

3.9 FLOODPLAINS

The regional study area for the proposed action includes many major and minor drainage crossings in six watersheds to the South Platte River. These watersheds (from north to south) include the Cache la Poudre River, Big Thompson River, South Platte River, St. Vrain Creek, Big Dry Creek, and Clear Creek (see **Figure 3.9-1** in **Section 3.9.2**). This section summarizes floodplain resources and evaluations presented in the *Water Quality and Floodplains Technical Report* (FHU, 2008c), and *Addendum* (FHU, 2011b), which should be referred to for additional information, details, and references.

3.9.1 Regulatory Framework

Various governmental policies guide the actions for construction in or near floodplains. These include:

- ▶ Executive Order 11988, Floodplain Management, which requires federal agencies to avoid, to the extent possible, long-term and short-term adverse impacts associated with the modification of floodplains and to avoid floodplain development wherever there is a practicable alternative.
- ▶ FHWA 23 CFR 650, Subpart A, which provides guidelines for floodplain and construction interaction.
- ▶ U.S. DOT Order 5650.2, Floodplain Management and Protection, which prescribes policies and procedures for ensuring that proper consideration is given to the avoidance and mitigation of adverse floodplain impacts in agency actions, planning programs, and budget requests.
- ▶ FEMA policy, which is administered in the regional study area by Denver, Boulder, Adams, Weld, and Larimer counties, along with most cities and towns, which are responsible for regulating development in FEMA-designated floodplains.
- ▶ Additional floodplain and drainage design policies required to be followed are outlined in the CDOT *Drainage Design Manual* (CDOT, 2004b), and the CDOT *Erosion Control and Stormwater Quality Guide* (CDOT, 2002b).

An inspection of current FEMA flood insurance rate maps was completed for the regional study area. All major drainageways are in FEMA zones AE, A, or X, which define boundaries of floodplains by varying degrees of detail. Smaller drainages are not defined by FEMA. Each floodplain zone and a list of major drainages in each specific zone is described below.

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3.9 Floodplains

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1 **Zone AE.** Zone AE is part of the FEMA 100-year flood hazard area where base flood
2 elevations have been determined. Zone AE floodplain areas in the regional study area include
3 Big Dry Creek, Big Thompson River at the BNSF Railway, Boxelder Creek Overflows, Clear
4 Creek, Grange Hall Creek, South Fork to Grange Hall Creek, and Tanglewood Creek.
5 AE Zone areas that also have a floodway delineated are Big Dry Creek, Big Thompson River
6 at the BNSF railway, Grange Hall Creek, South Fork to Grange Hall Creek, and Tanglewood
7 Creek. The new Cache la Poudre and Boxelder Creek Digital Flood Insurance Rate Map
8 (DFIRM) has a delineated floodway. A floodway is an area of the floodplain that should be
9 reserved (kept free of obstructions) to allow floodwaters to move downstream.

10 **Zone A.** Zone A is part of the FEMA 100-year flood hazard area where base flood elevations
11 have not been determined but a shaded, generalized floodplain is shown on the FEMA Flood
12 Insurance Rate Maps (FIRM). Zone A areas in the regional study area include Big Thompson
13 River, Little Thompson River, McKay Lake Drainageway, Mustang Run, Niver Creek, Quail
14 Creek, Sack Creek South, St. Vrain Creek, Shay Ditch, and the South Fork of Preble Creek.
15 US 85 Zone A areas include Second and Third creeks. FEMA's April 1995 publication,
16 *Managing Floodplain Development in Approximate Zone A Areas*, states that although base
17 flood elevations are not shown in Zone A areas, the community is still responsible for ensuring
18 that new developments in these areas are constructed using methods that will minimize flood
19 damage (FEMA, 1995). This often requires obtaining or calculating base (100 year) flood
20 elevations at the development site.

21 **Zone X.** Zone X is part of the FEMA 500-year flood area, 100-year flood area with average
22 depths of less than 1 foot, or with drainage areas less than 1 square mile. Zone X areas in the
23 regional study area include an unnamed tributary to Grange Hall Creek.

24 3.9.2 Affected Environment

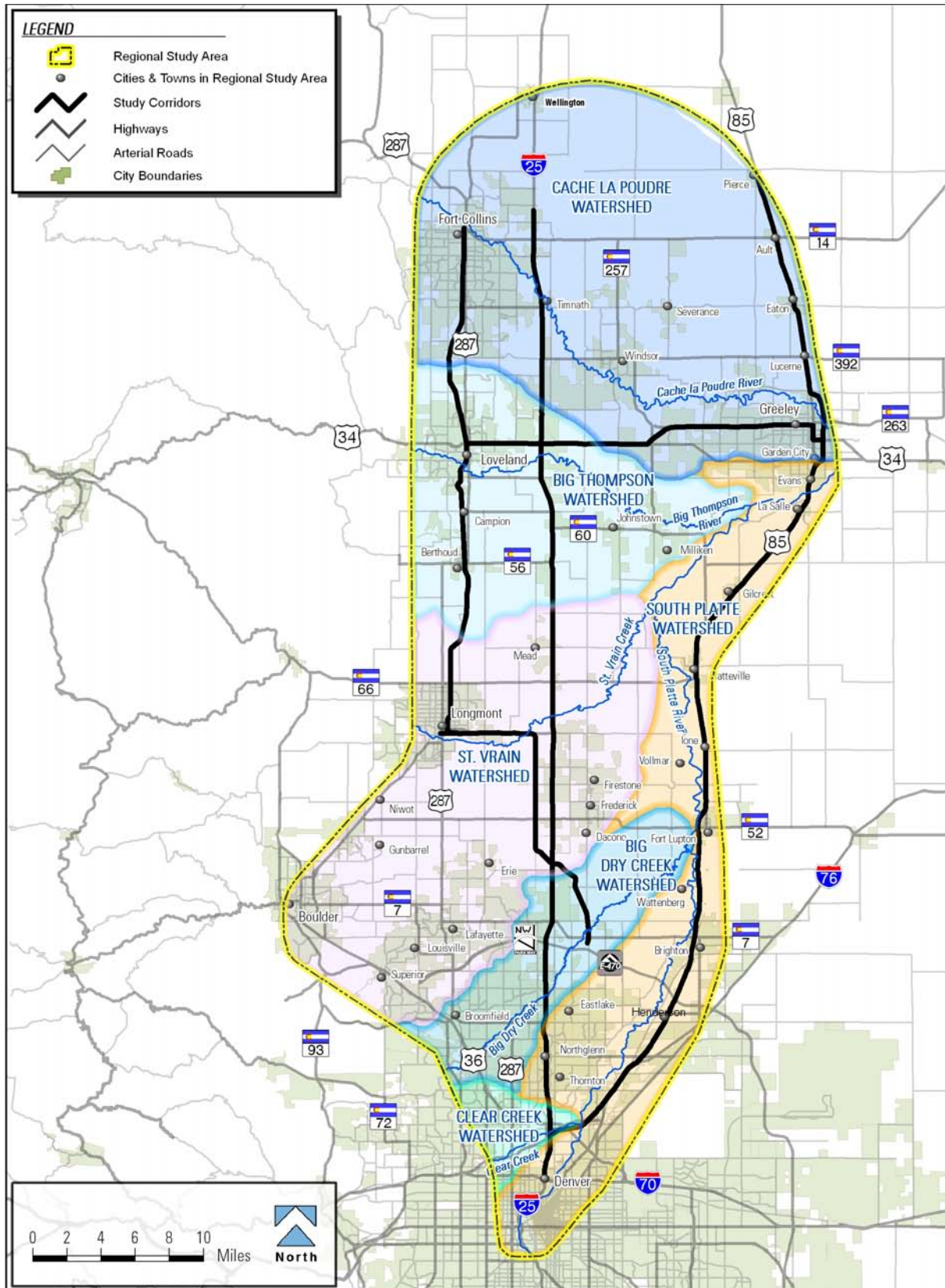
25 The following sections address flood history, floodplains, drainage, and floodplain functions in
26 the six watersheds. **Figure 3.9-1** delineates the watersheds within the regional study area.

27 3.9.2.1 CACHE LA POUFRE WATERSHED

28 The Cache la Poudre River has experienced major flooding seven times since 1844. The most
29 damage was caused by the 1904 flood. The 100-year flood width is about 1,300 feet near I-25.
30 The Boxelder Creek and Cache la Poudre River floodplains are complicated and
31 interconnected in the I-25 area. Flooding occurs in the I-25 right-of-way at Boxelder Creek, the
32 Cache la Poudre River, Fossil Creek, Swede Lake Outlet, and several minor crossings. Spring
33 Creek overtops the BNSF railway in Fort Collins where the proposed commuter rail route
34 would cross. The Spring Creek floodplain at the BNSF railway has a width of 2,000 feet.

35 The Cache la Poudre Bridge at I-25 is undersized, causing 33 percent of the 100-year flow to
36 split and pass south toward Harmony Road. While portions of the Cache la Poudre drainage
37 have been recently remapped, the mapping is based on several separate hydraulic models in
38 the split flow area that are not interconnected to establish water surface profiles with a
39 balanced hydraulic model output. Consequently, CDOT and the local agencies acknowledge
40 that reliance on the existing hydraulic models and floodplain mapping in order for each
41 jurisdiction to properly size new hydraulic structures for this complicated spit flow drainage
42 area is not in the best interest of all the jurisdictions involved.

1 Figure 3.9-1 Watershed Boundaries



1 However, the master plan for the City of Fort Collins is to keep this split flow intact, since the
2 entire 100-year flow cannot pass into the main channel without exceeding FEMA's allowable
3 rise. Fort Collins has future plans to raise Harmony Road and install a culvert or bridge to pass
4 these overflows. South of Harmony Road, the overflows eventually spill east over I-25 and
5 return to the Cache la Poudre River. Other physical limitations included a large bridge span,
6 sedimentation problems, and regulatory limitations for no rise in the water surface west of I-25.

7 Boxelder Creek improvements include two separate projects that are being considered to
8 better convey Boxelder Creek flows and control much of the existing flooding. The Boxelder
9 Creek Regional Alliance proposes to build a new Boxelder Creek conveyance channel east of
10 I-25. The second plan, which may occur later, is being sponsored by Fort Collins. It would
11 direct Boxelder flows along the west side of I-25. Even though the Alliance improvements
12 would occur first, the two projects are complimentary. The conveyance channel to be built as
13 part of the Alliance project is also needed to collect and convey localized stormwaters from the
14 areas north of Timnath.

15 According to CDPHE, the floodplain's primary functions are for agriculture, recreation, and
16 warm-water aquatic life. Additional uses include conveyance of stormwater, riparian habitat,
17 and water quality maintenance.

18 **3.9.2.2 BIG THOMPSON WATERSHED**

19 The Big Thompson River has experienced major flooding eight times since 1864. The worst
20 flooding occurred in 1976 when a cloudburst caused extensive flooding and took 139 lives.

21 At I-25, Big Thompson River has a 3,100-foot wide floodplain and Little Thompson River has a
22 700-foot wide floodplain. The Little Thompson frontage road bridge on the east side of I-25 is
23 a steel-truss bridge, which was built in 1938. Along the BNSF railway corridor, there is a
24 crossing of Big Thompson River where a 3,600-foot wide floodplain exists and one at Little
25 Thompson River where an 800-foot wide floodplain exists.

26 Flooding occurs at eight tributary crossings in this watershed. An un-named tributary to Big
27 Thompson River crosses under US 34 on the east side of I-25.

28 According to CDPHE, the floodplain's primary functions are for agriculture and warm-water
29 aquatic life. Additional uses are for conveyance of stormwater, riparian habitat, and water
30 quality maintenance.

31 **3.9.2.3 SOUTH PLATTE WATERSHED**

32 Second and Third creeks have had five recorded floods since 1948. During these floods, most
33 damage was limited to crops and livestock. A severe flood during 1984 resulted in one death.
34 US 85 is overtopped by Second Creek at 136th Avenue, and by Third Creek at 144th Avenue.
35 Floodplains for these two drainages are interconnected and have a combined 6,800-foot width
36 at US 85. Both areas are in FEMA Zone A.

37 According to CDPHE, the floodplain's primary functions are for agriculture and warm-water
38 aquatic life. Additional uses are for conveyance of stormwater, riparian habitat, and water
39 quality maintenance.

1 **3.9.2.4 ST. VRAIN WATERSHED**

2 St. Vrain Creek has experienced major flooding 10 times since 1864. The worst flooding
3 occurred in 1941 when a cloudburst and snowmelt combination caused extensive flooding.
4 The 100-year flood width is about 3,700 feet near I-25 and 7,000 feet wide where it crosses
5 the commuter rail corridor along SH 119. I-25 flooding also occurs at seven tributary crossings
6 in this watershed. St. Vrain Creek riprap channel drops were built near the east and west right-
7 of-way lines of I-25 to improve the stream's conveyance. The Colorado Division of Wildlife
8 (CDOW) has concerns that these drops are too steep and fish migration is impaired.

9 A total of 7,000 feet of SH 119 is overtopped by the combined flooding from the St. Vrain
10 Creek and Idaho Creek. Existing structures are absent adjacent to SH 119 where the
11 proposed commuter rail route would cross these drainages.

12 According to CDPHE, the floodplain's primary functions are for recreation and warm-water
13 aquatic life. Additional uses are for conveyance of stormwater, riparian habitat, and water
14 quality maintenance.

15 **3.9.2.5 BIG DRY CREEK WATERSHED**

16 Big Dry Creek has few records of flooding due to its numerous reservoirs and recent
17 agricultural past. The 100-year flood width is about 1,500 feet near I-25 and 574 feet wide near
18 the commuter rail corridor.

19 The Big Dry Creek crossing at I-25 is marginally adequate for passing stormwaters. Flooding
20 occurs at the tributaries at Little Dry Creek and the Tributary to Little Dry Creek, McKay Lake
21 Drainageway, Mustang Run, South Fork Preble Creek, Sack Creek South, Shay Ditch, and
22 Tanglewood Creek.

23 According to CDPHE, the floodplain's primary functions are for recreation and warm-water
24 aquatic life. Additional uses are for conveyance of stormwater, riparian habitat, and water
25 quality maintenance.

26 **3.9.2.6 CLEAR CREEK WATERSHED**

27 Clear Creek has experienced major flooding 12 times since 1864. The worst flooding occurred
28 in 1965 when a cloudburst and snowmelt combination caused extensive damage. The 100-
29 year flood width is about 3,700 feet near I-25. I-25 is not overtopped by Clear Creek. Tributary
30 crossings at Niver Creek and Niver Creek Tributary L have flooding within the I-25 right-of-
31 way.

32 According to CDPHE, the floodplain's primary functions are for agriculture and warm-water
33 aquatic life. Additional uses are for conveyance of stormwater, riparian habitat, and water
34 quality maintenance.

35

3.9.3 Environmental Consequences

This section describes the consequences of the No-Action Alternative and three build packages with regard to floodplains. Specific floodplain impacts are identified and mitigation measures to address adverse impacts are described. Additional measures to mitigate impacts associated with bridge construction and roadway fill encroachment on flood fringe areas are discussed in **Section 3.9.4**.

None of the crossings would have a significant encroachment on the floodplain. A significant encroachment is defined by FHWA as a transportation encroachment, and any direct support of a likely base floodplain development that would involve one or more of the following construction or flood related impacts:

- ▶ A significant potential for interruption or termination of a transportation facility that is needed for emergency vehicles or provides a community's only evacuation route.
- ▶ A significant risk.
- ▶ A significant adverse impact on natural and beneficial floodplain values.

3.9.3.1 NO-ACTION ALTERNATIVE

The No-Action Alternative would impact floodplains in areas where currently planned roadway improvements are planned. Existing conditions, described in **Section 3.9.2**, would continue. Probable improvements in floodplain areas are shown on **Figure 3.9-2**.

In summary, probable No-Action Alternative improvements in floodplain areas would include:

- ▶ SH 1 to SH 14 improvements: rehabilitation of one drainage structure.
- ▶ SH 14 to SH 60 improvements: rehabilitation of three drainage structures.
- ▶ SH 60 to E-470 improvements: rehabilitation of two drainage structures.
- ▶ E-470 to US 36 no drainage improvements are planned.

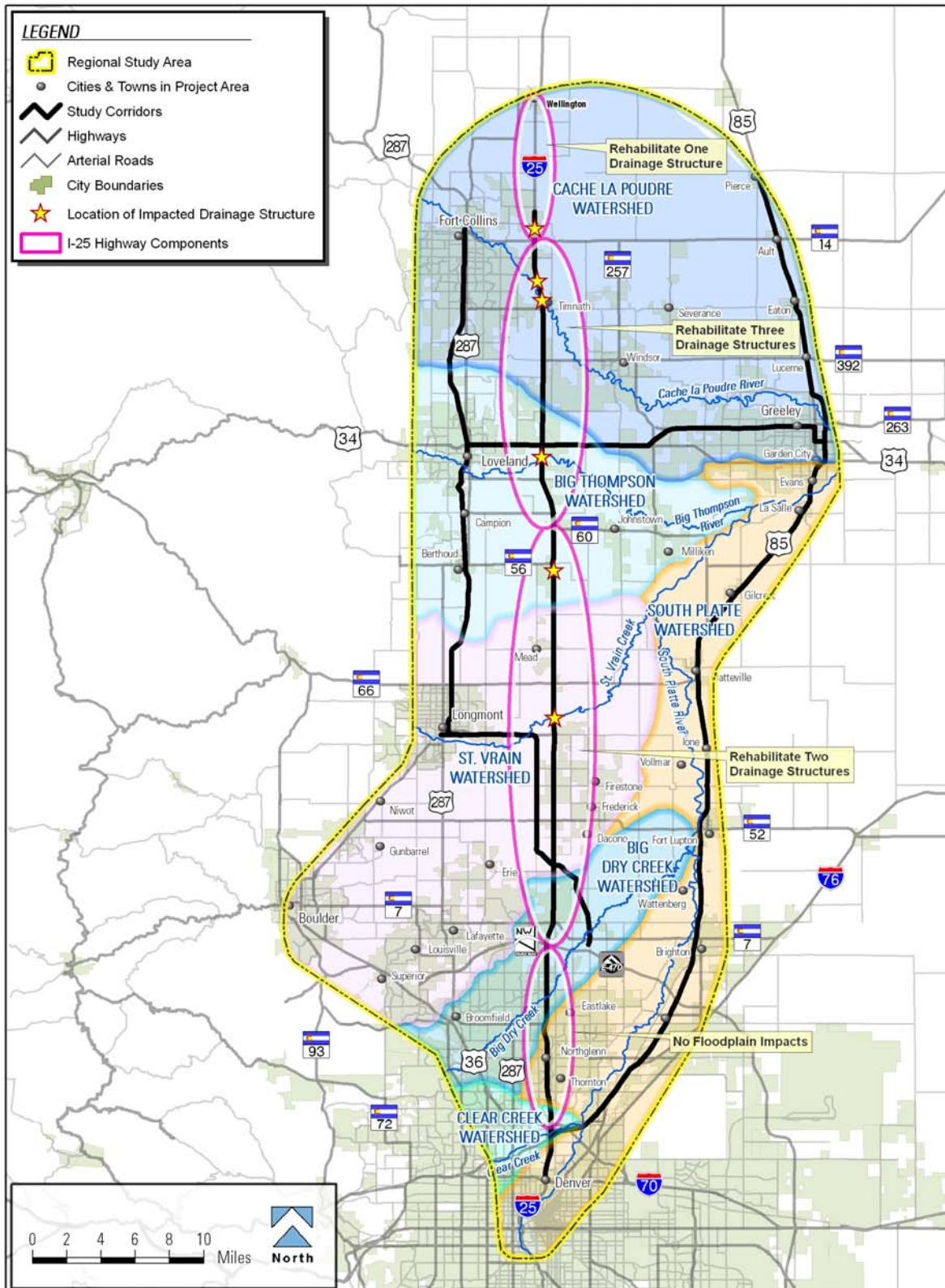
3.9.3.2 PACKAGE A

Package A includes construction of additional general purpose and auxiliary lanes on I-25, and the implementation of commuter rail and bus service. This alternative is described in detail in **Chapter 2 Alternatives**. **Table 3.9-1** summarizes the consequences to floodplains of each component of Package A, Package B, and the Preferred Alternative floodplain impacts.

Highway Components

Package A highway components would impact floodplains. Most drainage crossings are too small to pass the required flows under I-25 and would need to be replaced. In areas where the structures are sufficient to pass the required flows, the increased width of I-25 would necessitate their being lengthened. The specific components that would result in the greatest encroachment on floodplains are general purpose lane (GPL) improvements from SH 14 to SH 60 (4.9 acres) and GPL improvements from SH 60 to E-470 (4.6 acres). Any replacement or lengthening of a drainage structure, whether it is a bridge or culvert, would impact the floodplain. Specific consequences related to each highway component are shown in **Table 3.9-1** and on **Figure 3.9-1**.

1 Figure 3.9-2 Floodplain Impacts for the No-Action Alternative

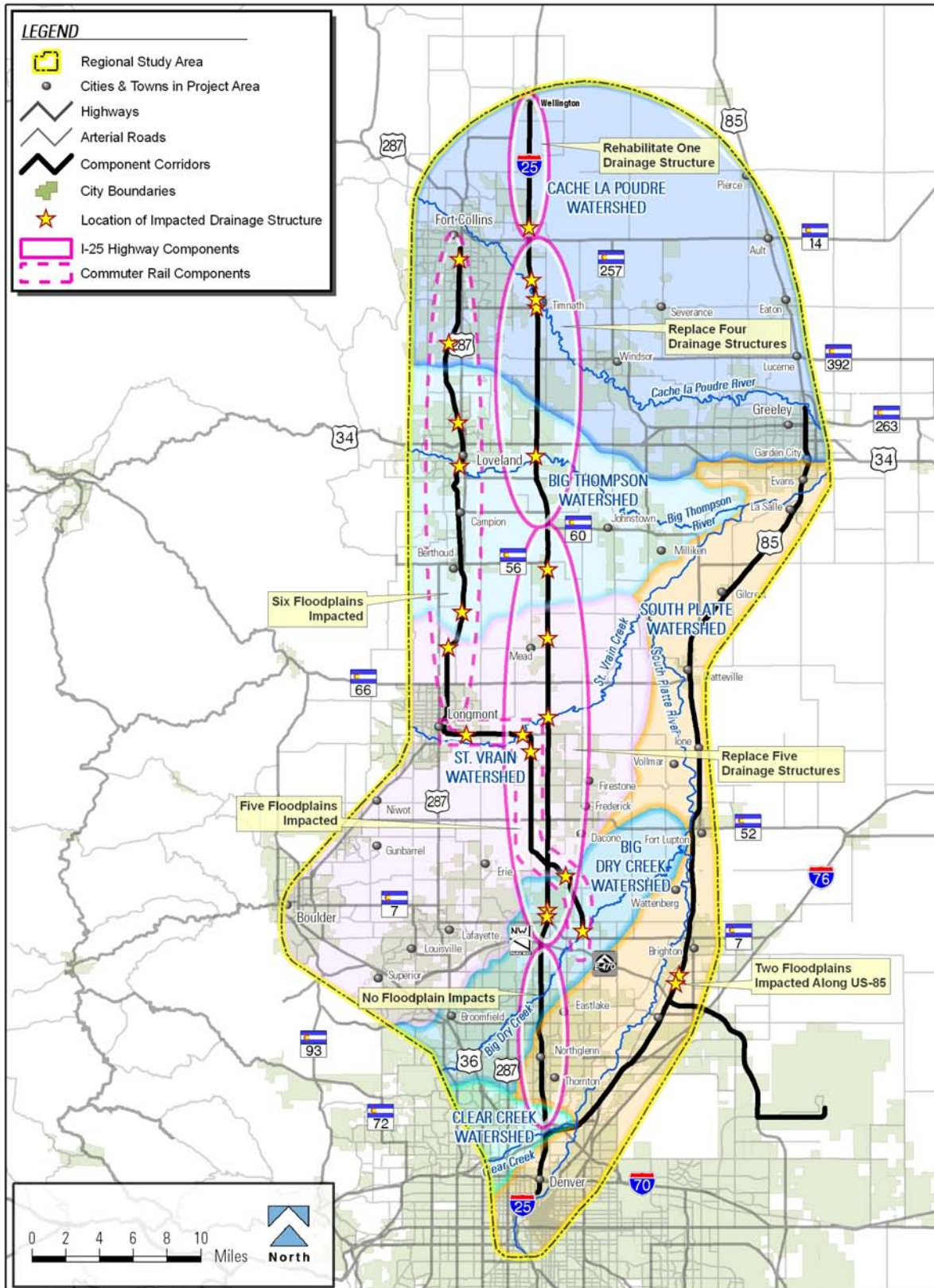


1 Table 3.9-1 Estimated Area of Impacts to Floodplains

Component Description	Impacted Area (Acres)	Component Description	Impacted Area (Acres)	Component Description	Impacted Area (Acres)
Package A Highway Components		Package B Highway Components		Preferred Alternative Highway Components	
Safety Improvements: SH 1 to SH 14	1.3	Safety Improvements: SH 1 to SH 14	1.3	Safety Improvements: SH 1 to SH 14	1.3
GPL Improvements: SH 14 to SH 60	4.9	Tolled Express Lanes: SH 14 to SH 60	6.0	Tolled Express Lanes and GPL Improvements: SH 14 to SH 66	4.3
GPL Improvements: SH 60 to E-470	4.6	Tolled Express Lanes: SH 60 to E-470	5.0	Tolled Express Lanes: SH 60 to E-470	4.2
Structure Upgrades: E-470 to US 36	0	Tolled Express Lanes: E-470 to US 36	1.2	Tolled Express Lanes: E-470 to US 36	1.2
<i>Total Package A Highway Impacts:</i>	<i>10.8</i>	<i>Total Package B Highway Impacts:</i>	<i>13.5</i>	<i>Total Preferred Alternative Highway Impacts:</i>	<i>11.0</i>
Package A Transit Components		Package B Transit Components		Preferred Alternative Transit Components	
Commuter Rail: Fort Collins to Longmont	1.7	BRT: Fort Collins/ Greeley to Denver	0	Commuter Rail: Fort Collins to Longmont	1.7
Commuter Rail: Longmont to North Metro	0.2	BRT: Fort Collins/ Greeley to DIA	0	Commuter Rail: Longmont to North Metro	0.2
Commuter Bus: Greeley to Denver	0.1			Commuter Bus: Greeley to Denver	0.1
Commuter Bus: Greeley to DIA	0			Commuter Bus: Greeley to DIA	0
<i>Total Package A Transit Impacts:</i>	<i>2.0</i>	<i>Total Package B Transit Impacts:</i>	<i>0</i>	<i>Total Preferred Alternative Transit Impacts:</i>	<i>2.0</i>
Total Package A Impacts:	12.8	Total Package B Impacts:	13.5	Total Preferred Alternative Impacts:	13.0

2 BRTBus Rapid Transit
3 GPLGeneral Purpose Lane

1 Figure 3.9-3 Package A Floodplain Impacts



1 Specific consequences related to each Package A highway component would be as follows:

- 2 ▶ Safety improvements involving floodplains from SH 1 to SH 14 would be limited to the
3 No-Action Alternative improvements involving rehabilitation of one drainage structure.
- 4 ▶ GPL improvements from SH 14 to SH 60 (plus auxiliary lanes between Harmony Road and
5 SH 60 widening would encroach on to three floodplains and would require the replacement
6 of four major drainage structures.
- 7 ▶ GPL improvements from SH 60 to E-470 widening would encroach on to four floodplains
8 and would require the replacement of five major drainage structures.
- 9 ▶ Structure upgrades from E-470 to US 36 would be limited to the No-Action Alternative,
10 which would have no floodplain impacts.

11 **Boxelder Creek** floodplains are mapped from the northern project limits to its confluence with
12 the Cache la Poudre River. The creek runs parallel to I-25 to the east for several miles before
13 it crosses under I-25. There are several overflow areas along I-25 before the Boxelder crosses
14 I-25. There are five structures at these locations. These structures would either be replaced in
15 kind, extended in kind, or a new larger structure would be needed. These improvements would
16 have the following floodplain impacts:

- 17 ▶ Improving the capacity of the drainage structures would decrease the amount of ponding
18 east of I-25 but could increase the chance of downstream flooding to the west of I-25.
- 19 ▶ Natural vegetation around the drainage structures would be disturbed during construction.

20 **Boxelder Creek** crosses under I-25 near mile post 269, flowing from east to west. The current
21 structure would be replaced in kind. This improvement would have the following floodplain
22 impacts:

- 23 ▶ There should be minimal or no changes to the floodplain limits. There may be local
24 changes due to the new structure, but this should not affect flooding upstream or
25 downstream of the structure.
- 26 ▶ Natural vegetation around the drainage structure would be disturbed during construction.

27 **The Cache la Poudre River** crosses under I-25 near mile post 266, flowing from west to east.
28 The current bridge would be replaced with a wider one along the new alignment of I-25 to
29 match the new typical section. Determination of the replacement structure type would be made
30 by CDOT, FEMA, and adjacent jurisdictions. These improvements would have the following
31 impacts on the floodplain:

- 32 ▶ There should be minimal or no changes to the floodplain limits. There may be local
33 changes due to the new structure and new structure location, but this should not affect
34 flooding upstream or downstream of the structure.
- 35 ▶ Natural vegetation around the drainage structure would be disturbed during construction.
- 36 ▶ Surrounding wetlands would be disturbed during construction and destroyed by the new
37 structure location.

38 **The Cache la Poudre River** 100-year flows split just west of I-25. The majority of the 100-year
39 flow heads east to the existing I-25 bridge, causing overtopping of the interstate. The
40 remaining flows pass to the south crossing Harmony Road before flooding I-25 at the I-25 and
41 Kechter Road crossroads. There are no structures at this location currently. CDOT and the

1 local agencies acknowledge that a comprehensive reevaluation at the time of final design
2 would be necessary to determine the appropriate alignment and sizing of structures throughout
3 this complicated split flow reach. Due to the level of design and information available at this
4 time, the proposed options are based on current regulations and the master plan for the City of
5 Fort Collins which plans to keep the split flow intact. Four concrete box culverts (CBCs) would
6 be added to this area, one in each quadrant of the crossroads. These improvements would
7 have the following impacts to the floodplain:

- 8 ▶ The floodplain limits would change with the new structures. I-25 should not be overtopped
9 anymore and the flows would become more channelized. There could be an increase in
10 downstream flooding due to the more concentrated flows.
- 11 ▶ Natural vegetation surrounding the roadway would be disturbed during construction.
- 12 ▶ Surrounding wetlands could be disturbed during construction.

13 **The Big Thompson River** crosses under I-25 near mile post 257, flowing from west to east.
14 The current bridge would be replaced with a new wider bridge due to widening of I-25. The
15 proposed bridge will not be much longer than the existing bridge, but the profile of I-25 was
16 raised to provide the capacity needed to pass the 100-year flows. This improvement would
17 have the following floodplain impacts:

- 18 ▶ There should be minimal or no changes to the floodplain limits. There may be local
19 changes due to the widening of the bridge, but this should not affect flooding upstream or
20 downstream of the structure.
- 21 ▶ Natural vegetation surrounding the structure would be disturbed during construction.
- 22 ▶ Surrounding wetlands would be disturbed during construction and destroyed due to the
23 widening of the structure.

24 **The Little Thompson River** crosses under I-25 near mile post 250, flowing from west to east.
25 The current bridge would be replaced with a new wider bridge and shifted to accommodate
26 widening of I-25 and a new alignment. These improvements would have the following
27 floodplain impacts:

- 28 ▶ There should be no or minimal changes to the floodplain. There may be local changes due
29 to the widening and shifting of the bridge, but this should not affect flooding upstream or
30 downstream of the structure.
- 31 ▶ Natural vegetation surrounding the structure would be disturbed during construction.
- 32 ▶ Surrounding wetlands would be disturbed during construction and destroyed due to the
33 widening and shifting of the structure.

34 **North Creek** crosses under I-25 near mile post 245, flowing from west to east. The existing
35 CBC would be replaced in kind, but it would probably be extended due to the new alignment of
36 the ramps and frontage road. This improvement would have the following floodplain impacts:

- 37 ▶ There should be minimal or no changes to the floodplain limits. There could be local
38 changes due to extending the CBC, but this should not affect flooding upstream or
39 downstream of the structure.

- 1 ▶ Natural vegetation surrounding the structure would be disturbed during construction.
- 2 ▶ Surrounding wetlands would be disturbed during construction and destroyed due to
- 3 extending the CBC.

4 **Little Dry Creek** crosses under I-25 near mile post 231, flowing from west to east. The
5 existing 72-inch reinforced concrete pipe (RCP) would be replaced with a larger structure. This
6 improvement would have the following floodplain impacts:

- 7 ▶ There should be minimal or no changes to the floodplain limits. There could be local
- 8 changes due to replacing the CBC, but this should not affect flooding upstream or
- 9 downstream of the structure.
- 10 ▶ Natural vegetation surrounding the structure would be disturbed during construction.
- 11 ▶ Surrounding wetlands would be disturbed during construction.

12 *Transit Components*

13 Package A transit components would impact floodplains where crossings occur and where the
14 commuter rail and commuter bus routes require widening that encroaches on to floodplains.
15 The commuter rail route from Fort Collins to Longmont would cross six floodplains and the
16 route from Longmont to North Metro would cross five floodplains. Commuter bus service along
17 the US 85 queue jumps would impact two floodplains between Greeley and Denver.
18 Commuter bus service to DIA would cross four floodplains, but would not impact any of them.
19 None of the bus stations, bus and commuter rail maintenance facilities, rail stations, or
20 associated parking facilities would impact a floodplain.

21 **Spring Creek** crosses under the BNSF railroad, the proposed alignment for the commuter rail,
22 approximately 0.15 miles south of Prospect Road. The existing CBC is inadequate, but adding
23 two 60-inch RCP would help pass the full 100-year flows. These improvements would have the
24 following impacts to the floodplain:

- 25 ▶ The railroad is currently overtopped by the 100-year flows. Adding the pipes could alleviate
- 26 this problem. However, there could be an increase in downstream flooding because the
- 27 flows would be more concentrated through the pipes as opposed to spilling over the
- 28 railroad.
- 29 ▶ Natural vegetation around the drainage structures would be disturbed during construction.

30 **Fossil Creek** crosses under the BNSF railroad five times between Fossil Creek Drive and
31 south of Trilby Road. The floodplain has been mapped by the City of Fort Collins in this area.
32 At these crossings, three of the structures would be replaced with larger structures, and two
33 new structures would be added. These improvements would have the following impacts to the
34 floodplain:

- 35 ▶ At three of the five crossings, Fossil Creek overtops the railroad. The new structures could
- 36 alleviate this problem. They could also reduce ponding on the upstream sides of the
- 37 railroad. Increasing the capacity of the crossing structures could cause more flooding
- 38 downstream however. Because Fossil Creek snakes back and forth around the railroad,
- 39 more detailed study would be needed to determine the full changes to the floodplain.
- 40 Channel improvements and downstream studies may be needed in the future.

41

- 1 ▶ Natural vegetation around the drainage structures would be disturbed during construction.
- 2 ▶ Current mapping only shows wetlands at two locations. At both of these locations, the
- 3 wetlands would be disturbed during construction.

4 **Dry Creek** crosses under the BNSF railroad near the Loveland Plaza Mobile Home Park. The
5 existing CBC is inadequate. This could be solved by adding several 96-inch RCP or replacing
6 the CBC with a larger structure. These improvements would have the following impacts to the
7 floodplain:

- 8 ▶ A larger structure or the added pipes could decrease ponding upstream of the railroad but
- 9 could increase the chance of flooding downstream of the railroad.
- 10 ▶ Natural vegetation around the drainage structures would be disturbed during construction.
- 11 ▶ Surrounding wetlands would be disturbed during construction.

12 **The Big Thompson River** crosses under the BNSF railroad approximately 1/3 of a mile south
13 of West 1st Street. The existing bridge is not overtopped and would be extended in kind. This
14 would have the following impacts to the floodplain:

- 15 ▶ There should be minimal or no changes to the floodplain limits. There may be local
- 16 changes due to extending the existing bridge, but this should not affect flooding upstream
- 17 or downstream of the structure.
- 18 ▶ Natural vegetation around the drainage structure would be disturbed during construction.
- 19 ▶ Surrounding wetlands would be disturbed during construction and could possibly be
- 20 destroyed due to the bridge extension.

21 **The Little Thompson River** crosses under the BNSF railroad approximately 1/3 of a mile
22 south of County Road 6c. The existing bridge is not overtopped and would be extended in
23 kind. This would have the following impacts to the floodplain:

- 24 ▶ There should be minimal or no changes to the floodplain limits. There could be local
- 25 changes due to extending the existing bridge, but this should not affect flooding upstream
- 26 or downstream of the structure.
- 27 ▶ Natural vegetation around the drainage structure would be disturbed during construction.
- 28 ▶ Surrounding wetlands would be disturbed during construction and could possibly be
- 29 destroyed due to the bridge extension.

30 **Spring Gulch** crosses under the BNSF railroad just south of 17th Avenue. The new commuter
31 rail would cross Spring Gulch again along SH 119. The existing pipe at the railroad is
32 inadequate. A larger structure is needed to pass the 100-year flows. At the new crossing, a
33 bridge is proposed as well. These improvements would have the following impacts to the
34 floodplain:

- 35 ▶ A larger structure at the railroad crossing and an adequately sized structure at the new
- 36 commuter rail crossing should maintain or improve the floodplains at these locations. There
- 37 could be a chance of increased flooding between these two bridges in Longmont, but this
- 38 area is only mapped to a Zone X level of detail currently.
- 39 ▶ Natural vegetation around the drainage structures would be disturbed during construction.

1 **The St. Vrain Creek** would cross under the proposed commuter rail approximately 1.5 miles
2 west of I-25 along SH 119. The proposed bridge would be very wide because of the wide,
3 shallow floodplain in this area. This improvement would have the following impacts to the
4 floodplain:

- 5 ▶ The new commuter rail bridge would be adjacent to the older SH 119 bridge. The SH 119
6 structure would have to be replaced to limit flooding at the new rail crossing.
- 7 ▶ Natural vegetation around the drainage structures would be disturbed during construction.
- 8 ▶ Surrounding wetlands would be disturbed during construction and destroyed due to the
9 new bridge.

10 **Idaho Creek** would cross under the proposed commuter rail approximately 0.66 miles west of
11 I-25 along SH 119. A wide bridge is proposed for this crossing as well, because the St. Vrain
12 floodplain encompasses Idaho Creek. This improvement would have the following impacts to
13 the floodplain:

- 14 ▶ Adding a bridge at the commuter rail crossing at the St. Vrain floodplain and at Idaho Creek
15 could change the floodplain upstream of SH 119. The current wide shallow floodplain may
16 split into two flows that join together again downstream of SH 119. More detailed study
17 would be needed in the future to determine the full extent of the changes to the floodplain.
18 There would probably not be an increase in the flooding downstream of the proposed
19 commuter rail due to the new bridges.
- 20 ▶ Natural vegetation around the drainage structures would be disturbed during construction.

21 **Little Dry Creek** would cross under the proposed commuter rail approximately 0.15 miles
22 south of Weld County Road 8 and 0.8 miles east of I-25. A new bridge is proposed at this
23 crossing. This would have the following impacts to the floodplain:

- 24 ▶ There should be minimal or no changes to the floodplain limits. There could be local
25 changes due to the new structure, but this should not affect flooding upstream or
26 downstream of the structure.
- 27 ▶ Natural vegetation around the drainage structures would be disturbed during construction.
- 28 ▶ Surrounding wetlands would be disturbed during construction and destroyed due to the
29 new bridge.

30 **Big Dry Creek** crosses under the UPRR approximately 0.5 miles north of SH 7 and 2.33 miles
31 east of I-25. The current bridge is not overtopped and it is recommended that this structure be
32 extended in kind. This would have the following impacts to the floodplain:

- 33 ▶ There should be minimal or no changes to the floodplain limits. There may be local
34 changes due to extending the existing structure, but this should not affect flooding
35 upstream or downstream of the structure.
- 36 ▶ Natural vegetation around the drainage structures would be disturbed during construction.
- 37 ▶ Surrounding wetlands would be disturbed during construction and destroyed due to the
38 new bridge.

39

1 **Second Creek** has floodplains with designation Zone A at the intersection of US 85 and East
2 136th Avenue. This is a location of a proposed queue jump for the commuter bus. Tapers and
3 a shoulder would be added to northbound US 85 turn and to eastbound 136th Avenue. This
4 would have the following impacts to the floodplain:

- 5 ▶ The additional pavement could increase flows and cause some local changes to the
6 floodplain limits.
- 7 ▶ Vegetation would be disturbed and destroyed during construction.

8 **First Creek** has floodplains with designation Zone A at the intersection of US 85 and East
9 104th Avenue. This is a location of a proposed queue jump for the commuter bus. Tapers and
10 a shoulder would be added to southbound US 85 and to westbound 104th Avenue. This would
11 have the following impacts to the floodplain:

- 12 ▶ The additional pavement could increase flows and cause some local changes to the
13 floodplain limits.
- 14 ▶ Vegetation would be disturbed and destroyed during construction.

15 **3.9.3.3 PACKAGE B**

16 Package B includes construction of tolled express lanes on I-25, and the implementation of
17 bus rapid transit service. This alternative is described in detail in **Chapter 2 Alternatives**.
18 **Table 3.9-1** summarizes the consequences of each component of Package B and provides a
19 comparison with Package A and the Preferred Alternative.

20 *Highway Components*

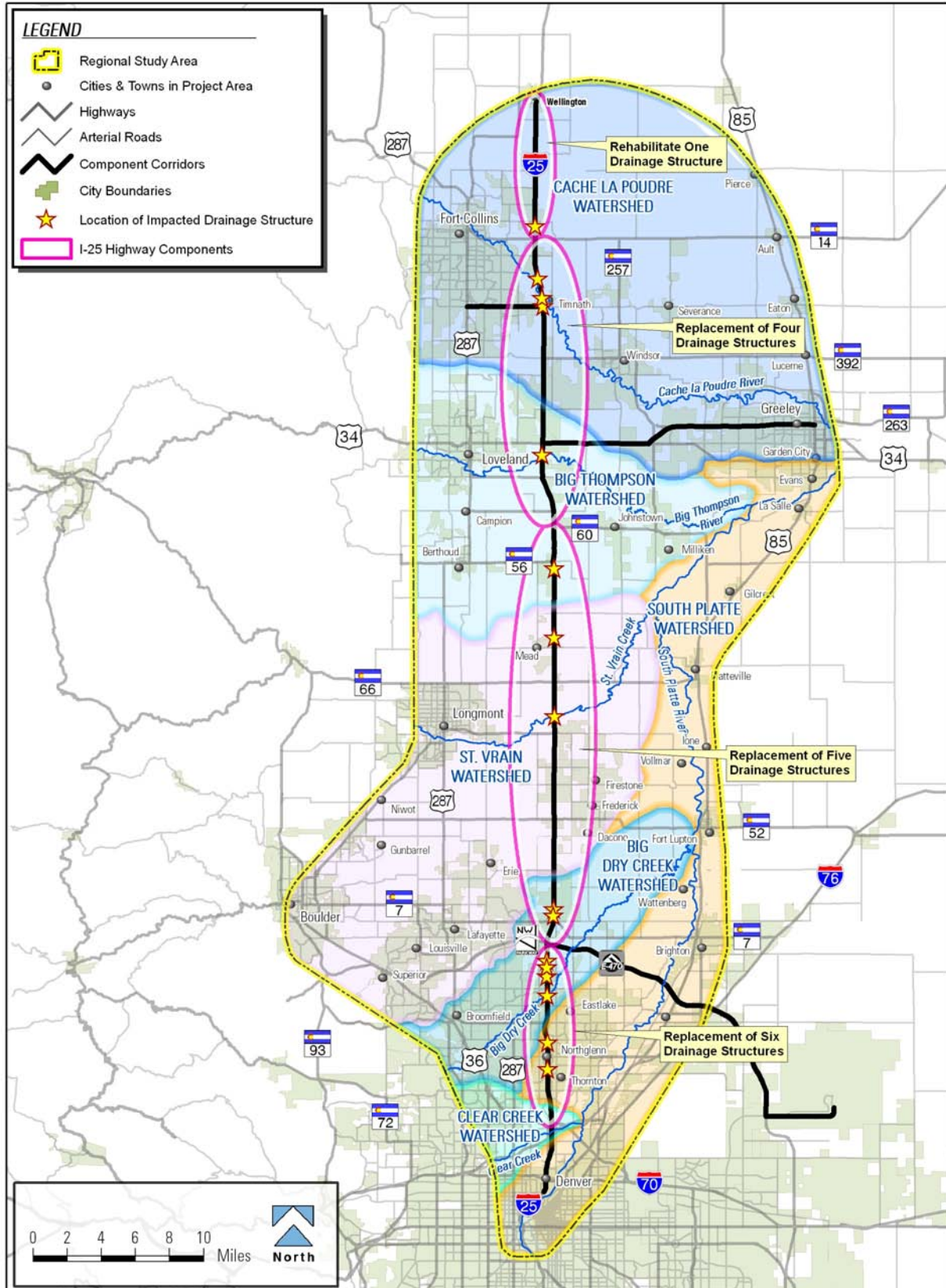
21 Package B highway components would impact floodplains. Most of the drainage crossings are
22 too small to pass the required flows under I-25 and would need to be replaced. In areas where
23 the structures are sufficient to pass the required flows, the increased width of I-25 would
24 necessitate their being lengthened. The specific component that would result in the greatest
25 encroachment on floodplains includes the tolled express lanes from SH 14 to SH 60
26 (6.0 acres). Areas along the bus routes would not require new drainage structures. Any
27 replacement or lengthening of a drainage structure, whether it is a bridge or a culvert, would
28 impact the floodplain. Specific consequences related to each Package B highway component
29 are shown on **Figure 3.9-4** and would be as follows:

- 30 ▶ Safety improvements involving floodplains from SH 1 to SH 14 would be limited to the
31 No-Action Alternative, which includes the rehabilitation of one drainage structure.
- 32 ▶ Tolled express lanes from SH 14 to SH 60 would encroach on to three floodplains and
33 would require the replacement of four major drainage structures.
- 34 ▶ Tolled express lanes from SH 60 to E-470 would involve widening that would encroach on
35 to four floodplains and require the replacement of five major drainage structures.
- 36 ▶ Tolled express lanes from E-470 to US 36 would involve widening that would encroach on
37 to five floodplains and require the replacement of six major drainage structures.

38 Floodplain impacts to the floodplains of Boxelder Creek, the Cache la Poudre River, the Big
39 Thompson River, the Little Thompson River, North Creek, St. Vrain Creek, and Little Dry
40 Creek would be slightly greater than those for Package A due to the wider highway section.

1 Figure 3.9-4 Package B Floodplain Impacts

2



1 **St. Vrain Creek** crosses under I-25 near mile post 242. The existing bridge would be replaced
2 with a new wider bridge to match the widening of I-25 in this area. This would have the
3 following impacts to the floodplain:

- 4 ▶ There should be minimal or no changes to the floodplain limits. There may be local
5 changes due to the widening of the bridge, but this should not affect flooding upstream or
6 downstream of the structure.
- 7 ▶ Natural vegetation surrounding the structure would be disturbed during construction.
- 8 ▶ Surrounding wetlands would be disturbed during construction and destroyed due to the
9 widening of the structure.

10 **The South Fork of Preble Creek** crosses under I-25 near mile post 229, flowing from west to
11 east. The existing CBC would be replaced with a larger CBC. This would have the following
12 floodplain impacts:

- 13 ▶ A larger structure might eliminate some of the spreading of the floodplain upstream of I-25.
14 Flooding could be increased downstream of I-25, however, due to the increased capacity of
15 the structure.
- 16 ▶ Natural vegetation surrounding the structure would be disturbed during construction.

17 **Mustang Run** crosses under I-25 near mile post 227, flowing from west to east. The existing
18 structure is an 18-inch corrugated metal pipe that would be replaced with a CBC. This would
19 have the following floodplain impacts:

- 20 ▶ A larger structure would probably reduce upstream ponding behind I-25. Immediately
21 downstream of the structure ponding could increase behind a levee at Bull Canal. It is
22 unlikely that flooding would increase downstream of the Bull Canal levee.
- 23 ▶ Natural vegetation surrounding the structure would be disturbed during construction.
- 24 ▶ Surrounding wetlands could be disturbed during construction.

25 **Shay Ditch** crosses under I-25 near mile post 227, flowing from west to east. The existing pipe
26 would be replaced with a CBC. This would have the following floodplain impacts:

- 27 ▶ Ponding upstream of I-25 would probably be reduced, but there could be an increased
28 chance of flooding downstream of I-25.
- 29 ▶ Natural vegetation surrounding the structure would be disturbed during construction.
- 30 ▶ Surrounding wetlands could be disturbed during construction.

31 **Big Dry Creek** crosses under I-25 near mile post 225, flowing from west to east. The existing
32 bridge would be replaced in kind and extended to match the widening of I-25. This would have
33 the following floodplain impacts:

- 34 ▶ There should be minimal or no changes to the floodplain limits. There could be local
35 changes due to extending the bridge, but this should not affect flooding upstream or
36 downstream of the structure.
- 37 ▶ Natural vegetation surrounding the structure would be disturbed during construction.
- 38 ▶ Surrounding wetlands would be disturbed during construction and destroyed due to the
39 extension of the bridge.

1 **Niver Creek** crosses under I-25 near mile post 219, flowing from west to east. The existing
2 CBC would be replaced and could be extended. This would have the following floodplain
3 impacts:

- 4 ▶ There should be minimal or no changes to the floodplain limits. There could be local
5 changes due to possibly extending the structure, but this should not affect flooding
6 upstream or downstream of the structure.
- 7 ▶ Natural vegetation surrounding the structure would be disturbed during construction.
- 8 ▶ Surrounding wetlands would be disturbed during construction and possibly destroyed due
9 to extending the CBC.

10 *Transit Components*

11 Package B transit components would not have a floodplain impact that would be in addition to
12 that described under highway components. None of the bus routes, bus stations, bus
13 maintenance facilities, or associated parking facilities would impact floodplains.

14 *Indirect Effects to Floodplains*

15 Improved structures at floodplain crossings can result in indirect effects to properties beyond
16 the regional study area. Improved crossings convey floodwaters more efficiently because
17 much of the original inadvertent detention caused by the highway embankment is removed.
18 Greater flows pass through the new structure and are conveyed through downstream areas.
19 These higher flows can cause increased flooding and potential damage to downstream
20 properties. It is CDOT's policy that new structures are to be sized to pass the upstream flows
21 through the highway right-of-way. The design flows are to be based on the current level of
22 development, and are not to assume that any inadvertent detention facilities will lower them.
23 Inadvertent detention facilities can include railroad embankments, irrigation canals, and ponds,
24 which might be removed in the future.

25 **3.9.3.4 PREFERRED ALTERNATIVE**

26 The Preferred Alternative includes construction of additional general purpose and auxiliary
27 lanes on I-25, and the implementation of commuter rail and bus service. This alternative is
28 described in detail in **Chapter 2 Alternatives. Table 3.9-1** summarizes the consequences to
29 floodplains of each component of Preferred Alternative and provides a comparison with
30 Package A and Package B floodplain impacts. The Preferred Alternative highway and transit
31 component are shown on **Figure 3.9-5**.

32 *Highway Components*

33 The Preferred Alternative highway components would impact floodplains. Most drainage
34 crossings are too small to pass the required flows under I-25 and would need to be replaced.
35 In areas where the structures are sufficient to pass the required flows, the increased width of
36 I-25 would necessitate their being lengthened.

37 Highway impacts to floodplains of Boxelder Creek, the Cache la Poudre River, the Big
38 Thompson River, the Little Thompson River, North Creek and the Little Dry Creek would be
39 very similar to the impacts described for Package A. The impacts may be slightly greater due
40 to a wider highway section.

1 Floodplain impacts to the St. Vrain Creek, South Fork of Preble Creek, Mustang Run, Shay
2 Ditch, Big Dry Creek, and Niver Creek would be very similar to the impacts described for
3 Package B. The impacts may vary slightly due to the changes in the highway sections.

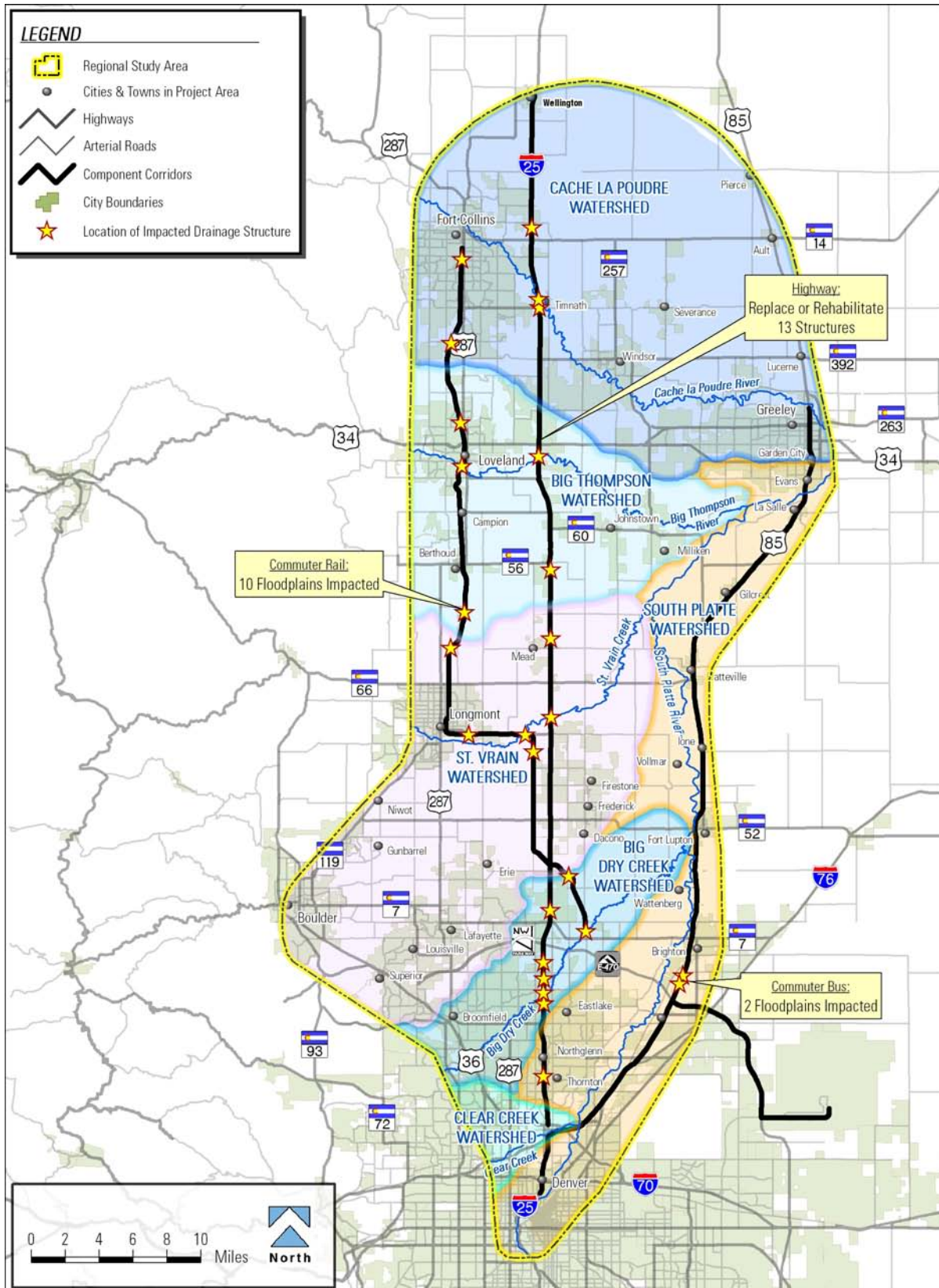
4 *Transit Components*

5 The Preferred Alternative transit components would impact floodplains where crossings occur
6 and where the commuter rail and commuter bus routes require widening that encroaches on to
7 floodplains. The commuter rail route from Fort Collins to Longmont would cross six floodplains
8 and the route from Longmont to North Metro would cross five floodplains. Commuter bus
9 service to DIA would cross four floodplains, but would not impact any of them. None of the bus
10 stations, bus and commuter rail maintenance facilities, rail stations, or associated parking
11 facilities would impact a floodplain.

12 Floodplain impacts to Spring Creek, Fossil Creek, Dry Creek, the Big Thompson River, the
13 Little Thompson River, Spring Gulch, St. Vrain Creek, Idaho Creek, Little Dry Creek, Big Dry
14 Creek, Second Creek, and First Creek would be similar to the impacts described in
15 Package A. Some areas will have less floodplain impacts than Package A due to commuter
16 rail being reduced to a single track in the Preferred Alternative.

17

1 Figure 3.9-5 Preferred Alternative Floodplain Impacts



3.9.4 Mitigation Measures

Impacts to floodplains would occur with bridge construction or where roadway fill would encroach onto the flood fringe areas. Mitigation measures that will be employed include:

- ▶ The 100-year FEMA design flows will be used for freeboard determinations, scour design, and to ensure that flow velocities are acceptable.
- ▶ The 500-year design flows will be used to further assess the scour design and set the depths of piles or caissons.
- ▶ The design will consider the maximum allowable backwater as allowed by FEMA.
- ▶ Degradation, aggregation, and scour are to be determined. Adequate counter measures will be selected using criteria established by the *National Cooperative Highway Research Program Report 568* (TRB, 2006)
- ▶ The design will be such that minimal disruption to the ecosystem will occur.
- ▶ The design will consider costs for construction and maintenance.
- ▶ A bridge deck drainage system that controls seepage at joints will be considered. If possible, bridge deck drains will be piped to a water quality feature before being discharged into a floodplain.
- ▶ The designs will comply with federal and state agencies. The designs will make every consideration towards local agency requirements and will be consistent with existing watershed and floodplain management programs.

Floodplain impacts would include increasing the sizes of bridges, culverts, and other drainage facilities in order to better convey floodwaters. In most cases, larger drainage structures would not disturb the existing low flow channel areas where riparian habitat is located. The overbanks adjacent to the low flow channels are generally expanded with the newer structures in order to pass the higher flows. Enlarged overbank areas are generally revegetated with a diverse planting in order to enhance the habitat.

Upstream flood risks should decrease with an enlarged drainage structure. Downstream flood risks can increase due to the improved conveyance of the stormwaters. It is CDOT policy to size a drainage structure based on FEMA flows, to obey the Natural Flow Rule of Colorado, and to hold others to the same standard (CDOT Drainage Design Manual, 2004, Sec.2.5.2 and 12.1.1). The standard flood for CDOT and FEMA is the 100-year flood. Impacts to downstream areas must be assessed at the time of preliminary and final design by using detailed hydraulic methods. All improvements are to follow the guidelines described in **Section 3.9.1**.

3.9.4.1 PACKAGE A

Boxelder Creek floodplains east of I-25 would be impacted. The following measures will be taken to mitigate floodplain impacts to the extent practicable:

- ▶ CDOT policy, which is to obey the Natural Flow Rule of Colorado and to hold others to the same standard (CDOT Drainage Design Manual, 2004, sec. 2.5.2 and 12.1.1), will be followed.

- 1 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
2 structural BMPs during each phase of construction to avoid potential pollutants from
3 entering state waters.
- 4 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
5 standards and specifications.
- 6 ▶ If wetlands are disturbed, the mitigation approach described in **Section 3.8 Wetlands** will
7 be followed.
- 8 ▶ SB 40 requirements will be met for applicable areas.

9 **Boxelder Creek** floodplains at I-25 would be impacted. The following measures will be taken
10 to mitigate floodplain impacts to the extent practicable:

- 11 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
12 structural BMPs during each phase of construction to avoid potential pollutants from
13 entering state waters.
- 14 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
15 standards and specifications.

16 **The Cache la Poudre** floodplains at I-25 would be impacted.

17 The following measures will be taken to mitigate floodplain impacts to the extent practicable:

- 18 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
19 structural BMPs during each phase of construction to avoid potential pollutants from
20 entering state waters.
- 21 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
22 standards and specifications.
- 23 ▶ Wetland mitigation will be conducted in accordance with the mitigation approach described
24 in **Section 3.8 Wetlands**.
- 25 ▶ SB 40 requirements will be met for applicable areas.

26 **The Cache la Poudre River** split flow floodplains at I-25 would be impacted. The following
27 measures will be taken to mitigate floodplain impacts to the extent practicable:

- 28 ▶ CDOT policy, which is to obey the Natural Flow Rule of Colorado and to hold others to the
29 same standard (CDOT Drainage Design Manual, 2004, sec. 2.5.2 and 12.1.1), will be
30 followed.
- 31 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
32 structural BMPs during each phase of construction to avoid potential pollutants from
33 entering state waters.
- 34 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
35 standards and specifications.
- 36 ▶ If wetlands are disturbed, the mitigation approach described in **Section 3.8 Wetlands** will
37 be followed.
- 38 ▶ SB 40 requirements will be met for applicable areas.

1 **The Big Thompson River** floodplains would be impacted at I-25. The following measures will
2 be taken to mitigate floodplain impacts to the extent practicable:

- 3 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
4 structural BMPs during each phase of construction to avoid potential pollutants from
5 entering state waters.
- 6 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
7 standards and specifications.
- 8 ▶ Wetland mitigation will be conducted in accordance with the mitigation approach described
9 in **Section 3.8 Wetlands**.
- 10 ▶ SB 40 requirements will be met for applicable areas.

11 **The Little Thompson River** floodplains would be impacted at I-25. The following measures
12 will be taken to mitigate floodplain impacts to the extent practicable:

- 13 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
14 structural BMPs during each phase of construction to avoid potential pollutants from
15 entering state waters.
- 16 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
17 standards and specifications.
- 18 ▶ Wetland mitigation will follow the approach described in **Section 3.8 Wetlands**.
- 19 ▶ SB 40 requirements will be met for applicable areas.

20 **North Creek** floodplains would be impacted at I-25. The following measures will be taken to
21 mitigate floodplain impacts to the extent practicable:

- 22 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
23 structural BMPs during each phase of construction to avoid potential pollutants from
24 entering state waters.
- 25 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
26 standards and specifications.
- 27 ▶ Wetland mitigation will follow the approach described in **Section 3.8 Wetlands**.
- 28 ▶ SB 40 requirements will be met for applicable areas.

29 **Spring Creek** floodplains would be impacted at the commuter rail corridor. The following
30 measures will be taken to mitigate floodplain impacts to the extent practicable:

- 31 ▶ CDOT policy, which is to obey the Natural Flow Rule of Colorado and to hold others to the
32 same standard (CDOT Drainage Design Manual, 2004, sec. 2.5.2 and 12.1.1), will be followed.
- 33 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
34 structural BMPs during each phase of construction to avoid potential pollutants from
35 entering state waters.
- 36 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
37 standards and specifications.
- 38 ▶ SB 40 requirements will be met for applicable areas.

1 **Fossil Creek** floodplains would be impacted at the commuter rail corridor. The following
2 measures will be taken to mitigate floodplain impacts to the extent practicable:

- 3 ▶ CDOT policy, which is to obey the Natural Flow Rule of Colorado and to hold others to the
4 same standard (CDOT Drainage Design Manual, 2004, sec. 2.5.2 and 12.1.1), will be
5 followed.
- 6 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
7 structural BMPs during each phase of construction to avoid potential pollutants from
8 entering state waters.
- 9 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
10 standards and specifications.
- 11 ▶ Wetland mitigation will follow the approach described in **Section 3.8 Wetlands**.
- 12 ▶ SB 40 requirements will be met for applicable areas.

13 **Dry Creek** floodplains would be impacted at the commuter rail corridor. The following
14 measures will be taken to mitigate floodplain impacts to the extent practicable:

- 15 ▶ CDOT policy, which is to obey the Natural Flow Rule of Colorado and to hold others to the
16 same standard (CDOT Drainage Design Manual, 2004, Section 2.5.2 and 12.1.1), will be
17 followed.
- 18 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
19 structural BMPs during each phase of construction to avoid potential pollutants from
20 entering state waters.
- 21 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
22 standards and specifications.
- 23 ▶ Wetland mitigation will follow the approach described in **Section 3.8 Wetlands**.
- 24 ▶ SB 40 requirements will be met for applicable areas.

25 **The Big Thompson River** floodplains would be impacted at the commuter rail corridor. The
26 following measures will be taken to mitigate floodplain impacts to the extent practicable:

- 27 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
28 structural BMPs during each phase of construction to avoid potential pollutants from
29 entering state waters.
- 30 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
31 standards and specifications.
- 32 ▶ Wetland mitigation will follow the approach described in **Section 3.8 Wetlands**.
- 33 ▶ SB 40 requirements will be met for applicable areas.

34 **The Little Thompson River** floodplains would be impacted at the commuter rail corridor. The
35 following measures will be taken to mitigate floodplain impacts to the extent practicable:

- 36 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
37 structural BMPs during each phase of construction to avoid potential pollutants from
38 entering state waters.

1 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
2 standards and specifications.

3 ▶ Wetland mitigation will follow the approach described in **Section 3.8 Wetlands**.

4 ▶ SB 40 requirements will be met for applicable areas.

5 **Spring Gulch** floodplains would be impacted at the commuter rail corridor. The following
6 measures will be taken to mitigate floodplain impacts to the extent practicable:

7 ▶ CDOT policy, which is to obey the Natural Flow Rule of Colorado and to hold others to the
8 same standard (CDOT Drainage Design Manual, 2004, sec. 2.5.2 and 12.1.1), will be
9 followed.

10 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
11 structural BMPs during each phase of construction to avoid potential pollutants from
12 entering state waters.

13 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
14 standards and specifications.

15 ▶ SB 40 requirements will be met for applicable areas.

16 **Idaho Creek** floodplains would be impacted at the commuter rail corridor. The following
17 measures will be taken to mitigate floodplain impacts to the extent practicable:

18 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
19 structural BMPs during each phase of construction to avoid potential pollutants from
20 entering state waters.

21 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
22 standards and specifications.

23 ▶ SB 40 requirements will be met for applicable areas.

24 **Little Dry Creek** floodplains would be impacted at the commuter rail corridor. The following
25 measures will be taken to mitigate floodplain impacts to the extent practicable:

26 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
27 structural BMPs during each phase of construction to avoid potential pollutants from
28 entering state waters.

29 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
30 standards and specifications.

31 ▶ Wetland mitigation will follow the approach described in **Section 3.8 Wetlands**.

32 ▶ SB 40 requirements will be met for applicable areas.

33 **Big Dry Creek** floodplains would be impacted at the commuter rail corridor. The following
34 measures will be taken to mitigate floodplain impacts to the extent practicable:

35 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
36 structural BMPs during each phase of construction to avoid potential pollutants from
37 entering state waters.

38 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
39 standards and specifications.

1 ▶ Wetland mitigation will follow the approach described in **Section 3.8 Wetlands**.

2 ▶ SB 40 requirements will be met for applicable areas.

3 **Second Creek** floodplains would be impacted at a commuter bus queue jump. The following
4 measures will be taken to mitigate floodplain impacts to the extent practicable:

5 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
6 structural BMPs during each phase of construction to avoid potential pollutants from
7 entering state waters.

8 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
9 standards and specifications.

10 ▶ SB 40 requirements will be met for applicable areas.

11 **First Creek** floodplains would be impacted at a commuter bus queue jump. The following
12 measures will be taken to mitigate floodplain impacts to the extent practicable:

13 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
14 structural BMPs during each phase of construction to avoid potential pollutants from
15 entering state waters.

16 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
17 standards and specifications.

18 ▶ SB 40 requirements will be met for applicable areas.

19 **3.9.4.2 PACKAGE B**

20 Floodplain impacts and mitigation measures to the floodplains of Boxelder Creek, the Cache
21 la Poudre River, the Big Thompson River, the Little Thompson River, North Creek, and Little
22 Dry Creek would be slightly greater than those for Package A because of the wider highway
23 section.

24 **The St. Vrain River** floodplains would be impacted at I-25. The following measures will be
25 taken to mitigate floodplain impacts to the extent practicable:

26 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
27 structural BMPs during each phase of construction to avoid potential pollutants from
28 entering state waters.

29 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
30 standards and specifications.

31 ▶ Wetland mitigation will follow the approach described in **Section 3.8 Wetlands**.

32 ▶ SB 40 requirements will be met for applicable areas.

33 **The South Fork of Preble Creek** floodplains would be impacted at I-25. The following
34 measures will be taken to mitigate floodplain impacts to the extent practicable:

35 ▶ The flows released downstream of I-25 will not be more than the present 100-year flows.
36 Downstream capacity should be designed for the present 100-year flow conditions
37 according to CDOT.

- 1 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
2 structural BMPs during each phase of construction to avoid potential pollutants from
3 entering state waters.
- 4 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
5 standards and specifications.
- 6 ▶ SB 40 requirements will be met for applicable areas.

7 **Mustang Run** floodplains would be impacted at I-25. The following measures will be taken to
8 mitigate floodplain impacts to the extent practicable:

- 9 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
10 structural BMPs during each phase of construction to avoid potential pollutants from
11 entering state waters.
- 12 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
13 standards and specifications.
- 14 ▶ If wetlands are disturbed, wetland mitigation will follow the approach described in
15 **Section 3.8 Wetlands**.
- 16 ▶ SB 40 requirements will be met for applicable areas.

17 **Shay Ditch** floodplains would be impacted at I-25. The following measures will be taken to
18 mitigate floodplain impacts to the extent practicable:

- 19 ▶ The flows released downstream of I-25 will not be more than the present 100-year flows.
20 Downstream capacity should be designed for the present 100-year flow conditions
21 according to CDOT.
- 22 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
23 structural BMPs during each phase of construction to avoid potential pollutants from
24 entering state waters.
- 25 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
26 standards and specifications.
- 27 ▶ If wetlands are disturbed, wetland mitigation will follow the approach described in
28 **Section 3.8 Wetlands**.
- 29 ▶ SB 40 requirements will be met for applicable areas.

30 **Big Dry Creek** floodplains would be impacted at I-25. The following measures will be taken to
31 mitigate floodplain impacts to the extent practicable:

- 32 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
33 structural BMPs during each phase of construction to avoid potential pollutants from
34 entering state waters.
- 35 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
36 standards and specifications.
- 37 ▶ Wetland mitigation will follow the approach described in **Section 3.8 Wetlands**.
- 38 ▶ SB 40 requirements will be met for applicable areas.

1 **Niver Creek** floodplains would be impacted at I-25. The following measures will be taken to
2 mitigate floodplain impacts to the extent practicable:

- 3 ▶ Sediment and erosion will be controlled by implementing appropriate structural and non-
4 structural BMPs during each phase of construction to avoid potential pollutants from
5 entering state waters.
- 6 ▶ Disturbed land will be seeded and re-vegetated in accordance with current CDOT
7 standards and specifications.
- 8 ▶ Wetland mitigation will follow the approach described in **Section 3.8 Wetlands**.
- 9 ▶ SB 40 requirements will be met for applicable areas.

10 **3.9.4.3 PREFERRED ALTERNATIVE**

11 Floodplain mitigation measures due to impacts from highway improvements to the floodplains
12 of Boxelder Creek, the Cache la Poudre River, the Big Thompson River, the Little Thompson
13 River, North Creek, and Little Dry Creek would be similar to those described for Package A
14 Floodplain mitigation measures due to impacts from transit improvements to the floodplains of
15 Spring Creek, Fossil Creek, Dry Creek, the Big Thompson River, the Little Thompson River,
16 Spring Gulch, Idaho Creek, the St. Vrain River, Little Dry Creek, Big Dry Creek, First Creek,
17 and Second Creek would be similar to those described in Package A.

18 Floodplain mitigation measured due to impacts from highway improvements to the floodplains
19 of the St. Vrain River, the South Fork of Preble Creek, Mustang Run, Shay Ditch, Big Dry
20 Creek, and Niver Creek would be similar to those described in Package B.

21 CDOT and the local agencies acknowledge that a comprehensive basin hydraulic model
22 reanalysis and appropriate map revisions would be necessary to determine the appropriate
23 sizing of various hydraulic structures throughout the complicated split flow reach of the Cache
24 la Poudre River at the I-25 crossing. Consequently, an appropriate mitigation measure would
25 be consideration for a comprehensive hydraulic model analysis to support the associated map
26 revisions and appropriate sizing of hydraulic structures across I-25 with implementation of the
27 Preferred Alternative.