



Floodplain Technical Memorandum

US 24 West

CDOT Project No. NH 0242-040

Project Control No. 187824

Colorado Department of Transportation

January 2010

US 24 West Environmental Assessment: Floodplain

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DATE: January 2010

1.0 Introduction

The Colorado Department of Transportation (CDOT) is conducting an Environmental Assessment (EA) for changes to a 4-mile portion of US 24 between Interstate 25 (I-25) and Manitou Springs. This memorandum provides a discussion of drainage issues and potential floodplain impacts for the proposed improvements to US 24 from I-25 in Colorado Springs to Manitou Springs. Potential impacts of both the No Action and Proposed Action Alternatives, described in Section 2.0 below, are evaluated.

2.0 No Action Alternative

The No Action Alternative consists of existing transportation facilities and committed transportation projects that would occur regardless of whether the Proposed Action is constructed. The No Action Alternative would not make any improvements to the existing condition beyond those which are already planned and funded. The projects listed below are shown in existing adopted transportation plans and are locally funded projects.

- **8th Street Intersection Improvements.** Lengthens turn lanes and acceleration and deceleration lanes on US 24, and widens 8th Street north and south of US 24.
- **8th Street Bridge Replacement.** Replaces the existing four-lane bridge structure over Fountain Creek at 8th Street.
- **21st Street Roadway Improvements.** Includes the widening of 21st Street south of US 24 to four 12-foot travel lanes with dedicated turn lanes, extended acceleration lane, and curb and gutter. Geometric improvements to the US 24/21st Street intersection will also be constructed.
- **25th Street Bridge Replacement.** Replaces the existing two-lane bridge structure over Fountain Creek at 25th Street.
- **Midland Trail Extension.** Extends Midland Trail between 21st Street and Manitou Avenue to connect with Manitou Springs' Creekside Trail.

Under the No Action Alternative, improvements to intelligent transportation systems (for example, variable message signs) would be implemented as part of the congestion management program. Existing bus routes and service would continue as they are today,

and bike and pedestrian facilities would only be extended or improved as local funds and grants allow.

From 17th Street to the US 24 crossing east of 21st Street, minor channel improvements are currently being designed under a separate project between Gold Hill Mesa developers, Colorado Springs Stormwater Enterprise, and CDOT. That project has designed the channel so that the 100-year water surface elevation would be below the future elevation of US 24.

3.0 Proposed Action

The Proposed Action would provide additional capacity on US 24 by building additional travel lanes, two new interchanges, and one new overpass. The Proposed Action includes rebuilding several cross-streets, replaces bridges over Fountain Creek, and includes modifications to Fountain Creek's channel at each bridge crossing. Sidewalks would be built at all intersections and interchanges. The Proposed Action would also accommodate a park and ride facility and two future local access points along the route, which would be built by others. The Proposed Action is illustrated in Exhibit 1.

A single point diamond interchange is proposed at the Cimarron Interchange. This interchange design differs from what was originally presented in the *I-25 Improvements through the Colorado Springs Urbanized Area EA* (CDOT, 2004). Since the I-25 EA was approved, new opportunities have been identified to improve existing and future traffic operations, making this improved design now feasible.

US 24 in the project area would be built to have eight through-lanes, four in each direction, east of 8th Street, and six through-lanes, three in each direction, from 8th Street to a point west of 31st Street. New interchanges are proposed at 8th and 21st Streets.

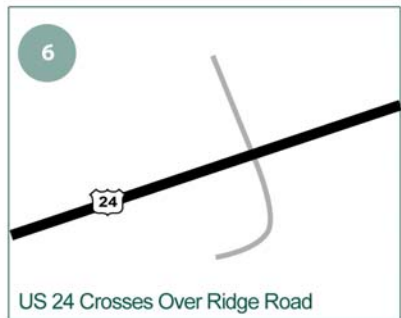
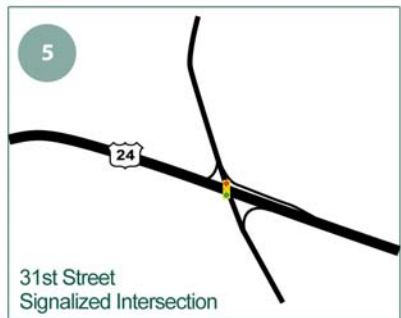
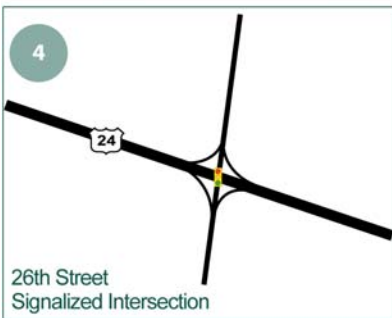
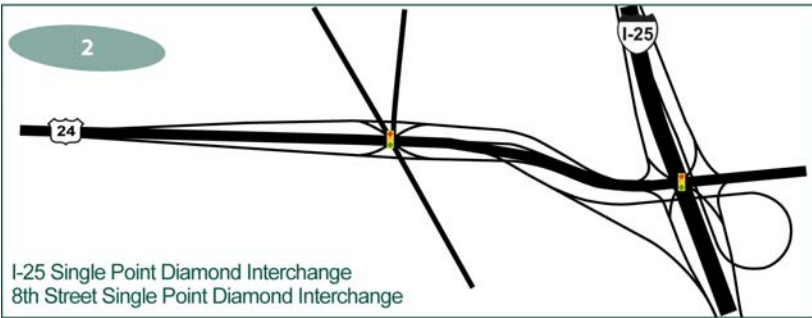
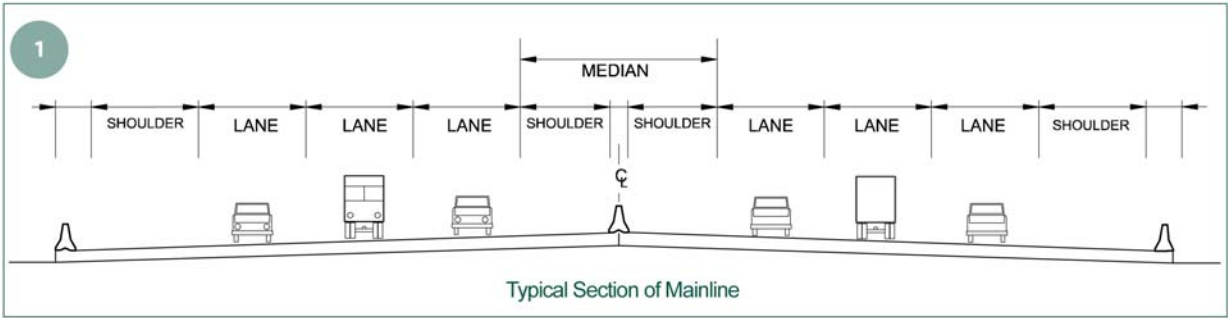
Intersection upgrades are proposed at 26th Street. The intersection of US 24 and 31st Street would be widened, as would the intersection with Colorado Avenue to the north. South of US 24, 31st Street would be rebuilt to align with the highway intersection.

At the west end of the corridor, an overpass would be built to carry US 24 over Ridge Road. Ridge Road would be widened between High Street and Colorado Avenue. The west end of the Proposed Action is approximately 1,800 feet west of the Ridge Road overpass where the overpass connects to the existing highway. Because there is not an existing or future congestion problem between Ridge Road and Manitou Avenue, no changes are proposed west of Ridge Road.

Accommodations would be made for the following features that will be built by others in the future:

- At 15th Street an overpass would be constructed to carry 15th Street over US 24 and Fountain Creek, and connect to the street network of Old Colorado City and Gold Hill Mesa. This overpass would include ramps on the east side to connect to the 8th Street intersection. Between the ramps and Colorado Avenue, 15th Street would be reconstructed to provide pedestrian features such as sidewalks.

EXHIBIT 1
Proposed Action



- At Ridge Road ramps providing direct access to US 24 would be constructed to convert the overpass to a tight diamond interchange.
- At 31st Street a park and ride facility would be constructed in the northeast quadrant of the intersection, with access from Colorado Avenue.

Elements of the Proposed Action specific to floodplains include replacing bridges on US 24, including ramps connecting to I-25, and cross streets for crossings over Fountain Creek from I-25 to Ridge Road. Compliance with agency criteria and removal of the US 24 corridor from the 100-year floodplain requires the replacement of all corridor bridges and modification to the creek's channel geometry. Elements of the Proposed Action specific to floodplains are summarized in Exhibit 2. Drainage improvements were not examined for Fountain Creek west of Ridge Road.

4.0 Regulatory Background

Floodplains are the lands on either side of a stream that are inundated when the capacity of the stream channel is exceeded. A 100-year floodplain is the regulatory floodplain associated with a 100-year design storm frequency. Changes in the floodplain, such as adding fill material, constructing buildings or bridges, or constricting the channel, can cause a rise in the water surface elevation. This increase in the water surface elevation can subsequently impact properties not previously affected.

The project affects the Fountain Creek floodplain, which is designated as Zone A, AE, and X by the Federal Emergency Management Agency (FEMA). The floodplain is shown on the Flood Insurance Rate Map (FIRM) for El Paso County and Incorporated Areas, Panel Numbers 707, 726, 728, and 729, dated March 1997 (see FIRM Exhibits 1 through 4 in Appendix A). The following regulatory requirements listed below apply to the floodplains located within the US 24 study area.

- **Executive Order (EO) 11988, Floodplain Management (1977)** directs federal agencies to “provide leadership and take action to reduce the risk of flood loss, to minimize the impacts of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.” This EO was authorized to assist in furthering NEPA, the National Flood Insurance Act of 1968 (amended), and the Flood Disaster Protection Act of 1973.
- **23 Code of Federal Regulations (CFR), Part 650 - Highways, Chapter I - Federal Highway Administration, U.S. Department of Transportation, Part 650 - Bridges, Structures, and Hydraulics**, prescribes the policies and procedures that the FHWA is directed to implement in the “location and hydraulic design of highway encroachments on floodplains.”
- **44 CFR Part 1 - Emergency Management and Assistance, Chapter I - FEMA**, contains the basic policies and procedures of FEMA to regulate floodplain management and to analyze, identify, and map floodplains for flood insurance purposes.
- **FHWA - Keep US 24 out of 100-year floodplain.**

EXHIBIT 2

Elements of the Proposed Action Specific to Floodplains

Location	Description of Proposed Improvement/Anticipated Impact ¹
Fountain Creek to Monument Creek	<ul style="list-style-type: none"> • Re-construction of flyover would involve two crossings of Fountain Creek.
Monument Creek to US 24 Crossing (east of 8th Street)	<ul style="list-style-type: none"> • Widen the Fountain Creek channel bottom to 200 feet from its confluence with Monument Creek to the US 24 bridge east of 8th Street.
US 24 Crossing to 8th Street	<ul style="list-style-type: none"> • Replace the existing US 24 bridge with a new bridge with a rectangular opening width of 200 feet. This low girder of the new bridge will be approximately 5 feet higher than the low girder of the existing bridge. • Transition the channel bottom from 200 to 160 feet. • Replace the 8th Street bridge with a bridge that has a rectangular opening width of 160 feet and a minimum freeboard of 2 feet. This low girder of the new bridge will be approximately 2 feet higher than the low girder of the existing bridge.
8th Street to 17th Street	<ul style="list-style-type: none"> • Construction of a new US 24 eastbound off-ramp above the floodplain to prevent the 100-year flood from inundating the lower US 24 mainline. • A retaining wall would be built along the north creek bank to limit encroachment of the off-ramp embankment into the creek. • The creek bottom would be widened out to the new retaining wall to increase conveyance.
17th Street to US 24 Crossing (east of 21st Street)	<ul style="list-style-type: none"> • The US 24 bridge east of 21st Street would be replaced with a bridge providing a rectangular opening of 160 feet and a freeboard of approximately 4 feet.
US 24 Crossing to 21st Street	<ul style="list-style-type: none"> • Construct a wall along the north bank and widen the channel to 160 feet. • Replace the 21st Street bridge with a new bridge having a rectangular opening of 110 feet and a minimum freeboard of 2 feet. The low girder of the new bridge should be approximately 4 feet higher than the existing bridge low girder.
21st Street to 23rd Street	<ul style="list-style-type: none"> • No improvements are recommended within this reach other than the channel transition at the 21st Street bridge.
23rd Street to 26th Street	<ul style="list-style-type: none"> • In this reach the channel would be lowered approximately 4.9 feet at the 26th Street bridge. The banks will require some improvements to accommodate the deeper channel section. • The bridge at 25th Street would be removed and not replaced. This bridge does not meet hydraulic criteria and would no longer be needed since the properties it accesses will be purchased by CDOT for the expansion of US 24. • The bridge at 26th Street would be replaced with one providing a 160-foot rectangular opening width and a minimum freeboard of 2 feet. The low girder of the new bridge should be approximately 6 feet higher than the low girder of the existing one.
26th Street to 29th Street	<ul style="list-style-type: none"> • The channel would need to be realigned horizontally to the north to avoid encroachment by the highway into the existing channel.

EXHIBIT 2

Elements of the Proposed Action Specific to Floodplains

Location	Description of Proposed Improvement/Anticipated Impact ¹
29th Street to 31st Street	<ul style="list-style-type: none">• Replace the 31st Street bridge with a structure providing a 160-foot rectangular width and a minimum freeboard of 2 feet. The low girder of the new bridge would be approximately 5 feet higher than the existing bridge low girder.• The channel would also be lowered approximately 4 feet at the 31st Street bridge to improve capacity. Some bank improvements will be needed to accommodate the deeper channel cross section.
31st Street to Ridge Road	<ul style="list-style-type: none">• No channel improvements are recommended other than the channel transitions at the upstream and downstream faces of the bridges.• The Ridge Road bridge would be replaced to provide a rectangular opening width of 160 feet and a minimum freeboard of 2 feet.

Notes:

¹ The project will abide by the terms and requirements of CDOT's latest *Drainage Design Manual*, including following minimum freeboard requirements.

The project has the following design criteria as specified by Federal, State, and Local agencies:

- **CDOT** - The project will abide by the terms and requirements of CDOT's latest *Drainage Design Manual*, including following minimum freeboard requirements for US 24 bridges (typically 4 feet below bottom of girder).
- **El Paso County** - The El Paso County floodplain administrator recommends that project improvements not increase the 100-year floodplain elevation.
- **City of Colorado Springs** - Convey 100-year flow under connecting local roadway bridges with a 2 foot freeboard.

5.0 Methodology

A portion of the floodplain and stream channel is reserved for the passage of flood waters while providing for appropriate use of adjacent lands. This section of channel is called the floodway, and must be reserved to discharge the base flood without increasing the water surface more than a designated height. The floodway limits are typically generated through hydraulic modeling and are site specific to each stream channel. Delineating a floodway requires an analysis of the effects of eliminating areas of flow in the overbanks on computed water surface elevations.

Although a detailed study and hydraulic model of Fountain Creek are available through FEMA, a new hydraulic model based on recent survey data was developed by URS Corporation for the U.S. Army Corps of Engineers (USACE). Dave Jula of Michael Baker has given approval (as FEMA's representative) to use this new model for the US 24 study since it will be reviewed and eventually adopted by FEMA for map revision.

The hydraulic analysis was performed using the HEC-RAS software developed by the USACE. A HEC-RAS model of existing channel and bridge conditions was prepared for the USACE. The model was then modified for the Proposed Action improvements. The URS

existing conditions model still needs to be updated to reflect projects recently constructed, and for survey and bridge datum updates.

FEMA has published a maximum 100-year flow rate of 20,500 cubic feet per second through the project reach of Fountain Creek. The hydrologic analysis performed by URS Corporation for the USACE determined a maximum 100-year flow of 19,000 cubic feet per second. The URS study is in the process of being reviewed and approved by FEMA and is used for this analysis.

The floodplain hydraulic analysis was performed in accordance with 23 CFR Part 650, and 44 CFR Part 1. The Proposed Action drainage structures have been sized to comply with FEMA regulations of not increasing the 100-year water surface elevation within detailed floodplain areas.

Channel improvements are proposed to provide transitions to the replacement bridges and to realign the creek to avoid new US 24 encroachments. General channel modifications require grading a transition from the face of each bridge to a point approximately 100 feet upstream and downstream of the bridge. The creek will transition from its existing shape to a rectangular shape at each new bridge. The length of channel improvements will vary depending on the excavation depth at the bridge and the distance required to tie into the existing channel. A rectangular opening was modeled at each bridge crossing to minimize property impacts created by sloping bridge abutments.

A channel slope of 0.5% was used in the model to reduce velocities and stabilize the channel through the bridge. Since the longitudinal slope of the existing creek is steeper, drop structures would be required to achieve the desired channel depth at the bridge.

The following channel improvements were selected in the preliminary hydraulic analysis to meet local, state, and federal floodplain requirements. Improved channel slopes of 4 (horizontal) to 1 (vertical) were used wherever possible within the improved channel locations. Vertical walls may be required in other locations to complete transitions at bridges, to minimize environmental impacts where the creek is in close proximity to the roadway improvements, and to limit grading from extending beyond CDOT property.

- **Fountain to Monument Creek:** No modifications
- **Monument Creek to US 24:** Widen channel bottom to 200 feet
- **US 24th to 8th Street:** Widen channel bottom and transition from 200 to 160 feet
- **8th to 13th Streets:** Construct retaining wall along north bank bordering US 24; widen channel to wall
- **13th to 17th Streets:** Raise US 24 above floodplain; construct retaining wall between roadway and Fountain Creek
- **17th to US 24 (east of 21st Street):** Gold Hill Mesa project is constructing channel modifications
- **US 24 to 21st Streets:** Construct bank wall; widen channel to 160 feet
- **21st to 23rd Streets:** No modifications beyond the bridge transitions

- **23rd to 26th Streets:** Lower channel; some associated bank modifications
- **26th to 29th Streets:** Relocate channel thalweg due to new expressway encroachments
- **29th to 31st Streets:** Lower channel; some associated bank modifications
- **31st Street to Ridge Road:** No modifications beyond the bridge transitions
- **Ridge to East of El Paso Blvd:** No modifications

Drainage impacts are divided into two categories: floodplain impacts and non-floodplain impacts. Floodplain impacts affect floodplains which have been designated as regulatory on mapping used by the FEMA flood insurance program. Floodplain impacts are measured by the change in the water surface elevation or base flood elevation. All other drainage impacts are classified as non-floodplain impacts and are not discussed in this technical memorandum.

6.0 Existing Conditions

The FEMA designated flood zones A, AE, and X are shown in **FIRM** Exhibits 1 through 4 in **Appendix A** for the US 24 project area. Areas designated as Zone A are within the 100-year floodplain as determined by approximate hydraulic methods. Specific flood elevations are neither shown nor available within this zone. Zone AE designates areas within the 100-year floodplain where 100-year flood elevations are available since detailed hydraulic methods were used. Zone X areas can experience 100-year flooding but with average depths less than 1 foot.

Regulated floodplains are associated with five major streams in the project area: Fountain Creek, Monument Creek, Camp Creek, Beckers Lane Tributary, and Sutherland Creek. A description of each of these streams, derived from FEMA Flood Insurance Studies, is provided below.

- **Fountain Creek:** Fountain Creek originates approximately 5 miles northeast of Green Mountain Falls in Teller County. From its headwaters, Fountain Creek flows southeasterly for approximately 18 miles, often exceeding a gradient of 150 feet per mile, to join Monument Creek. The headwaters are fed from glacial snow packs and springs of the alpine canyons of Pikes Peak. Fountain Creek parallels and is in close proximity to the highway throughout the study area. Of the 17 bridges that cross Fountain Creek within the study area, only two convey the 100-year flood.
- **Monument Creek:** Monument Creek has a drainage area of approximately 228 square miles. The stream length is approximately 35 miles with a slope of approximately 1.7%. The watershed extends from the confluence of Monument Creek and Upper Fountain Creek in Colorado Springs to its headwater streams in northern El Paso County at the Palmer divide.
- **Camp Creek:** Camp Creek originates in the Pike National Forest northwest of Colorado Springs, approximately 5 miles northwest of Glen Eyrie, continues south approximately 3 miles to Colorado Springs, and joins Fountain Creek near 30th Street. The creek flows in a concrete-lined channel in residential areas.

- **Beckers Lane Tributary:** Beckers Lane Tributary flows parallel to Beckers Lane in the eastern part of Manitou Springs and drains an area of 0.85 square mile.
- **Sutherland Creek:** Sutherland Creek begins south of Colorado Springs in the Pike National Forest and has a drainage area of 5.37 square miles at its mouth. The upper basin is vegetated and the lower reach is moderately developed. In many areas, the stream channel is heavily vegetated with thick stands of scrub oak.

From 31st Street east, US 24 is overtopped throughout the study corridor by the 100-year floodplain that extends roughly 200 feet to each side of Fountain Creek. The floodplain expands to approximately 2,700 feet as the creek approaches I-25 and its confluence with Monument Creek. Flooding at the confluence extends north almost to West Colorado Avenue and south of the I-25 interchange. The elevated portion of I-25 is out of the floodplain but all of the US 24 mainline and connecting ramps are within the 100-year floodplain (see FIRM Exhibits 1 through 4 in Appendix A).

Fountain Creek is wooded on both banks from its confluence with Monument Creek to 8th Street. The 8th Street bridge is overtopped during the 25-year storm event. Between 8th and 13th Streets the channel has recently been reconstructed. All trees were removed and small saplings have been planted. The outer bank of the trickle channel, constructed as part of the channel improvement, is armored with large rock.

From 13th Street to the US 24 crossing, east of 21st Street, the creek is lightly wooded. The US 24 bridge immediately east of 21st Street is subject to overtopping during the 50-year storm event.

Between US 24 and the Safeway Grocery parking lot near 32nd Street the creek has wooded banks. Both the 21st and 26th Street bridges are overtopped during the 25-year storm event. The 10-year event overtops the 160-foot 31st Street bridge. East of 31st Street, West Colorado Avenue and adjoining property are within the Camp Creek 100-year floodplain. Along the Safeway Grocery property the creek narrows to a width of 85 feet.

Midway between Ridge Road and Safeway the channel is able to convey only the 10-year flood event. The half-dozen retail properties between the Safeway and 31st Street to the east are also inundated during storm events greater than the 10-year. US 24 is not within the floodplain in this area since it is much higher than the retail properties. West of Safeway the creek banks widen to roughly 130 feet and become wooded. Neither the existing channel in this reach nor the Ridge Road bridge are able to convey the 100-year flood event.

Continuing west the Creek is widely separated from US 24. Within this reach the creek is conveyed through several small bridge crossings and is joined by Beckers Lane Tributary. These bridges are overtopped during the 100-year storm event. West of the confluence with Beckers Lane Tributary, Fountain Creek crosses US 24 immediately east of El Paso Boulevard. The US 24 bridge is able to convey the Fountain Creek 100-year storm event.

Immediately south of US 24, Sutherland Creek flows into Fountain Creek. There is a flow split on Sutherland Creek with high flows also crossing under US 24 via Crystal Hill Boulevard.

Past drainage studies listed have been made on Fountain Creek.

- In 1994, Muller Engineering estimated peak flow rates.
- In 1999 FEMA developed water surface elevations with the USACE HEC-2 water surface profile computer program. Letters of Map Revision (LOMRs) were issued in 1990-91 for the reach of Fountain Creek between 31st Street and Ridge Road.
- In 2004, CH2M HILL prepared a Letter of Map Revision (LOMR) for the revised channel between 8th and 21st Streets.
- In 2005, URS revised estimated peak flow rates in a study for USACE based on new hydrology.

7.0 Impacts and Mitigation

Impacts of No Action Alternative

Throughout the study area, nearly all of existing US 24 and much of the adjoining property is subject to 100-year flooding from Fountain Creek. Without the proposed project, these areas will remain within the 100-year floodplain (see **FIRM** Exhibits 1 through 4 in **Appendix A**). An estimated 134 private properties are within the floodplain.

Impacts of Proposed Action Alternative

The Proposed Action would raise and widen US 24, improve intersections, and increase flow capacity at bridges. Preliminary floodplain and hydraulics analyses indicate that the Proposed Action would not result in an adverse impact to flood elevations or limits in the affected watercourses. New bridges would be designed to accommodate a 100-year flood. The creek would also be widened through some sections as required to accommodate new bridge construction. These improvements would remove all of US 24 and some adjoining properties from the Fountain Creek 100-year floodplain. US 24 and its interchanges or intersections with connecting cross streets would no longer be overtopped during the 100-year storm event. An estimated 95 private properties would be removed from the floodplain; leaving 39 properties within the floodplain.

The floodplain limits and the water surface elevation will be reduced at all bridge crossings and most creek reaches by the Proposed Action (see Exhibits 1 through 8 in **Appendix B**). Existing and Proposed Action water surface elevations at each bridge crossing are shown in Exhibit 3.

Along US 24 encroachments into the Fountain Creek floodplain would occur from the Proposed Action. These encroachments would occur where changes are proposed to existing roadway embankments in areas adjacent to the creek. Some embankment encroachments may extend into the floodplain, while others may encroach directly into the low flow channel. Only minor impacts are anticipated at the confluences of each tributary creek to Fountain Creek.

Though the 100-year water surface would decrease for most of the creek within the corridor, some sections between the proposed improvements may experience minor fluctuations in water surface elevation due to modified upstream and downstream hydraulics and other

modeling anomalies. Further hydraulic analysis during final design will confirm actual limits of hydraulic impacts.

Avoidance and Minimization

The Proposed Action was designed to remove US 24 and the maximum number of properties currently within the Fountain Creek floodplain. Beyond the scope of this project, additional properties may be able to be removed from the regulatory floodplain should US 24 obtain certification as a levee. Additional work to Fountain Creek, such as constructing retaining/flood walls, could be performed in the future to remove properties along the creek from the floodplain. Another future alternative would be to purchase property remaining within the floodplain. Pre-Disaster Mitigation funds for programs of this type are available from the Colorado Division of Emergency Management.

EXHIBIT 3

Comparison of No Action and Proposed Action Water Surface Elevations

Location	No Action ²		Proposed Action			
	Bridge Length (ft)	Overtopped in 100-year Event	Bridge Length (ft) ¹	Overtopped in 100-year Event	Increase in Bridge Height (ft) ¹	Water Surface Rise (ft) ³
US 24 EB to I-25 NB		N/A	New Flyover	No	N/A	-
US 24 EB to I-25 NB		N/A	New Flyover	No	N/A	-
I-25 Eastside Trail	43	Yes	200	Yes	-	-10
I-25 NB On Ramp	106	Yes	200	No	-4	-12
I-25 Mainline	292	No	Maintain Exist	No		-13
I-25 SB Off-ramp		N/A	200	N/A	N/A	-13
US 24 (East of 8th)	86	Yes	200	No	5	-9
8th St ¹	61	Yes	160	No	2	-9
US 24 (East of 21st)	41	Yes	160	No	4	-7
21st St ¹	112	Yes	110	No	4	-5
25th St ¹	63	Yes	Remove Exist	N/A	N/A	N/A
26th St	74	Yes	160	No	6	-12
Golden Ln (Fountain Creek RV Park)	39	Yes	Maintain Exist	Yes		N/A
31st St	63	Yes	160	No	5	-7
Ridge Rd	63	Yes	160	No	3	-10
Timber Lodge Private Drive	37	Yes	Maintain Exist	Yes	-	-
Timber Lodge Private Drive	30	Yes	Maintain Exist	Yes	-	-
Colorado Ave	11	Yes	Maintain Exist	Yes	-	-

EXHIBIT 3

Comparison of No Action and Proposed Action Water Surface Elevations

Location	No Action ²		Proposed Action			
	Bridge Length (ft)	Overtopped in 100-year Event	Bridge Length (ft) ¹	Overtopped in 100-year Event	Increase in Bridge Height (ft) ¹	Water Surface Rise (ft) ³
Beckers Lane	20	Yes	Maintain Exist	Yes	-	-
US 24 (El Paso Blvd)	195	No	Maintain Exist	No	-	-
Garden of the Gods Place	97	Yes	Maintain Exist	Yes	-	-

Notes:

¹ Bridge to be replaced as part of the programmed improvements of the No Action alternative.

² It is assumed that only bridge replacements are included in programmed improvements for the No Action alternative. With the identified bridge replacements, there would be no significant change in water surface elevations without channel improvements along Fountain Creek, which are assumed to NOT be included in the programmed bridge improvements. Therefore, bridge lengths are shown as existing conditions for informational purposes and the Water Surface Rise is shown as a comparison between the existing 100-year water surface elevation and the proposed Action 100-year water surface elevation.

³ These numbers are based on preliminary bridge and channel geometry assumptions. They are only approximations and may change during final design. The rise (or fall) in water surface elevations is based on models using existing bridge geometry WITHOUT programmed improvements compared to proposed bridge geometry WITH channel improvements. Programmed bridge improvements would not significantly modify the 100-year water surface elevation without improvements to the channel along Fountain Creek.

Mitigation of Proposed Action

Encroachments into the Fountain Creek floodplain and low flow channel would be mitigated through the construction of retaining walls and relocation of channel thalwegs as described in Exhibit 4.

EXHIBIT 4

Proposed Mitigation for Impacts to Floodplains

Location	Impact	Mitigation
8th to 21st Street - Right Side	Embankment into floodplain	None - No floodplain impacts
25th Street to East of 31st Street – Left Side	Embankment into low flow channel	Construct walls, relocate channel thalweg
31st Street to Ridge Road – Left Side	Embankment into low flow channel	Construct walls, relocate channel thalweg

8.0 References

City of Colorado Springs prepared by Muller Engineering. *Fountain Creek Drainage Basin Planning Study*. 1994.

Federal Emergency Management Agency (FEMA). *Flood Insurance Study El Paso County, Colorado and Incorporated Areas Volume 1 of 4*. August 1999.

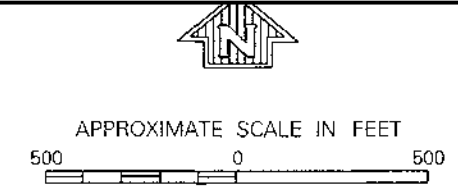
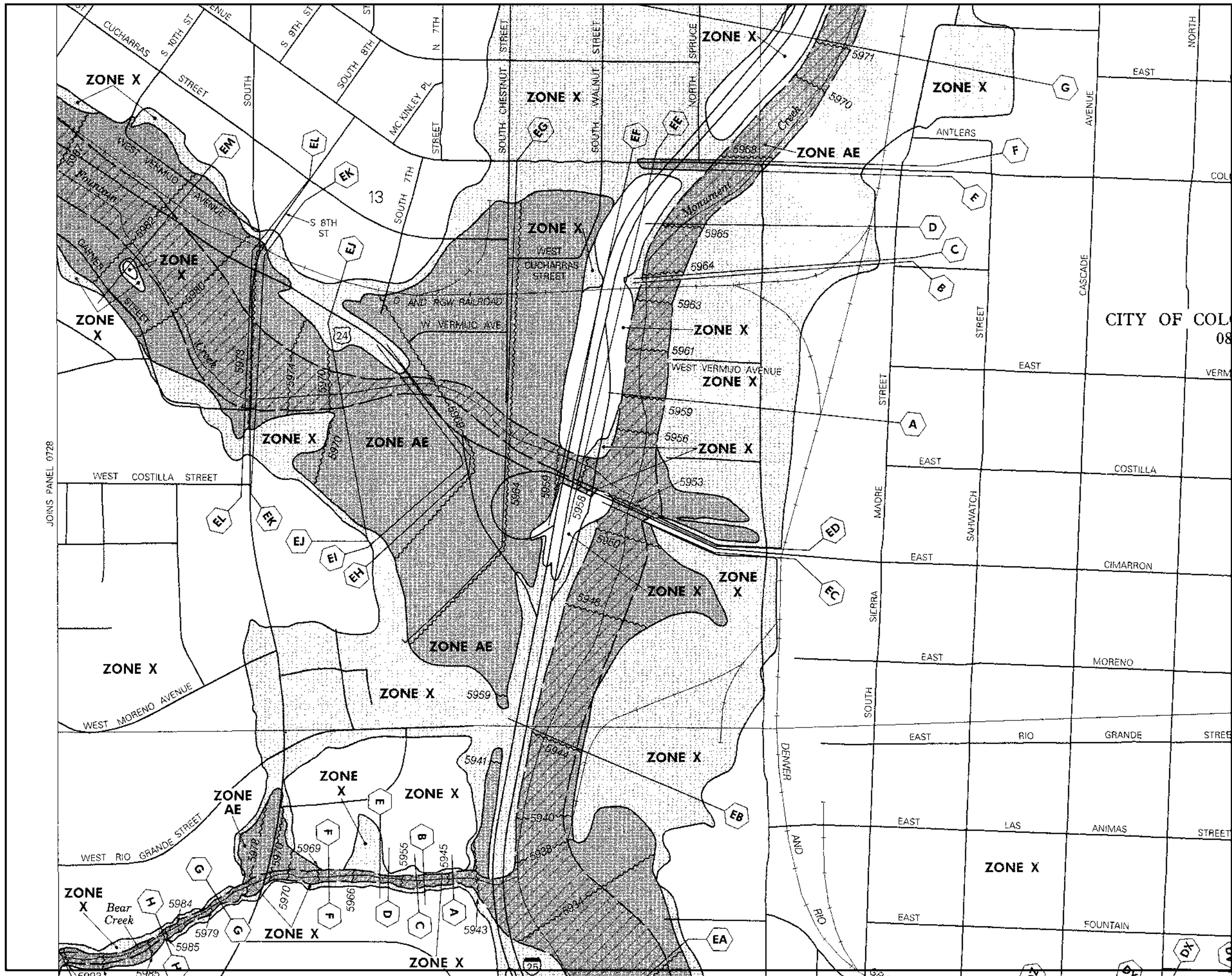
United States Army Corps of Engineers (USACE). *HEC-RAS 3.1.3 River Analysis System*. May 2005.

URS. *Upper Fountain Creek HEC-RAS model*. 2006.

USACE prepared by URS. *Fountain Creek Watershed Study*. 2005

ATTACHMENT A

Flood Insurance Rate Maps



NATIONAL FLOOD INSURANCE PROGRAM

**FIRM
FLOOD INSURANCE RATE MAP**
EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS

PANEL 729 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
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**MAP NUMBER
08041C0729 F**

**EFFECTIVE DATE:
MARCH 17, 1997**

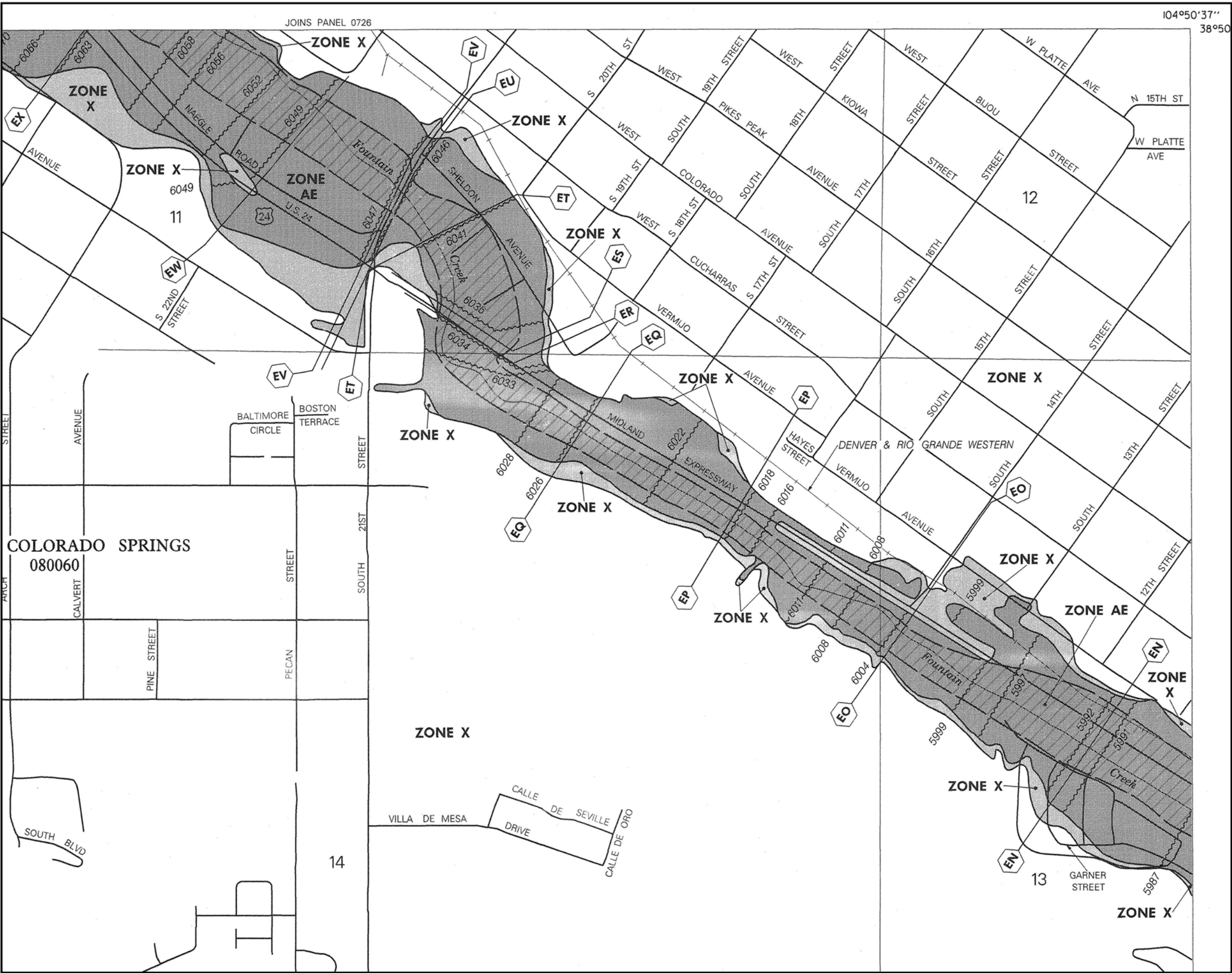


Federal Emergency Management Agency

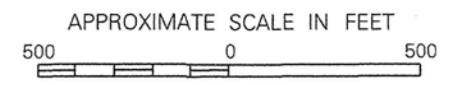
Exhibit 1.1

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

JOINS PANEL 0728



104°50'37"
38°50'



NATIONAL FLOOD INSURANCE PROGRAM

**FIRM
FLOOD INSURANCE RATE MAP**

**EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS**

PANEL 728 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0728	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0728	F

**MAP NUMBER
08041C0728 F**

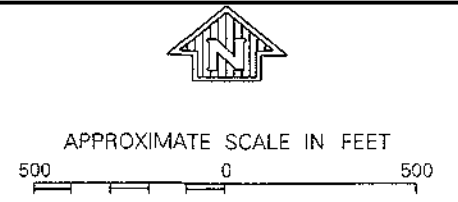
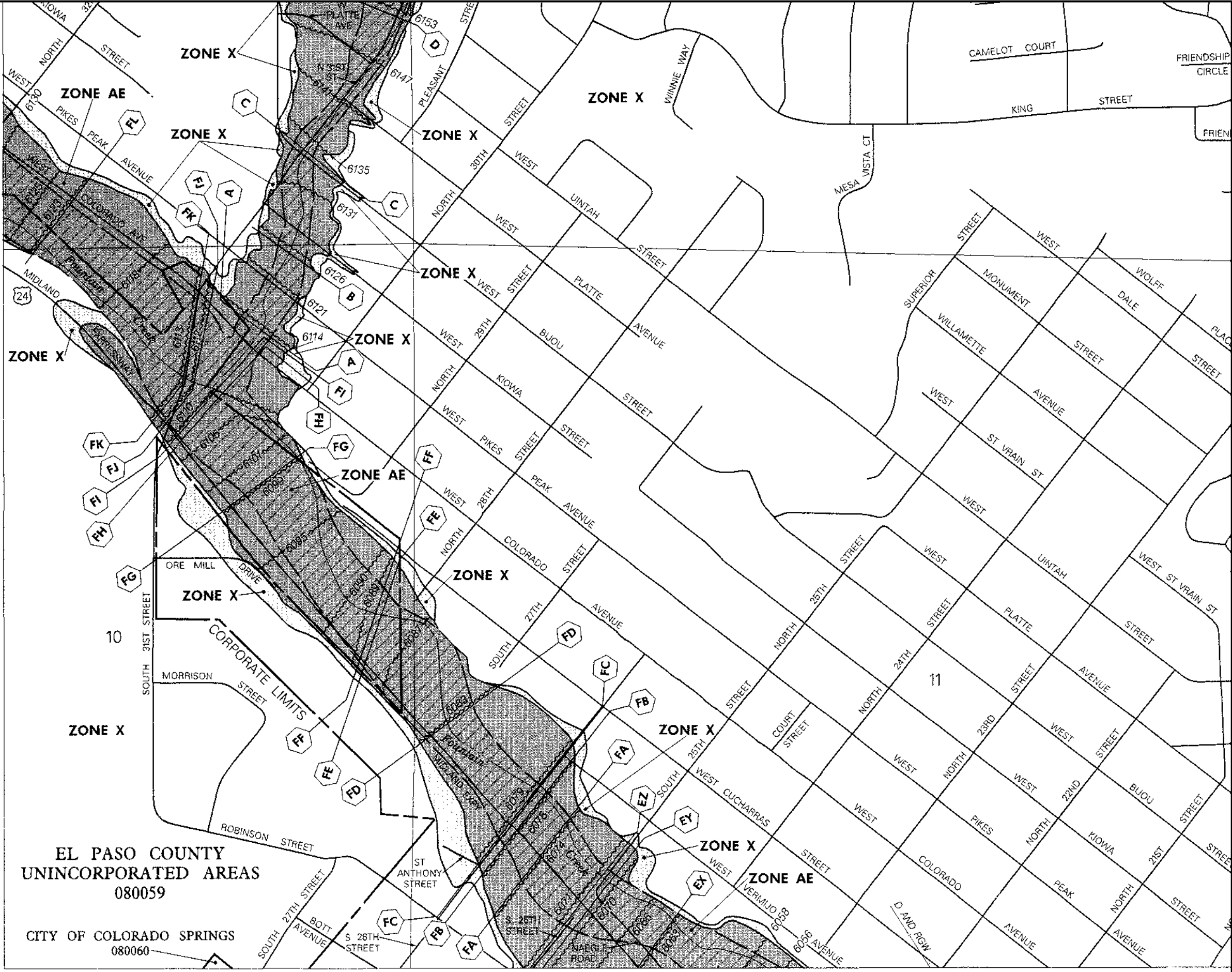
**EFFECTIVE DATE:
MARCH 17, 1997**



Federal Emergency Management Agency

Exhibit 1.2

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



NATIONAL FLOOD INSURANCE PROGRAM

**FIRM
FLOOD INSURANCE RATE MAP**

**EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS**

PANEL 726 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0726	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0726	F

**MAP NUMBER
08041C0726 F**

**EFFECTIVE DATE:
MARCH 17, 1997**



Federal Emergency Management Agency

Exhibit 1.3

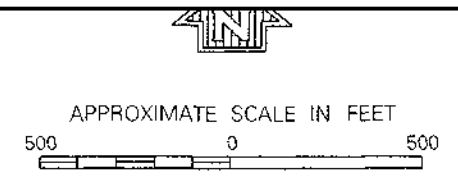
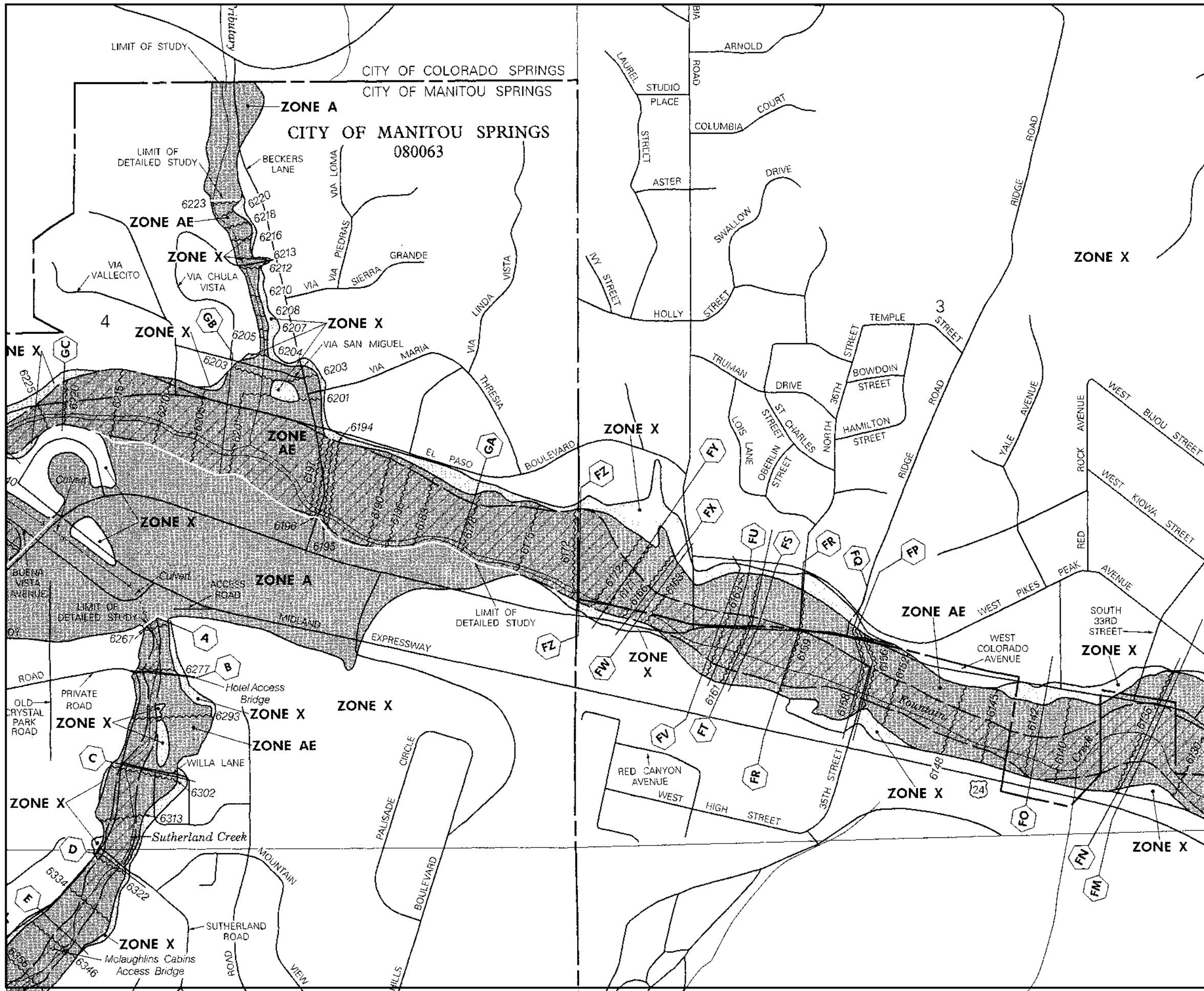
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

**EL PASO COUNTY
UNINCORPORATED AREAS
080059**

**CITY OF COLORADO SPRINGS
080060**

87"
104°52'30"

JOINS PANEL 0728



NATIONAL FLOOD INSURANCE PROGRAM

**FIRM
FLOOD INSURANCE RATE MAP**

**EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS**

PANEL 707 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080253	0707	F
EL PASO COUNTY UNINCORPORATED AREAS	080259	0707	F
MANITOU SPRINGS, CITY OF	080283	0707	F

**MAP NUMBER
08041C0707 F**

**EFFECTIVE DATE:
MARCH 17, 1997**



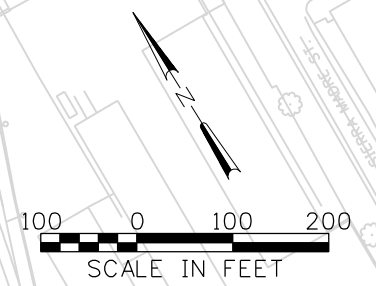
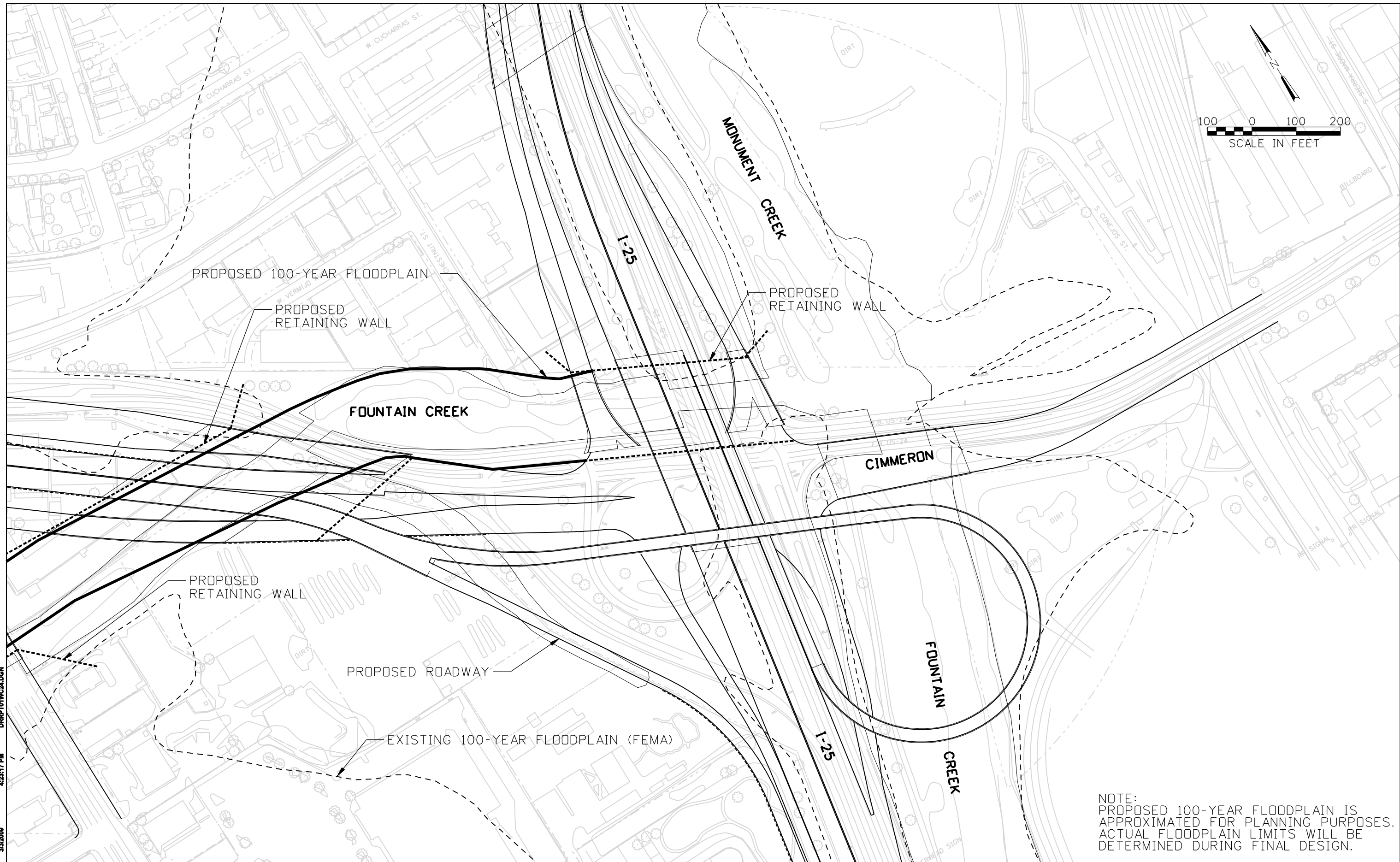
Federal Emergency Management Agency

Exhibit 1.4

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

ATTACHMENT B

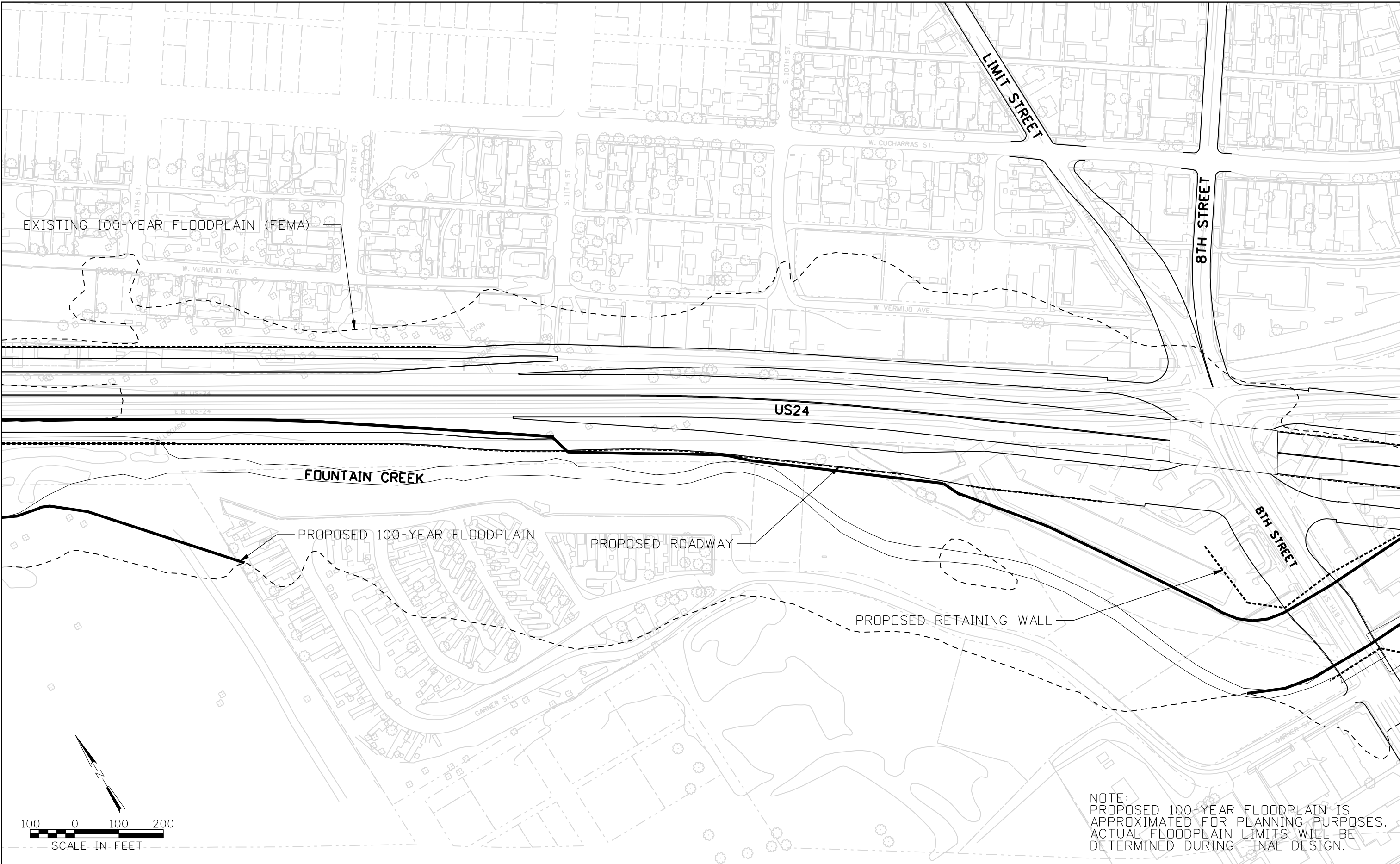
Existing and Proposed Floodplain Limits and Water Surface Elevations



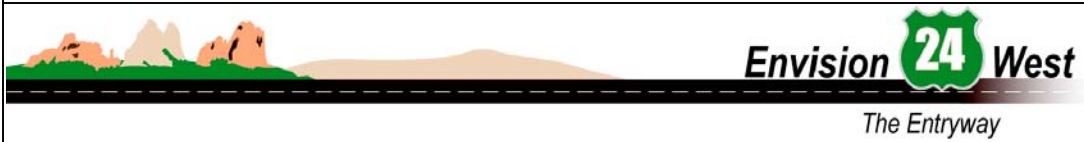
DRRPT01WC24.DGN
4:23:17 PM
3/2/2009

NOTE:
PROPOSED 100-YEAR FLOODPLAIN IS APPROXIMATED FOR PLANNING PURPOSES. ACTUAL FLOODPLAIN LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

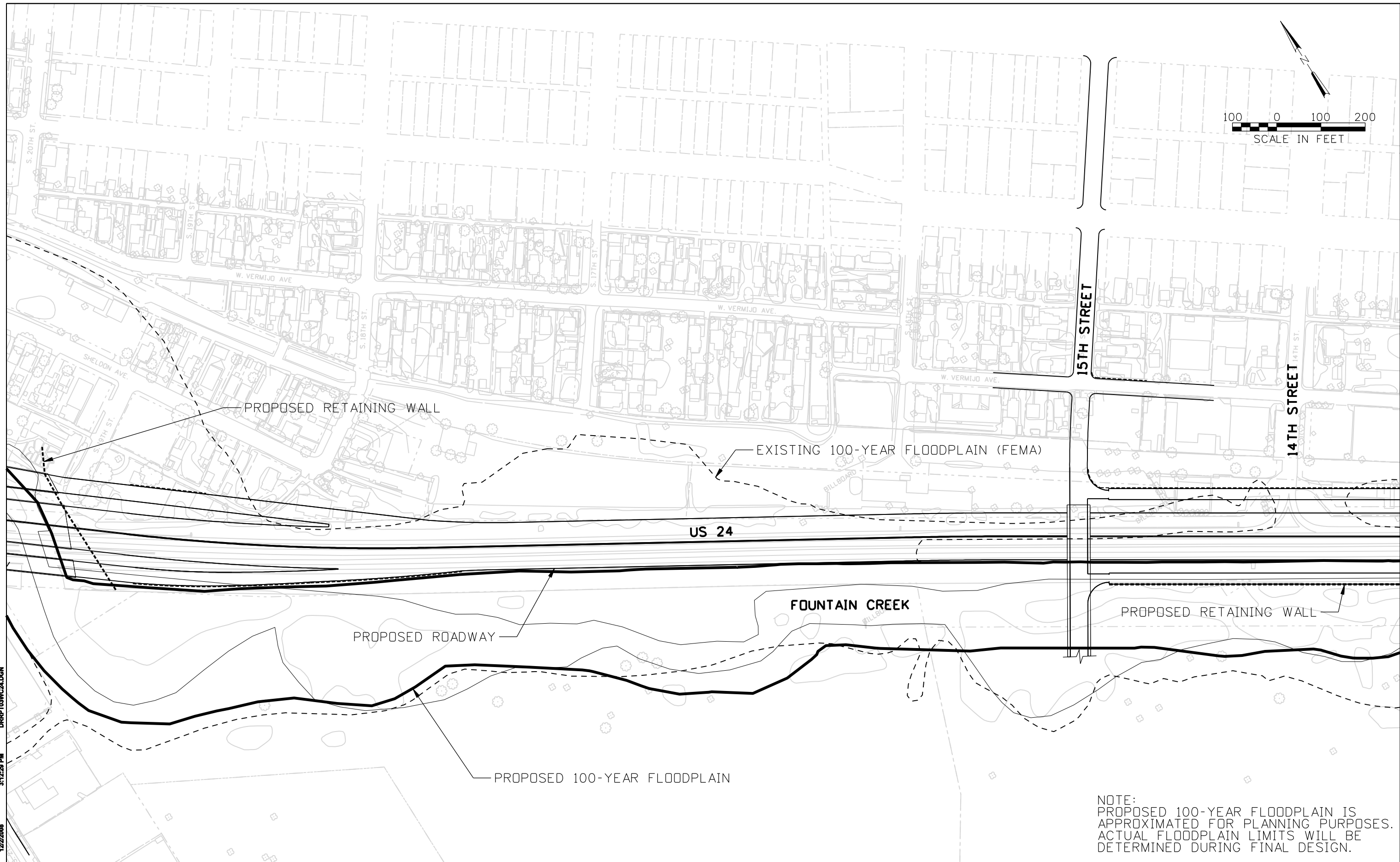
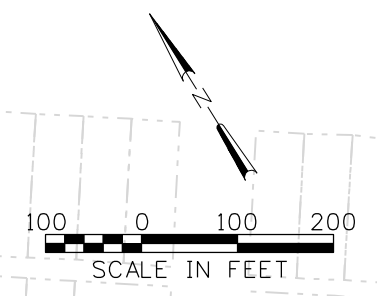




12/2/2008 3:11:14 PM DRRPT02WC24.DGN US24-A:hurst



**US 24 WEST MIDLAND EXPRESSWAY
 EXISTING AND PROPOSED FOUNTAIN CREEK 100-YEAR FLOODPLAIN
 EXHIBIT 2.2**



PROPOSED RETAINING WALL

EXISTING 100-YEAR FLOODPLAIN (FEMA)

US 24

FOUNTAIN CREEK

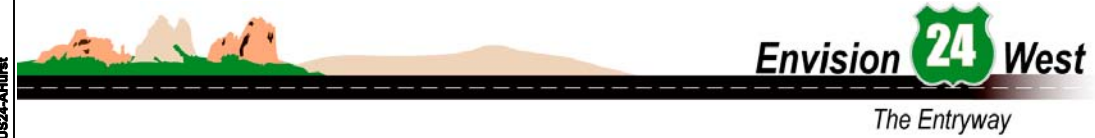
PROPOSED ROADWAY

PROPOSED 100-YEAR FLOODPLAIN

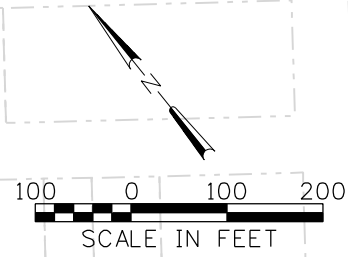
PROPOSED RETAINING WALL

NOTE:
 PROPOSED 100-YEAR FLOODPLAIN IS APPROXIMATED FOR PLANNING PURPOSES. ACTUAL FLOODPLAIN LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

12/2/2008 3:12:28 PM DRRPT03WC24.DGN US24-A-Hurst



**US 24 WEST MIDLAND EXPRESSWAY
 EXISTING AND PROPOSED FOUNTAIN CREEK 100-YEAR FLOODPLAIN
 EXHIBIT 2.3**



EXISTING 100-YEAR FLOODPLAIN (FEMA)
PROPOSED 100-YEAR FLOODPLAIN

FOUNTAIN CREEK

US 24

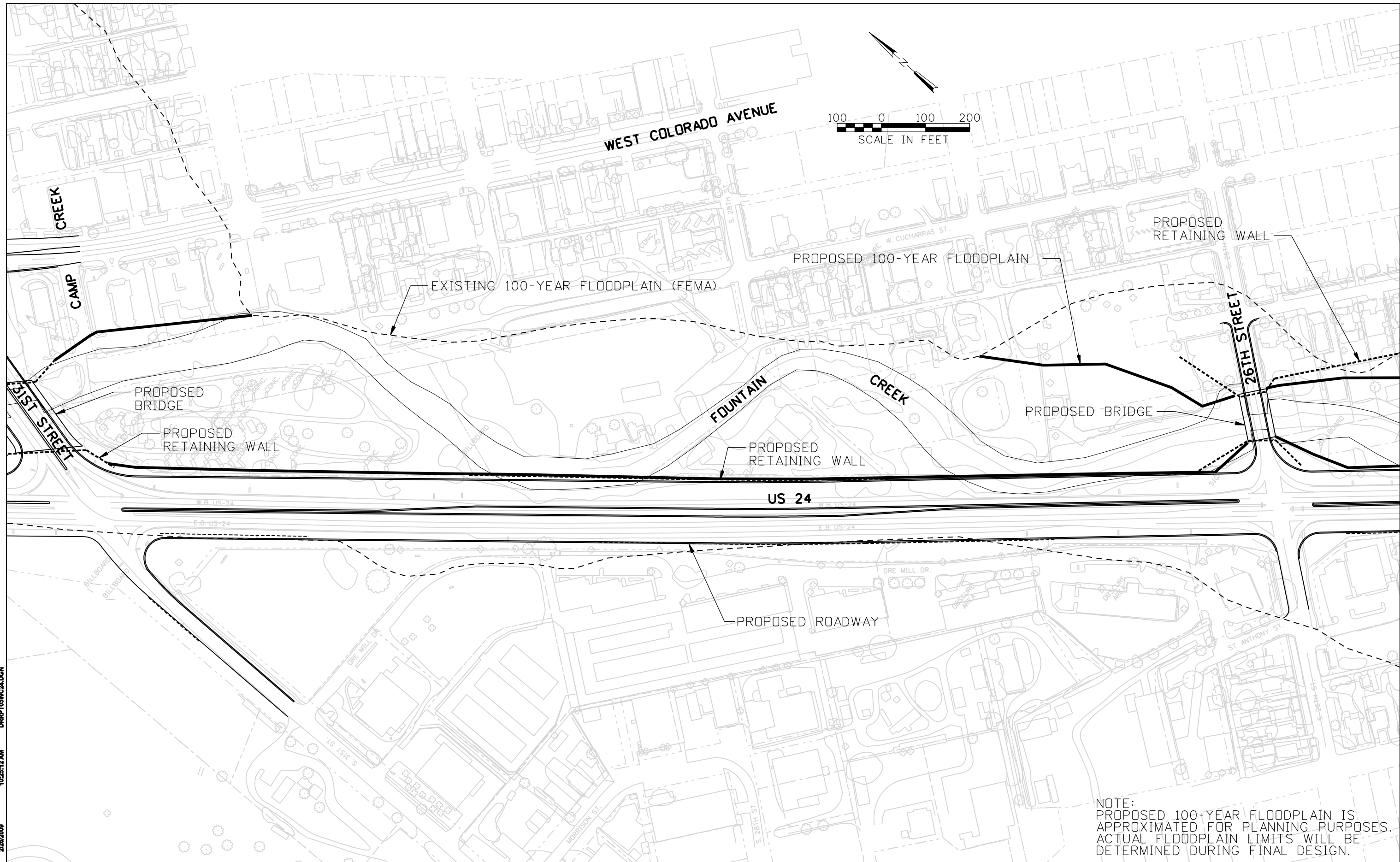
PROPOSED ROADWAY

PROPOSED RETAINING WALL

NOTE:
PROPOSED 100-YEAR FLOODPLAIN IS APPROXIMATED FOR PLANNING PURPOSES. ACTUAL FLOODPLAIN LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

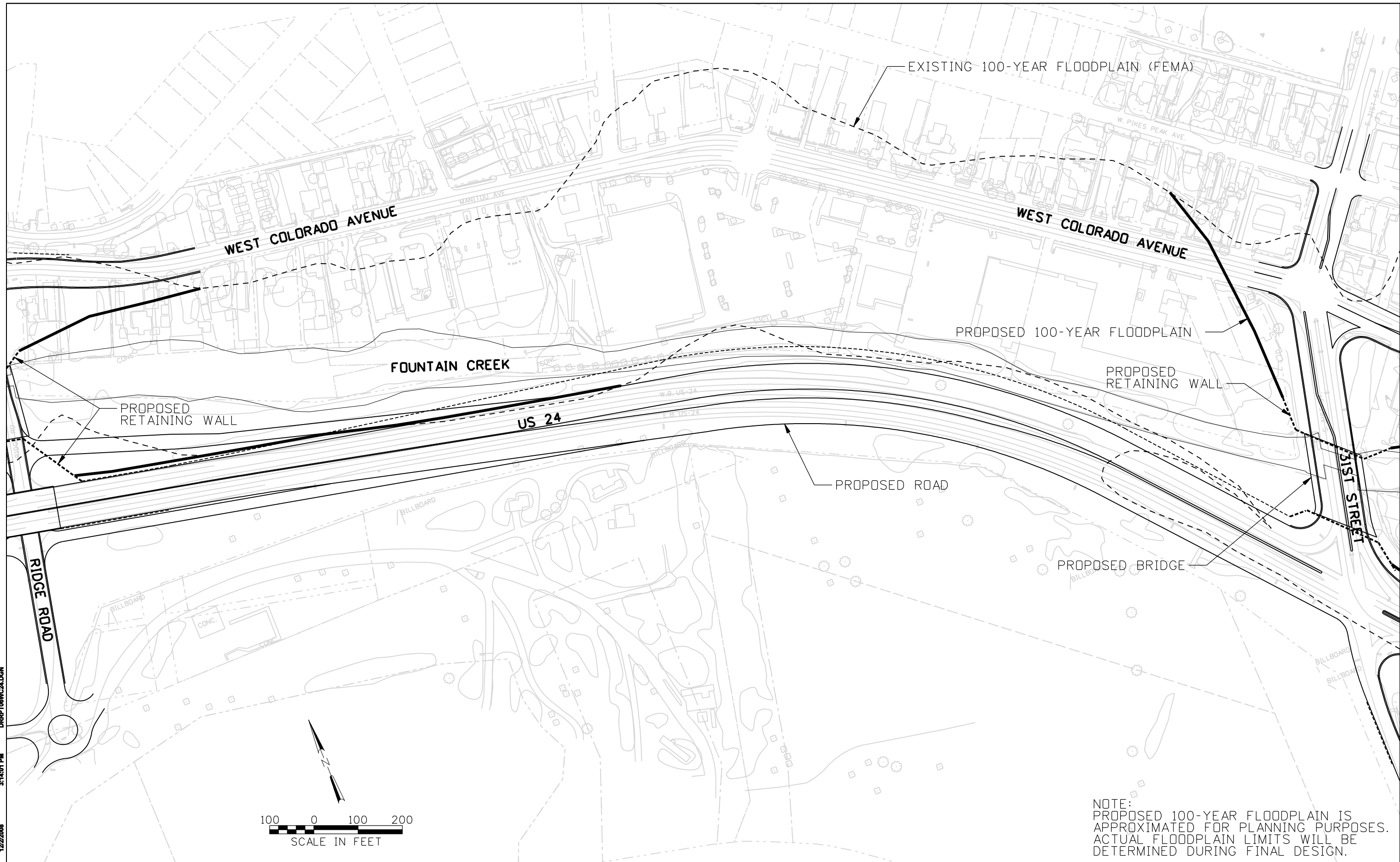
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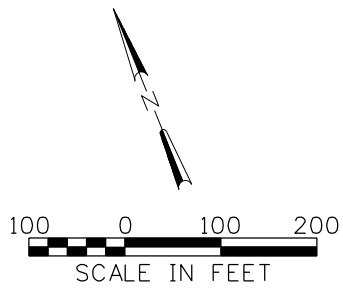


NOTE:
 PROPOSED 100-YEAR FLOODPLAIN IS APPROXIMATED FOR PLANNING PURPOSES. ACTUAL FLOODPLAIN LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

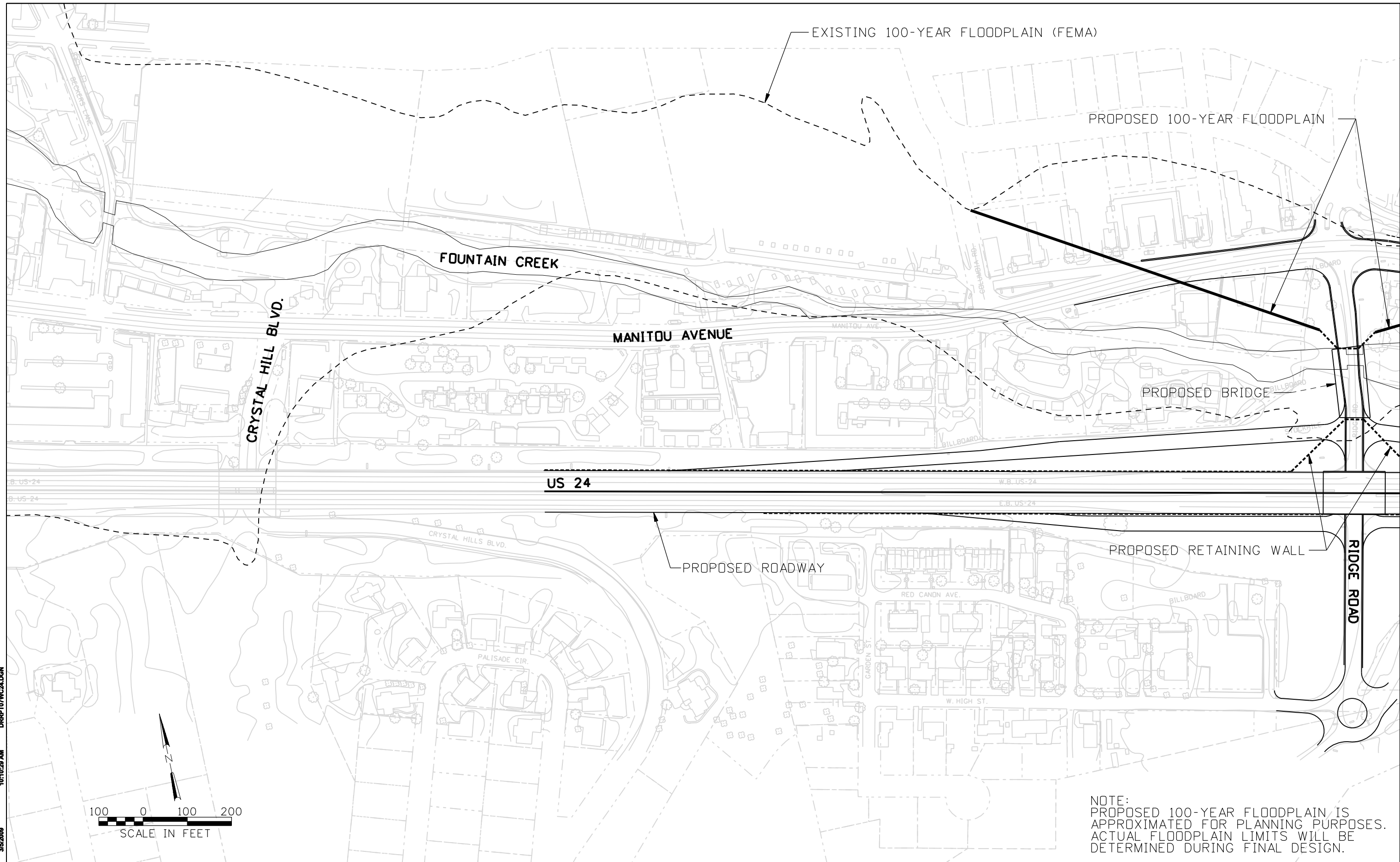
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12/2/2008 3:14:01 PM DRRPT06WC2A.DGN US24-A.Hurst

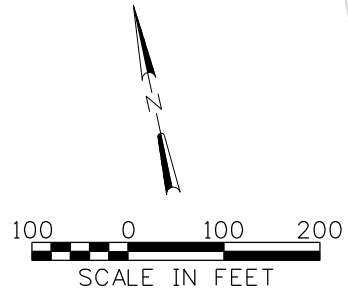


NOTE:
 PROPOSED 100-YEAR FLOODPLAIN IS APPROXIMATED FOR PLANNING PURPOSES. ACTUAL FLOODPLAIN LIMITS WILL BE DETERMINED DURING FINAL DESIGN.



NOTE:
 PROPOSED 100-YEAR FLOODPLAIN IS APPROXIMATED FOR PLANNING PURPOSES. ACTUAL FLOODPLAIN LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

3/5/2009 10:10:29 AM DRRPT07WC2A.DGN



EXISTING 100-YEAR FLOODPLAIN (FEMA)

BECKERS LAN TRIBUTARY

BLACK CANYON RD

GARDEN DRIVE

FOUNTAIN CREEK

EL PASO BLVD

GARDEN OF THE GODS PLACE

MANITOU AVE

SUTHERLAND CREEK

NOTE:
PROPOSED 100-YEAR FLOODPLAIN IS APPROXIMATED FOR PLANNING PURPOSES. ACTUAL FLOODPLAIN LIMITS WILL BE DETERMINED DURING FINAL DESIGN.

3/5/2009 10:15:51 AM DRRPT08WC24.DGN

