

3.10 NATURAL RESOURCES

The Natural Resource Section includes four subsections: Section 3.10.1 discusses mineral resources and geological impacts, Section 3.10.2 discusses water resources impacts, Section 3.10.3 discusses wetlands and wetland impacts, and Section 3.10.4 discusses floodplain impacts.

3.10.1 Mineral Resources, Geology, and Soils

3.10.1.1 Introduction to Analysis

Summary of Results

Geologic features in the project study area would affect the engineering design for the Preferred Alternative. Geotechnical conditions present in the project study area that could substantiate a challenge to project construction include expansive and/or collapsible soils and bedrock that could lead to increased instability or erosion of excavated or altered slopes, and shallow groundwater. The potential for sinking over shallow abandoned coal mine workings at the proposed Flatiron and Downtown Louisville stations may be avoided by thorough identification of subsurface conditions and appropriately engineered project design.

No mineral extraction opportunities would be precluded with the implementation of the Preferred Alternative. With appropriate mitigation, none of the geological or soil conditions preclude the completion of the Preferred Alternative.

Projects associated with the No Action Alternative would be faced with the same geotechnical challenges as the Preferred Alternative.

Purpose

The success of construction projects depends on consideration of the conditions of the construction site. This is particularly true of the geologic conditions that would provide support for the new facility. Geologic resources are evaluated with a focus on their ability to withstand and support the project during construction and operations. This analysis identifies engineering mitigation measures to account for the anticipated geotechnical challenges found in the project study area.

3.10.1.2 Affected Environment

The project study area consists of broad mesas, linear ridges, and gently rolling hills interspersed with swales, ravines, and flat terrain. The underlying bedrock varies from thick silty shale to interbedded and lenticular sandstone, siltstone, claystone, shale, and lesser amounts of conglomerate. Depth to bedrock is variable, but areas of shallow bedrock are common across the project study area. The water table may occur in unconsolidated deposits or in bedrock. Groundwater seeps may occur in bedrock that is close to the ground surface. Depth to the water table is highly variable across the project study area, but it is generally shallow in the Louisville, Boulder, and Longmont sections.

Soils in the project study area are dominated by sandy loams and clay loams, locally with gravel or cobbles. Thin sandy deposits are common in significant drainages. Thicker sand and gravel deposits line major drainages and cap mesas across the area. Widely occurring

soil problems include moderate to high shrink-swell potential, high corrosivity to untreated steel, shallow bedrock, susceptibility to differential settlement, susceptibility to piping, and susceptibility to wind or water erosion. Some soils are affected by very shallow seasonal water tables and flooding.

Seismic risk in the project study area is consistent with the moderate seismic risk present in the Denver metropolitan area.

The risk of subsidence over shallow abandoned coal mines is limited to the western margin of the Broomfield and Louisville sections because the other areas are not undermined. Oil and gas resources are widely distributed in the Broomfield, Louisville, Boulder, and Longmont sections.

The State of Colorado recognizes separate ownership of surface estates and mineral estates, meaning that owners of mineral rights can exercise their option to develop mineral resources, even where the surface land is owned by others.

3.10.1.3 Impact Evaluation

Methodology

Geologic conditions were identified using existing information. This information was supplemented with field reconnaissance and by discussion with United States Department of Agriculture/Natural Resources Conservation Service staff regarding soil conditions. Impacts from the Preferred Alternative were then evaluated against the descriptions of the affected environment. This analysis of mineral resources, geology, and soils identified both potential impacts of the project on the resources, as well as the potential impacts of the geologic resources upon the project. In general, the proposed alignment is located in developed areas and impacts to geologic resources themselves are limited. Primarily, the geologic conditions present impacts on the project and must be accounted for in design and construction methods.

Results

No Action Alternative

Direct, Indirect, Temporary Construction, and Cumulative Impacts

It is anticipated that the roadway and transit projects included in the No Action Alternative would likely result in direct, indirect, temporary construction, and cumulative impacts to mineral resources. The location and severity of impacts resulting from these projects will be evaluated in the environmental documents being prepared for these projects.

Preferred Alternative

Direct Impacts

A number of geotechnical conditions exist within the study area. However, with the appropriate mitigation measures, none of the conditions preclude the implementation of the Preferred Alternative.

NWR Corridor Alignment

Geotechnical conditions present in the project study area that could substantiate a challenge to project construction include expansive and/or collapsible soils and shallow bedrock that could lead to increased instability, soil erosion, slumping and caving of excavated or altered slopes, and shallow groundwater. If unmitigated, the destructive effects of these factors may

increase over time and damage structure foundations. Seismic risk in the project study area is consistent with the moderate seismic risk present in the Denver metropolitan area. Since the project would follow an existing freight railroad alignment it would be unlikely to preclude future mineral resource extractions.

Proposed Stations

The potential for sinking over shallow abandoned coal mine workings at the proposed Flatiron and Downtown Louisville stations may be avoided using thorough identification of subsurface conditions and appropriately engineered project design. If unmitigated, the destructive effects of these factors may increase over time and damage structure foundations. Based on proposed station locations and fact that the resources present in the project study area are widely distributed, the stations would not preclude oil or gas extractions. Gravel and coal extractions at stations would be unlikely due to adjacent land uses.

Phase 1

Moderate seismic risks exist with the Denver metropolitan area, as do risks from substrate conditions, including high shrink-swell potential, high corrosivity, shallow bedrock, seasonally shallow groundwater, and susceptibility of surficial deposits to caving in excavations, differential settlement, and erosion. Potential impacts to mineral resources in Phase 1 would be the same as those described above under the Northwest Rail (NWR) Corridor Alignment and Proposed Stations section.

Indirect Impacts

The Preferred Alternative is not anticipated to block future extraction of oil and gas or other economic minerals in the project study area.

Temporary Construction Impacts

Temporary construction impacts would be the same as identified under the direct impacts. They are similar for all the sections and proposed station sites.

Cumulative Impacts

The Preferred Alternative is not anticipated to result in any cumulative impacts beyond what has been described under the direct impacts.

Avoidance and Minimization Measures

Efforts will be made during design and construction to avoid the shallow, abandoned coal mines in the Broomfield and Louisville sections to avoid the risk of sinking. Revisions to project design will be made, if needed, to minimize the impacts on mineral resources, geology, and soils.

3.10.1.4 Mitigation Measures

Mitigation techniques to reduce identified impacts to mineral resources, geology, and soils are described in Table 3.10-1.

TABLE 3.10-1. PROPOSED MITIGATION MEASURES - MINERAL RESOURCES, GEOLOGY, AND SOILS

Impact	Impact Type	Mitigation Measures
Slumping and caving of slopes and excavations	Construction	Engineering slope cuts for stability; shoring of slope cuts and shallow excavations; retaining walls; and dewatering systems where appropriate.
Erosion and soils instability	Construction	Engineering techniques such as drainage systems to direct surface water and runoff; slope design; covering slope during construction; use of engineered fill; and prompt and appropriate revegetation.
Damage to structure foundations	Construction	<ul style="list-style-type: none"> Mitigation of expansive bedrock, soil, and surficial materials with deep foundations into bedrock below perennial water table; specialized piers and footings; over-excavation with moisture treatment and compaction of backfill; engineered or imported fill; subsurface drainage systems; and surface water diversions. Mitigation of collapsible soils with shoring of excavations; retaining walls; drainage systems; excavation and engineered or imported fill; compaction; pre-construction flooding and/or loading; and use of geogrids or geotextiles. Mitigation of corrosive soils with coated and resistant steel and concrete; and drainage systems. Mitigation of shallow groundwater with engineered fills and dewatering systems.
Subsidence of ground surface over abandoned coal mine workings at the proposed Flatiron and Downtown Louisville stations	Construction	<ul style="list-style-type: none"> Identification of shallow subsurface voids. Engineering techniques such as grouting to fill shallow voids. Appropriate engineering of foundation and structure.
Seismic risk	Construction	Engineering and design to conform with anticipated probable maximum seismic event.

Source: NWR Corridor Project Team, 2009.

3.10.2 Water Sources (Supply and Conservation)

3.10.2.1 Introduction to Analysis

Summary of Results

The quality of existing surface water and groundwater in the project study area has been historically altered over time by development and associated increases in impervious surfaces and runoff. The Preferred Alternative, including construction of 11 proposed stations and the alignment from Denver Union Station (DUS) to Longmont, would result in an increase of approximately 92 acres in impervious surfaces compared to the existing condition of the project study area. The alignment would traverse 19 streams between DUS and Longmont.

Overall Preferred Alternative impacts are relatively small compared to the overall affects of the No Action Alternative, which includes continued urbanization and population growth within the project study area. Stormwater controls would be implemented throughout the

project study area to effectively mitigate water quality impacts due to increased impervious areas associated with the NWR Corridor project.

Potential permanent water quality impacts could occur due to increased impervious surfaces that increase runoff during storm events. The Driscoll Model evaluates whether runoff from a project would increase levels of a zinc and copper in receiving water to levels that could be toxic to aquatic life. The results indicated that an increase in copper and zinc in runoff would occur due to operation of the 11 proposed stations, but increases in these pollutants would be relatively small. Copper loads would only exceed the once-in-3-year acute criteria value in three stream segments. Zinc would not exceed the acute criteria in any stream segment. The acute criteria level is the most stringent of the United States Environmental Protection Agency (USEPA) criteria. Discharges from all proposed stations would be below the threshold effects level for both copper and zinc. While it is probable that the project could increase discharges of bacteria and organic compounds, the contributions would be negligible based on the predictions of the model. This impact is expected to be minor because runoff and water quality from the project would be mitigated according to local stormwater detention requirements.

There is the potential for temporary water quality impacts during construction due to an increase in erosion and subsequent sedimentation of nearby surface waters. This potential impact would be minimized by the implementation of a project-specific Stormwater Management Plan (SWMP). A SWMP is required by existing regulations and would specify the use of erosion and sediment control Best Management Practices (BMP) to minimize construction-related water quality impacts.

Groundwater dewatering would likely be required in several areas during construction. Groundwater in any of these areas would be treated prior to being discharged to a local storm sewer, as required by permit (Section 3.11, Hazardous Material). No other impacts to groundwater are anticipated.

It is anticipated that the roadway and transit projects included in the No Action Alternative would likely result in direct, indirect, temporary construction, and cumulative impacts to water resources. The location and severity of impacts resulting from these projects will be evaluated in the environmental documents being prepared for these projects.

Purpose

Surface water features are important indicators of the environmental health of the project study area and provide important habitats for wildlife. They are also used for domestic water supplies, agricultural water supplies, and recreational activities. Groundwater aquifers are also important because of their use for domestic and agricultural water supplies. In addition, water quality is a highly regulated resource under the Clean Water Act (CWA).¹ The Colorado Department of Health and Environment (CDPHE) is responsible for enforcing the CWA in the state.

¹ National Environmental Policy Act, Council on Environmental Quality Regulations, CWA, National Pollutant Discharge Elimination System (NPDES); Colorado Water Quality Control Act; CDPHE Regulation 31 The Basic Standards and Methodologies for Surface Water; CDPHE Regulation 38: Classification and Numeric Standards (CDPHE 2008c); CDPHE, Regulation 92: Section 303(D) List – Water-Quality-Limited Segments Requiring Total Maximum Daily Limits; CDPHE Regulation 94 – Colorado’s Monitoring and Evaluation List (CDPHE 2008d).

3.10.2.2 Affected Environment

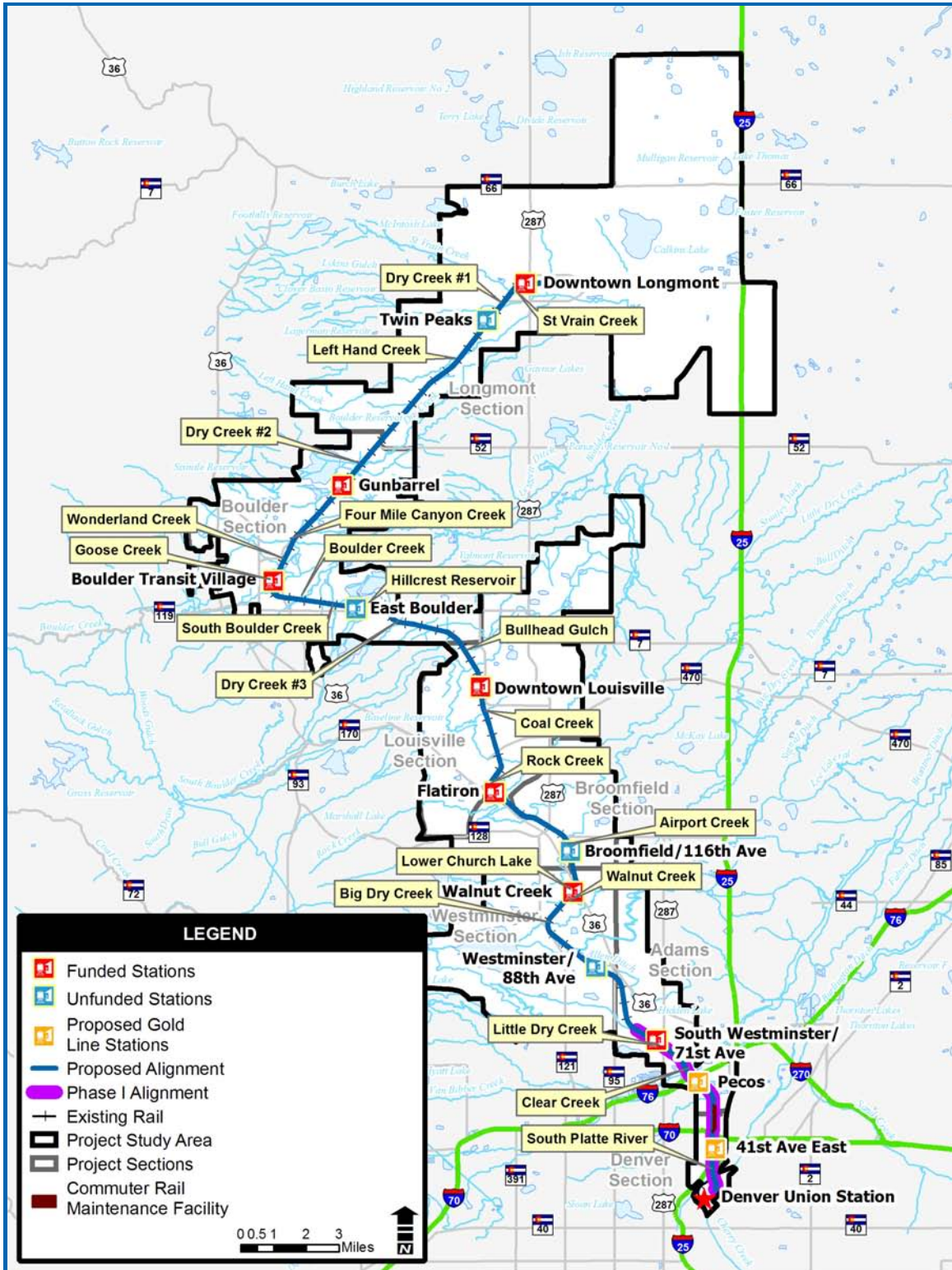
Surface Water and Water Quality

The study area for this analysis encompasses a 300-foot wide buffer on each side of the centerline of the existing rail alignment (600-foot wide total) and proposed station locations along approximately 41 linear miles of existing rail alignment.

The project study area is located in the South Platte River Basin (United States Geologic Survey 2009). Drainage from this basin flows in an east or northeast direction to the South Platte River. There are 19 creeks, two lakes, and numerous irrigation ditches within the study area (300 feet of the proposed alignment and proposed stations) (CDPHE 2009a). The creeks, lakes, and major irrigation ditches are shown on Figure 3.10-1. The Colorado Water Quality Commission (WQCC) has classified streams for various uses. Classifications are established for any state surface water, except water in ditches and other man-made conveyance structures. Although ditches are considered waters of the state, they are not classified and numeric water quality standards do not apply. In addition, the WQCC has developed a list of stream segments included in the CWA 303(d) list of impaired water for various physical, biological, inorganic, and metal contaminants. This information is included in Table 3.10-2. The creeks and lakes in the project study area, from south to north, are:

- South Platte River
- Clear Creek
- Little Dry Creek
- Big Dry Creek
- Walnut Creek
- Lower Church Lake
- Airport Creek
- Rock Creek
- Coal Creek
- Bullhead Gulch
- Dry Creek #3
- Hillcrest Reservoir
- South Boulder Creek
- Boulder Creek
- Goose Creek
- Wonderland Creek
- Fourmile Canyon Creek
- Dry Creek #2
- Left Hand Creek
- Dry Creek #1
- St. Vrain Creek

FIGURE 3.10-1. SURFACE WATER FEATURES IN THE PROJECT STUDY AREA



Sources: Colorado Department of Transportation (CDOT), 2006; Denver Regional Council of Governments (DRCOG), 2007-08; ESRI SDC, 2004; NWR Corridor Project Team, 2008-09.

TABLE 3.10-2. WATER QUALITY CLASSIFICATIONS OF SURFACE WATER ELEMENTS

Name	WB-ID ¹	Classifications (Attainment) ^{2,3}	Designation ⁴	303(d) List Impairment ⁵	303(d) List Priority ⁵
Denver Section					
South Platte River	COSPUS14_0600	Aq Life Warm 1 (FS) Recreation 1A (NS) Agriculture (FS) Water Supply (FS)	No designation (therefore subject to anti-degradation analysis)	<i>E. coli</i> (unknown)	Total Maximum Daily Load completed
Adams Section					
Clear Creek	COSPCL15_0700	Aq Life Warm 1 (NS) Recreation 1A (NS) Agriculture (FS) Water Supply (FS)	Use-protected	<i>E. coli</i> , Aquatic Life Use ⁶ , organic sediment (unknown)	High, Low
Little Dry Creek	COSPCL18b_0700	Aq Life Warm 2 (FS) Recreation 2 (FS) Agriculture (FS) Water Supply (FS)	Use-protected	Not listed	Not listed
Westminster Section					
Big Dry Creek	COSPB01_0600	Aq Life Warm 2 (NS) Recreation 1B (NS) Agriculture (FS)	Use-protected	<i>E. coli</i> , Selenium (unknown)	High, Low
Walnut Creek	COSPB01_0600	Aq Life Warm 2 (NS) Recreation 1B (NS) Agriculture (FS)	Use-protected	<i>E. coli</i> , Selenium (unknown)	High, Low
Broomfield Section					
Airport Creek	COSPB01_0600	Aq Life Warm 2 (NS) Recreation 1B (NS) Agriculture (FS)	Use-protected	<i>E. coli</i> , Selenium (unknown)	High, Low
Louisville Section					
Rock Creek	COSPBO08_0800	Aq Life Warm 2 (FS) Recreation 1A (FS) Agriculture (FS)	Use-protected	Not listed	Not listed
Coal Creek	COSPBO07b_0800	Aq Life Warm 2 (FS) Recreation 1A (NS) Agriculture (FS)	Use-protected	<i>E. coli</i> (unknown)	High

TABLE 3.10-2. WATER QUALITY CLASSIFICATIONS OF SURFACE WATER ELEMENTS

Name	WB-ID ¹	Classifications (Attainment) ^{2,3}	Designation ⁴	303(d) List Impairment ⁵	303(d) List Priority ⁵
Bullhead Gulch	COSPBO11_0800	Aq Life Warm 2 (FS) Recreation 1A (FS) Agriculture (FS) Water Supply (FS)	Use-protected	Not listed	Not listed
Boulder Section					
Dry Creek #3	COSPBO11_0800	Aq Life Warm 2 (FS) Recreation 1A (FS) Agriculture (FS) Water Supply (FS)	Use-protected	Not listed	Not listed
South Boulder Creek	COSPBO05_0800	Aq Life Warm 1 (FS) Recreation 1A (FS) Agriculture (FS) Water Supply (FS)	Use-protected	Not listed	Not listed
Boulder Creek	COSPBO02_0800	Aq Life Cold 1(FS) Recreation 1A (FS) Agriculture (FS) Water Supply (FS)	No designation (therefore subject to anti-degradation analysis)	<i>E. coli</i> (below 13 th only)	High
Goose Creek	COSPBO11_0800	Aq Life Warm 2 (FS) Recreation 1A (FS) Agriculture (FS) Water Supply (FS)	Use-protected	Not listed	Not listed
Wonderland Creek	COSPBO11_0800	Aq Life Warm 2 (FS) Recreation 1A (FS) Agriculture (FS) Water Supply (FS)	Use-protected	Not listed	Not listed
Fourmile Canyon Creek	COSPBO11_0800	Aq Life Warm 2 (FS) Recreation 1A (FS) Agriculture (FS) Water Supply (FS)	Use-protected	Not listed	Not listed
Dry Creek #2	COSPSV06_0800	Aq Life Warm 2 (NS) Recreation 1A (NS) Agriculture (FS)	Use-protected	<i>E. coli</i> , Selenium	High, Low

TABLE 3.10-2. WATER QUALITY CLASSIFICATIONS OF SURFACE WATER ELEMENTS

Name	WB-ID ¹	Classifications (Attainment) ^{2,3}	Designation ⁴	303(d) List Impairment ⁵	303(d) List Priority ⁵
Longmont Section					
Left Hand Creek	COSPSV05_0800	Aq Life Warm 2 (FS) Recreation 1A (FS) Agriculture Water Supply (FS)	Use-protected	Not listed	Not listed
Dry Creek #1	COSPSV06_0800	Aq Life Warm 2 (NS) Recreation 1A (NS) Agriculture (FS)	Use-protected	<i>E. coli</i> , Selenium	High, Low
St Vrain Creek	COSPSV03_0800	Aq Life Warm 1 (NS) Recreation 1A (II) Agriculture (FS)	Use-protected	Not listed	Not listed

Source: NWR Corridor Project Team, 2009.

Notes:

¹ WB-ID = Water Body Identification (CDPHE, 2009a)

WB-ID example: "COSP011" First four letters: CO = Colorado and SP = South Platte River Basin

Next two letters designate the WQCC Basin: CL = Clear Creek; BD = Big Dry; BO = Boulder Creek Basin; SV = St. Vrain; US=Upper South Platte River Basin.

The final numbers and occasionally a letter represent the WQCD Stream Segment.

² Classifications (CDPHE, 2009b)

Recreation 1A – Existing Primary Contact

Recreation 1B – Potential Primary Contact

Recreation 2 – Not suitable or intended to become suitable for primary contact recreation uses

Agriculture – Suitable or intended to become suitable for irrigation of crops and as drinking water for livestock.

Domestic Water Supply – Suitable or intended to become suitable for potable water supplies

Aq Life Cold 1: Class 1 – Cold Water Aquatic Life

Aq Life Warm 1: Class 1 – Warm Water Aquatic Life

Aq Life Warm 2: Class 2 – Cold and Warm Water Aquatic Life

³ The Attainment categories are as follows (Source CDPHE, 2008a):

- FS= Fully Supporting
- NS = Not Supporting
- II = Insufficient Information

⁴ Designation documents the antidegradation polices for the state waters to maintain existing water quality conditions (Source CDPHE 2008c):

Use Protected - the quality of these waters may be altered so long as applicable use-based water quality classifications and standards are met

No Designation -undesignated waters subject to antidegradation review requirements before any new or increased water quality impacts are allowed.

⁵ Source CDPHE 2008b

⁶ Aquatic Life Use – Fish Consumption Advisories (FCA) are issued by CDPHE in instances where analysis of fish tissue samples provides documentation of a public health risk.

Issuance of a FCA indicates impairment due to "Aquatic Life Use" (CDPHE, 2008b).

E. coli = *Escherichia coli*

The project study area would traverse approximately nine Municipal Separate Storm Sewer System (MS4) permittees, including City and County of Denver, City of Westminster, Adams County, City and County of Broomfield, City of Louisville, Colorado Department of Transportation, City of Boulder, Boulder County, and City of Longmont. The MS4 permit holders convey runoff directly to state waters and therefore are responsible for water quality and maintenance of their system under CDPHE.

Groundwater

There are two main aquifers in the project study area (Robson and Banta 2005), the South Platte River surficial aquifer and the Denver Basin aquifer system (Figure 3.10-2). The shallow South Platte River aquifer is associated with the major streams in the project study area. The surficial aquifer generally ranges between 20 and 100 feet below ground surface. The Denver Basin aquifer system consists of four separate aquifers and lies beneath the southern portion of the project study area. These aquifers are up to 2,000 feet in depth. There is no principal aquifer beneath the northern portion of the project study area (Robson and Banta 2005). The regional groundwater flow is generally to the east/northeast towards the South Platte River.

A total of 181 water wells were mapped within the project study area (Table 3.10-3) (Colorado Department of Water Resources [DWR] 2009). Approximately half of the wells are used for domestic supply with the remaining wells divided evenly between other uses. The well records do not indicate whether these wells are still in use. This determination would need to be made as the project enters the final design process, because active wells may need to be relocated. In addition to the supply wells listed below, there are a variety of monitoring wells associated with contaminated properties throughout the project study area.

TABLE 3.10-3. WATER WELLS WITHIN THE PROJECT STUDY AREA

Section	Well Type					
	Commercial	Domestic	Industrial	Irrigation	Municipal	Other
Denver ²	0	0	0	1	0	18
Adams	0	4	1	3	5	0
Westminster	0	31	0	2	0	0
Broomfield	4	5	1	0	0	0
Louisville	0	6	0	0	3	3
Boulder	8	57 ¹	2	3	1	5
Longmont	0	15	0	0	1	2
Total	12	118	4	9	10	28

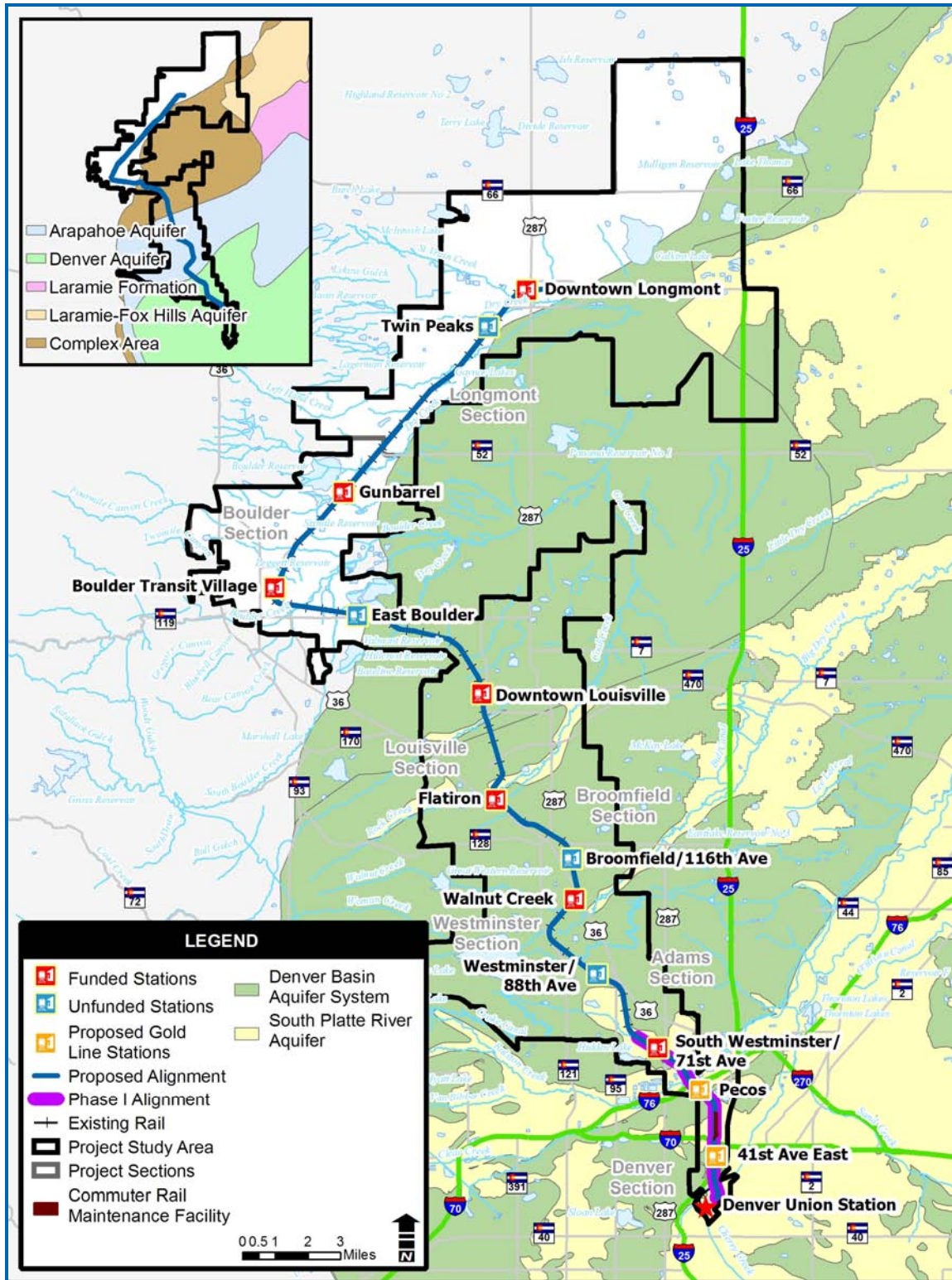
Source: DWR, 2009.

Notes:

¹ Six of these wells are for household use only.

² Information on the Denver Section is pulled from the Gold Line Final EIS and the breakdown of well types was categorized differently.

FIGURE 3.10-2. SOUTH PLATTE RIVER SURFICIAL AQUIFER AND THE DENVER BASIN AQUIFER SYSTEM



Sources: CDOT, 2006; DRCOG, 2007-08; ESRI SDC, 2004; NWR Corridor Project Team, 2008-09.

3.10.2.3 Impact Evaluation

Methodology

Surface Water and Water Quality

Annual pollutant mass loading from runoff from the proposed parking and station facilities was evaluated using the Driscoll Model for existing and projected conditions. Driscoll Modeling was completed for the 2035 condition, which is assumed as the worst case scenario. The Driscoll Model is based on a Probabilistic Dilution Model under the USEPA National Urban Runoff Program that specifically addresses pollutant runoff resulting from traffic. Rainfall statistics, statistics for runoff water quality concentrations, and stream flow data were used to develop probabilities of stream concentrations. The model analyzes copper and zinc, two metals that are the best indicators of pollution runoff. These elements are considered to be surrogates for all contaminants of concern including bacteria (*Escherichia coli* [*E. Coli*] and fecal coliform), organic sediments, oil and grease, etc. The procedure compares the once-in-3-year concentrations of zinc and copper to an acutely toxic value that is specified at this frequency by USEPA criteria. From these probabilities, stream concentrations were identified that would likely exceed standards once every 3 years. These were then compared to the USEPA's 3-year recurrence toxic criteria values for aquatic life (USEPA acute criteria), or similar state criteria, to evaluate impacts.

Groundwater

Potential impacts to groundwater hydrology are discussed in terms of impervious surfaces and shallow groundwater. Impacts of the Preferred Alternative were evaluated in the context of: 1) interference with groundwater recharge for net deficit in aquifer volume or lowering of local groundwater elevations; 2) substantial excavation below grade resulting in the need for dewatering and discharge of a substantial quantity of groundwater; and 3) the need to abandon or replace any monitoring or supply wells.

Results

No Action Alternative

The No Action Alternative assumes that existing and committed improvements, as defined in Chapter 2.0, Alternatives Considered, would be implemented by others as planned.

Direct, Indirect, Temporary Construction, and Cumulative Impacts

It is anticipated that the roadway and transit projects included in the No Action Alternative would likely result in direct, indirect, temporary construction, and cumulative impacts to water resources. The location and severity of impacts resulting from these projects will be evaluated in the environmental documents being prepared for these projects.

Preferred Alternative

Direct Impacts

NWR Corridor Alignment

Surface Water and Water Quality

The proposed alignment between the South Westminster/71st Avenue Station and Longmont would traverse 16 stream features and would be adjacent to two surface water features. The runoff from the rail structures along the proposed alignment would be collected and brought to the stormwater system through under-drains and discharged to local storm drainage systems. Direct impacts resulting in a potential decrease in the water quality would be primarily due to the construction of an additional commuter rail track and improvements to the existing track. In its current state, the proposed alignment serves as a freight line for the

BNSF Railway Company. In its proposed state, the proposed alignment would serve both freight and commuter rail vehicles. In general, use would not change with the exception of the proposed stations. The erosion that would occur would be retained by temporary or permanent sediment basins or traps that would be constructed along the proposed alignment. This would act as treatment to the sediment-laden water generated by construction. The existing amount of impervious area would slightly increase due to new structures (estimated at 1 acre).²

Groundwater

The overall use of the project study area would remain the same after the NWR Corridor project is in place and, therefore, no additional groundwater contamination threats would exist. Groundwater may be encountered during construction near the crossings of the 16 streams or along two other surface water features and groundwater dewatering may be required. If any of these areas are contaminated, groundwater would be treated prior to being discharged to local storm sewers, as required by regulation, under a special permit. Project construction could directly impact water supply, and groundwater monitoring wells. If wells are in use, they would be replaced and, if not in use, wells would be abandoned per state regulations.

Proposed Stations

Surface Water and Water Quality

To quantify the impact of runoff from the proposed stations on local surface waters, mass loading calculations by use of Driscoll Modeling was completed for each station using the 2035 station design. New impervious area is one input to the Driscoll Modeling. The existing amount of impervious area would increase due to asphalt paving at the station sites (estimated at 69 acres).³ The Driscoll Model is a probabilistic dilution model developed and applied in the USEPA's Nationwide Urban Runoff Program, and reviewed and approved by USEPA's Science Advisory Board. It permits the user to compute the magnitude and frequency of occurrence of in-stream pollutant concentrations under the variable and intermittent discharges that are produced by stormwater runoff. The model represents a broad range of site conditions that can be applied to sites throughout the United States. The model represents the median site or average site condition which may or may not contain BMPs. The Driscoll Model is a very general model not intended to analyze specifics within each individual site. With BMPs in place at each proposed station, one could expect water quality conditions would improve depending on the efficiency of removal of the BMP for each pollutant.

With the exception of Rock Creek and St. Vrain Creek, the model indicated that an increase in copper and zinc runoff to receiving streams would occur. Copper loads are relatively small and would only exceed the once-in-3-year acute criteria value in two cases (Little Dry Creek from Westminster/88th Avenue Station and Walnut Creek Station from Broomfield/116th Avenue Station) (Table 3.10-4). The acute criteria is defined by the USEPA as the desired concentration of runoff from the analyzed facilities that would have no adverse

² This is calculated based on the total acreage estimates of each station (2035), assuming 0.4 mile of aerial structure.

³ This is calculated based on the total acreage estimates of each station (2035), assuming an average of 90 percent impervious.

effects on the most sensitive of the species used in the bioassays. However, the loading in all discharges is below the threshold effects level, which is defined as the mortality of the most sensitive individual of the most sensitive species. With the effective implementation of BMPs, the impacts are not expected to result in any negative impacts on water quality. Based on these results, the project would cause a negligible increase in discharges of bacteria and organic compounds to existing and proposed storm sewers in the project study area. Therefore, the project is not expected to measurably contribute to the levels of contaminants of concern such as *E. coli* and selenium.

TABLE 3.10-4. DRISCOLL MODELING RESULTS: ANNUAL MASS LOAD – PROPOSED STATIONS

Station	Receiving Stream	Copper (pounds per year)		Zinc (pounds per year)	
		Existing ¹	Preferred Alternative ¹	Existing ¹	Preferred Alternative ¹
South Westminster/71 st Avenue	Station included in Phase 1.				
Westminster/88 th Avenue	Little Dry Creek	1.4	1.5	8.5	9.2
Walnut Creek	Big Dry Creek	0.4	0.5	2.6	3.3
Broomfield/116 th Avenue	Walnut Creek	0.5	0.8	3.1	5.0
Flatiron	Rock Creek	0.7	0.7	4.4	4.4
Downtown Louisville	Coal Creek	0.4	1.0	2.4	5.8
East Boulder	South Boulder Creek	0.9	1.0	5.4	6.3
Boulder Transit Village	Boulder Creek	0.4	0.5	2.5	3.2
Gunbarrel	Dry Creek (No. 2)	0.3	0.5	1.5	2.6
Twin Peaks	Left Hand Creek	0.4	0.6	2.2	3.4
Downtown Longmont	St. Vrain Creek	1.3	1.3	7.8	7.7

Source: NWR Corridor Project Team, 2009.

Notes:

¹ Rounded to the tenth.

Assumes that drainage conditions in 2035 would represent the worst-case scenario.

Groundwater

There is a potential that groundwater would be encountered during the construction of six stations (Walnut Creek, Flatiron, East Boulder, Boulder Transit Village, Gunbarrel, and the Downtown Longmont) due to close proximity to surface water features. Impacts would be addressed similarly to those described above under the NWR Corridor Alignment section.

Phase 1

Surface Water and Water Quality

The alignment between DUS and the South Westminster/71st Avenue Station would cross three surface water features: the South Platte River, Clear Creek and Little Dry Creek. Implementation of the alignment would add 7.65 acres of new impervious surface. The runoff from the rail structures along the proposed alignment would be collected and brought

to the stormwater system through under-drains, and discharged to the local storm drainage system.

Copper loads are relatively small and would exceed the once-in-3-year acute criteria at Little Dry Creek from the South Westminster/71st Avenue Station (Table 3.10-5); however, all values are below the threshold effects level. All zinc loads would be below the once-in-3-year acute criteria at the South Westminster/71st Avenue Station. Additional information on the Driscoll Model is included above under the Proposed Stations section.

TABLE 3.10-5. DRISCOLL MODELING RESULTS: ANNUAL MASS LOAD – PHASE 1

Station	Receiving Stream	Copper (pounds per year)		Zinc (pounds per year)	
		Existing ¹	Preferred Alternative ¹	Existing ¹	Preferred Alternative ¹
South Westminster/71 st Avenue	Little Dry Creek	1.0	1.5	6.0	9.0

Source: NWR Corridor Project Team, 2009.

Notes:

¹ Rounded to the tenth.

Assumes that drainage conditions in 2035 would represent the worst-case scenario.

The South Westminster/71st Avenue Station would add approximately 14 acres of impervious surfaces.⁴

Groundwater

There is a potential that groundwater would be encountered during the construction near the South Platte River, Clear Creek, and Little Dry Creek. Impacts would be addressed similarly to those described above under the NWR Corridor Alignment section.

Indirect Impacts

Completion of the project may stimulate some new development near the proposed stations. The change from vegetated ground cover to impervious roads, parking lots, and buildings would increase stormwater runoff as well as decrease water quality. It is assumed that through traditional land development and local stormwater regulations, this increased runoff would be detained in local and regional permanent water quality detention and retention ponds. If these BMPs are not implemented, then increased channelization and poor water quality could result from future development. The continued channelization would reduce the time it takes peak flows to reach the major creeks. A reduction in peak times results in higher peak flows and increased flood risk along the major creeks. If implemented properly, the permanent BMPs would mitigate all impacts due to water quantity and water quality.

Any hazardous materials stored for the NWR Corridor project would be covered under a Spill Prevention, Control, and Countermeasure (SPCC) plan and would describe the means of collection and treatment of runoff during and after a hazardous waste spill. The storage of hazardous materials would adhere to all local, state, and federal regulations.

⁴ This is calculated based on the total acreage estimates of each station (2035), assuming an average of 90 percent impervious

Temporary Construction Impacts

Increased erosion is a likely temporary construction impact. The construction of the Preferred Alternative would result in temporary erosion and sedimentation impacts to the streams traversed by the corridor alignment and at station locations. It is anticipated that the alignment would be built in phases; thereby, limiting the amount of disturbed acres at one time. A SWMP would be implemented to minimize these impacts.

It is estimated that a total of 580 acres would be temporarily disturbed during the construction of the Preferred Alternative. Approximately 460 acres would be impacted during the construction NWR Corridor Alignment, 73 acres would be impacted during the construction of the Proposed Stations, and 47 acres would be impacted during the construction of Phase 1.

During construction of all stream crossings, there is a potential for some temporary destruction of riparian vegetation. With proper BMPs and erosion control devices in place, the destruction of riparian vegetation would be limited as much as possible to only allow for the construction of the proposed stream crossings. Upon completion of the project, the Regional Transportation District (RTD) would be responsible to reestablish the native riparian vegetation in the impacted areas.

With BMPs and erosion control devices properly in place, water quality would not change during the construction processes. Temporary BMPs for water quality include erosion control devices such as silt fence, check dams, temporary sediment traps and basins, erosion logs, different varieties of inlet protection, and rip rap have proven to be effective at controlling sedimentation and erosion during construction. The BMPs and erosion control devices would treat stormwater runoff from the impacted areas. Water quality detention basins would be one of the most effective BMPs used during the construction processes. This BMP has a high efficiency of removing sediment and suspended solids from runoff and controlling the stormwater discharge into local surface waters. BMPs and erosion control devices would require periodic maintenance by RTD to remove sediment and accumulation of debris.

Temporary construction impacts would occur during the demolition of the existing buildings in the project study area. A SWMP would be developed and would use BMPs and erosion control devices to capture sediment and properly dispose of captured materials, in conformance with National Pollutant Discharge Elimination System (NPDES) permit requirements.

With BMPs and erosion control devices properly in place, the water quality would not change during demolition or construction processes. The BMPs and erosion control devices would treat stormwater runoff from the impacted areas. BMPs and erosion control devices would require periodic maintenance by RTD or the general construction contractor to remove sediment and accumulation of debris.

Cumulative Impacts

The construction of the Preferred Alternative would be consistent with existing land uses, but the amount of impervious surfaces would increase. However, regionally, the implementation of all of the FasTracks projects would have a small affect on the amount of new impervious surfaces, compared to the amount of new impervious surfaces needed to accommodate the 2035 population. As the population increases between 2005 and 2035, the amount of impervious area would increase by approximately 3,300 acres, assuming an average density of 10 people per acre and 40 percent impervious surfaces (Federal Highway Administration

2007). As stated in the 2007 RTD *Programmatic Cumulative Effects Analysis* (PCEA), given current stormwater control requirements, water quality is not anticipated to degrade below existing conditions and may improve as water quality control measures are updated, with or without the FasTracks projects (RTD 2007).

In addition, development density is expected to increase around proposed stations, reducing the amount of urban sprawl and preserving more natural pervious surfaces, resulting in a qualitative benefit to water quality.

Avoidance and Minimization Measures

In most instances, the construction activities would avoid in-stream construction of bridge piers. BMPs would be used at all excavations to contain erosion and minimize potential water quality impacts

3.10.2.4 Mitigation Measures

Mitigation techniques to reduce identified impacts to water resources are described in Table 3.10-6.

TABLE 3.10-6. PROPOSED MITIGATION MEASURES - WATER RESOURCES

Impact	Impact Type	Mitigation Measures
Destruction of Riparian Vegetation	Construction	<ul style="list-style-type: none"> • Temporary BMPs for construction, including reestablishment of native vegetation.
Contaminated Groundwater	Construction	<ul style="list-style-type: none"> • Dewatered water will be discharged to the storm sewer in accordance with discharge permits.
Groundwater	Construction/ Operations	<ul style="list-style-type: none"> • Discharge into nearby storm sewer in accordance with local discharge permits.
Water Quality	Construction/ Operations	<ul style="list-style-type: none"> • Water detention ponds at all proposed stations. • Temporary BMPs such as silt fences, erosion log barriers, and temporary check dams during construction. • SPCC Plan, if required. • Compliance with RTD MS4 requirements as well as Adams County, Boulder County, City of Boulder, City and County of Broomfield, City and County of Denver, City of Longmont, City of Louisville, City of Westminster and Colorado Department of Transportation (CDOT) MS4 requirements, where appropriate. During project construction within CDOT right of way, the CDOT Water Quality Consent Decree, which was issued to CDOT by Colorado Department of Public Health and Environment (effective, January 2009) will need to be complied with. • Permanent BMPs such as water quality detention basins and rip rap. • Non-Structural BMPs such as parking lot sweeping, use of vegetative buffers, spill containment measures, and minimizing disturbed areas by project construction phasing. • Temporary and permanent BMP maintenance.

TABLE 3.10-6. PROPOSED MITIGATION MEASURES - WATER RESOURCES

Impact	Impact Type	Mitigation Measures
Increased Run-off/Impervious Surfaces	Construction/ Operations	<ul style="list-style-type: none"> • Onsite detention basins at each station in accordance with local requirements. This may benefit some areas that currently have no stormwater controls. • Permanent BMPs including, if necessary, flow attenuation devices and/or detention basins and rip rap.
Erosion and Stormwater Discharge	Construction/ Operations	<ul style="list-style-type: none"> • CWA Section 402 NPDES Permits, including a stormwater construction permit, in accordance with all local and state regulations and dewatering permits. • Stormwater BMPs. • Project-specific temporary and permanent water quality plans. • Project-specific SWMPs.
Increases in Mass Loading (Copper and Zinc)	Operations	<ul style="list-style-type: none"> • Construction of onsite detention basins for water quality at all stations in accordance with municipal and state regulations and parking areas designed to minimize directly connected impervious surfaces.
Acquisition of Supply Wells	Construction/ Operations	<ul style="list-style-type: none"> • Operations monitoring and supply wells will be protected or replaced in the same or similar location depending on the site conditions. • Non-operational monitoring and supply wells will be abandoned in accordance with state requirements.

Source: NWR Corridor Project Team, 2009.

3.10.3 Wetlands and Other Waters of the United States

3.10.3.1 Introduction to Analysis

Summary of Results

The Preferred Alternative would result in the direct, permanent impact of 6.15 acres (3.35 jurisdictional [J] and 2.80 non jurisdictional [NJ]) of wetlands in the project study area. In addition, the project would result in direct permanent impact to 1.25 acres (0.78 J and 0.47 NJ) of other water features. Therefore, the Preferred Alternative would have a permanent impact on 4.13 J acres of wetlands and other waters of the United States. Construction of the Preferred Alternative would result in temporary impacts to 0.69 J acre of wetlands and other waters of the United States. The United States Army Corps of Engineers (USACE) Section 404 permitting process requires the consideration of all jurisdictional wetlands and other water features impacted, including temporary impacts due to construction. The USACE considers a total of 4.82 J acres of wetlands and other water features to be impacted by the Preferred Alternative.

Phase 1 of the Preferred Alternative would have permanent, direct impact on a total of 0.11 J acre of wetlands and other water features. A total of 0.11 J acre of temporary impacts to other water features would also result for Phase 1 of the Preferred Alternative for a total of 0.22 J acre of impact. Phase 1 was permitted separately from the alignment and stations, and required a Nationwide Permit from the USACE, which was obtained on 1 April 2010. An Individual Permit would be required for the remaining alignment and station portion of the project, per Section 404 of the CWA.

The roadway and transit projects included in the No Action Alternative would likely result in direct, indirect, temporary construction, and cumulative impacts to wetlands and other water features. Impacts associated with the No Action Alternative will be addressed in the environmental documentation prepared for the individual projects as they are funded. If necessary, appropriate permits will be obtained for these projects.

Purpose

Wetlands are defined by the USACE (33 Code of Federal Regulations [CFR] 328.3, 1986) and the USEPA (40 CFR 230.3, 1980) and wetlands are closely regulated as important resources. The protection of these areas is critical for maintaining the physical, chemical, and biological integrity of the waters within the United States. Many wetlands and other aquatic features are considered "Waters of the US" by the USACE, and these features are protected under Section 404 of the CWA.

The purpose of this analysis is to identify and formally delineate all wetlands and other water features that occur in the project study area. Designs are then assessed for their ability to avoid the resource completely, minimize impacts, or as a last resort, mitigate the impacts. This document utilizes relevant information from the *Wetlands and Other Waters of the United States Technical Memorandum for the Northwest Rail Corridor* (URS 2010).

Agency Coordination

Table 3.10-7 identifies the key milestones and coordination between RTD and USACE.

TABLE 3.10-7. SUMMARY OF USACE COORDINATION MEETINGS AND KEY MILESTONES

Date	Meeting/Milestone Description
June 22, 2007	NWR Corridor Project initiation
October 30, 2007	Review EMU and DMU technology evaluation
February 12, 2008	Identify appropriate Jurisdictional Determination process
February 25, 2008	Review Purpose and Need, project study area, and RTD Environmental Evaluation outline
May 14, 2008	Review sample Jurisdictional Determination
November 13, 2008	Received USACE Jurisdictional Determination for surveyed wetlands and other water features
January 13, 2009	Review alternatives screening
February 13, 2009	Review first draft of the Section 404(b)(1) Evaluation which covered the Purpose and Need, project study area, and alternatives considered
September 25, 2009	Review draft of NWR Environmental Evaluation and Section 404(b)(1) Evaluation
October 15, 2009	Comments on draft NWR Environmental Evaluation and Section 404(b)(1) Evaluation
October 29, 2009	Comments Meeting for NWR Environmental Evaluation documents
November 3, 2009	Comments Meeting for Appendix A - Section 404(b)(1) Showing
January 28, 2010	Comments Meeting for draft Wetlands Technical Memorandum

Source: NWR Corridor Project Team, 2009.

Notes:

DMU = Diesel Multiple Unit

EMU = Electric Multiple Unit

3.10.3.2 Affected Environment

For purposes of this analysis, the project study area for wetlands/other water features encompasses a 300-foot wide buffer on each side of the centerline of the existing rail alignment (600-foot wide total) and proposed station locations along approximately 41 linear miles of existing rail alignment. For wetlands and other water features, the project study area also includes all areas within 100 feet of any proposed station or other constructed transportation facility. Along State Highway 119 (Boulder and Longmont sections), a narrower buffer has been implemented, extending from the northwest side of the proposed alignment to the northeast bound road lane, as the Preferred Alternative would not cross the highway.

Impacts associated with the Preferred Alternative are separated into three components, the sum of which makes up the total project impacts.

1. **NWR Corridor Alignment** – Impacts that would result from construction of the track alignment north of the South Westminster/71st Avenue Station to Longmont.
2. **Proposed Stations** – Impacts that would result from construction of the proposed station platforms and associated park-n-Rides. Both funded and unfunded stations are included in the impact analysis. Impacts associated with the South Westminster/71st Avenue Station are included in Phase 1, because this station would be constructed as part of Phase 1.

3. **Phase 1** – Impacts that would result from construction of the track alignment between DUS and the South Westminster/71st Avenue Station. Phase 1 would be constructed first, as part of RTD’s Eagle P3 project.

Data Collection and Field Surveys

Wetlands and other water features were formally delineated within the project study area using the protocol outlined in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). The project study area was formally surveyed in spring 2006 and reassessed in March and April 2008. Surveys were performed driving and/or walking the length of the proposed alignment to identify, evaluate, and delineate any wetlands and other water features.

The wetlands were classified into three groups, including palustrine emergent (PEM), palustrine scrub/shrub (PSS), and PEM/PSS combination. PEM, PSS, and PEM/PSS represent different wetland types depending on their location, type of vegetation, etc. PEM is typically characterized by cattail, bulrushes, and sedges. PSS typically includes wetlands found adjacent to water sources characterized by shrubs such as willow.

On November 13, 2008 a formal jurisdictional determination was issued by the USACE for waters of the US (including wetlands) within the project study area.

Wetland Functions

In response to a decision by the USACE on May 28, 2009, a new wetland functional assessment was applied to wetlands in the project study area using the Functional Assessment of Colorado Wetlands (FACWet) Methodology (Johnson, et al. 2009). The method was approved for general use beginning on June 9, 2009 and is primarily designed to address the regulatory community’s need for functional assessment in administration of the CWA in Colorado.

The wetlands in the study area were assessed using the FACWet Method. Through discussions with the USACE and RTD staff, it was decided that FACWet would only be applied to those wetlands impacted by the project. Additionally, it was agreed that in order to streamline the assessment, only the most prominent wetlands in the study area would be assessed individually and all other wetlands would be placed into groups for a collective assessment. This approach is outlined in the *Draft Approach to Applying FACWet for Northwest Rail* (AlpineEco 2009) and summarized below.

A total of 11 wetlands were assessed individually. All of the individually assessed wetlands fall into the Functioning or Functionally Impaired categories. The relatively low scores are primarily a result of the wetlands being situated in or near highly developed areas. Even if the immediately surrounding land is somewhat undeveloped (e.g. Dry Creek, Coal Creek, and Left Hand Creek), all of the sites have been adversely affected by the large urban centers situated upstream and by historical disturbances from agricultural, commercial, industrial, residential, and/or transportation corridor development (including the railroad).

The wetland with the highest overall functional capacity index score is Lower Church Lake. Although this wetland is not “natural” and has been created in uplands with irrigation water, it is a pond that retains the characteristics of the intended wetland type. This wetland received very high scores (greater than 0.75) for support of aquatic habitat, food chain support,

nutrient/toxicant removal, and sediment retention/shoreline stabilization. These scores are mostly a result of the site having good water distribution, intact geomorphology, and good vegetative structure and complexity.

All of the other individually assessed wetlands are associated with natural drainages and received similar scores, except those in highly urbanized areas like Clear Creek and Little Dry Creek, which scored substantially lower. Of the drainages in less urbanized areas, Dry Creek scored the highest and received high ratings (greater than or equal to 0.75) for fish and aquatic habitat, flood attenuation, water storage, nutrient/toxicant removal, and production export/food chain support. These scores are mostly the result of the site having a good buffer capability (relatively undeveloped Habitat Connectivity Envelope [HCE]); good water source, distribution, and outflow; and relatively good vegetative structure and complexity.

Although there are 10 possible wetland groups, only four are applicable to the study area: Developed Stormwater (DSW), Developed Irrigated (DI), Developed Riverine (DR), and Undeveloped Irrigated (UI). A total of 61 wetlands were assessed in these groups. All of the wetland groups had relatively low scores. Two of the wetland groups fall into the Functionally Impaired category (DR and UI) and two fall into the Non-Functioning category (DSW and DI). The low scores are a result of the generally disturbed and urban nature of the area and/or the mostly managed and manipulated primary water sources.

The UI group scored the highest, primarily as a result of its generally undeveloped HCE leaving more historical wetlands intact, providing fewer dispersal barriers, increased buffer capacity, and having less input of toxicants. The DR group generally scored better than the DSW and DI groups because these wetlands have a more natural source of hydrology with more intact geomorphology and more vegetation structure and complexity.

Generally, all of the wetland groups had low scores for hydrology. This is either because of the developed nature of the surrounding area (DSW, DI, and DR) or as a result of having a fully managed water regime (UI). This corresponds to generally low scores for aquatic habitat, flood attenuation, water storage, nutrient/toxicant removal, and production export/food chain support.

All of the groups had generally low scores for wildlife habitat. This is mostly a result of the presence of contaminated water, managed/manipulated flows, and/or the presence of exotic plants. Most of the sites in the four groups are dominated by non-native wetland vegetation and are missing vegetation zones that would likely be present in reference wetlands. This translates to poor scores for wildlife habitat and sediment retention/shoreline stabilization.

Field Survey Results

Results of the field surveys are presented by project section in the text below. Tables 3.10-8, 3.10-9 and 3.10-10 are included below providing a summary of acres of wetlands, other water features, and riparian buffers surveyed. More detailed information on wetlands can be found in the *Wetlands and Other Waters of the United States Technical Memorandum for the Northwest Rail Corridor* (URS 2010).

TABLE 3.10-8. SUMMARY OF WETLANDS WITHIN THE STUDY AREA

Study Area Section	PEM Total (acres)	PEM Jurisdictional (acres)	PEM/PSS Total (acres)	PEM/PSS Jurisdictional (acres)	Total (acres)	Total Jurisdictional (acres)
Denver	-	-	<0.01	<0.01	<0.01	<0.01
Adams	0.90	0.64	4.20	3.55	5.10	4.19
Westminster	4.55	2.55	1.41	1.31	5.96	3.86
Broomfield	2.70	0.96	1.33	1.19	4.03	2.15
Louisville	1.49	0.61	0.21	0.13	1.70	0.74
Boulder	6.34	5.03	13.89	10.49	20.23	15.52
Longmont	0.12	0.04	1.46	0.88	1.58	0.92
Subtotal	16.10	9.83	22.50	17.55	38.60	27.38

Source: NWR Corridor Project Team, 2009.

Note: Discrepancies in summing may occur due to rounding; however, acreage totals have been verified.

¹Wetland type is based on Cowardin et al. (1979).

<-Less than

TABLE 3.10-9. SUMMARY OF OTHER WATER FEATURES WITHIN THE STUDY AREA

Study Area Section	Streams Total (acres)	Streams Jurisdictional (acres)	Ponds Total (acres)	Ponds Jurisdictional (acres)	Total (acres)	Total Jurisdictional (acres)
Denver	0.35	0.27	-	-	0.35	0.27
Adams	3.84	3.80	5.26	3.56	9.10	7.35
Westminster	1.14	1.08	6.53	-	7.67	1.08
Broomfield	0.64	0.60	-	-	0.64	0.6
Louisville	1.05	0.81	2.46	1.63	3.51	2.44
Boulder	5.53	4.31	3.54	3.38	9.07	7.69
Longmont	1.88	1.46	-	-	1.88	1.46
Subtotal	14.43	12.33	17.79	8.57	32.22	20.89

Source: NWR Corridor Project Team, 2009.

Note: Discrepancies in summing may occur due to rounding, but are less than 0.01 acre.

TABLE 3.10-10. SUMMARY OF RIPARIAN BUFFERS WITHIN THE STUDY AREA

Feature ID	Feature Name	Total (acres)
Denver		
OW 3-1	South Platte River	0.25
Subtotal		0.25
Adams		
OW 7	Clear Creek	1.26
OW 11	Little Dry Creek	5.03
Subtotal		6.29
Louisville		
OW 44	Rock Creek	0.57
OW 52	Coal Creek	3.05
Subtotal		3.62
Boulder		
OW 57	Davidson Ditch Lateral	1.24
OW 59	Marshallville Ditch	0.25
OW 2-3, OW 4-2, OW 5-1, OW 6-1	Boulder and Whiterock Ditch	6.71
OW 4-1	Fourmile Canyon Creek	1.10
OW 85	South Boulder Creek	0.85
OW 89	Dry Creek	1.29
Subtotal		11.44
Longmont		
OW 17-1	Lefthand Creek	2.98
OW 22-1	St. Vrain River	1.20
Subtotal		4.18
Total		25.78

Source: NWR Corridor Project Team, 2009.

Denver Section

There is less than 0.01 J acre of wetlands and 0.35 acre (0.27 J and 0.08 NJ) of other water features in the Denver Section (refer to Tables 3.10-8, 3.10-9, and 3.10-10). The most prominent of these wetlands are discussed below.

Note: normally we only include the scientific name of plants the first time the common name is used.

South Platte River: Although the wetlands are small fringe wetlands in an urban setting, they have been included in this discussion because they are associated with the largest waterway in the region. The wetlands along the South Platte River are PEM/PSS and are mostly dominated by sandbar willow (*Salix interior*), Emory's sedge (*Carex emoryi*), reed canarygrass (*Phalaris arundinacea*), creeping spikerush (*Eleocharis palustris*), and western

goldentop (*Euthamia occidentalis*). The riparian corridor along the South Platte River is an important element in system function. The wetlands provide limited sediment/nutrient/toxicant removal, bank stabilization, and limited wildlife habitat, flood flow attenuation, and recreation/education potential.

Adams Section

A total of 5.10 acres (4.19 J and 0.91 NJ) of wetlands and 9.10 acres (7.35 J and 1.75 NJ) of other water features are present in the Adams Section (refer to Tables 3.10-8, 3.10-9, and 3.10-10). The most prominent of these are discussed below.

Clear Creek: The wetlands along Clear Creek at the railroad crossing are classified as PEM/PSS. The wetlands are dominated by crack willow (*Salix fragilis*), sandbar willow (*Salix interior*), Emory's sedge (*Carex emoryi*), reed canarygrass (*Phalaris arundinacea*), common teasel (*Dipsacus fullonum*), and common reed (*Phragmites australis*). These wetlands cover much of the Clear Creek floodplain, and provide wildlife habitat, general aquatic habitat, bank stabilization, flood attenuation, and production export/food chain support.

Little Dry Creek and its tributary, Hidden Creek: Little Dry Creek and Hidden Creek parallel the railroad for more than 1 mile with portions of the creeks channelized along the rail embankment. Plant communities change along the reach, but are comprised of PEM wetlands (60 percent) with pockets of PSS (40 percent). Much of the narrow floodplain has been reengineered for flood control. Most of the wetlands are located immediately abutting the channel; however, in some areas, large shrubs wetlands have formed that are separated from the channel by the rail line. These wetlands are primarily fringes surrounding a large retention pond with subsurface connectivity to Clear Creek. The wetlands are dominated by Emory's sedge (*Carex emoryi*), reed canarygrass (*Phalaris arundinacea*), soft-stem bulrush (*Scirpus validus*), creeping spikerush (*Eleocharis palustris*), creeping bentgrass (*Agrostis stolonifera*), and sandbar willow (*Salix interior*). These wetlands provide sediment/nutrient/toxicant/removal, bank stabilization, aquatic and wildlife habitat, sediment removal, flood attenuation, production export/food chain support, and recreation/education potential.

Westminster Section

A total of 5.96 acres (3.86 J and 2.1 NJ) of wetlands and 7.67 acres (1.08 J and 6.59 NJ) of other water features are present in the Westminster Section (refer to Tables 3.10-8, 3.10-9 and Table 3.10-10). The most prominent of these are discussed below.

Wadsworth Wetlands and Big Dry Creek: Portions of these wetlands are a defined downstream element of the Wadsworth Wetland complex, a wetland corridor that originates at the dam face of Standley Lake and eventually flows into Big Dry Creek



Big Dry Creek

(a water of the US). Other portions of the wetlands are generally dominated by broadleaf cattail (*Typha latifolia*), narrowleaf cattail (*Typha angustifolia*), and sandbar willow (*Salix interior*). A wide floodplain exists around Big Dry Creek, collecting and filtering stormwater runoff from the surrounding developments, including runoff sustaining some wetlands. The wetlands in the complex provide water quality improvement, flood attenuation, wildlife habitat, short-term water storage, and groundwater recharge.

Lower Church Lake: Lower Church Lake is located just southwest of the intersection of US 36 and the railway. It is a terminal feature that was created from water diverted via Clear Creek through Church Ditch. The lake appears to be sustained by stormwater from the surrounding areas. It is fringed with 100 percent PEM wetlands. The wetlands are dominated by reed canarygrass (*Phalaris arundinacea*), soft-stem bulrush (*Scirpus validus*), broadleaf cattail (*Typha latifolia*), and narrowleaf cattail (*Typha angustifolia*). The wetlands provide water quality improvement, bank stabilization, aquatic and wildlife habitat, groundwater recharge, and recreation/education potential. The Lower Church Lake wetlands are considered non-jurisdictional by the USACE due to isolation from any water of the US.

No riparian buffers were identified within the Westminster Section.

Broomfield Section

A total of 4.03 acres (2.15 J and 1.88 NJ) of wetlands and 0.64 acre (0.60 J and 0.04 NJ) of other water features are present in the Broomfield Section (refer to Tables 3.10-8, 3.10-9 and Table 3.10-1). The most prominent of these are discussed below.

East Tributary of Rock Creek: The Rock Creek East Tributary wetlands include those wetlands located just south of the existing track near the Interlocken commercial development (east of the mainstem of Rock Creek). The wetlands in this area are classified as PEM/PSS. These wetlands are dominated by broadleaf cattail (*Typha latifolia*), narrowleaf cattail (*Typha angustifolia*), Baltic rush (*Juncus balticus*), reed canarygrass (*Phalaris arundinacea*), and sandbar willow (*Salix interior*). They provide some limited wildlife habitat, sediment /nutrient/toxicant removal, short and long-term water storage, sediment and shoreline stabilization, and groundwater discharge.



Un-named tributary to Rock Creek

No riparian buffers were identified in the Broomfield Section.

Louisville Section

A total of 1.70 acres (0.74 J and 0.96 NJ) of wetlands and 3.51 acres (2.44 J and 1.07 NJ) of other water features are present in the Louisville Section (refer to Tables 3.10-8, 3.10-9, and 3.10-10). The Coal Creek wetland is discussed below.

Coal Creek: Coal Creek crosses the existing railroad and contains wetlands classified as 100 percent PEM. The wetlands are mostly dominated by redbtop (*Agrostis gigantea*), creeping bentgrass (*Agrostis stolonifera*), timothy (*Phleum pratense*), and quackgrass (*Agropyron repens*). These wetlands provide general wildlife habitat, general aquatic habitat, sediment/nutrient/toxicant removal, bank stabilization, production export/food chain support, flood attenuation, and recreation potential due to the proximity to Louisville Community Park and the regional Coal Creek Trail.

Boulder Section

A total of 20.23 acres (15.52 J and 4.71 NJ) of wetlands and 9.07 acres (7.69 J and 1.38 NJ) of other water features are present in the Boulder Section. (refer to Tables 3.10-8, 3.10-9, and 3.10-10). These are discussed below.

New Dry Creek: New Dry Creek contains several wetlands within its established floodplain. These wetlands are classified as predominantly PEM (80 percent) with a PSS component (20 percent). Wetlands abutting New Dry Creek are dominated by broadleaf cattail (*Typha latifolia*), reed canarygrass (*Phalaris arundinacea*), threesquare (*Schoenoplectus pungens*), creeping spikerush (*Eleocharis palustris*), slender rush (*Juncus tenuis*), and sandbar willow (*Salix interior*). These wetlands provide general wildlife habitat, sediment/nutrient/toxicant removal, bank stabilization, production export/food chain support, and flood attenuation.

South Boulder Creek Area: The wetlands in the South Boulder Creek area along the railroad classified as PEM. The wetlands are generally dominated by Emory's sedge (*Carex emoryi*), woolly sedge (*Carex pellita*), reed canarygrass (*Phalaris arundinacea*), and sandbar willow (*Salix interior*). These wetlands provide general wildlife habitat, sediment /nutrient/toxicant removal, bank stabilization, flood attenuation, long and short term water storage, production export/food chain support, groundwater discharge/recharge, and recreation/education potential.



Dry Creek

Dry Creek: Dry Creek connects to both South Boulder Creek and two small private ponds via the Flat Iron Channel. This wetland area is classified as predominantly PEM/PSS with sandbar willow prevalent. The complex rated highly in improvement of general wildlife habitat, sediment/nutrient/toxicant removal, bank

stabilization, flood attenuation, long and short term water storage, and groundwater discharge/recharge.

Boulder Creek Area: Boulder Creek wetlands are classified as predominantly PEM (85 percent) and PSS (15 percent). Most of these wetlands are diverse, and dominated by Emory's sedge (*Carex emoryi*), dame's rocket (*Hesperis matronalis*), poison hemlock (*Conium maculatum*), reed canarygrass (*Phalaris arundinacea*), creeping bentgrass (*Agrostis stolonifera*), and sandbar willow (*Salix interior*). The Boulder Creek wetlands provide general wildlife habitat, sediment /nutrient/toxicant removal, bank stabilization, flood flow attenuation, and recreation/education potential.

Fourmile Canyon Creek Area: The Fourmile Canyon Creek Area includes those wetlands and other water features along and near Fourmile Canyon Creek in Boulder County and the Boulder and Whiterock Ditch. These wetlands are classified as mostly PEM (60 percent) with some substantial areas of PSS (40 percent). Most of the creek-bank within the project study area is comprised of a high quality riparian overstory. The wetland vegetation that occurs within the floodplain is very diverse. The wetland is dominated by woolly sedge (*Carex pellita*), Nebraska sedge (*Carex nebrascensis*), Emory's sedge (*Carex emoryi*), reed canarygrass (*Phalaris arundinacea*), broadleaf cattail (*Typha latifolia*), cloaked bulrush (*Scirpus pallidus*), Kentucky bluegrass (*Poa pratensis*), aquatic speedwell (*Veronica americana*), watercress (*Nasturtium officinale*), and sandbar willow (*Salix interior*). The wetlands provide general wildlife habitat, water quality improvement, bank stabilization, production export/food chain support, and flood attenuation. A recreation trail along the area, and the observance of frequent use of the trail, gives the area a high rating for recreation activities and educational potential.

Dry Creek/Boulder and Whiterock Ditch: Dry Creek contains several wetlands within its greater floodplain classified as PEM. The wetlands are dominated by broadleaf cattail (*Typha latifolia*), reed canarygrass (*Phalaris arundinacea*), three-square (*Schoenoplectus pungens*), slender rush (*Juncus tenuis*), and sandbar willow (*Salix interior*). These wetlands provide general wildlife habitat, sediment /nutrient/toxicant/ removal, bank stabilization, and flood attenuation.

Associated with Dry Creek is the Boulder and Whiterock Ditch near where the ditch flows from the Boulder Reservoir. At this location is an associated wetland that has good flood attenuation, wildlife habitat, sediment/shoreline stabilization, and long-term surface water storage.

Longmont Section

A total of 1.58 acres (0.92 J and 0.66 NJ) of wetlands and 1.88



Left Hand Creek

acres (1.46 J and 0.42 NJ) of other water features are present in the Longmont Section (refer to Tables 3.10-8, 3.10-9, 3.10-10). These are discussed below.

Left Hand Creek: The vegetative community associated with Left Hand Creek in the project study area is primarily riparian. The area contains a well established and diverse overstory. There are well-vegetated terraces downstream of the railroad bridge, which aid in the attenuation of high flow events. Due to entrenchment and loose, sandy soils, Left Hand Creek contains only a few wetlands within its floodplain. These are 100 percent PEM, consisting mostly of reed canarygrass (*Phalaris arundinacea*), with small amounts of other wetland species. The Left Hand Creek wetland has good flood attenuation, wildlife habitat, and sediment/shoreline stabilization.

St. Vrain River Wetland: The proposed project crosses the St. Vrain River in two places within the project study area. In both places, the river not only contains wetlands, but a well established riparian overstory. The channels through the floodplain downstream of the railroad bridge have created numerous heterogeneous habitats of 50 percent PEM/50 percent PSS within the project study area. Wetlands within the project study area are dominated by crack willow (*Salix fragilis*), sandbar willow (*Salix interior*), Emory's sedge (*Carex emoryi*), and reed canarygrass (*Phalaris arundinacea*). The St. Vrain River provides good general wildlife habitat, fish habitat, flood attenuation, long and short term surface water storage, and production export/food chain support, among others. Also, the area has good recreation/educational potential due to the presence of a pedestrian bridge over the river within the project study area, and a bicycle path that follows the river along the northeast bank.

3.10.3.3 Impact Evaluation

The ability of a wetland to perform functions such as groundwater recharge, flood flow attenuation, erosion control, or to provide wildlife habitat for state-listed, federal-listed, and endangered species, may be altered or destroyed from construction activities resulting in disturbance. Wetland vegetation holds and improves soils and preserves or improves water quality by removing pollutants and dissipating flow energy.

Impacts to wetlands may include temporary construction impacts due to construction traffic, storage or spills of chemicals; and permanent impacts, such as earthwork, bridge shadowing, introduction of noxious weed species, or increased surface impermeability.

Loss of wetland vegetation may reduce habitat for wildlife including the organisms that comprise the base of the food web. Exposed bare soils may provide opportunities for noxious weed introduction or the soil may erode, resulting in a decreased ability of wetland vegetation to reestablish.

When impervious surface area increases within a watershed, runoff from seasonal storm events generally results in higher storm flows and lower base flows within a drainage. Groundwater recharge in an area may also be reduced. Coupled with the loss of vegetation, higher flows may result in increased erosion and bank scour. In areas of loose soils, resulting sedimentation may contribute to lower dissolved oxygen levels, reducing water quality and habitat for aquatic species.

Methodology

Impacts to wetlands and other water features were assessed both quantitatively and qualitatively. Impacts were determined in Geographic Information Systems by using an “intersect” function between design and construction layouts based on the engineering plans, and the wetlands and other water features. Acreages were divided into impacts for the rail alignment, stations, and Phase 1 for each wetland and other water features. Given the preliminary level of design available, impacts are conservative estimates. Station impacts were calculated using the station footprint with all impacts within the station footprint considered permanent for this analysis. The discussion of impacts for Phase 1 includes the portion of track from DUS to the South Westminster/71st Avenue Station (approximately Bradburn Boulevard) and the South Westminster/71st Avenue Station footprint.

Permanent Impacts

Permanent impacts (direct and indirect) include those wetlands and other water features that would be destroyed or would have their function permanently altered as a result of the NWR Corridor project.

Temporary Construction Impacts

Temporary impacts are defined as those that cause temporary modification of wetland functions. These impacts are associated with construction activities, such as in temporary use areas and construction access roads, and would be relatively minor and localized. In assessing station construction, it was assumed that temporary impacts would be contained within the footprint of the station and therefore be considered part of the permanent impact of the station.

Cumulative Impacts

Cumulative impacts are defined under the National Environmental Policy Act (NEPA) as impacts resulting from incremental impacts of the project added to past, present, or reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. RTD's 2007 PCEA was used as a primary reference source in the development of cumulative effects for the project study area. The PCEA document is included in Appendix B.

Additional Impacts to City of Boulder Open Space Wetlands

The City of Boulder has unique requirements for mitigation of impacted wetlands within their jurisdiction. Therefore, wetland impacts were also calculated for:

- Open space lands within the City of Boulder;
- City of Boulder owned property within the city limits, but not identified as open space lands (i.e., parks, utilities, etc.); and
- Property owned by the City of Boulder within unincorporated Boulder County.

Wetland and parcel data were obtained directly from the City of Boulder to conduct the impact analysis.

Results

No Action Alternative

The No Action Alternative assumes that existing and committed improvements, as defined in Chapter 2.0, Alternatives Considered, would be implemented by others as planned.

Direct, Indirect, Temporary Construction, & Cumulative Impacts

It is anticipated that wetlands, other water features, and riparian buffers would be encountered for some or all of the roadway and transit projects identified under the No Action Alternative. These projects would most likely result in direct, indirect, temporary construction, and cumulative impacts. The extent of these impacts will be evaluated in the environmental documents being prepared for these projects.

Preferred Alternative

Direct Impacts

Direct permanent impacts to wetlands and other water features are presented in Tables 3.10-11 through 3.10-13 and are discussed below.

TABLE 3.10-11. DIRECT, PERMANENT IMPACTS TO WETLANDS BY CLASSIFICATION UNDER THE PREFERRED ALTERNATIVE

Study Area Section	PEM Total (acres)	PEM Jurisdictional (acres)	PEM/PSS Total (acres)	PEM/PSS Jurisdictional (acres)	Total (acres)	Total Jurisdictional (acres)
Alignment²						
Denver (Denver Section is included in Phase 1)						
Adams	0.09	0.09	0.02	0.02	0.11	0.11
Westminster	0.13	-	<0.01	0.00	0.13	-
Broomfield	0.37	0.32	0.24	0.24	0.61	0.56
Louisville	0.37	<0.01	0.02	<0.01	0.39	<0.01
Boulder	1.94	1.36	2.51	1.02	4.45	2.38
Longmont	0.03	0.02	0.31	0.23	0.34	0.25
Alignment Subtotal	2.93	1.79	3.10	1.51	6.03	3.30
Stations^{2,3}						
East Boulder	0.02	-	-	-	0.02	-
Louisville	-	-	0.05	-	0.05	-
Stations Subtotal	0.02	-	0.05	-	0.07	-

TABLE 3.10-11. DIRECT, PERMANENT IMPACTS TO WETLANDS BY CLASSIFICATION UNDER THE PREFERRED ALTERNATIVE

Study Area Section	PEM Total (acres)	PEM Jurisdictional (acres)	PEM/PSS Total (acres)	PEM/PSS Jurisdictional (acres)	Total (acres)	Total Jurisdictional (acres)
Phase 1²						
Denver	-	-	-	-	-	-
Adams	0.05	0.05	-	-	0.05	0.05
South Westminster/71 st Avenue Station	-	-	-	-	-	-
Phase 1 Subtotal	0.05	0.05	-	-	0.05	0.05
Total	3.00	1.84	3.15	1.51	6.15	3.35

Source: NWR Corridor Project Team, 2009.

Notes:

Discrepancies in summing may occur due to rounding; however, acreage totals are accurate.

¹Indirect permanent impacts and temporary construction impacts are not included.

²Impacts associated with the portion of the Adams Section from 52nd Avenue to approximately Bradburn Boulevard are included in Phase 1. Additionally, all impacts associated with the South Westminster/71st Avenue Station are included in Phase 1.

³Platform impacts are categorized under alignment.

Wetlands

NWR Corridor Alignment

As shown in Table 3.10-11, there would be 6.03 acres (3.30 J and 2.73 NJ) of direct, permanent impact to wetlands from the construction of the proposed alignment. Of these 0.79 J acre are PEM wetlands and 1.51 J acres are PEM/PSS wetlands.

The Boulder Section contains the greatest acreage impacted (4.45 acres combined PEM and PEM/PSS wetlands).

Proposed Stations

As shown in Table 3.10-11, an additional 0.07 NJ acre of permanent impact to wetlands would occur from development of all stations. The greatest impact would occur from the construction of the proposed Louisville Station (0.05 NJ acre).

TABLE 3.10-12. IMPACTS TO OTHER WATER FEATURES UNDER THE PREFERRED ALTERNATIVE

Study Area Section	Streams (acres)	Ponds (acres)	Total (acres)	Total Jurisdictional (acres)
Alignment²				
Denver (Denver Section is included in Phase 1)				
Adams	0.09	-	0.09	0.09
Westminster	0.02	-	0.02	<0.01
Broomfield	0.05	-	0.05	0.05
Louisville	0.10	-	0.10	0.08
Boulder	0.53	0.17	0.70	0.35
Longmont	0.20	-	0.20	0.15

Northwest Rail Corridor

TABLE 3.10-12. IMPACTS TO OTHER WATER FEATURES UNDER THE PREFERRED ALTERNATIVE

Study Area Section	Streams (acres)	Ponds (acres)	Total (acres)	Total Jurisdictional (acres)
Alignment Subtotal	0.99	0.17	1.17	0.72
Stations^{2,3}				
Louisville	0.02	-	0.02	-
East Boulder	-	<0.01	<0.01	-
Station Subtotal	0.02	<0.01	0.02	-
Phase 1²				
Denver	-	-	-	-
Adams	0.06	-	0.06	0.06
South Westminster/ 71 st Avenue Station	-	-	-	-
Phase 1 Subtotal	0.06	-	0.06	0.06
Total	1.07	0.17	1.25	0.78

Source: NWR Corridor Project Team, 2009.

Notes:

Discrepancies in summing may occur due to rounding; however, acreage totals are accurate.

¹Indirect permanent impacts are not included.

²Impacts associated with the portion of the Adams Section from 52nd Avenue to approximately Bradburn Boulevard are included in Phase 1. Additionally, all impacts associated with the South Westminster/71st Avenue Station are included in Phase 1.

³Platform impacts are categorized under alignment.

Other Water Features

NWR Corridor Alignment

As shown in Table 3.10-12, there would be 1.17 acres (0.72 J and 0.45 NJ) of direct, permanent impact to other water features from the construction of the proposed alignment. The most impacted acreage (0.70 acre [0.35 J and 0.35 NJ]) would occur to other water features within the Boulder Section.

Proposed Stations

As shown in Table 3.10-12, an additional 0.02 NJ acre of direct, permanent impact to other water features would occur from the construction of the Downtown Louisville and East Boulder stations.

Riparian Buffers

NWR Alignment

As shown in Table 3.10-13, there would be a total of 1.86 acres of direct, permanent impact to mature, woody riparian buffers from the construction of the proposed alignment. The greatest amount of impact would occur to woody riparian buffers within the Boulder Section.

Proposed Stations

No impact to mature, woody riparian buffers would occur from station construction.

TABLE 3.10-13. DIRECT, PERMANENT IMPACTS TO RIPARIAN BUFFERS UNDER THE PREFERRED ALTERNATIVE

Feature Name	Total (acres)
Alignment¹	
Denver (Denver Section is included in Phase 1)	
Adams (Impacts occur in Phase 1 only)	
Boulder	
Davidson Ditch Lateral	0.09
Marshallville Ditch	0.01
Boulder and Whiterock Ditch	1.33
Fourmile Canyon Creek	0.09
South Boulder Creek	0.15
Dry Creek	<0.01
Subtotal	1.67
Longmont	
Lefthand Creek	0.07
St. Vrain Creek	0.12
Subtotal	0.19
Alignment Subtotal	1.86
Stations^{1,2}	
No impacts would occur to riparian buffers at station sites.	
Phase 1¹	
Denver	
No impacts would occur to riparian buffers in the Denver Section.	
Adams	
Clear Creek	0.04
Little Dry Creek	0.47
South Westminster/71st Avenue Station	
No impacts would occur to riparian buffers at station sites.	
Phase 1 Subtotal	0.51
Total	2.37

Source: NWR Corridor Project Team, 2009.

Notes:

Discrepancies in summing may occur due to rounding; however, acreage totals are accurate.

¹Impacts associated with the portion of the Adams Section from 52nd Avenue to approximately Bradburn Boulevard are included in Phase 1. Additionally, all impacts associated with the South Westminster/71st Avenue Station are included in Phase 1.

²Platform impacts are categorized under alignment.

Impacts to City of Boulder Open Space Wetlands

In addition to the totals provided in Table 3.10-11, permanent impacts to wetlands on Open Space and other property owned by the City of Boulder total an additional 1.87 acres within the Boulder Section.

Phase 1

Implementation of Phase 1 between DUS and the South Westminster/71st Avenue Station would result in direct permanent impact to 0.05 J acres of wetlands; 0.06 J acres of other water features; and 0.51 acres of impact to riparian buffers. Wetlands between DUS and Pecos Street were included in the February 2009 Nationwide Permit approved for the Gold Line Final Environmental Impact Statement (FTA, 2009) (Appendix C). The Gold Line Nationwide Permit addresses the area from DUS to Pecos Street. No wetlands impacts occur in the area from DUS to Pecos Street. Tables 3.10-11 through 3.10-13 provide details of the impacts that occur in Phase 1 between Pecos Street and Bradburn Boulevard.

The BNSF Railway Company is considering an additional storage track near the South Westminster/71st Avenue Station. If this option were to be implemented, it would create an additional direct, permanent impact to other water features of <0.01 acre. The impacted other water feature is not considered jurisdictional by the USACE.

Indirect Impacts

Indirect permanent impacts to wetlands and other water features would include constriction of stream flow from bridge construction, erosion resulting in sedimentation, and noxious weed invasion.

Stream constriction occurs from bridge abutments coupled with high flow events that cause increased water velocity downstream of the bridge, resulting in bank scour. Bank erosion and loss of vegetation downstream may occur if multiple high flow conditions are coupled with bridge construction that constricts the floodplain.

Sedimentation into wetlands from erosion would typically be most pronounced in those wetlands along a railway edge where there is increased flow frequency, volume, and velocity due to the increase in impermeable surface in the immediate area. Sedimentation impacts would be most pronounced in areas that receive and retain/detain surface runoff for longer periods of time.

Temporary Construction Impacts

It is estimated that wetlands within the project area would be temporarily impacted by the construction of the Preferred Alternative. The temporary construction impacts are only associated with the proposed alignment as all construction activities associated with the stations and Phase 1 would be contained within the direct impact areas. Table 3.10-14 includes acreages of temporary impacts to wetlands within the Preferred Alternative by classification.

TABLE 3.10-14. TEMPORARY CONSTRUCTION IMPACTS TO WETLANDS BY CLASSIFICATION FROM THE PREFERRED ALTERNATIVE

Study Area Section	PEM Total (acres)	PEM Jurisdictional (acres)	PEM/PSS Total (acres)	PEM/PSS Jurisdictional (acres)	Total (acres)	Total Jurisdictional (acres)
Alignment¹						
Denver	-	-	-	-	-	-
Adams	0.06	0.06	-	-	0.06	0.06
Westminster	-	-	-	-	-	-
Broomfield	0.01	0.01	-	-	0.01	0.01
Louisville	0.05	-	-	-	0.05	-
Boulder	0.10	0.08	0.28	0.27	0.38	0.35
Longmont	<0.01	-	0.04	0.04	0.04	0.04
Alignment Subtotal	0.22	0.15	0.32	0.31	0.54	0.46
Stations^{1,2}						
No temporary construction impacts would occur to wetlands at station sites.						
Phase 1¹						
No temporary construction impacts would occur to wetlands for Phase 1.						
Total	0.22	0.15	0.32	0.31	0.54	0.46

Source: NWR Corridor Project Team, 2009.

Notes:

¹Impacts associated with the portion of the Adams Section from 52nd Avenue to approximately Bradburn Boulevard are included in Phase 1. Additionally, all impacts associated with the South Westminster/71st Avenue Station are included in Phase 1.

²Platform impacts are categorized under alignment.

< = less than

Table 3.10-15 includes temporary impacts to other water features under the Preferred Alternative. There would be no additional temporary impact to other water features from the construction of stations as all temporary impacts are included within the permanent footprint of the station.

TABLE 3.10-15. TEMPORARY CONSTRUCTION IMPACTS TO JURISDICTIONAL OTHER WATER FEATURES FROM THE PREFERRED ALTERNATIVE

Study Area Section	Streams (acres)	Ponds (acres)	Total Jurisdictional (acres)
Alignment²			
Denver	-	-	-
Adams	0.02	-	0.02
Westminster	-	-	-
Broomfield	0.01	-	0.01
Louisville	0.02	-	0.02
Boulder	0.09	<0.01	0.06
Longmont	0.01	-	0.01
Alignment Subtotal	0.15	<0.01	0.12
Stations^{2,3}			
No temporary construction impacts would occur to jurisdictional other water features at station sites.			
Phase 1²			
Denver	-	-	-
Adams	0.11	-	0.11
South Westminster/ 71 st Avenue Station	-	-	-
Subtotal	0.11	-	0.11
Total	0.26	<0.01	0.23

Source: NWR Corridor Project Team, 2009.

Notes:

¹Indirect permanent impacts are not included.

Note: Discrepancies in summing may occur due to rounding; however, acreage totals are accurate.

²Impacts associated with the portion of the Adams Section from 52nd Avenue to approximately Bradburn Boulevard are included in Phase 1. Additionally, all impacts associated with the South Westminster/71st Avenue Station are included in Phase 1.

³Platform impacts are categorized under alignment.

Cumulative Impacts

Wetlands are dynamic systems whose size, function, and structure correlate with changes in hydrologic regimes. These regimes would be affected by new development, land use changes, and new regulatory requirements. There is typically a net loss of wetlands with any development near or within these features.

Since 1950, the amount of wetlands located in both the project study area and the larger Denver metropolitan area has decreased due to development related to the more than doubling of the population. Historically, Colorado's wetlands only accounted for 3 percent of the surface area of the state. Due to a lack of regulations prior to the early 1970s, up to 50 percent of those wetlands have been lost, which is proportionately greater than other habitat type losses in Colorado (RTD 2007). Due to improved regulations protecting wetlands, the loss of wetlands would be markedly less than experienced historically. Implementing the

Preferred Alternative could encourage moderately denser growth, thus slightly reducing the potential for wetlands on some undeveloped land to be impacted in the future.

3.10.3.4 Mitigation Measures

Per Section 404 of the CWA, impacts to wetlands and other water features must be avoided, minimized, or mitigated (in order of preference). All impacted wetlands and other water features will be mitigated in accordance with current USACE mitigation policies and the conditions of the USACE Section 404 Permit. All mitigation plans will be developed in coordination with the USACE and other appropriate agencies during the Section 404 permitting process. USACE requires mitigation for all impacts to jurisdictional wetlands and other water features. However, RTD policy requires 1:1 mitigation for all impacts, either jurisdictional or non jurisdictional. All mitigation for the wetlands along the proposed alignment would be mitigated in accordance with USACE and RTD policies.

Avoidance and Minimization Measures

Throughout the Environmental Evaluation process, the footprint of the Preferred Alternative was refined and modified to avoid and/or minimize impacts to wetlands. These minimization efforts included:

- The length of all station platforms was reduced from 800 feet, which would accommodate an 8-car train, to 400 feet, which would accommodate a 4-car train, in order to minimize impacts to wetlands and other resources. The width of the platform was also narrowed as much as feasible to minimize resource impacts while accommodating safe access for transit patrons.
- Bypass tracks at stations were originally considered in order to meet Americans with Disabilities Act guidelines and to separate rail and freight traffic at stations. In the original design, one 1,500-foot long passing track would be located on each side of the mainline tracks at each station, thereby significantly increasing the size of the station footprints and potential impacts. In order to minimize impacts to several resources (including wetlands) the station platforms were redesigned without passing tracks.
- Two station options were originally evaluated at the Gunbarrel Station. Subsequent analysis and public process concluded that the Gunbarrel East site provided better transportation and access needs and resulted in less environmental impacts to wetlands.
- The Westminster/88th Avenue, Walnut Creek, East Boulder, and Gunbarrel stations were all redesigned to minimize (or avoid) impacts to wetlands.
- The proposed track alignment was modified in multiple locations to minimize wetland impacts along the length of the proposed alignment. Avoidance and minimization measures included shifting the proposed new track to the other side of the existing track, minimizing track centers, adding walls to minimize the track footprint, or bridging the tracks over sensitive resource areas.

Compensatory Mitigation

The overall goals of any compensatory mitigation would be to replace acres of wetlands directly impacted by the project and to replace those wetland functions lost. Each step of a compensatory mitigation project would be determined in coordination with the USACE. Site selection would be based on hydrological data collected from groundwater monitoring wells that would be monitored for a minimum of 1 year. Once a replacement site is selected and

the final impacts are known, a detailed mitigation plan would be developed. The plan would describe all phases of wetland creation, including the site layout, shallow groundwater monitoring well installation, construction details, planting plan, and success monitoring.

Compensatory mitigation for the proposed project will comply with the *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule* (Federal Register Volume 73, No. 70, April 2008). Mitigation credits would be purchased to compensate for a 1:1 mitigation ratio, as required by RTD guidelines and/or USACE required compensation that would focus on replacement of functional losses on all impacts to waters of the United States.

Additional Compensatory Mitigation within the City of Boulder

The City of Boulder would require a total of 3.74 acres of wetlands and surface water features be replaced. This project will adhere to current City of Boulder wetland mitigation requirements.

A Mitigation Plan detailing mitigation location and construction will be developed with the City of Boulder. The total permanent impact to the City of Boulder wetlands is a conservative estimate based on the current design. The acreage of City of Boulder permanent impacts is likely to decrease as detailed bridge construction footprints are finalized.

Mitigation techniques to reduce identified impacts to wetlands and other water features are described in Table 3.10-16.

TABLE 3.10-16. PROPOSED MITIGATION MEASURES - WETLANDS AND OTHER WATERS OF THE UNITED STATES

Impact	Impact Type	Mitigation Measures
Wetlands and other water feature impacts	Direct	<ul style="list-style-type: none"> All mitigations outlined in the USACE permit will be followed.
Loss of wetlands due to the placement of dredged or fill material	Direct/Construction	<ul style="list-style-type: none"> Wetland replacement will be completed per USACE requirements. Wetland 1:1 replacement for non-jurisdictional wetlands per RTD requirements. Credits will be purchased or on-site mitigation conducted for non-jurisdictional impacts. Appropriate permits will be acquired. Phase 1 Section 404 Permit was issued by USACE on 1 April 2010.
Temporary wetland impacts due to construction	Construction	<ul style="list-style-type: none"> Prior to construction, orange temporary fence and sediment control measures will be placed to protect existing wetlands that are located outside the planned area of disturbance. Wetland areas designated as areas of temporary disturbance that will be used for construction access will be covered with geotextile, straw, and soil prior to use. Temporarily impacted wetlands will be restored to their preconstruction condition. Construction equipment moving between watersheds will be washed prior to commencing work within a new area to prevent the spread of aquatic invasive species.

TABLE 3.10-16. PROPOSED MITIGATION MEASURES - WETLANDS AND OTHER WATERS OF THE UNITED STATES

Impact	Impact Type	Mitigation Measures
Sedimentation and erosion of wetlands and other water features	Construction	<ul style="list-style-type: none"> • BMPs will be implemented during all phases of construction to reduce impacts from sedimentation and erosion, including the use of berms, brush barriers, check dams, erosion control blankets, filter strips, sandbag barriers, sediment basins, silt fences, straw-bale barriers, surface roughening, and/or diversion channels. • When practicable, construction in waterways will be performed during low-flow or dry periods. • Flowing water will be diverted around active construction areas. • No fill material will be stored in wetlands or other water features. • No unpermitted discharges will be allowed.
Contamination of wetlands and other water features	Construction and Operation	<ul style="list-style-type: none"> • There will be no equipment staging, storage of materials, use of chemicals (such as soil stabilizers, dust inhibitors, and fertilizers), or equipment refueling within 50 feet of wetlands or other water features. • Any new or modified bridges will be designed to minimize direct discharge of stormwater runoff into wetlands.
Impacts to City of Boulder owned wetlands	Construction	<ul style="list-style-type: none"> • City of Boulder wetlands mitigations will be completed per City of Boulder requirements.

Source: NWR Corridor Project Team, 2009.

3.10.4 Floodplains, Drainage, and Hydrology

3.10.4.1 Introduction to Analysis

Summary of Results

The Preferred Alternative would result in the construction of 21 crossings of the 100-year floodplain. Since all proposed bridge structures would replicate the existing railroad structure, as well as the expansion and/or replacement of the existing culvert systems and bridges, the direct impacts would be minimal. Only in four instances would the 100-year floodplain water surface elevation rise due to construction of a new commuter rail bridge. In all the cases, the projected rise in water surface elevation is less than the 1.0 foot criteria from the Federal Emergency Management Agency (FEMA). In most locations, the 100-year floodplain water surface elevations would either stay the same or decrease.

In the current conditions, the existing railroad bridges would become inundated by the 100-year flood in six separate locations associated with different waterways. With the Preferred Alternative there would only be two floodplain crossings that would become inundated by the 100-year flood. There are two locations in which proposed stations would encroach on the 100-year floodplain; however, in one of the proposed station locations the 100-year floodplain would be altered to convey the 100-year flows outside the station parking lot. There would be no other impacts to the 100-year floodplain as a result of the project.

It is anticipated that the roadway and transit projects included in the No Action Alternative would likely result in direct, indirect, temporary construction, and cumulative impacts to floodplains, drainage, and hydrology. The location and severity of impacts resulting from these projects will be evaluated in the environmental documents being prepared for these projects.

Purpose

Floodplains are important environmental resources that, if unmanaged, can cause major damage. Therefore, it is important to evaluate whether the NWR Corridor project would limit the current natural conveyance of floodwaters or modify the water surface elevation. The purpose of this section is to evaluate whether the NWR Corridor project would be built in or modify the existing 100-year floodplain⁵. Any addition to impervious surfaces would require the use of detention systems so that excess storm runoff associated with increased basin imperviousness would not exceed current runoff amounts.

⁵ NEPA, CEQ, National Flood Insurance Act, Flood Disaster Protection Act, Executive Order on Floodplain Management, 44 CFR Chapter 1 FEMA and Flood Management Protection.

3.10.4.2 Affected Environment

The proposed alignment would cross over the 100-year floodplain in approximately 21 locations, as shown on Figure 3.10-3. Each floodplain crossing is associated with a major waterway, including the following streams:

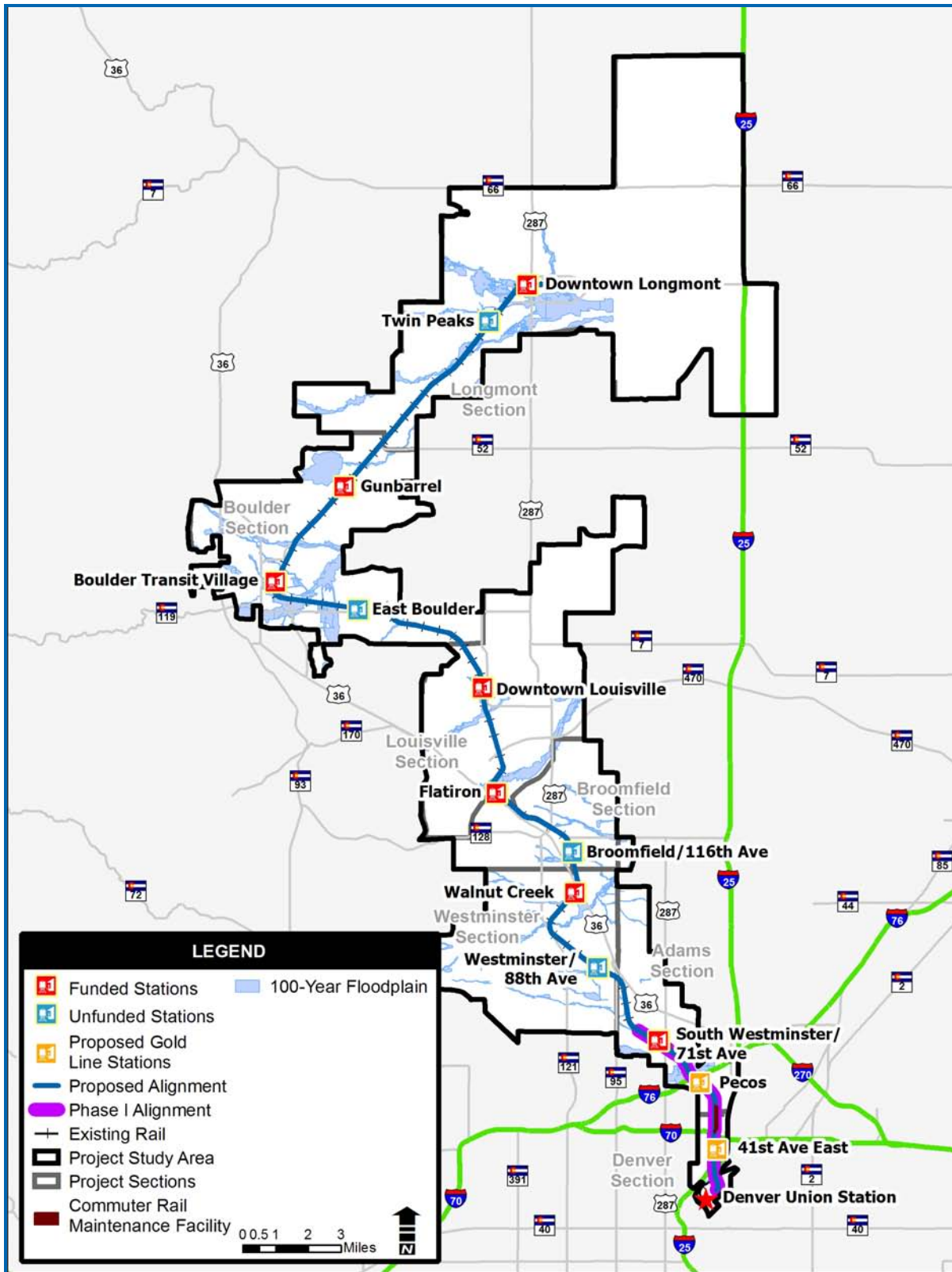
- South Platte River
- Clear Creek
- Little Dry Creek
- Big Dry Creek
- Walnut Creek
- Airport Creek
- Rock Creek
- Coal Creek
- Dry Creek Number (No.) 3
- Bullhead Gulch
- South Boulder Creek
- South Boulder Creek Overflow Channel
- Boulder Creek
- Goose Creek
- Wonderland Creek
- Fourmile Canyon Creek
- Dry Creek No. 2
- Lefthand Creek
- Lefthand Creek Overflow Channel
- Dry Creek No. 1
- St. Vrain Creek

Flooding within Broomfield, Adams, and Boulder counties is usually produced by periods of intense rainfall associated with both local and general storm systems. Most thunderstorms that produce intense rainfall periods usually occur during the spring and early summer months, often combining with the annual runoff produced by snowmelt (Ayres 2005).

In the existing condition, there are six locations in which railroad bridges are overtopped by the 100-year water surface elevation associated with major waterways. Overtopping occurs when the bridges become inundated by water from the 100-year flows. This occurs at the crossings over Clear Creek, Bullhead Gulch, South Boulder Creek Overflow Channel, Wonderland Creek, Fourmile Canyon Creek, and the Lefthand Creek Overflow Channel.

Encroachment of any of the floodplains in the project study area would be subject to the requirements of local jurisdictions. During construction activities, BMPs for erosion and runoff control would be implemented. Detention systems would allow for the storage and control of stormwater runoff. Requirements for onsite detention facilities are provided in Table 3.10-17 by jurisdiction.

FIGURE 3.10-3. 100-YEAR FLOODPLAINS IN THE PROJECT STUDY AREA



Sources: CDOT, 2006; DRCOG, 2007-08; ESRI SDC, 2004; NWR Corridor Project Team, 2008-09.

TABLE 3.10-17. JURISDICTIONAL REQUIREMENTS FOR ONSITE DETENTION

Jurisdiction	Flood Levels		Freeboard Requirements	Detention Sizing Methods	Underground Detention	Above-ground Detention
	Minor	Major				
UDFCD	5- and 10-year plus WQCV	100-year plus no less than one-half WQCV	1 foot above the water surface elevation when the emergency spillway is conveying the maximum design or emergency flow	Simplified method based on empirical equations in storage chapter of District Manual	Only in ultra-urban setting where no on-surface methods are practicable	Preferred
City and County of Denver	10-year plus WQCV	100-year plus one-half WQCV	Greater than or equal to 5 acres - 1 foot above water surface elevation Less than 5 acres - 1 foot above 100-year water surface elevation			
Adams County	5-year plus WQCV	100-year plus one-half WQCV	1 foot above calculated overall volume		Only when other options are insufficient. Under no circumstances would Adams County accept underground detention at any publicly owned facility	
City of Westminster		100-year	1 foot above computed Water Surface Elevation for Major Storm Event		Only in ultra-urban setting where no on-surface methods are practicable	
City and County of Broomfield	10-year		1 foot above the water surface elevation when the emergency spillway is conveying the maximum design or emergency flow			
City of Louisville						
City of Boulder	5- and 10-year plus WQCV	100-year plus no less than one-half WQCV	1 foot above the water surface elevation when the emergency spillway is conveying the maximum design or emergency flow			
Boulder County	10-year	100-year				
City of Longmont						

Sources: Adams County 2008; Boulder County, 1984; City and County of Broomfield, 2007; City of Boulder, 2000; City and County of Denver, 2006; City of Longmont, 1984; City of Louisville 1982; City of Westminster, 2009; and UDFCD, 2001.

Notes:

UDFCD = Urban Drainage and Flood Control District

WQCV = Water Quality Capture Volume

3.10.4.3 Impact Evaluation

Methodology

Several streams, ditches, and other water features are located within the project study area. A baseline map of the floodplains associated with these water features was developed from FEMA Flood Insurance Rate Maps. Drainage Master Plans and Flood Hazard Area Delineations were obtained from the UDFCD, incorporated into the floodplain maps for the project study area, and the 100-year floodplain event was mapped. The impacts of the proposed transit bridges were then modeled using the HEC-RAS hydraulic model to evaluate whether construction would cause a change in the water surface elevations during a 100-year flood.

Results

No Action Alternative

The No Action Alternative assumes that existing and committed improvements, as defined in Chapter 2.0, Alternatives Considered, would be implemented by others as planned.

Direct, Indirect, Temporary Construction, and Cumulative Impacts

It is anticipated that the roadway and transit projects included in the No Action Alternative would likely result in direct, indirect, temporary construction, and cumulative impacts to floodplains, drainage, and hydrology. The location and severity of impacts resulting from these projects will be evaluated in the environmental documents being prepared for these projects.

Preferred Alternative

There are 21 FEMA- and/or UDFCD-designated 100-year floodplains located within the project study area. The discussion below focuses on proposed structures over the different waterways and the impacts on the 100-year floodplain as a result of new crossings.

Direct Impacts

NWR Corridor Alignment

There would be minimal effects on future flood elevations due to the construction of new bridges and the expansion of existing crossings on the 18 different 100-year floodplain crossings in the NWR Corridor Alignment. Due to the existing BNSF Railway Company railroad bridges along each major 100-year floodplain crossing, the natural and beneficial floodplain values would be preserved after construction of the Preferred Alternative. Many bridges and crossing would be completely replaced; therefore, RTD or BNSF Railway Company will be developing drainage plans.

In all but two cases, the 100-year floodplain water surface elevation either remains the same or lowers in elevation. In all cases in which the 100-year floodplain water surface elevation is lowered, it is a positive benefit to the area, as the 100-year floodplain water surface elevation is reduced. This also means that the 100-year flow is more unobstructed as it travels downstream in these regions. The two locations in which the floodplain elevations increase would be at the Coal Creek and South Boulder Creek bridge crossings. In both cases, the proposed bridges would be adequate to pass the 100-year flow and the changes are less than the FEMA criteria allowing no more than a 1.0 foot elevation rise in the 100-year water surface elevation. These impacts are shown in Table 3.10-18 by section.

TABLE 3.10-18. FLOODPLAIN CHANGE IN WATER SURFACE ELEVATION

FEMA Floodplain Crossing	Change in Water Surface Elevation (feet)
Denver Section	
Denver Section floodplain crossings are included in Phase 1.	
Adams Section	
Adams Section floodplain crossings are included in Phase 1.	
Westminster Section	
Big Dry Creek	0.0
Walnut Creek	0.0
Broomfield Section	
Airport Creek	-5.6
Louisville Section	
Rock Creek	0.0
Coal Creek	0.3
Bullhead Gulch	-2.3
Boulder Section	
Dry Creek (No. 3)	0.0
South Boulder Creek	0.1
South Boulder Creek – Overflow Channel	-1.5
Boulder Creek	-0.5
Goose Creek	0.0
Wonderland Creek	0.0
Fourmile Canyon Creek	-4.1
Dry Creek (No. 2)	-4.0
Longmont Section	
Left Hand Creek	0.0
Left Hand Creek - Overflow Channel	-2.3
Dry Creek (No. 1)	0.0
St. Vrain Creek	0.0

Source: NWR Corridor Project Team, 2009.

Notes:

- = Negative

No. = Number

For both the Coal Creek and South Boulder Creek crossings, the existing railroad bridges are hydraulically adequate to support 100-year flood flows. The new adjacent bridges would be constructed to replicate the existing railroad bridge. This would cause very minor increases in floodplain water surface elevation, as there is less cross-sectional area that water has to flow through.

The existing bridge over Coal Creek is composed of a four-span bridge with a 12-foot by 11-foot concrete box culvert. The existing structure was deemed as hydraulically adequate to support the existing 100-year flows. In its current condition, the existing bridge is 12.3 feet above the existing 100-year water surface elevation. The project would be constructed as a single adjacent four-span bridge that would accommodate double tracking. The proposed

bridge for the commuter rail tracks would mimic the existing bridge; however, the existing 100-year water surface elevation would rise slightly to 5,323 feet above mean sea level (msl), which is approximately 0.3 foot above the 100-year water surface in its existing state, and below the 1.0 foot threshold as required by FEMA. The proposed bridge would be located approximately 12.0 feet above the proposed 100-year water surface elevation (URS 2009).

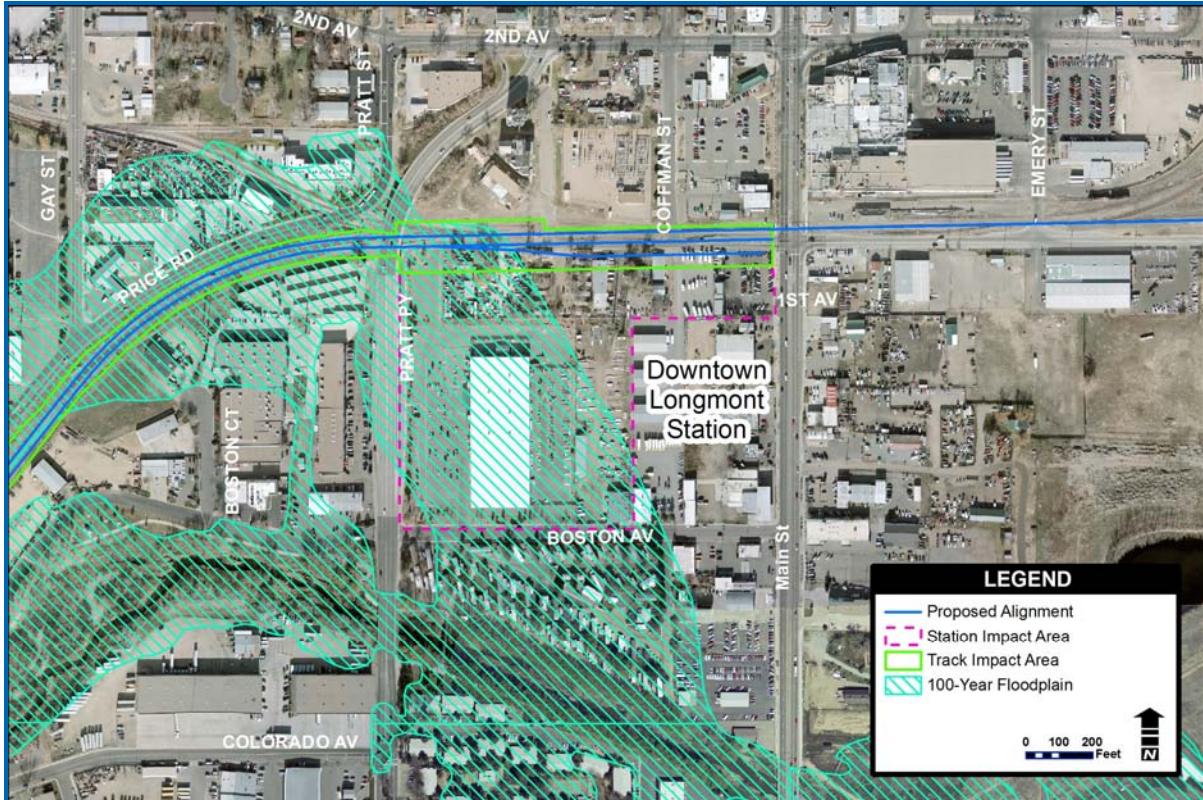
The existing bridge over South Boulder Creek is composed of an eight-span bridge. The existing eight-span bridge was deemed adequate to pass the 100-year flowrate. The crossing over South Boulder Creek would be in the form of an adjacent eight-span bridge that would mimic the existing bridge. The new bridge would be large enough to accommodate the double track. The addition of the new bridge would cause a slight rise in the 100-year water surface elevation. The new elevation of the 100-year floodplain would be 5,221.1 feet above msl, which is approximately 0.1 foot higher than the 100-year water surface elevation in the existing condition, and below the 1.0 foot threshold as required by FEMA. The proposed and existing bridges would be located approximately 3.6 feet above the proposed 100-year water surface elevation (URS 2009).

Once the NWR Corridor project is constructed, there would only be two locations at the proposed commuter rail lines that would be inundated by a 100-year flood. This would occur as the NWR Corridor project crosses Wonderland Creek and the South Boulder Overflow Channel. This would be an improvement over existing conditions, where the existing rail line is overtopped in six locations.

Proposed Stations

North of the South Westminster/71st Avenue Station, the Downtown Longmont Station would be the only station located within the 100-year floodplain.

Approximately 75 percent of the total area of the Downtown Longmont Station would encroach on the 100-year floodplain, including parking lots and commuter rail platforms (Figure 3.10-4). Currently, the City of Longmont is evaluating options for capturing and conveying flows from the 100-year storm event that would minimize 100-year floodplain impacts within the station footprint, as well as the surrounding areas.

FIGURE 3.10-4. 100-YEAR FLOODPLAIN AROUND THE DOWNTOWN LONGMONT STATION


Sources: CDOT, 2006; DRCOG, 2007-08; ESRI SDC, 2004; NWR Corridor Project Team, 2008-09.

Phase 1

There would be minimal effects on future flood elevations due to the construction of new bridges and the expansion of existing crossings on the three different 100-year floodplain crossings between DUS and the South Westminster/71st Avenue Station. In two cases, the 100-year floodplain water surface elevation would be increased due to the construction of proposed commuter-rail crossings. The proposed bridge structures over the South Platte River and Clear Creek would directly increase the 100-year floodplain water surface elevation. However, the proposed bridges would be adequate to pass the 100-year flow and the change in both instances is less than the FEMA criteria, which allows no more than 1.0 foot elevation rise in the 100-year water surface elevation. The proposed crossing over Little Dry Creek would not impact the 100-year floodplain water surface elevation. These impacts are shown by section in Table 3.10-19.

TABLE 3.10-19. PHASE 1 FLOODPLAIN CHANGE IN WATER SURFACE ELEVATION

FEMA Floodplain Crossing	Change in Water Surface Elevation (feet)
Denver Section	
South Platte River	0.19
Adams Section	
Clear Creek	0.47
Little Dry Creek	0.0

Source: NWR Corridor Project Team, 2009.

Notes:

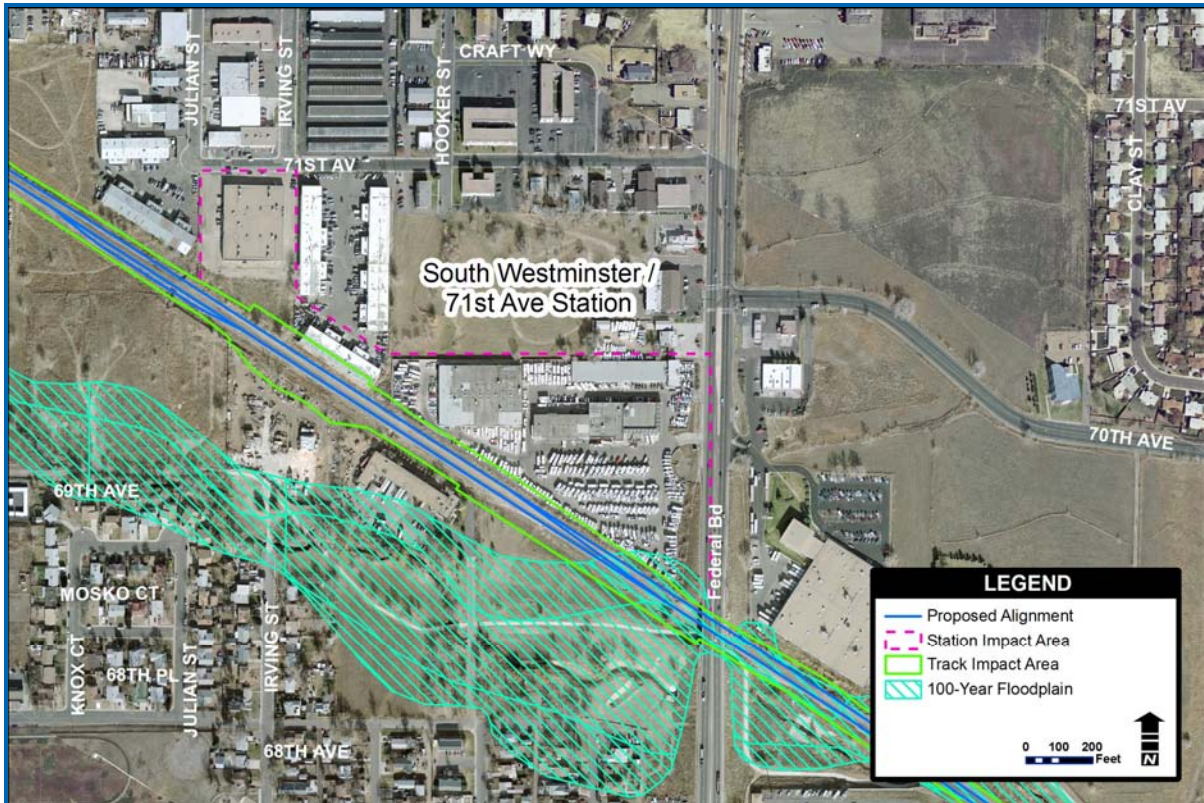
- = Negative

No. = Number

There is an existing 8-span BNSF Railway Company single-track railroad bridge over Clear Creek. In its current condition, the existing railroad bridge would be overtopped during the 100-year flood. The proposed plan indicates not replacing the existing railroad bridge, but to construct a double track 16-span commuter-rail bridge approximately 480-feet in length just upstream of the existing BNSF Railway Company single-track railroad bridge. The proposed bridge would be at the same elevation as the existing BNSF Railway Company railroad bridge. This is compatible with the recommendations in the *Major Drainageway Plan*. At some future time, the existing BNSF Railway Company railroad bridge would need to be replaced with a longer structure to eliminate track overtopping in the 100-year event.

The southern portion of the parking lot of the South Westminster/71st Avenue Station would also encroach on the 100-year floodplain. Approximately 3 percent of the total area of the South Westminster/ 71st Avenue Station would be located in the existing 100-year floodplain (Figure 3.10-5).

FIGURE 3.10-5. 100-YEAR FLOODPLAIN AROUND THE SOUTH WESTMINSTER/71ST AVENUE STATION



Sources: CDOT, 2006; DRCOG, 2007-08; ESRI SDC, 2004; NWR Corridor Project Team, 2008-09.

The South Westminster/71st Avenue Station would be designed to accommodate the 100-year floodplain flows so the station would not be flooded and would adhere to all FEMA regulations.

Indirect Impacts

The principal indirect effect of the Preferred Alternative would be associated with potential transit-oriented development. This type of development or redevelopment would occur around the proposed stations. This could result in an increase in impervious areas in sections of the proposed alignment that are not fully developed. Sections in which this could occur would primarily be in Louisville and Longmont. All planned developments would be required to fulfill state and local government storm drainage requirements that limit storm runoff to historic undeveloped levels. Due to the state and local government requirements, there would be no indirect impacts on the 100-year floodplains.

Temporary Construction Impacts

Due to the development of the Preferred Alternative within the project study area, there would be some temporary construction impacts within the 100-year floodplain, such as an increase in erosion and sedimentation due to land disturbance activities. Colorado state and local jurisdiction regulations have been put into place to minimize the environmental impacts construction can cause. These regulations require the implementation of BMPs and erosion control techniques and devices, as well as a SWMP. RTD and associated contractors would

adhere to all state, county, and local regulations regarding the state-issued Stormwater Construction Permit. Temporary construction impacts would be minimal during construction due to the proper implementation of BMPs and erosion control techniques and devices.

Cumulative Impacts

The amount of impervious surfaces and runoff would continue to increase with continued urban expansion in the project study area. Projected development would substantially increase impervious surfaces in existing undeveloped areas by adding buildings, sidewalks, and streets to support an expanding economy as well as population. Development related to the continued population growth between 2005 and 2035 would result in approximately 3,300 acres of impervious surfaces in the study area. The Preferred Alternative would result in an additional 92 acres of impervious surfaces, or less than 3 percent of the estimated new impervious surfaces in 2035. Impacts associated with additional impervious surfaces would be managed to predevelopment conditions using jurisdictional detention requirements, which have proven to be effective in minimizing the effects of urban runoff (RTD 2007).

Avoidance and Minimization Measures

Efforts were made to avoid and minimize impacts to floodplains throughout the project. Given the existing rail alignment dictates the location of the corridor, minimization efforts were most successful at station locations where the footprints were more flexible. Various station layouts were considered taking into account all impacts including floodplain. Additional efforts will be made during design and construction to further avoid floodplain impacts.

3.10.4.4 Mitigation Measures

As stipulated by 23 CFR 650.115(5), encroachment within any of the floodplains would be subject to the requirements of local jurisdictions. RTD would work with local jurisdictions and UDFCD regarding potential floodplain impacts. All necessary precautions have been made in design to try to improve 100-year floodplain conditions wherever feasibly possible. This is done by the replacement of existing BNSF Railway Company bridges and crossings incapable of safely passing the 100-year flood. In seven 100-year floodplain crossings, the existing drainage would be improved due to the implementation of the preferred alternative.

During construction of the Preferred Alternative at 100-year floodplain crossings, RTD and associated contractors would be required by local and state regulations to implement BMPs and erosion control devices as part of a SWMP for each specific crossing or each phase of the project. Temporary BMPs such as silt fence, erosion logs, check dams, sediment traps and basins, as well as storm sewer inlet protection and rip rap, would be implemented to reduce the amount of erosion and sedimentation during the construction process and prevent sediment from reaching state waters. All the above mentioned BMPs have proven to be effective at reducing the amount of erosion and sedimentation during the construction process.

Temporary and permanent detention basins have proven to be effective at mitigating permanent impacts from increased development, as well as increased sedimentation during construction, which is a temporary impact. In the temporary condition, a detention basin serves as a sediment collector that collects runoff from a large area and allows pollutants to settle out of the water before it is released off site. An increase in impervious area like pavement, produces much more runoff than a non-pervious area, such as natural ground

cover. The detention basin collects and holds the extra runoff produced and provides a controlled release rate back to pre-development or more pervious conditions. This reduces impacts to downstream channels, storm sewers, or any other drainage receiving water.

Other than those discussed above, no additional mitigation measures would be required. Requirements for necessary floodplain permits are provided in Table 3.10-20 by jurisdiction. Although the City and County of Broomfield does not have a specific permit for floodplain development, the reviewers will ensure adherence to all state and federal regulations regarding new construction in the 100-year floodplain.

TABLE 3.10-20. REQUIRED FLOODPLAIN MODIFICATION PERMITS

Permit Name	Regulatory Agency	Responsibility to Obtain
Floodplain Development Permit	City and County of Denver	RTD
Sewer Use and Drainage Permit		
Floodplain Development Permit	City of Westminster	RTD
Floodplain Use Permit	Adams County	RTD
Floodplain Development Permit	Boulder County	RTD
Floodplain Development Permit	City of Louisville	RTD
Floodplain Development Permit	City of Boulder	RTD
Public Works Development Permit	City of Longmont	RTD
Floodplain Development Permit		
Conditional Letter of Map Revision	FEMA, UDFCD	RTD
Letter of Map Revision		

Source: NWR Corridor Project Team, 2009.

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