I-25 Parallel Arterial Study – Hydraulics Memorandum

CDOT Project No. 22911
Date: July 13, 2020
From: Michael Baker International
To: Eric Salemi, CDOT Region 4

Introduction

This memorandum summarizes the preliminary hydraulics design along the proposed alignment of the I-25 Parallel Arterial, a planned new arterial roadway consisting of Weld County Road (WCR) 9 ½ and Larimer County Road (LCR) 3 (a.k.a. North IPA, a.k.a. High Plains Boulevard). The study encompasses an approximate 13.25-mile improvement project, limits of the project are south of WCR 32 to south of US-34, terminating at Ronald Reagan Blvd (see Figure 1, Project Map). The alignment was identified in the 2003 Weld County I-25 Parallel Arterial Study (Reference 1) and consists of improvements to the existing sections of WCR 9 ½ and new roadway alignments to complete the 13.25-mile stretch. The ultimate project consists of but is not limited to: at-grade intersections, railroad crossings, floodplain crossings, drainage improvements, utility relocations, access control planning and right-of-way definition.

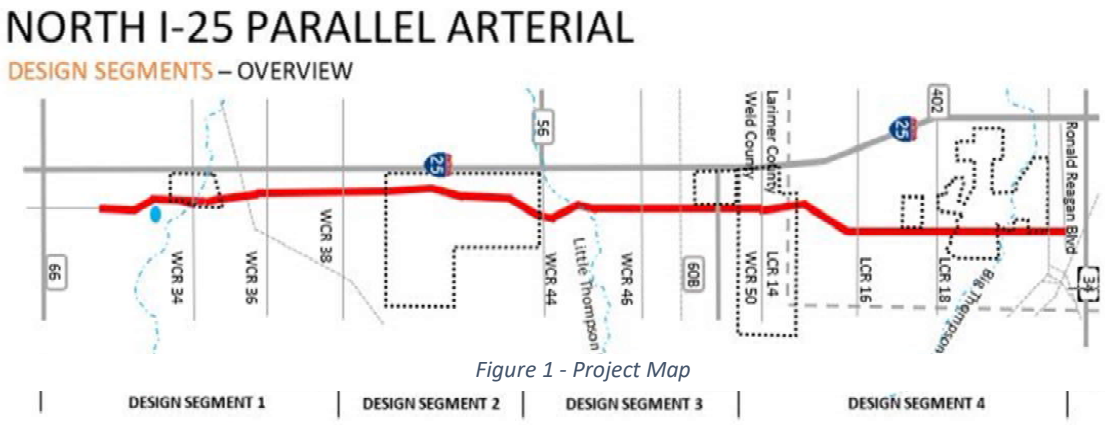


Figure 1 - Project Map

Objectives

The purpose of this memorandum is to establish a compatible drainage design and criteria that are acceptable to CDOT and the local governing agencies as their design standards are similar but not always equal. Therefore, consistent criteria to be followed are established in this memorandum, following appropriate local, federal and state criteria. In addition, this memorandum documents the methodologies and hydrologic/hydraulics approach utilized to develop the preliminary drainage system along the proposed arterial.

This memorandum is an abbreviated version of the CDOT standard Hydraulic Design Report due to the conceptual nature of this project. The proposed hydraulics analysis and design process broadly follows the guidelines set forth in the CDOT Drainage Design Manual. A more formal and complete hydraulics design will be completed by others as segments of the project are implemented by developers and/or local agencies along the corridor.

The goal of the North IPA corridor is to provide regional connectivity throughout the northern Colorado transportation network to support future development and population growth. The corridor extends through Weld County, Larimer County, and the Towns of Mead, Berthoud and Johnstown. A Technical

Advisory Committee (TAC) was formed that included representatives from CDOT, each of these local agencies and the City of Loveland. The design has been coordinated with the TAC for the purpose of providing consistency of applied design criteria throughout the corridor.

Design Coordination and Design Segments

As shown on Figure 1, the project was broken into four different design segments. Segment 2 is through the proposed Wilson Ranch development. For this segment, a basic drainage design layout is shown on the plans for the purpose of providing general guidance and developing approximate quantities. However, a more detailed analysis was not performed on this segment because it is being designed by others for the developer.

Several other proposed developments are in various stages of planning, design, or construction along the corridor. Coordination has occurred with the developments to make sure the proposed North IPA corridor and corresponding right-of-way are being preserved as areas develop. Proposed developments along the corridor include: McRae Development, Wilson Ranch, Anadarko, Vista Commons, Great Plains Village, and Thompson River Ranch. Available drainage studies from Vista Commons (Reference 2) and Great Plains Village (Reference 3) were reviewed to incorporate pertinent information into the preliminary design.

The area in the vicinity of the intersection with SH-60 is being further developed by the design team for the North I-25 improvements, Segments 5 and 6. This design will impact the Home Supply Ditch and contributing drainage basins in the area. The design for SH-60 has been advanced by others due to the need to provide a park and ride facility as part of the North I-25 project.

The proposed alignment crosses the Great Western Railroad (GWRR) in three locations. The plans show options for a grade-separated crossing at each location. The base design assumes at-grade crossings. As the design develops and is finalized at any of these locations, further coordination with GWRR will be required to determine the final crossing configuration.

As the design developed there was extensive coordination between the roadway and drainage designs. The roadway profile was adjusted in many locations throughout the corridor to better accommodate drainage needs (for both cross drains and outfalls needed for onsite systems). Roadside ditches were also modeled in more detail to better define the construction limits required to control runoff conveyance and maintenance of existing drainage patterns.

As previously noted, the limits of this study are from south of WCR 32 to south of US-34, terminating at Ronald Reagan Blvd. The overall corridor may ultimately extend from SH-66 to US-34. There are separate Planning and Environmental Linkage (PEL) studies that have been completed along the SH-66 and US-34 corridors in recent years. Implementation of improvements along these major corridors could impact the final alignment and profile of the North IPA. For example, whether intersections with North IPA are at-grade or grade-separated would be significant differences in the design. Therefore, designs of these potential connections are conceptually shown on the design plans in plan-view only, and will be further designed by others in the future.

Design Criteria

A combination of design standards from the various local agencies were compiled to create the proposed drainage criteria for this project to ensure that the design realistically can meet or exceed the minimum drainage parameters from these agencies. Standards from CDOT and the Mile High Flood District standards were also considered in the design, and more stringent local guidelines were applied as appropriate. See the design criteria summary table in the Appendix.

Methodology & Modeling Approach

Hydrology

The Rational Method and Colorado Urban Hydrograph Procedure (CUHP) were utilized to create the runoff flow rates for the offsite drainage basin areas. These basins were delineated using the project LiDAR data, supplemented with topographic data provided by the Lund Partnership. Intensity-duration-frequency curves were extracted from the National Oceanic and Atmospheric Administration (NOAA) using the *Atlas 14 Volume 8 Version 2.0*. The Rational Method was applied to the onsite basins as the areas are smaller than 160 acres. The runoff calculations were developed in spreadsheets and are provided electronically.

The Rational Method followed the procedures outlined in the CDOT Drainage Design Manual (Reference 4), Chapter 7 – Hydrology. CUHP calculations were performed with Urban Drainage and Flood Control District CUHP 2005 Version 2.01. release date 10/31/2019.

Hydraulics

The cross drains were modeled in HY-8 using the 100-year storm event to determine the required culvert dimensions to meet the allowable headwater to depth ratio (HW/D). Culvert design information (invert elevations, lengths, and slopes) are preliminary and subject to change during final design. See the culvert summary table and offsite basin maps in the Appendix for more information.

The 10-year storm event was modeled using InRoads Storm and Sanitary (Version SS2) to calculate flow spread, inlet spacing, hydraulic grade lines, flow velocities and inlet/pipe sizes. The 100-year cross drains were included in the network layout where onsite systems connect to them; however, the 10-year flow was injected in the cross drain upstream to appropriately model the drainage networks for the 10-year event. Existing drainage flow patterns were preserved as much as practical.

Channels crossing the bridges such as Little Thompson River were modeled for the 100-year storm in HEC-RAS Version 5.0. See the HEC-RAS summary tables and figures in the Appendix. The Little Thompson River crossing is described in further below.

Little Thompson River Crossing

Existing and Proposed Conditions

The new alignment of WCR 9 ½ in the vicinity of the Little Thompson River crossing is approximately 0.75 miles east of I-25 with a curved alignment that begins at the intersection of WCR 44 and extends north to WCR 46. The Little Thompson River is located approximately 1,500 feet north of WCR 44 and crosses WCR 9 ½ at a 20-degree skew. The horizontal alignment of the river crossing will be within the tangent section of the reverse curves and the vertical alignment will be a constant 0.50% grade at the crossing, meeting the design requirements for a roadway design speed of 55 mph. There is no existing roadway or structure at this location. The alignment at the river crossing was set based on crossing the floodplain at its narrowest width. The natural topography at the proposed crossing location constricts the floodplain width to approximately 200 feet, whereas it is significantly wider both upstream and downstream of this location.

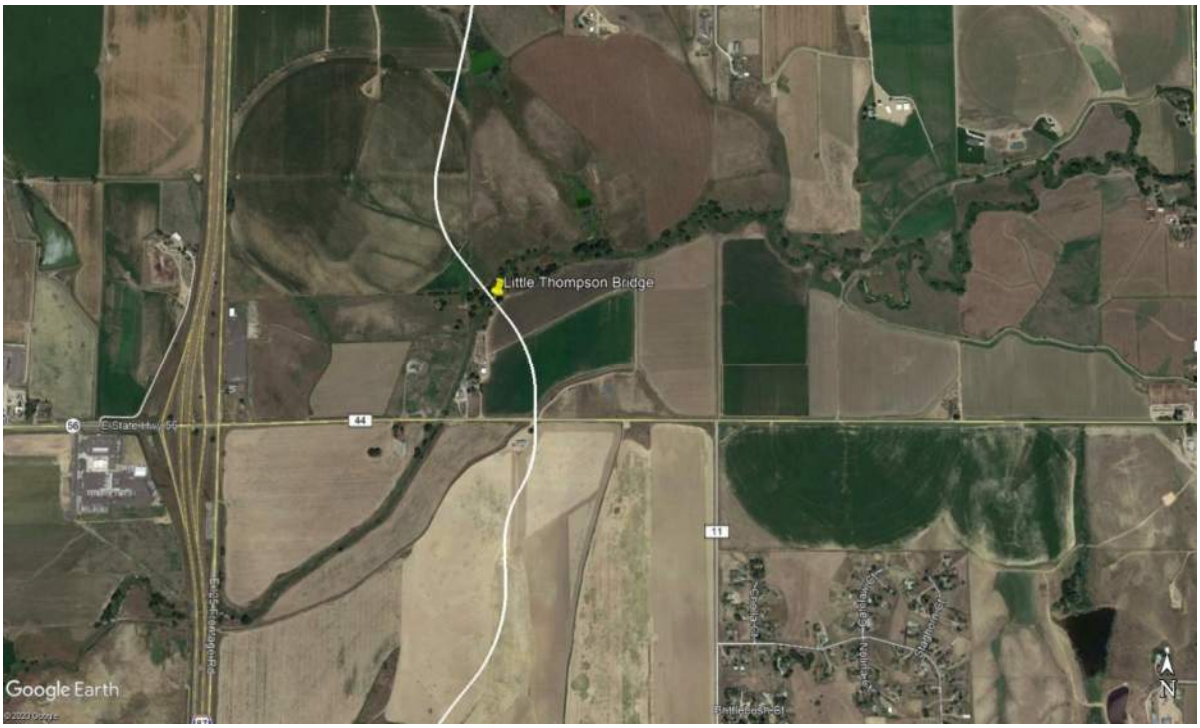


Figure 2 - Aerial Photo of WCR 9 ½ and Little Thompson River

The proposed roadway typical section across the bridge will consist of a four-lane divided highway with two 12'-0" lanes, an 8'-0" outside and a 4'-0" inside shoulder, and an 8'-0" barrier-separated sidewalk in each direction with a 15'-0" median. The structure crossing the Little Thompson River will be split into separate structures for northbound and southbound traffic and each will be 48'-0" out-to-out to accommodate the approach roadway section, CDOT Bridge Rail Type 9 and a 1'-0" wide pedestrian railing.

The layout of the proposed two-span structures will place the proposed abutments behind the existing riparian area and provide adequate waterway opening to convey the 100-year flood, while also placing the pier outside the main channel to reduce flood impacts, scour potential and affording easier access for construction, inspection and maintenance.

Other Structure Layouts Considered

The following structure layouts were also considered but were deemed impracticable when compared to the proposed structure.

Single Span Structures:

- Single span at 217'-8" with a 20-degree skew.
- Single span at 230'-9" with a 0-degree skew.

These structures would span the existing riparian area and floodplain limits without the need to construct a pier within the floodway. At the request of CDOT Region 4 the 0-degree skew option was considered to increase the ease of construction and future maintenance, but the additional length required would increase the construction costs when compared to the skewed option and was therefore not used. Both single span options would be too long for conventional precast, prestressed, concrete girders typically used in Colorado. There would be increased construction costs for fabrication, shipping and installation for steel superstructure types while also raising the

proposed roadway an additional 1'-0" or more due to increased structure depth to meet hydraulics and freeboard requirements. Therefore, a single span option was deemed impracticable.

Multi Span Structures:

- Two spans at 142'-0" and 94'-0" with a 0-degree skew.

  Per the request of CDOT Region 4, similar to the single span structures, a non-skewed two span alternate was considered to increase the ease of construction and future maintenance, but the additional length required would increase the cost of construction when compared to the skewed option. The skewed option also places the abutments more in alignment with the major flood flow, thus decreasing the potential for abutment scour during a major flood event.

The effective model and floodplain boundaries for the HEC-RAS analysis were derived from the Colorado Hazard Mapping Program (CHAMP) data that was developed after the 2013 flood events in northern Colorado. Although not reflected on the current Flood Insurance Rate Map (FIRM), this model has been adopted and accepted as the effective model that reflects current existing floodplain conditions for the Little Thompson River in this area. Hydraulic analyses were completed for this structure for the options described above and are provided electronically. The proposed structure is designed to convey the 100-year design flood and provide more than 2'-0" of freeboard. The proposed structure is discussed in more detail in a separate Structure Selection Memo (Reference 5)

Wilson Ranch

It should be noted that the design team was contacted by Wilson Ranch in March 2020. They are considering an alternate alignment through their development that includes shifting the intersection at WCR-44 approximately 300 feet to the east. This would cause a significant design change to the north for the North IPA alignment, most notably for the bridge crossing of the Little Thompson River. To shift the intersection further east while still maintaining the current bridge crossing location would be difficult and require design exceptions for tangent lengths at intersection approaches. It was agreed by the TAC that the North IPA design will keep the intersection location where it currently is because it is the most cost-effective alignment for the bridge length. If Wilson Ranch proposes to change the design, they and Berthoud recognize that this will create additional project costs related to the bridge crossing.

Other Major Floodplain Crossings

North Creek

The North IPA crosses North Creek at the intersection of WCR 34 at approximately a 45-degree skew, flowing from northwest to southeast. The FIRM for Weld County identifies this drainageway as "Unnamed Stream" (FIRM Panel 08123C1880E, effective date January 20, 2016). It is a Zone A floodplain, and the floodplain is approximately 400 feet wide at the proposed crossing. The existing crossing of WCR 34 is a 120-inch corrugated metal pipe. This drainageway was not re-studied as part of the CHAMP program after the 2013 flood, so updated HEC-RAS modeling is not available.

Approximately 2,500 upstream of the proposed crossing, North Creek crosses I-25 through a double-celled 10' x 6' concrete box culvert (CBC). According to the Town of Mead Stormwater Master Plan (Reference 6), the existing 100-year peak flow rate at this crossing is 2,230 cfs.

The hydrologic and hydraulic conditions of North Creek in this area were studied in more detail in the Preliminary Hydraulics Report for the I-25/State Highway 66 to N/O State Highway 56 Reconstruction Project (Reference 7). This report notes a similar 100-year flowrate 2,418 cfs at the I-25 crossing and recommends replacing the existing crossing of I-25 with a box culvert having a span of 48 feet and

height of 6 feet. Because of the proximity of the North IPA crossing, it was agreed to assume this same size crossing for the North IPA project. The crossing is shown as a quadruple-celled 12' x 6' CBC.

Big Thompson River

Several alternatives were considered through the segment of the project between LCR 16 and Ronald Reagan Boulevard. Options considered included:

- **Design a bridge to meet FEMA, CDOT, and TAC standards**

The bridge over the Big Thompson River would be designed to a 30% level with hopes that one day there will be funding to build it. This bridge option would meet FEMA and CDOT floodplain regulations as well as the design criteria set by the TAC.

- **Design an interim condition crossing**

Similar to a "replace-in-kind" repair, a substandard bridge would be designed at existing grade to cross the existing meanders in the Big Thompson River thalweg and low-flow channel. The remainder of the floodplain would be designed as an at-grade roadway with the ultimate North IPA section. The bridge and roadway would be designed to prevent a rise on insurable structures but are anticipated to overtop during heavy rainfall events. Signage would be used to detour traffic during these events. The roadway would also be designed to tie-in with alignments from the Thompson River Ranch development. This section of the corridor would require a variance in TAC design criteria for design and posted speed limits due to the vertical limitations caused by the River and GWRR crossings.

Johnstown adopted the State of Colorado Water Conservation Board floodplain regulations, which reinforces the no-rise criteria. They do allow for their board to approve/decline variances, but their ordinance specifically states, "Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result."

The final selected alignment best supports Johnstown's current and ongoing development plans, has the lowest ROW impacts, and maintains the established roadway design requirements throughout most of the segment. The design speed is reduced to 55 mph at the Big Thompson River crossing. The bridge structure at the river crossing will be a significant cost to the overall project due to the wide floodplain and requires a structure length of approximately 2,200 linear feet.

The proposed interim design, until funding is available for a bridge structure over the Big Thompson River that meets FEMA requirements, will terminate the North IPA alignment at LCR 18 (SH 402) then utilize the existing roadway alignment along LCR 18 to connect to the I-25 frontage road. The goal is to design a bridge and roadway at approximately existing grade, so no rise is caused on insurable structures.

Effective Flood Insurance Rate Maps for the corridor are provided in the Appendix.

Irrigation Ditches

The IPA alignment crosses several irrigation ditches and canals, including:

- Sekich Ditch – just north of the North Creek crossing at WCR-34
- Farmers Extension Canal – at the intersection of WCR-38
- Miner Longan Ditch – at the intersection of WCR-44
- Home Supply Ditch – at the intersection of SH-60
- Hillsboro Ditch – along the alignment of LCR-3, just north of LCR-18
- Several other unnamed minor lateral crossings

The general approach to the preliminary sizing of irrigation ditch crossings was to match the size and shape (e.g. span and rise of box culverts) of adjacent roadway crossings. This approach ensures that existing hydraulics conditions such as capacity, depth, velocity, and freeboard are met or exceeded.

At the Hillsboro Ditch a single-span 45-foot long bridge structure is proposed. This is discussed in more detail in a separate Structure Selection Memo (Reference 8)

Conclusion

This memorandum documents preliminary drainage and hydraulics design along the North IPA corridor, with the exception of specific locations that are being designed by others. The preliminary design documented herein and shown on the design plans provide guidance and criteria to be followed as the design progresses and is finalized by others as the corridor develops.

References

1. Weld County I-25 Parallel Arterial Study; prepared by Felsburg Holt & Ullevig; September 2003
2. Preliminary Drainage Report for Vista Commons; Johnstown, CO; prepared by Colorado Civil Group, Inc.; October 2018
3. Preliminary Drainage Report, Great Plains Village; Johnstown, CO; prepared by Core Consultants, Inc.; November 2019
4. Colorado Department of Transportation; Drainage Design Manual; 2019
5. WCR 9.5 over the Little Thompson River, Structure Selection Memorandum; prepared by Michael Baker International; May 7, 2020
6. Town of Mead Stormwater Master Plan; prepared by JVA Consulting Engineers; February 2019
7. I-25 / State Highway 66 to N/O State Highway 56 Reconstruction Project, Milepost 243.3 to Milepost 251.1, Preliminary Hydraulics Report; prepared by Muller Engineering Company, Inc.; February 12, 2014
8. LCR 3 over the Hillsboro Ditch, Structure Selection Memorandum; prepared by Michael Baker International; May 7, 2020

Appendix Materials

Design Criteria Summary Table

Culvert Summary Table

Offsite Basin Maps

Little Thompson River - HEC-RAS Summary Tables and Figures

Flood Insurance Rate Maps

ITEM	CRITERIA SELECTED	SOURCE
Storm Event		
Minor	10-year storm	Per Engineer
Major	100-year storm	CDOT
Storm Hydrology		
Area	Rational Method for areas less than 160 acres and CUHP Method for areas larger than 160 acres	Town of Mead, Weld County
Intensity-Duration-Frequency Curve	NOAA Atlas 14 Volume 8 Version 2.0	CDOT
Run-off Coefficients	Table 6.5	Mile High District (USDCMV1)
Imperviousness Values	Figure 6-1, Figure 6-2, Figure 6-3	Mile High District (USDCMV1)
Pipe		
Design	10-year storm	Per Engineer
Minimum Cover	2 ft minimum between top of pipe and top of road or as recommended by the manufacturer	CDOT
Size	18-inches minimum, 15-inches for laterals	CDOT
Slope	0.5% minimum	Per Engineer
Velocity	3 ft/s minimum per CDOT, 16 ft/s maximum per Engineer	CDOT & Per Engineer
Length	300 ft maximum	CDOT
Material	RCP Class III Minimum	Per Engineer
Manning's Coefficient	Standard, 0.0012 - 0.0013 for RCP, 0.016 for curb and gutter	Per Engineer
Inlets		
Design	10-year storm	Per Engineer
Classification	CDOT Standard: Type R	CDOT
Size	5 ft, 10 ft and 15 ft	Per Engineer
Spacing	300 ft maximum	CDOT
Spread	14 ft maximum, one lane free of spread	Per Engineer
Longitudinal Slope	0.5% minimum	Per Engineer

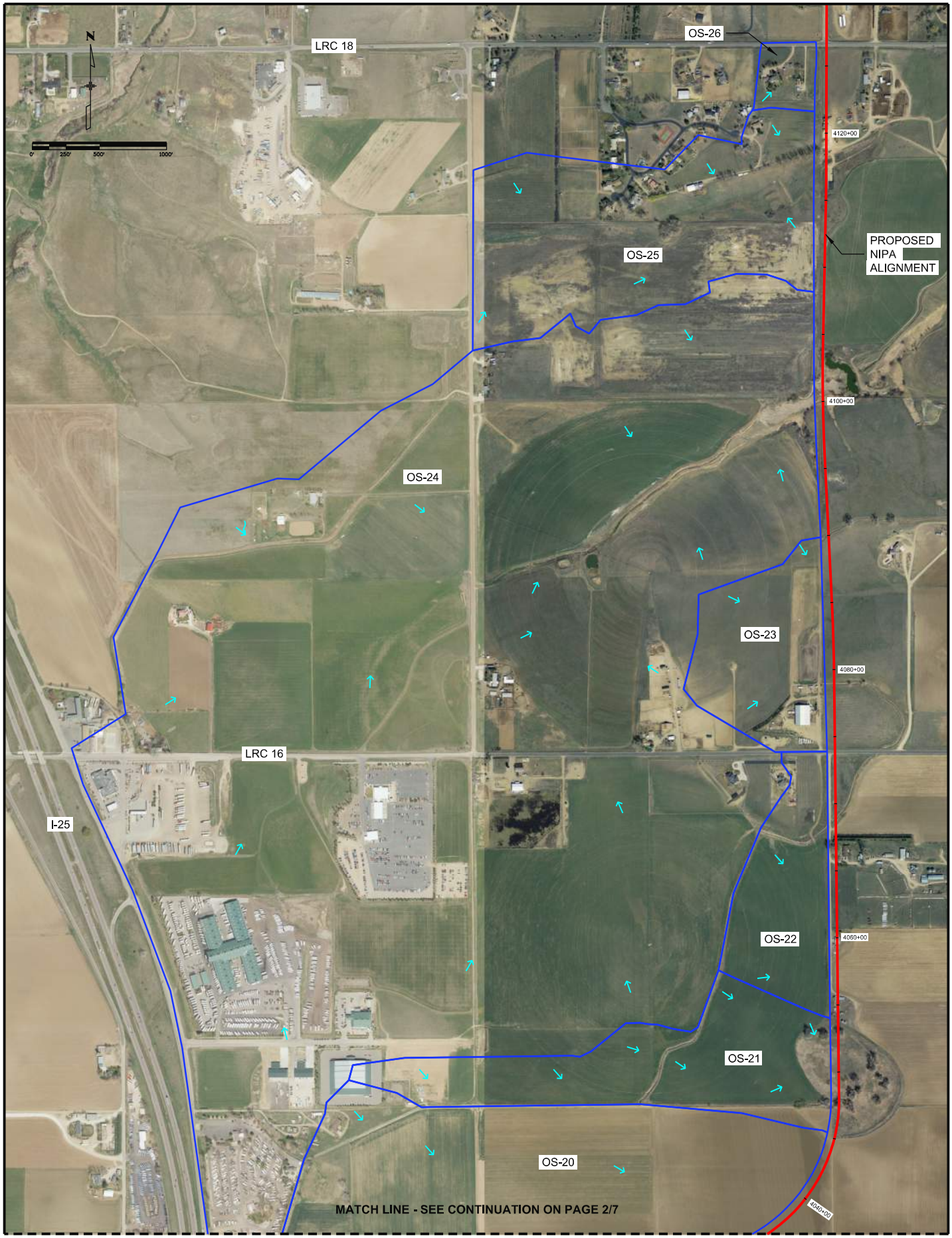
ITEM	CRITERIA SELECTED	SOURCE
Inlets (Continued)		
Clog Factor	Opening < 20"; 30-60% 20" < Opening < 60"; 20-50% 60" < Opening; 10-30% Approx. 70 to 80% of the design flow should be intercepted. Only Part of the flow bypassing an inlet is added to the total for the next inlet. Typically 50% of the by pass flow.	CDOT
Ponding Depth	Residential dwellings should be no less than 12 inches above the 100-year flood at the ground line or lowest water entry of a building. The depth of water should not exceed the street crown to allow operation of emergency vehicles. The depth of water over the gutter flow line should not exceed 12-inches	Larimer County
Location	- All sag points in the gutter grade - Upstream of median breaks, entrance/exit ramp gores & x-walks - Immediately upstream of bridge approaches - Immediately upstream of superelevation transitions - Immediately upstream of intersecting streets - Immediately upstream on intersecting streets before storm runoff reaches the major hwy	CDOT
Culverts		
Design	100-year storm	CDOT
Shape	Circular or Box	Per Engineer
Maximum Headwater to Diameter	Smaller than 36"; 2.0 ft 36" ≤ D ≤ 60"; 1.7 ft 60" ≤ D ≤ 84 in; 1.5 ft 84" ≤ D ≤ 120"; 1.2 ft 120" or greater; 1.0 ft	CDOT
Minimum Cover	18" minimum and HS-20 loading	Town of Mead
Slope	0.5% minimum	Per Engineer
Velocity	3 ft/s minimum, 16 ft/s maximum	Per Engineer
Manning's	0.013 for RCP, 0.012 for RCB	Per Engineer
Material	RCP, RCB	Per Engineer
Skew	The culvert skew must not be less than 45 degrees without the approval of the Region Hydraulic Engineer	CDOT

Off Site Culvert Crossing Data

Basin ID	Station	Shape	No. of Barrels	Dia./Height (ft)	Width (ft)	100-Year Flow (cfs)	Invert EL. (ft)	HW/D (ft)
OS-01	1033+13	CIRCLE	1	1.25	-	7	4926.50	1.78
OS-02	1017+01	CIRCLE	1	3.5	-	45	4912.00	0.91
OS-03	1033+13	BOX	1	4.0	8	185	4925.00	1.09
OS-04	1053+89	BOX	1	4.0	6	168	4913.00	1.26
OS-05	1066+45	CIRCLE	1	5.0	-	144	4903.84	1.10
OS-05A	1060+00	CIRCLE	1	2.0	-	23	4911.75	1.70
OS-06	1078+80	BOX	1	4.0	8	160	4929.64	0.98
OS-07	1089+11	BOX	1	4.0	8	137	4943.58	0.88
OS-07A	1110+00	CIRCLE	3	1.5	-	31	4970.50	1.37
OS-08	1123+28	CIRCLE	3	4.0	-	71	4997.27	0.49
OS-08A	1134+90	CIRCLE	1	3.5	-	66	4992.54	1.20
OS-09	1144+82	BOX	1	4.0	8	303	4967.00	1.67
OS-10	1182+45	BOX	1	4.0	7	206	5053.28	1.46
OS-11A	1234+08	BOX	1	4.0	5	169	5057.60	1.41
OS-15	3046+14	BOX	2	4.0	5	325	4904.15	1.44
OS-15A	3060+00	CIRCLE	1	3.5	3.5	71	4924.00	1.28
OS-16A	3066+56	CIRCLE	1	5.0	-	136	4934.00	1.05
OS-16	3081+96	BOX	2	4.0	5	328	4953.50	1.13
OS-17	3109+90	CIRCLE	2	3.0	-	73	4975.62	1.03
OS-18	3130+50	BOX	2	3.0	7	392	4970.00	1.67
OS-19	4012+41	BOX	1	3.0	6	144	4982.45	1.64
OS-20	4039+25	BOX	1	4.0	8	260	4957.50	1.43
OS-21	4050+69	CIRCLE	1	4.0	-	98	4947.88	1.39
OS-22	4057+08	CIRCLE	1	4.0	-	74	4948.03	1.01
OS-23	4085+58	CIRCLE	1	4.0	-	92	4951.51	1.20
OS-24	4100+65	BOX	1	5.0	6	509	4906.99	1.35
OS-25	4118+14	CIRCLE	1	5.0	-	174	4897.15	1.28
OS-26	4126+62	CIRCLE	1	2.0	-	17	4893.03	1.24

Note 1: Inverts and headwater to diamter calculations are estimated based on preliminary design and are subject to change during the final design phase.

Note 2: The offsite basins for Segment 2 and north of Segment 4 are not included in this study and will be design by others.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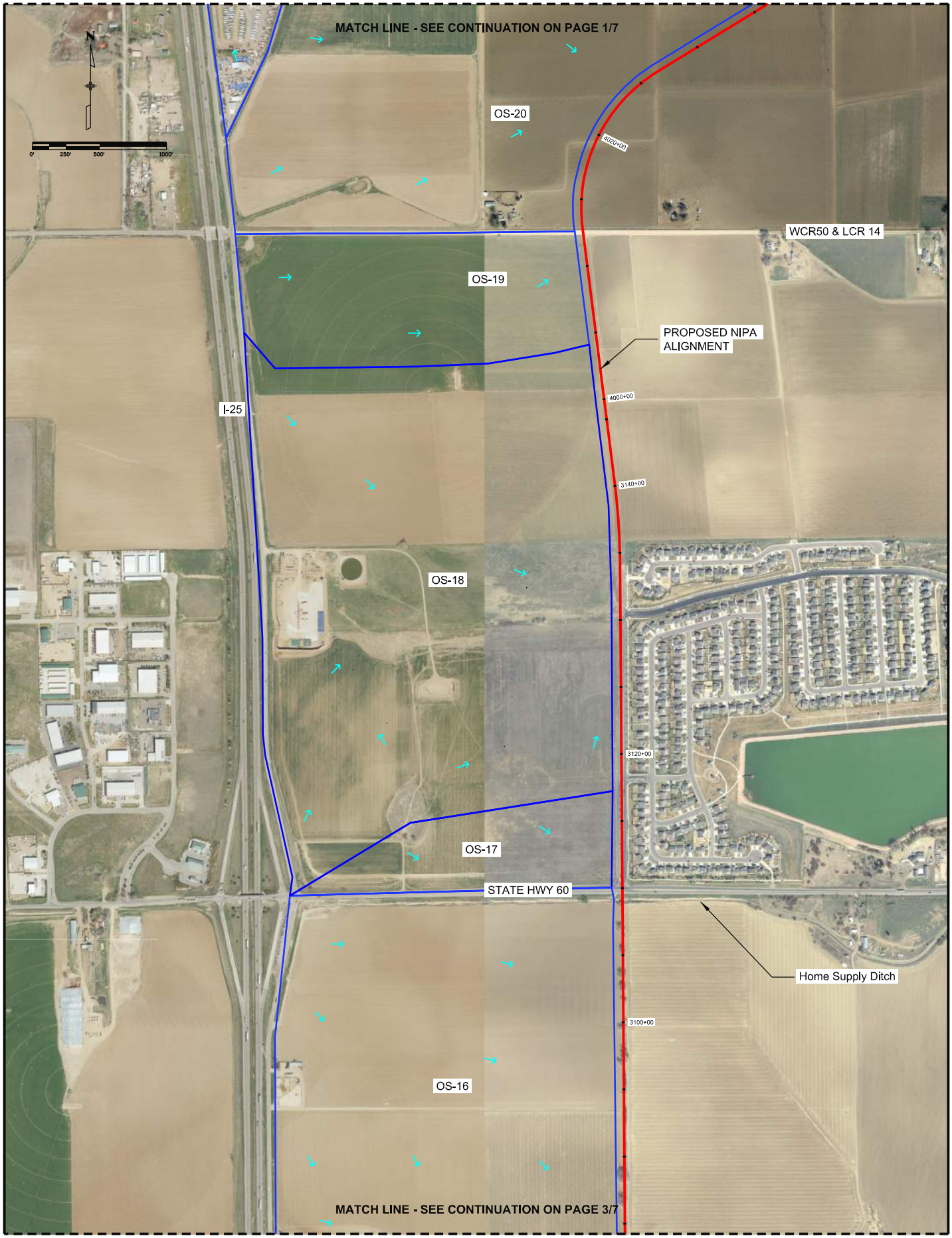
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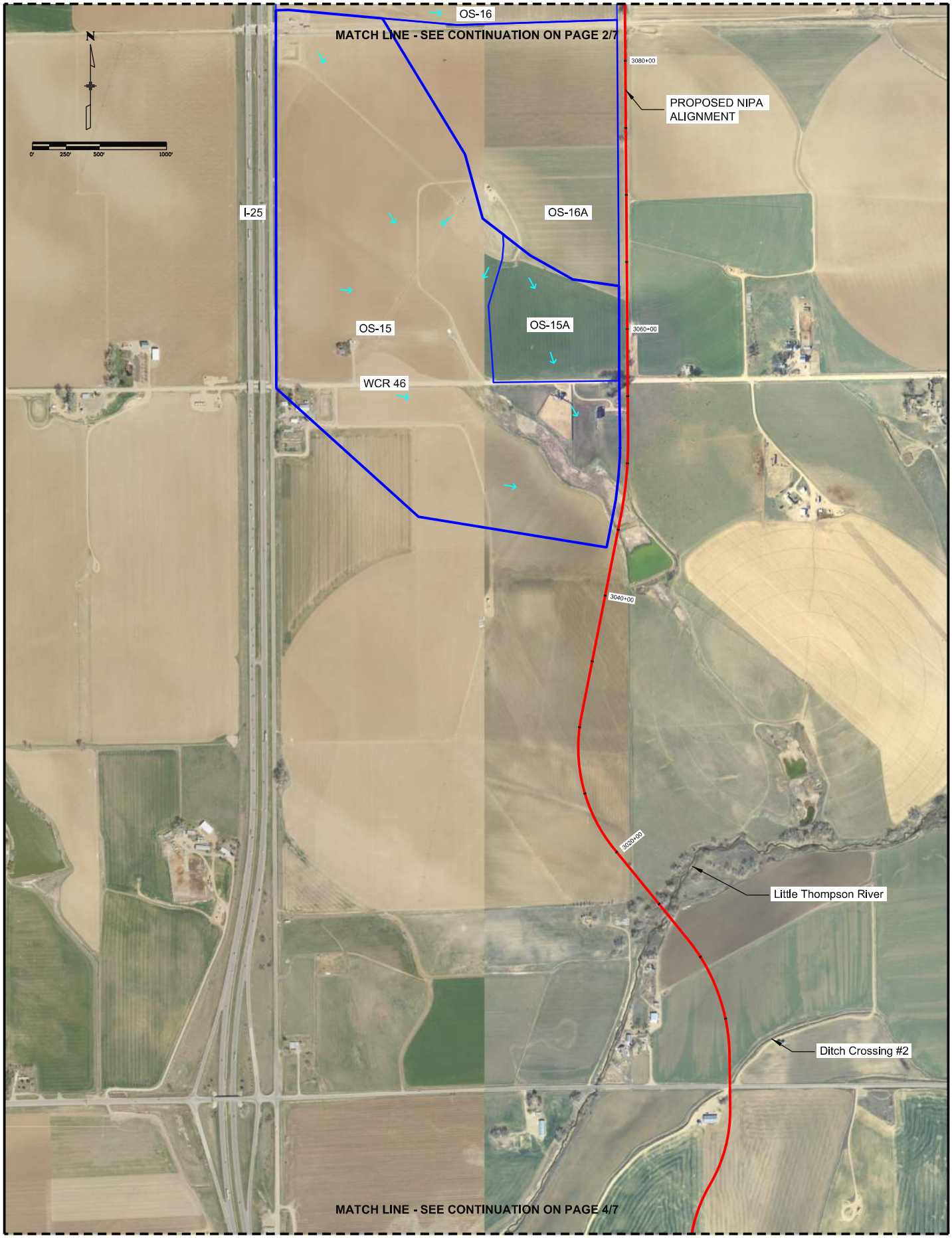
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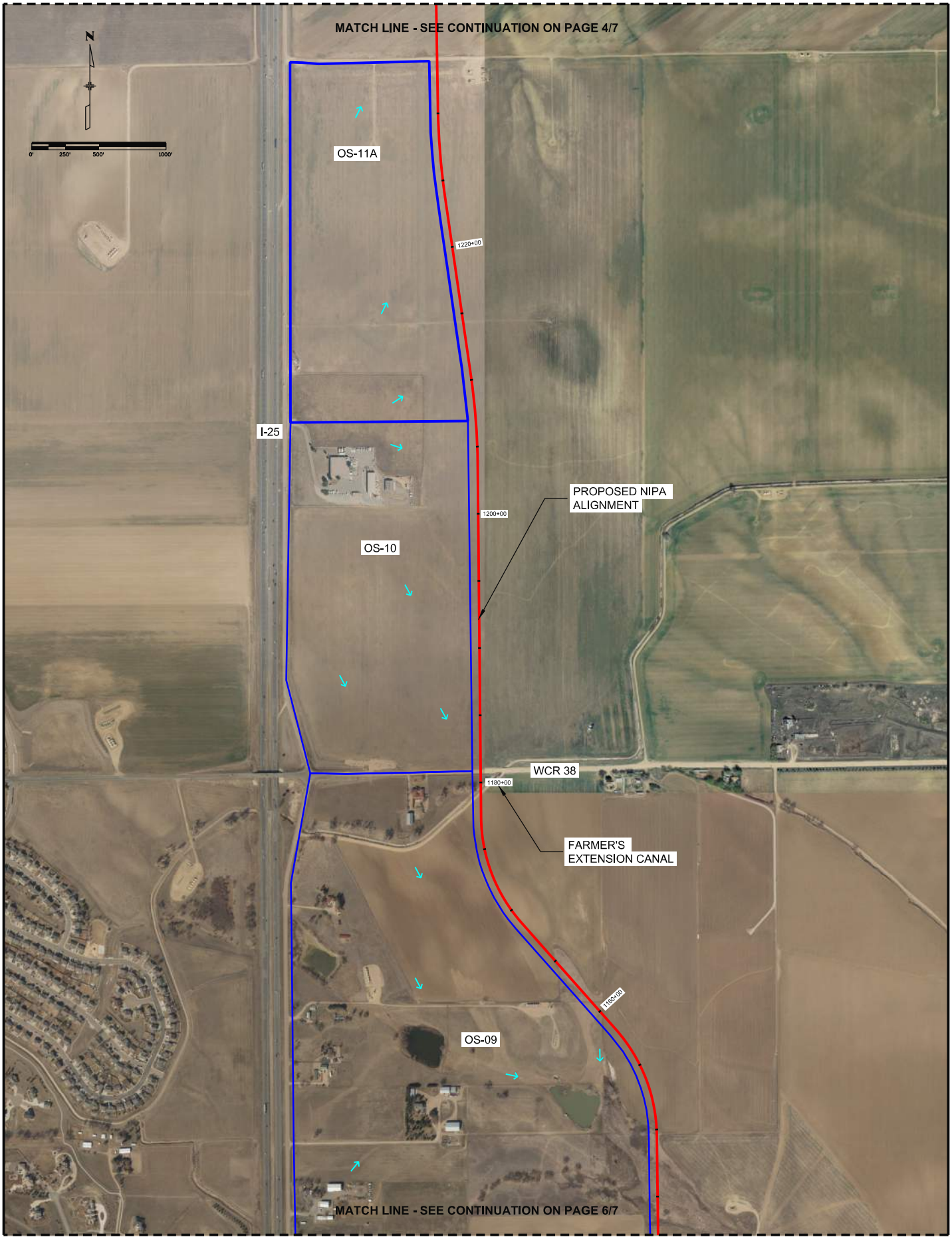
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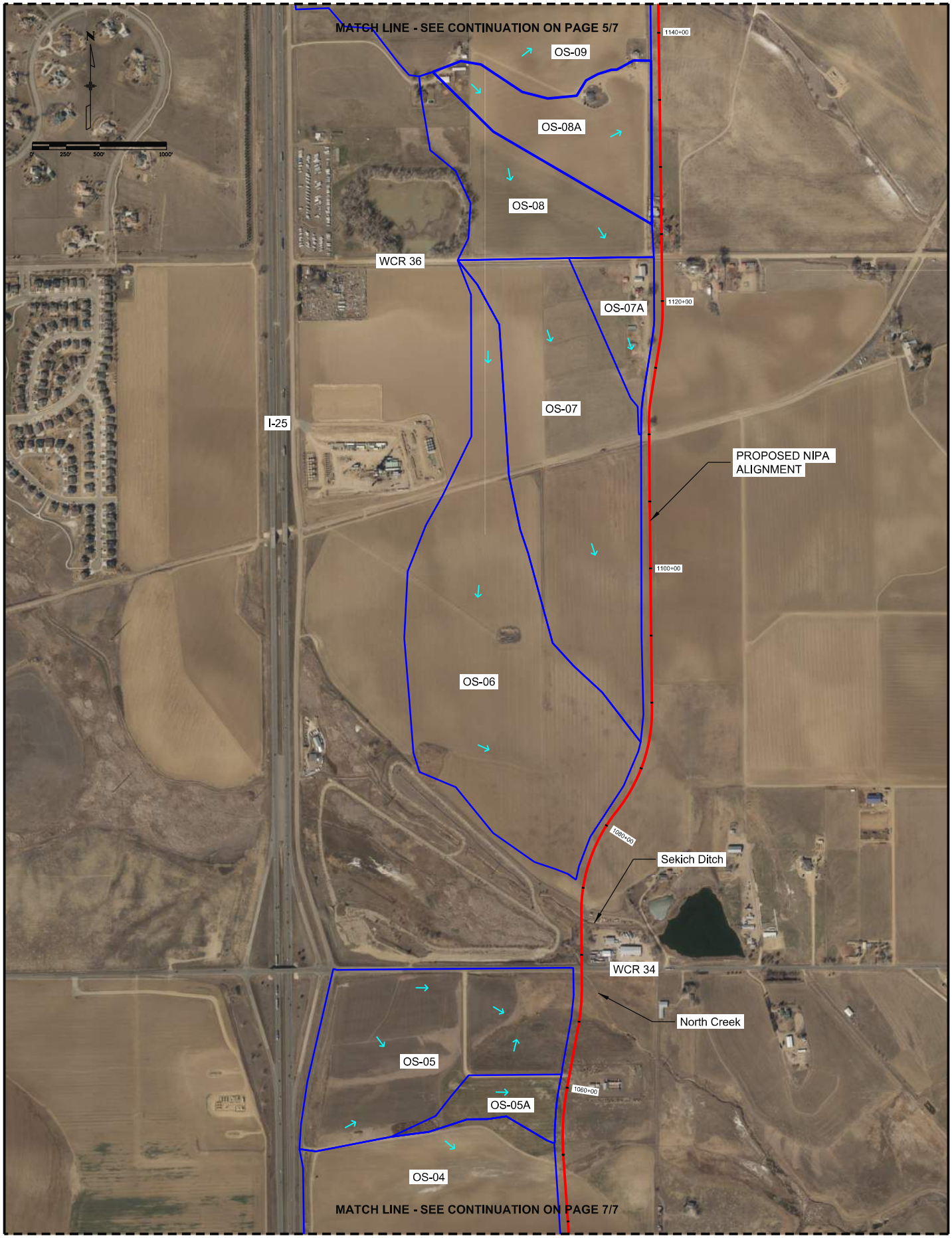
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Existing Conditions

HEC-RAS Plan: LTR_Existing FW River: Little Thompson Reach: LTR_2A_Lower Profile: 1%

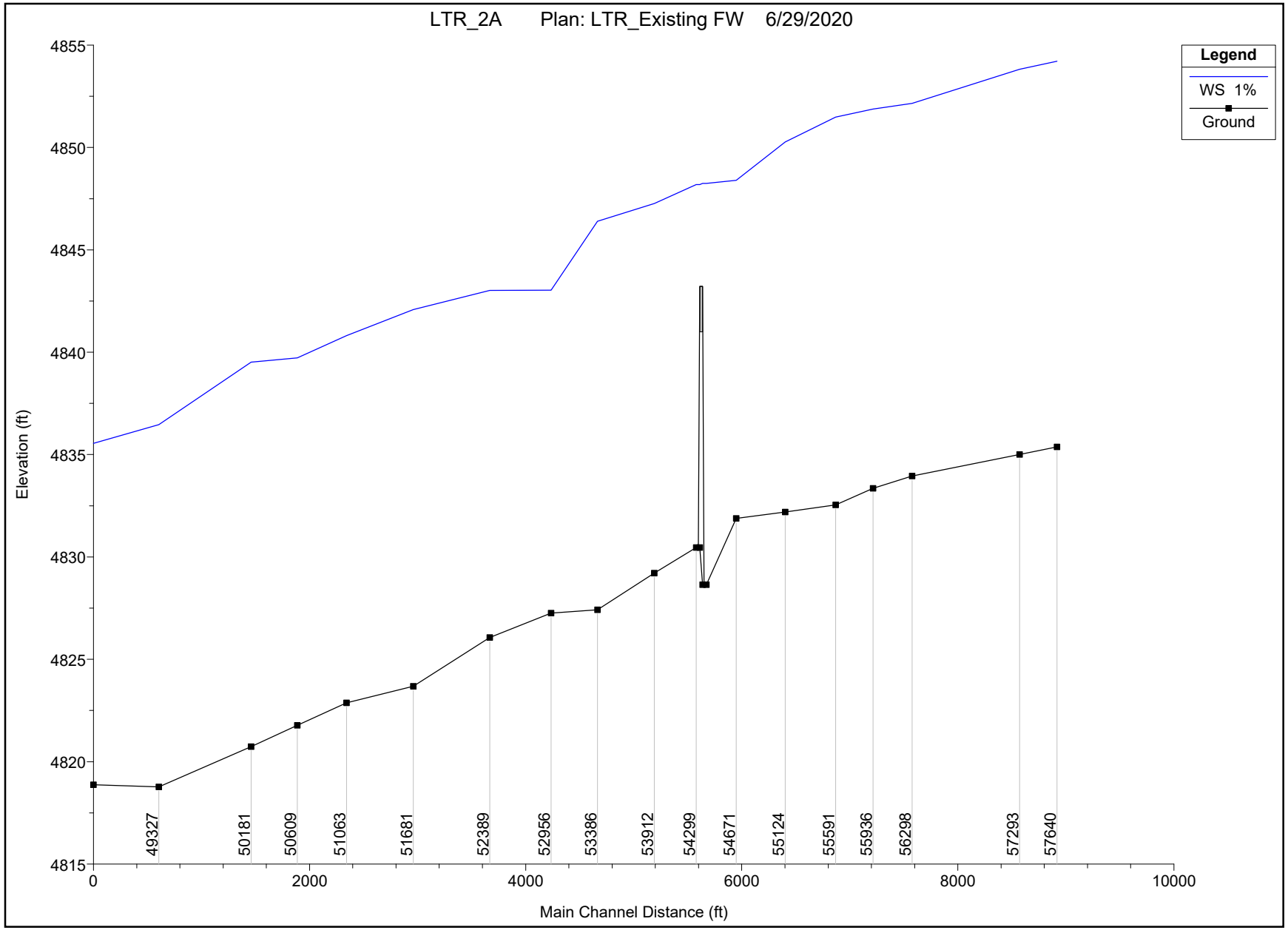
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
LTR_2A_Lower	57640	1%	15765.00	4835.37	4854.21	4851.22	4856.36	0.003581	11.79	1384.30	161.06	0.62
LTR_2A_Lower	57293	1%	15765.00	4835.00	4853.82	4848.12	4855.00	0.001478	8.96	2070.02	381.64	0.42
LTR_2A_Lower	56298	1%	15765.00	4833.95	4852.16	4851.19	4853.29	0.002171	10.67	2618.12	671.85	0.50
LTR_2A_Lower	55936	1%	15765.00	4833.35	4851.88	4849.78	4852.55	0.001426	8.31	3178.77	732.29	0.40
LTR_2A_Lower	55591	1%	15765.00	4832.54	4851.49	4848.99	4852.14	0.001108	8.28	3404.55	796.79	0.38
LTR_2A_Lower	55124	1%	15765.00	4832.19	4850.27	4849.47	4851.32	0.003005	10.84	2541.54	722.41	0.52
LTR_2A_Lower	54671	1%	15765.00	4831.88	4848.39	4847.42	4849.77	0.003809	10.69	2107.69	528.41	0.53
LTR_2A_Lower	54393	1%	15765.00	4828.64	4848.25	4845.79	4848.62	0.000804	6.84	4595.11	1074.69	0.32
LTR_2A_Lower	54345		Bridge									
LTR_2A_Lower	54299	1%	15765.00	4830.46	4848.19	4845.34	4848.47	0.000739	6.42	5328.27	1500.69	0.31
LTR_2A_Lower	53912	1%	15765.00	4829.21	4847.27	4844.96	4847.95	0.001550	9.30	3034.44	1279.35	0.43
LTR_2A_Lower	53386	1%	15765.00	4827.42	4846.39	4843.35	4847.16	0.001420	9.35	2906.90	1295.05	0.43
LTR_2A_Lower	52956	1%	15765.00	4827.26	4843.03	4842.20	4845.99	0.005096	14.48	1280.92	182.88	0.74
LTR_2A_Lower	52389	1%	15765.00	4826.07	4843.02	4839.85	4843.62	0.001461	8.21	3223.25	731.37	0.40
LTR_2A_Lower	51681	1%	15765.00	4823.68	4842.08	4839.41	4842.71	0.001698	8.30	3261.06	822.40	0.41
LTR_2A_Lower	51063	1%	15765.00	4822.88	4840.81	4838.54	4841.56	0.002086	8.95	2606.40	420.05	0.44
LTR_2A_Lower	50609	1%	15765.00	4821.78	4839.73	4837.49	4840.50	0.002204	9.45	2751.28	713.57	0.46
LTR_2A_Lower	50181	1%	15765.00	4820.73	4839.51	4837.08	4839.80	0.000839	6.21	5254.75	1491.42	0.29
LTR_2A_Lower	49327	1%	15765.00	4818.77	4836.47	4835.34	4838.67	0.004909	12.92	1569.09	274.15	0.67
LTR_2A_Lower	48722	1%	15765.00	4818.87	4835.55	4834.45	4836.17	0.002203	8.20	3732.99	1556.77	0.45

Existing Conditions

Plan: LTR_Existing FW Little Thompson LTR_2A_Lower RS: 54345 Profile: 1%

E.G. US. (ft)	4848.62	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	4848.25	E.G. Elev (ft)	4848.62	4848.47
Q Total (cfs)	15765.00	W.S. Elev (ft)	4848.25	4848.19
Q Bridge (cfs)	1345.23	Crit W.S. (ft)	4846.79	4846.89
Q Weir (cfs)	14419.77	Max Chl Dpth (ft)	19.60	17.73
Weir Sta Lft (ft)	1625.59	Vel Total (ft/s)	4.43	4.20
Weir Sta Rgt (ft)	2545.46	Flow Area (sq ft)	3555.34	3756.11
Weir Submerg	0.90	Froude # Chl	0.21	0.22
Weir Max Depth (ft)	5.40	Specif Force (cu ft)	12596.70	11991.36
Min El Weir Flow (ft)	4843.23	Hydr Depth (ft)	4.03	4.17
Min El Prs (ft)	4841.00	W.P. Total (ft)	974.54	988.37
Delta EG (ft)	0.15	Conv. Total (cfs)		
Delta WS (ft)	0.06	Top Width (ft)	881.20	946.31
BR Open Area (sq ft)	319.34	Frctn Loss (ft)		
BR Open Vel (ft/s)	4.21	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)		
Br Sel Method	Press/Weir	Power Total (lb/ft s)	0.00	0.00

Existing Conditions



Proposed Conditions

HEC-RAS Plan: LTR_Proposed_SP River: Little Thompson Reach: LTR_2A_Lower

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
LTR_2A_Lower	57640	10%	4636.00	4835.37	4849.48	4845.53	4850.04	0.001697	6.01	771.74	109.00	0.40
LTR_2A_Lower	57640	1.00%	15765.00	4835.37	4854.21	4851.23	4856.36	0.003580	11.79	1384.37	161.07	0.62
LTR_2A_Lower	57293	10%	4636.00	4835.00	4849.23	4842.96	4849.50	0.000541	4.15	1122.52	126.46	0.24
LTR_2A_Lower	57293	1.00%	15765.00	4835.00	4853.82	4848.09	4855.00	0.001478	8.96	2070.21	381.67	0.42
LTR_2A_Lower	56298	10%	4636.00	4833.95	4847.82	4843.48	4848.64	0.001673	7.35	724.84	211.06	0.41
LTR_2A_Lower	56298	1.00%	15765.00	4833.95	4852.15	4851.22	4853.29	0.002173	10.67	2617.47	671.63	0.50
LTR_2A_Lower	55936	10%	4636.00	4833.35	4847.48	4842.98	4848.02	0.001320	6.10	950.66	311.95	0.36
LTR_2A_Lower	55936	1.00%	15765.00	4833.35	4851.88	4849.81	4852.55	0.001426	8.31	3178.42	732.18	0.40
LTR_2A_Lower	55591	10%	4636.00	4832.54	4847.20	4841.66	4847.63	0.000776	5.51	1152.19	353.01	0.30
LTR_2A_Lower	55591	1.00%	15765.00	4832.54	4851.48	4849.00	4852.14	0.001108	8.28	3404.16	796.70	0.38
LTR_2A_Lower	55124	10%	4636.00	4832.19	4845.72	4842.81	4846.94	0.003692	9.17	622.66	223.50	0.54
LTR_2A_Lower	55124	1.00%	15765.00	4832.19	4850.26	4849.48	4851.32	0.003013	10.85	2538.37	721.91	0.52
LTR_2A_Lower	54671	10%	4636.00	4831.88	4845.04	4839.84	4845.52	0.001596	5.63	907.54	188.39	0.33
LTR_2A_Lower	54671	1.00%	15765.00	4831.88	4848.51	4847.40	4849.81	0.003592	10.45	2170.60	535.33	0.52
LTR_2A_Lower	54393	10%	4636.00	4828.64	4844.87	4838.19	4845.11	0.000498	4.51	1799.15	655.03	0.24
LTR_2A_Lower	54393	1.00%	15765.00	4828.64	4848.38	4845.77	4848.72	0.000752	6.65	4736.78	1096.53	0.31
LTR_2A_Lower	54345		Bridge									
LTR_2A_Lower	54299	10%	4636.00	4830.46	4843.02	4839.85	4843.65	0.001675	7.00	1179.07	498.33	0.43
LTR_2A_Lower	54299	1.00%	15765.00	4830.46	4848.32	4845.33	4848.59	0.000691	6.25	5461.98	1517.54	0.30
LTR_2A_Lower	53912	10%	4636.00	4829.21	4841.84	4840.85	4842.77	0.002555	8.68	787.70	245.13	0.51
LTR_2A_Lower	53912	1.00%	15765.00	4829.21	4847.49	4844.95	4848.11	0.001401	8.94	3170.67	1328.58	0.41
LTR_2A_Lower	53397	10%	4636.00	4829.00	4840.34	4838.97	4841.27	0.003181	8.52	801.41	256.55	0.51
LTR_2A_Lower	53397	1.00%	15765.00	4829.00	4846.53	4843.48	4847.26	0.001843	9.25	3012.00	1174.97	0.42
LTR_2A_Lower	53060	10%	4636.00	4828.00	4840.01	4835.67	4840.33	0.001462	4.54	1020.47	174.58	0.33
LTR_2A_Lower	53060	1.00%	15765.00	4828.00	4845.95	4840.69	4846.69	0.001619	6.91	2309.10	1119.26	0.38
LTR_2A_Lower	53017	10%	4636.00	4828.00	4839.67	4835.07	4840.19	0.002098	5.80	799.44	121.63	0.40
LTR_2A_Lower	53017	1.00%	15765.00	4828.00	4844.80	4841.44	4846.35	0.003144	10.25	1791.95	483.40	0.54
LTR_2A_Lower	52927		Bridge									
LTR_2A_Lower	52837	10%	4636.00	4828.00	4839.19	4835.05	4839.69	0.001870	5.71	836.89	154.03	0.38
LTR_2A_Lower	52837	1.00%	15765.00	4828.00	4843.63	4840.81	4845.31	0.003690	10.83	1749.36	405.00	0.58
LTR_2A_Lower	52389	10%	4636.00	4826.07	4838.59	4835.43	4838.94	0.001140	5.50	1369.79	385.62	0.33
LTR_2A_Lower	52389	1.00%	15765.00	4826.07	4843.02	4839.84	4843.62	0.001461	8.21	3223.25	731.37	0.40
LTR_2A_Lower	51681	10%	4636.00	4823.68	4837.68	4834.29	4838.11	0.001445	5.81	1113.79	277.46	0.35
LTR_2A_Lower	51681	1.00%	15765.00	4823.68	4842.08	4839.38	4842.71	0.001698	8.30	3261.06	822.40	0.41
LTR_2A_Lower	51063	10%	4636.00	4822.88	4836.27	4833.83	4836.96	0.002550	7.38	919.13	339.29	0.45
LTR_2A_Lower	51063	1.00%	15765.00	4822.88	4840.81	4838.54	4841.56	0.002087	8.96	2605.99	420.04	0.44
LTR_2A_Lower	50609	10%	4636.00	4821.78	4835.21	4833.58	4835.82	0.002159	7.11	949.50	277.72	0.42
LTR_2A_Lower	50609	1.00%	15765.00	4821.78	4839.72	4837.47	4840.50	0.002207	9.45	2749.19	712.80	0.46
LTR_2A_Lower	50181	10%	4636.00	4820.73	4834.52	4830.44	4835.05	0.001499	6.22	995.52	278.74	0.36
LTR_2A_Lower	50181	1.00%	15765.00	4820.73	4839.51	4837.07	4839.80	0.000841	6.22	5249.65	1490.38	0.29
LTR_2A_Lower	49327	10%	4636.00	4818.77	4833.19	4829.18	4833.73	0.001687	6.08	852.18	167.09	0.37
LTR_2A_Lower	49327	1.00%	15765.00	4818.77	4836.43	4835.38	4838.67	0.004973	12.98	1560.02	271.85	0.67
LTR_2A_Lower	48722	10%	4626.00	4818.87	4832.25	4828.94	4832.68	0.001737	5.62	1092.45	358.86	0.38
LTR_2A_Lower	48722	1.00%	15502.00	4818.87	4835.55	4834.39	4836.15	0.002130	8.06	3732.99	1556.77	0.44

Proposed Conditions

Plan: LTR_Proposed_SP Little Thompson LTR_2A_Lower RS: 54345 Profile: 10%

E.G. US. (ft)	4845.11	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	4844.87	E.G. Elev (ft)	4845.11	4845.11
Q Total (cfs)	4636.00	W.S. Elev (ft)	4844.87	4844.79
Q Bridge (cfs)	2966.15	Crit W.S. (ft)	4838.67	4840.09
Q Weir (cfs)	1669.85	Max Chl Dpth (ft)	16.23	14.33
Weir Sta Lft (ft)	1775.00	Vel Total (ft/s)	4.92	5.16
Weir Sta Rgt (ft)	2337.07	Flow Area (sq ft)	941.32	898.57
Weir Submerg	0.00	Froude # Chl	0.32	0.42
Weir Max Depth (ft)	1.89	Specif Force (cu ft)	4625.23	4151.60
Min El Weir Flow (ft)	4843.23	Hydr Depth (ft)	1.83	1.93
Min El Prs (ft)	4841.00	W.P. Total (ft)	607.95	553.98
Delta EG (ft)	1.46	Conv. Total (cfs)		
Delta WS (ft)	1.85	Top Width (ft)	514.69	466.62
BR Open Area (sq ft)	319.34	Frctn Loss (ft)		
BR Open Vel (ft/s)	9.29	C & E Loss (ft)		
BR Sluice Coef		Shear Total (lb/sq ft)		
BR Sel Method	Press/Weir	Power Total (lb/ft s)		

Plan: LTR_Proposed_SP Little Thompson LTR_2A_Lower RS: 54345 Profile: 1.00%

E.G. US. (ft)	4848.72	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	4848.38	E.G. Elev (ft)	4848.72	4848.59
Q Total (cfs)	15765.00	W.S. Elev (ft)	4848.38	4848.32
Q Bridge (cfs)	1302.36	Crit W.S. (ft)	4846.80	4846.92
Q Weir (cfs)	14462.64	Max Chl Dpth (ft)	19.74	17.86
Weir Sta Lft (ft)	1617.51	Vel Total (ft/s)	4.31	4.09
Weir Sta Rgt (ft)	2551.39	Flow Area (sq ft)	3653.71	3854.36
Weir Submerg	0.92	Froude # Chl	0.20	0.21
Weir Max Depth (ft)	5.50	Specif Force (cu ft)	12936.20	12356.78
Min El Weir Flow (ft)	4843.23	Hydr Depth (ft)	4.10	4.25
Min El Prs (ft)	4841.00	W.P. Total (ft)	984.70	994.20
Delta EG (ft)	0.14	Conv. Total (cfs)		
Delta WS (ft)	0.06	Top Width (ft)	891.36	964.66
BR Open Area (sq ft)	319.34	Frctn Loss (ft)		
BR Open Vel (ft/s)	4.08	C & E Loss (ft)		
BR Sluice Coef		Shear Total (lb/sq ft)		
BR Sel Method	Press/Weir	Power Total (lb/ft s)		

Plan: LTR_Proposed_SP Little Thompson LTR_2A_Lower RS: 52927 Profile: 10%

E.G. US. (ft)	4840.19	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	4839.67	E.G. Elev (ft)	4840.11	4839.77
Q Total (cfs)	4636.00	W.S. Elev (ft)	4839.51	4839.23
Q Bridge (cfs)	4636.00	Crit W.S. (ft)	4835.22	4835.22
Q Weir (cfs)		Max Chl Dpth (ft)	11.51	11.23
Weir Sta Lft (ft)		Vel Total (ft/s)	6.21	5.71
Weir Sta Rgt (ft)		Flow Area (sq ft)	746.04	811.51
Weir Submerg		Froude # Chl	0.43	0.40
Weir Max Depth (ft)		Specif Force (cu ft)	4286.18	4243.36
Min El Weir Flow (ft)	4853.18	Hydr Depth (ft)	6.55	5.40
Min El Prs (ft)	4849.10	W.P. Total (ft)	136.30	170.40
Delta EG (ft)	0.50	Conv. Total (cfs)	86073.9	94832.9
Delta WS (ft)	0.48	Top Width (ft)	113.92	150.29
BR Open Area (sq ft)	2383.54	Frctn Loss (ft)	0.30	0.07
BR Open Vel (ft/s)	6.21	C & E Loss (ft)	0.03	0.02

Proposed Conditions

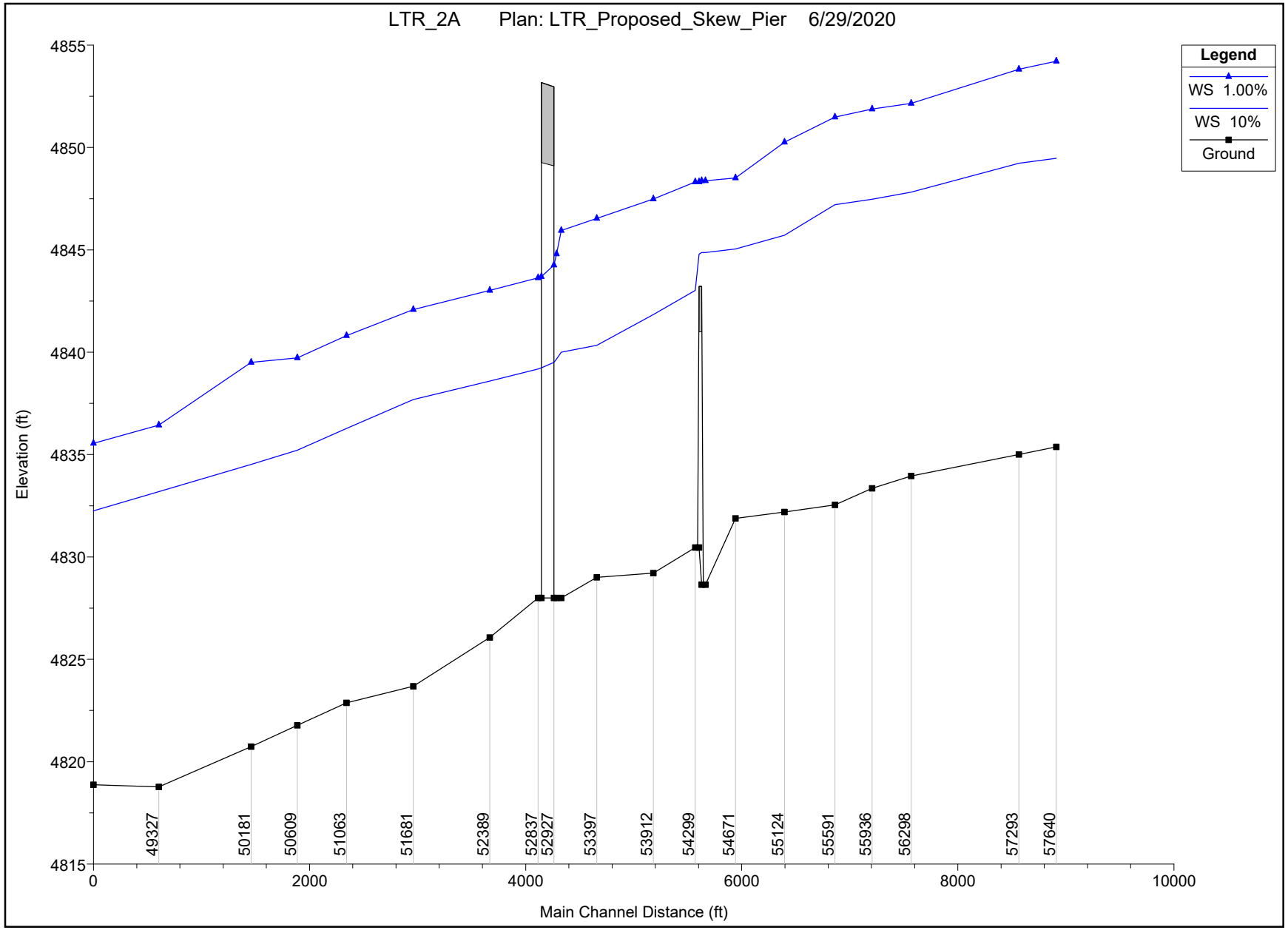
Plan: LTR_Proposed_SP Little Thompson LTR_2A_Lower RS: 52927 Profile: 10% (Continued)

BR Sluice Coef		Shear Total (lb/sq ft)	0.99	0.71
BR Sel Method	Energy only	Power Total (lb/ft s)	6.16	4.06

Plan: LTR_Proposed_SP Little Thompson LTR_2A_Lower RS: 52927 Profile: 1.00%

E.G. US. (ft)	4846.35	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	4844.80	E.G. Elev (ft)	4846.15	4845.53
Q Total (cfs)	15765.00	W.S. Elev (ft)	4844.26	4843.69
Q Bridge (cfs)	15765.00	Crit W.S. (ft)	4841.75	4841.08
Q Weir (cfs)		Max Chl Dpth (ft)	16.26	15.69
Weir Sta Lft (ft)		Vel Total (ft/s)	10.43	10.24
Weir Sta Rgt (ft)		Flow Area (sq ft)	1511.48	1540.17
Weir Submerg		Froude # Chl	0.48	0.48
Weir Max Depth (ft)		Specif Force (cu ft)	14005.72	13852.97
Min El Weir Flow (ft)	4853.18	Hydr Depth (ft)	8.34	8.77
Min El Prs (ft)	4849.10	W.P. Total (ft)	214.86	210.35
Delta EG (ft)	1.04	Conv. Total (cfs)	217133.1	220384.3
Delta WS (ft)	1.17	Top Width (ft)	181.17	175.60
BR Open Area (sq ft)	2383.54	Frctn Loss (ft)	0.60	0.14
BR Open Vel (ft/s)	10.43	C & E Loss (ft)	0.03	0.08
BR Sluice Coef		Shear Total (lb/sq ft)	2.32	2.34
BR Sel Method	Energy only	Power Total (lb/ft s)	24.15	23.94

Proposed Conditions



NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

FEMA recommends that a Flood Insurance Policy be purchased for structures in areas where **levees** are shown as providing protection from the 1% annual chance flood. Flooding is not covered by standard property/fire/dwelling insurance policies nor is it covered by Homeowners Insurance, Renters Insurance, Condominium Owners Insurance, or Commercial Property Insurance. Contact your insurance agent and local floodplain administrator for further information.

Visit http://www.fema.gov/pdf/fhm/frm_gsah.pdf for information on levees and the risk of flooding in areas shown as being protected by levees.

The **projection** used in the preparation of this map was State Plane Colorado North (feet). The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by the Larimer County GIS and Mapping Department. Additional input was provided by the City of Fort Collins Geographic Information Service Division. These data are current as of 2005.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the Flood Insurance Study report. As a result of improved topographic data, the profile baseline, in some cases, may deviate significantly from the channel centerline or appear outside the Special Flood Hazard Area.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov.

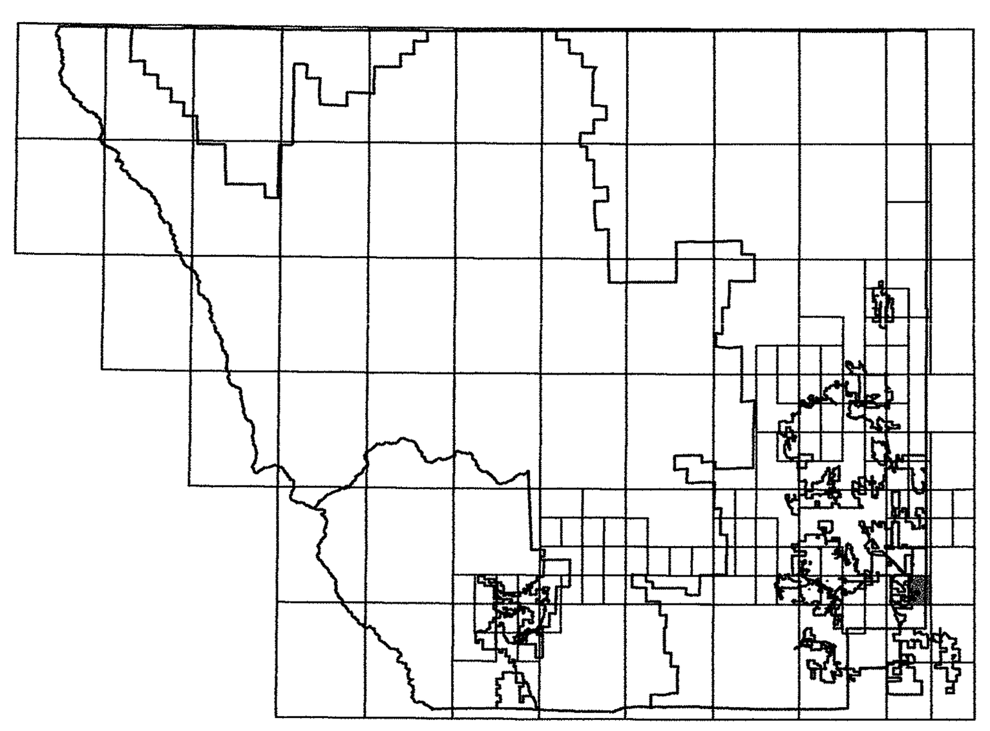
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1- 877- FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

Larimer County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)	Flooding Source	Vertical Datum Offset (ft)
Big Thompson River (from downstream Limit of Detailed Study to Approx. 2400' downstream of Cedar Creek)	3.2		

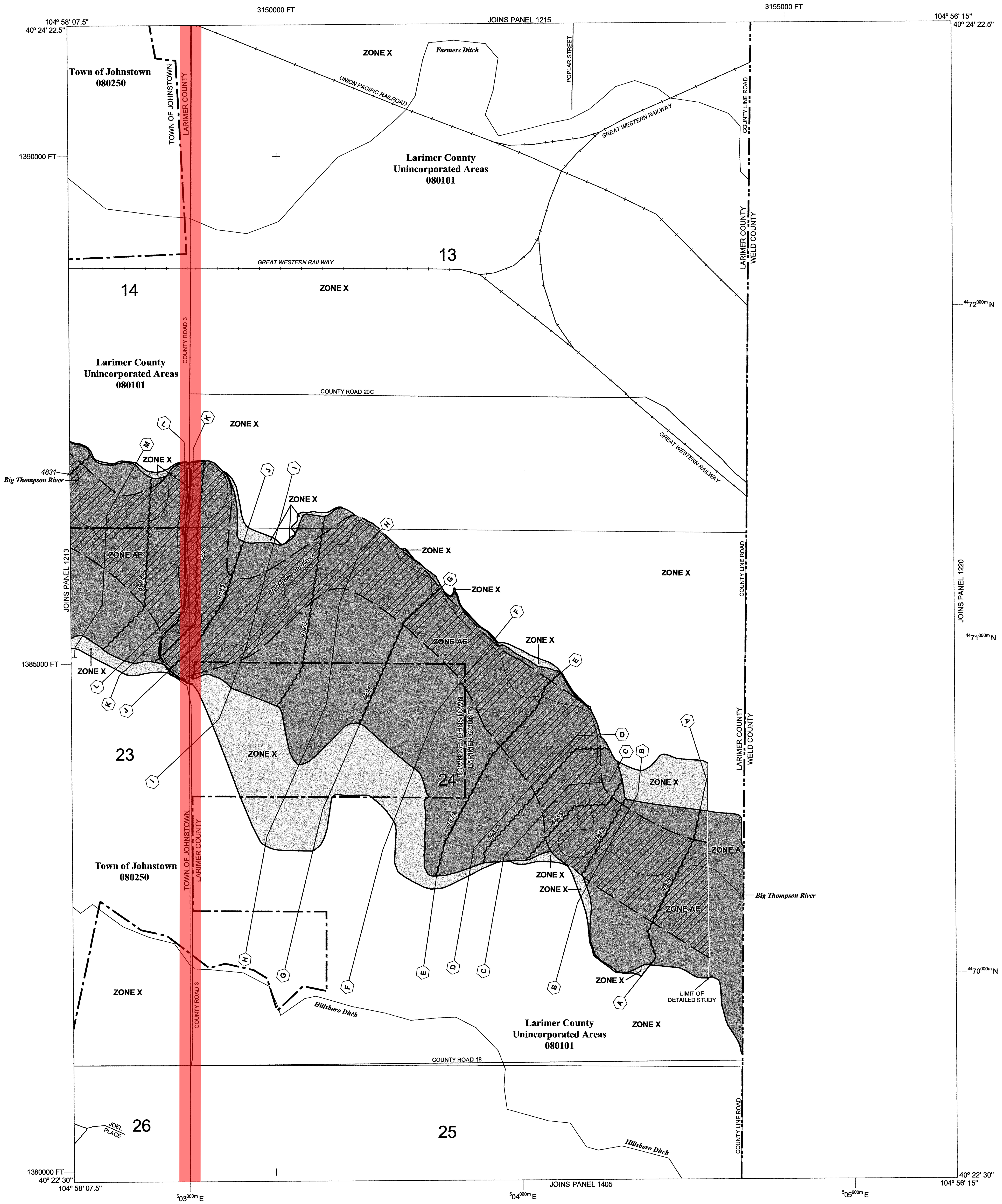
Example: To convert Big Thompson River elevations to NAVD 88, 3.2 feet were added to the NGVD 29 elevations.

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard Information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 5 NORTH, RANGE 68 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

Floodplain boundary

Floodway boundary

Zone D boundary

Boundary dividing Special Flood Hazard Area zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
104° 50' 37.5" , 39° 30' 00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
3180000 FT	5000-foot ticks: Colorado State Plane coordinate system, North zone, Lambert Conformal Conic projection
$^{42}76^{000}$ mN	1000-meter Universal Transverse Mercator grid ticks, zone 13
KK6400 ×	National Geodetic Survey bench mark (see explanation in Notes to Users section of this FIRM panel)

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
DECEMBER 19, 2006

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1214F

FIRM

FLOOD INSURANCE RATE MAP

LARIMER COUNTY, COLORADO

AND INCORPORATED AREAS

PANEL 1214 OF 1420

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
JOHNSTOWN, TOWN OF	080250	1214	F
LARIMER COUNTY	080101	1214	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08069C1214F

EFFECTIVE DATE
DECEMBER 19, 2006

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

FEMA recommends that a Flood Insurance Policy be purchased for structures in areas where **levees** are shown as providing protection from the 1% annual chance flood. Flooding is not covered by standard property/fire/dwelling insurance policies nor is it covered by Homeowners Insurance, Renters Insurance, Condominium Owners Insurance, or Commercial Property Insurance. Contact your insurance agent and local floodplain administrator for further information.

Visit http://www.fema.gov/pdf/fhm/frm_qsah.pdf for information on levees and the risk of flooding in areas shown as being protected by levees.

The **projection** used in the preparation of this map was State Plane Colorado North (feet). The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by the Larimer County GIS and Mapping Department. Additional input was provided by the City of Fort Collins Geographic Information Service Division. These data are current as of 2005.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the Flood Insurance Study report. As a result of improved topographic data, the profile baseline, in some cases, may deviate significantly from the channel centerline or appear outside the Special Flood Hazard Area.

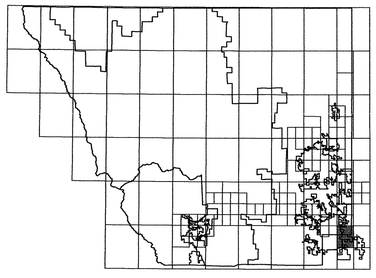
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov.

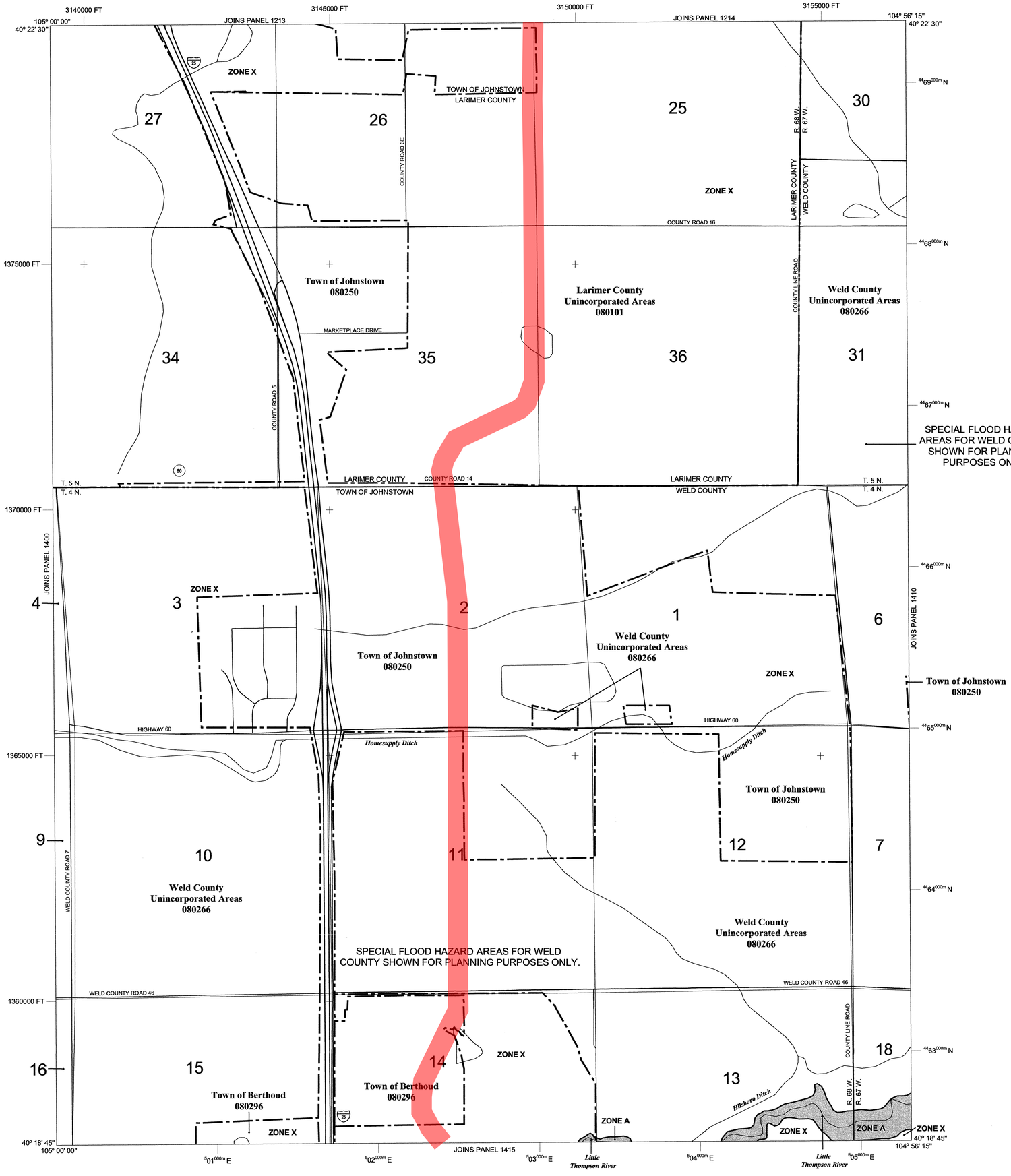
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1- 877- FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard Information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 4 NORTH, RANGE 67 WEST AND TOWNSHIP 4 NORTH, RANGE 68 WEST AND TOWNSHIP 5 NORTH, RANGE 67 WEST AND TOWNSHIP 5 NORTH, RANGE 68 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

Floodplain boundary
Floodway boundary
Zone D boundary
Boundary dividing Special Flood Hazard Area zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 Base Flood Elevation line and value; elevation in feet*
(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A–A Cross section line
104° 50' 37.5" , 39° 30' 00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
3180000 FT 5000-foot ticks: Colorado State Plane coordinate system, North zone, Lambert Conformal Conic projection
4276000mN 1000-meter Universal Transverse Mercator grid ticks, zone 13
KK6400 National Geodetic Survey bench mark (see explanation in Notes to Users section of this FIRM panel)

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
DECEMBER 19, 2006

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1405F

FIRM
FLOOD INSURANCE RATE MAP
LARIMER COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 1405 OF 1420

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BERTHOUD, TOWN OF	080296	1405	F
JOHNSTOWN, TOWN OF	080250	1405	F
LARIMER COUNTY	080101	1405	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08069C1405F

EFFECTIVE DATE
DECEMBER 19, 2006

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from NAIP Orthophotography produced with a one meter ground resolution from photography dated 2013.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

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If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 — 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
3100000 FT	5000-foot ticks: Colorado State Plane Central Zone (FIPS Zone 0502), Lambert Conformal Conic projection
$^{4}89^{000m}$ N	1000-meter Universal Transverse Mercator grid values, zone 13
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
January 20, 2016

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1680E

FIRM

FLOOD INSURANCE RATE MAP

WELD COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 1680 OF 2250
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WELD COUNTY	080266	1680	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08123C1680E
EFFECTIVE DATE
JANUARY 20, 2016

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from NAIP Orthophotography produced with a one meter ground resolution from photography dated 2013.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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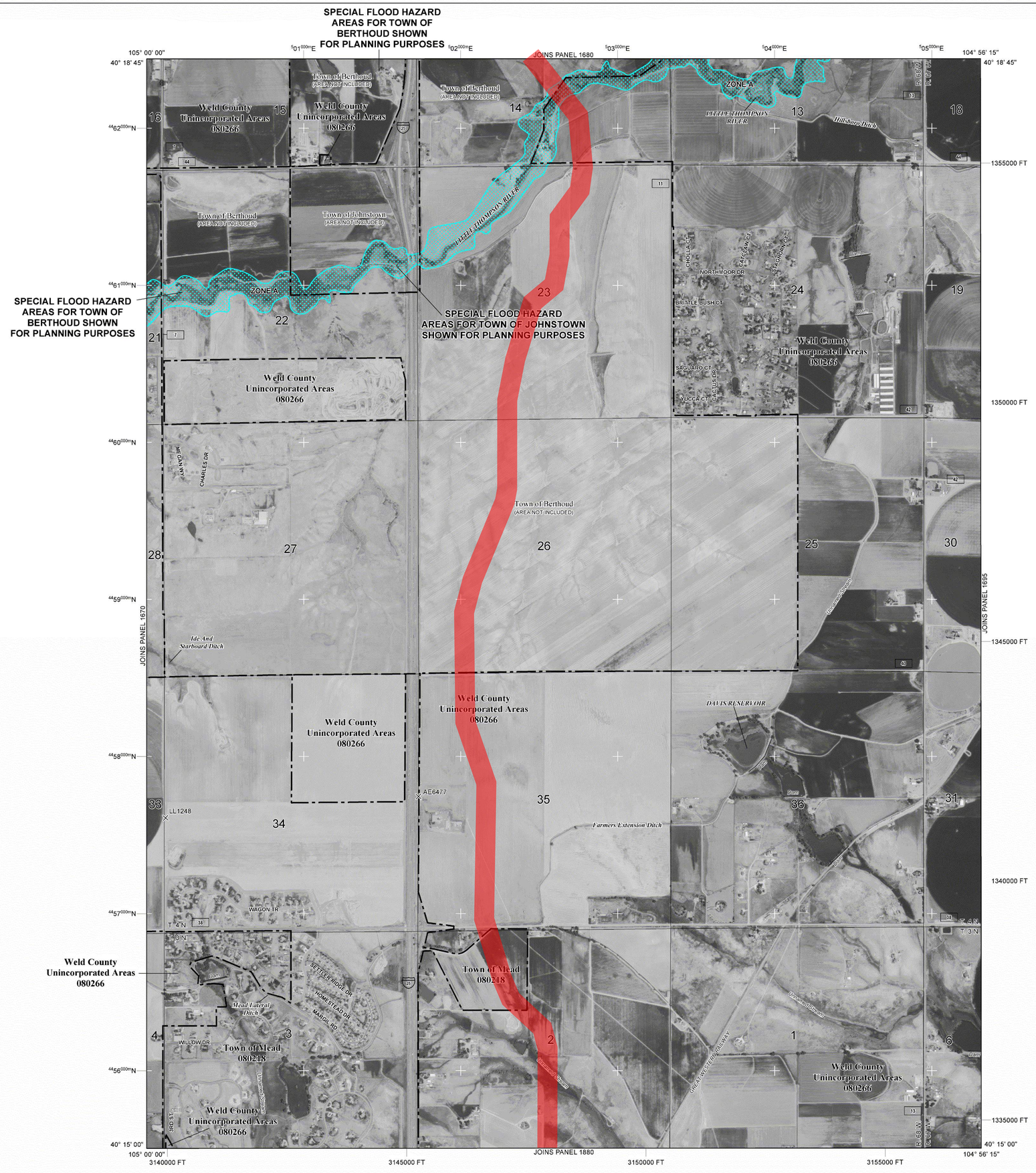


LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 — 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
3100000 FT	5000-foot ticks: Colorado State Plane Central Zone (FIPS Zone 0502), Lambert Conformal Conic projection
4489000m N	1000-meter Universal Transverse Mercator grid values, zone 13
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
January 20, 2016

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1690E

FIRM

FLOOD INSURANCE RATE MAP

WELD COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 1690 OF 2250
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MEAD, TOWN OF	080218	1690	E
WELD COUNTY	080266	1690	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08123C1690E
EFFECTIVE DATE
JANUARY 20, 2016

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from NAIP Orthophotography produced with a one meter ground resolution from photography dated 2013.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

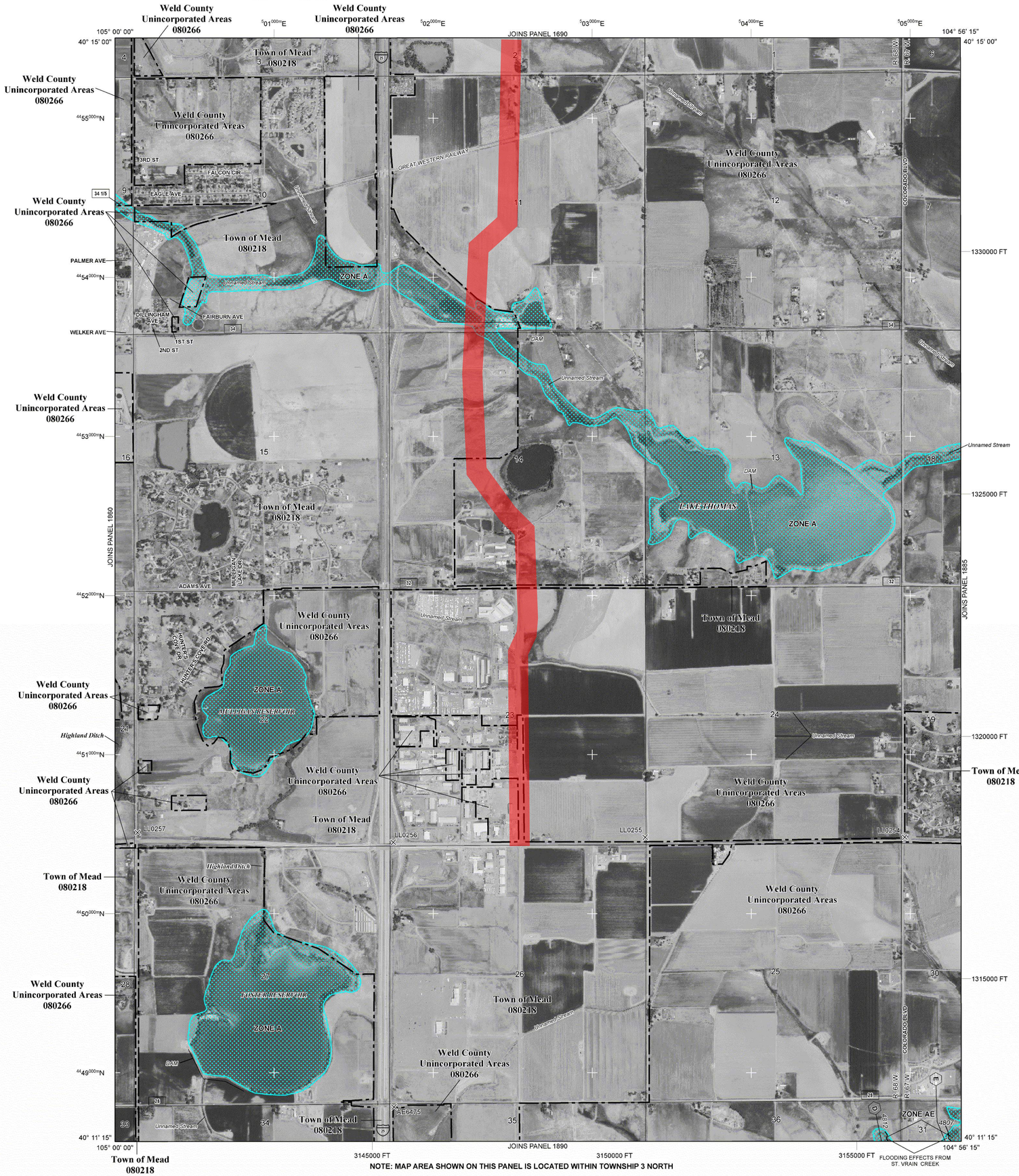
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
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- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
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- 3100000 FT — 5000-foot ticks: Colorado State Plane Central Zone (FIPS Zone 0502), Lambert Conformal Conic projection
- 4489000mN — 1000-meter Universal Transverse Mercator grid values, zone 13
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

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500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1880E

FIRM

FLOOD INSURANCE RATE MAP

WELD COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 1880 OF 2250
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
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WELD COUNTY	080266	1880	E

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MAP NUMBER
08123C1880E
EFFECTIVE DATE
JANUARY 20, 2016

Federal Emergency Management Agency