investigation of this reach of Mail Creek was conducted almost 10 years ago by TST, Inc. Additional stability analysis should be conducted in the future to determine, in greater detail, the erosion issues and possible solutions.

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