56TH AVENUE

ENVIRONMENTAL ASSESSMENT

Quebec Street to Havana Street

WATER QUALITY TECHNICAL REPORT

APRIL 2008

PREPARED FOR:

DENVER
THE MILE HIGH CITY

City and County of Denver
in partnership with

U.S. Department of Transportation
Federal Highway Administration

US Department of Transportation
Federal Highway Administration

DOT
DEPARTMENT OF TRANSPORTATION

Colorado Department of Transportation

PREPARED BY:

URS

URS Corporation
Denver, Colorado

56th Avenue, Quebec Street to Havana Street
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1.0 WATER QUALITY

1.1 Summary

This report is part of an overall effort to make improvements to 56th Avenue from Quebec Street to Havana Street. The preferred alternative includes widening the roadway to six lanes and adding multi-use paths.

The quality of surface and groundwater in the project area will be evaluated in this report. This report also discusses regulations governing water quality within the project area and the water resources and water quality conditions for determining the impacts of transportation alternatives for 56th Avenue. Water quality conditions are identified according to watershed basins, as runoff from the proposed transportation improvements will be collected by drainage basins.

To determine water quality impacts of the roadway widening project, the drainage basins for receiving waters were researched to develop the data needed for water quality evaluations.

1.2 Affected Environment

The 56th Avenue project is located in the South Platte River Basin. This large basin encompasses more than 4,000 square miles. The 56th Avenue Environmental Assessment (EA) area is on the watershed boundary between Irondale Gulch to the north and Sand Creek to the south. Both Irondale Gulch and Sand Creek are east bank tributaries to the South Platte River, (see Location Map, Figure 1-1). The terrain throughout the project area is flat to gently rolling with a predominant trend to slope to the north and west. Some depression areas (areas with no positive drainage to a major natural water course) exist in the area as remnants of aeolian land forms in a generally urban environment. As an example, several watercourses with drainage basins in excess of 30 square miles, such as the Irondale Gulch, drain toward the South Platte River but do not have an outlet and end in marshes, irrigation features, or lakes.

The study area for water quality impacts is generally the immediate site of the roadway widening project and water bodies within the study area, into which the runoff from the project would be collected and discharged. The majority of this project is on the former Stapleton Airport property, which will be redeveloped in the next several years according to the North Stapleton General Development Plan. There is no existing drainage infrastructure within this part of the North Stapleton property at this time. The west end of the project is within an area that has already been redeveloped, and storm drainage infrastructure exists.

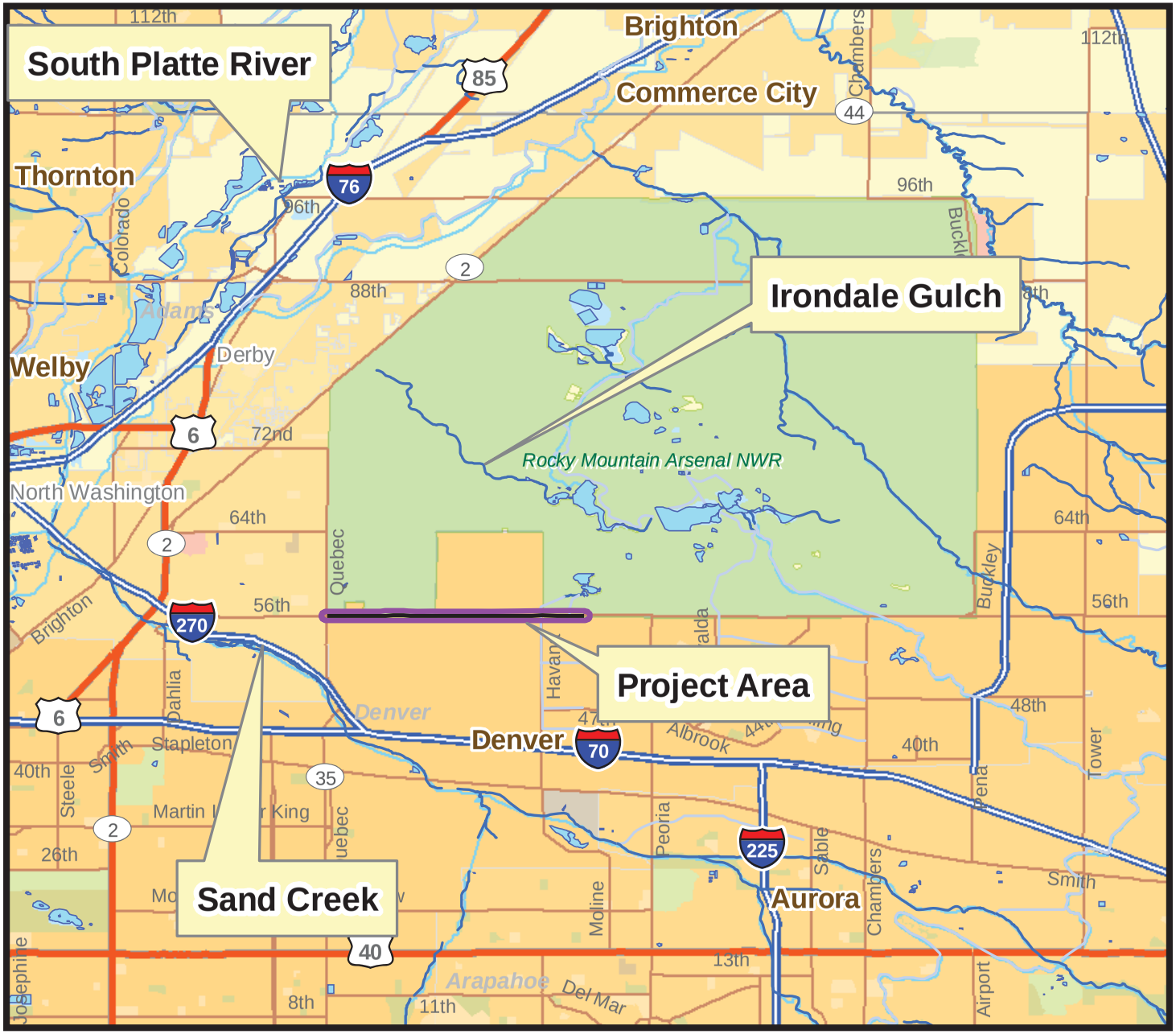

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FIGURE 1 -1
Project Location

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1.3 Streams, Rivers and Lakes

No perennial streams are located in the 56th Avenue EA project area, and there are no irrigation ditches located in the project area.

From Quebec Street to Spruce Street, the most recent improvements to 56th Avenue include curb and gutter, and a storm drain system that conveys surface runoff to a retention pond at the southwest corner of Quebec Street and 56th Avenue. Between Spruce Street and Valentia Street, the project area consists of an improved roadway with curb and gutter and a storm drain system, which conveys surface runoff to an existing detention pond that can accommodate the 100-year event north of 56th Avenue in Commerce City.

East of Valentia Street, the existing roadway does not have curb and gutter and surface runoff is conveyed in existing roadside ditches or sheet flows off the roadway onto adjacent lands. The eastern end of the project area drains to the west initially, and then to the north via the one intermittent drainageway, the Havana Interceptor. This concrete lined channel drains storm runoff from the south to the north and crosses under 56th Avenue just west of Havana Street. The Havana Interceptor empties into the Havana Pond ½ mile to the northeast of the project area within the Rocky Mountain Arsenal National Wildlife Refuge (RMANWR). The Havana Pond does not have a low outlet level. The Havana Interceptor has a United States Geological Survey (USGS) stream gauge installed at a point just north of where the channel crosses 56th Avenue.

1.4 Water Quality Regulations Affecting the Project

The primary federal regulatory drivers for the current stormwater quality program are the Phase I and Phase II Stormwater Regulations under the Clean Water Act, 33 USC 1251, et seq. which, among other requirements, require regulated entities to acquire a National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit for their stormwater discharges. The United States Environmental Protection Agency (USEPA) stormwater NPDES regulations specify entities that are required to have MS4 permits control the discharge of pollutants to the maximum extent practicable. The Colorado Department of Health and Environment (CDPHE) has jurisdiction over the NPDES permit program in Colorado.

Other Jurisdictional Regulatory Requirements

The 56th Avenue Improvements area overlaps both the City and County of Denver (CCD) and City of Commerce City, which is in Adams County. The City and County of Denver and the City of Commerce City have individual Phase I and Phase II permits respectively.

Groundwater

The 56th Avenue Improvements project area is situated above the Denver groundwater basin. The Denver Basin underlies a 6,700-square-mile area in Colorado, extending from the Front Range of the Rocky Mountains east to near Limon, and from Greeley south to near Colorado Springs. This basin includes four main bedrock aquifers that occur as layers in an elongated bowl-shaped basin, three of which are located in the project area. The

three Denver Basin aquifers located in the project area are the Denver Aquifer, the Arapahoe Aquifer, and the Laramie-Fox Hills Aquifer. The aquifers are generally confined, except in areas in the upper parts of aquifers where surface water may interact with groundwater.

The low transmissivity of the Denver Basin aquifers historically has limited large-volume, low-profit water uses, such as irrigation of most commercial crops, and has enabled water use that is less constrained by cost. Records from 1985 show that water withdrawn from the approximately 12,000 wells completed in the Denver Basin aquifer was primarily used for public supply, with the remainder used for agriculture. There are water supply wells within the project area.

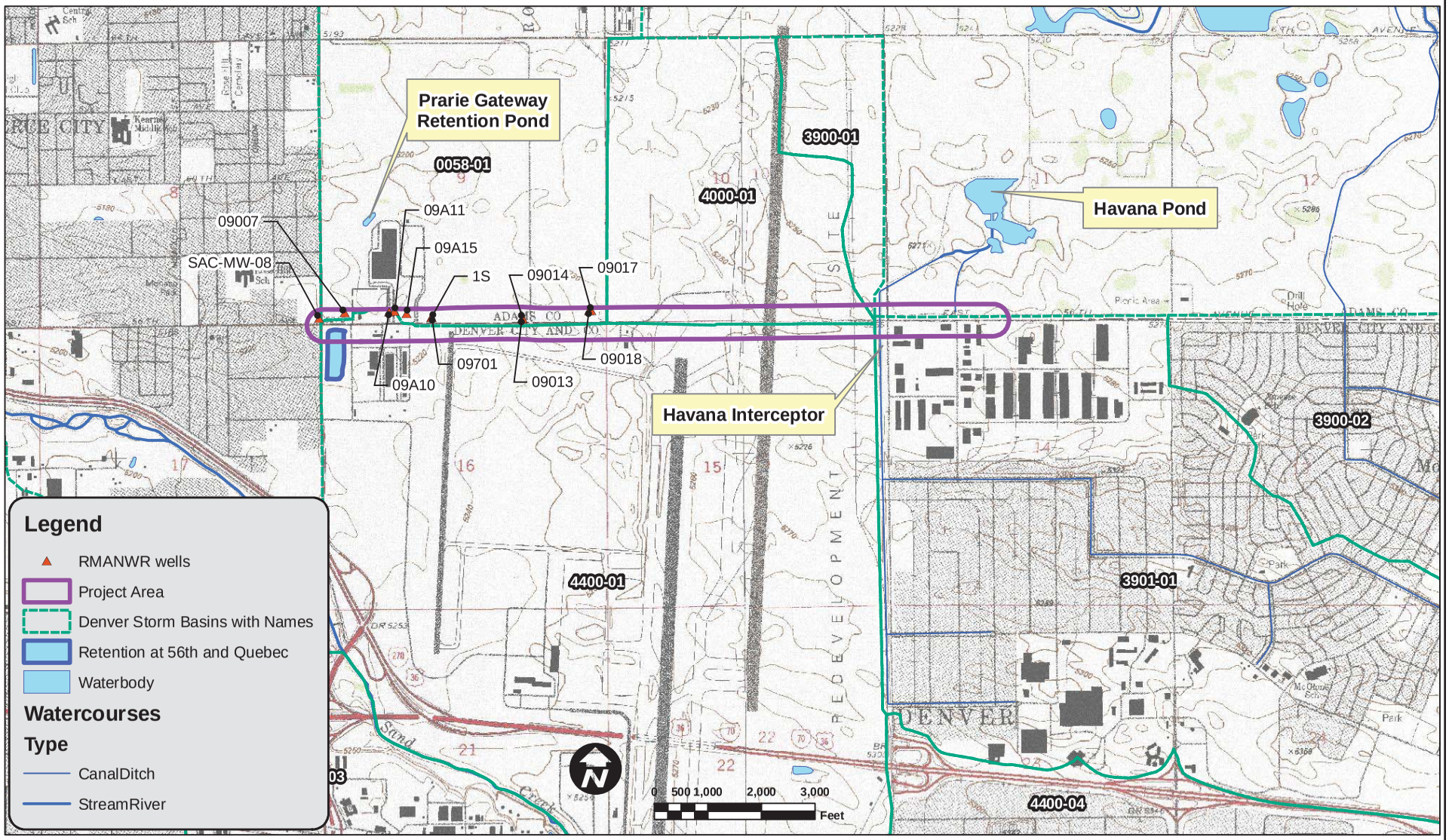
The data provided by Rocky Mountain Arsenal National Wildlife Reserve (RMANWR) lists ten monitoring wells that are located within 300 feet of the 56th Avenue Improvements project area, see Figure 1-2 and Table 1-1. Four of these wells are listed as closed and abandoned, and two are listed as being unable to locate. No active wells listed by the Colorado Division of Water Resources (DWR) were in the project area. The location, disposition and plans for any remaining active monitoring wells will have to be addressed as part of the design of the improvements.

Table 1-1
Groundwater Wells in the Study Area

Site ID	Well Owner	Well Status	Status Date	Well Description	Comments
09013	US Army	Canceled	2002-11-04		Unable To Locate During Summer 2002 Field Recon
09014	US Army	Canceled	2002-11-04		Unable To Locate During Summer 2002 Field Recon
SAC-MW-08	SACWSD	Open		SACWSDMW-08	
1S	US Army	Closed	2003-07-09		Closed By PMC During Well Abandonment Project
09701	US Army	Closed	2003-07-09		Closed By PMC During Well Abandonment Project
09A15	US Army	Canceled	1989-08-04		
09007	US Army	Closed	1997-11-26		
09A10	US Army	Canceled	1989-08-04		
09A11	US Army	Canceled	1989-08-04		
09018	US Army	Closed	2003-07-09		Closed By PMC During Well Abandonment Project
09017	US Army	Closed	2003-07-09		Closed By PMC During Well Abandonment Project

Source: URS Corporation
Notes:
- Cancelled = out of use; could not find or known to be destroyed.
- Closed = no longer existing
- Open = functioning with use or plans for use.
- Data provided by RMANWR
- SACWSD = South Adams County Water & Sanitation District
- PMC = Program Management Contractor

Our research concludes that no active wells will be impacted by the widening of 56th Avenue.



Source: URS Corporation

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FIGURE 1 - 2
Water Quality Affected Area

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Surface Water Classifications

None of the water bodies within the project area have been classified. The Colorado Water Quality Control Commission (WQCC) has classified streams for various uses as described in Colorado Regulation 38, *Classifications and Numeric Standards for South Platte River Basin, Laramie River Basin, Republican River Basin, Smoky Hill River Basin*, dated January 30, 2002.

The numeric water quality standards that are suitable for maintaining the water quality in order to preserve the beneficial uses or improve the water quality of the stream are listed in the subsequent section. According to the water quality regulations established by the WQCC, classifications are established for any state surface waters, 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. Of particular note are streams with designated uses of Domestic Water Supply, Recreation Class 1a or 1b, or Cold Water Aquatic Life Class 1.

The WQCC's 303(d) List of Impaired State Waters identifies water bodies and parameters for which the WQCC has determined that one or more assigned uses or standards are not currently attained. According to the 303(d) List provided on the CDPHE website, effective April 30, 2006, both of the ultimate receiving streams for project, the Segment 14, 15 of the South Platte River Mainstem (COSPUS14 and COSPUS15) and Sand Creek (COSPUS16a) are listed as impaired, for E-coli and for Selenium and E-coli, respectively.

The only major watercourse crossing in the project study area is described below in Table 1-2. The Havana Interceptor is not classified by the CDPHE, but it does have a USGS gage just to the north of the project, which has very limited water quality data associated with it.

The Havana Interceptor is one of several intermittent drainages in this area that flow to the northwest. Irondale Gulch is also an intermittent drainage. More of these intermittent drainages are directly connected with the South Platte, although they are tributary to the South Platte for very large events. They are interrupted by development consisting of railroads or irrigation features with no formal crossing.

Table 1-2
Watercourse Crossings

Stream	Crossing	River Basin	Total Upstream Watershed area (square miles)
Havana Interceptor	Bridge west of Havana Street	Mainstem of the South Platte River from the Burlington Ditch diversion in Denver, Colorado, to a point immediately below the confluence with Big Dry Creek.	3.6

Source: City and County of Denver Storm Drainage Master Plan, April 2005.

2.0 WATER QUALITY IMPACT EVALUATION

Existing water quality conditions are the basis for estimating the effects of roadway alternatives on water resources in the study area. Water quality data and/or standards are established for only the South Platte River and Sand Creek and do not exist for the other streams in the project area.

For the receiving waters that do not have water quality data, estimates were extrapolated based on similar land use. Baseline conditions are identified by sub-watersheds, as surface water runoff from the roadway improvements will generally follow existing drainage patterns. The study area for water quality impacts is generally the immediate site of discharge points from the project area, where runoff from the roadway system would be collected and conveyed into the stream or receiving water. For this study, two heavy metals (copper and zinc) were evaluated for impacts to surface water. Table 2-1 lists the constituents of concern for roadway runoff.

Table 2-1
Typical Water Quality Pollutants of Concern

Constituent	Source	Basis for Inclusion
Suspended solids	Pavement wear, vehicles, atmosphere, maintenance, snow/ice abrasives, sediment disturbance	Excessive sediment can be detrimental to aquatic life (primary producers, benthic invertebrates, and fish) by interfering with photosynthesis, respiration, growth, and reproduction.
Zinc	**Tire wear, motor oil, and grease**	**Toxic to aquatic organisms, can bioaccumulate, and has the potential to contaminate drinking water supplies.**
Cadmium	Tire wear, insecticide application	Toxic to aquatic organisms, can bioaccumulate, and has the potential to contaminate drinking wear supplies.
Arsenic	Lead slag waste when smelter slag is used as the abrasive blast material for removal of surface coatings. Slag is likely to contain arsenic and mercury in hazardous quantities	Toxic to aquatic organisms, can bioaccumulate, and has the potential to contaminate drinking water supplies.
Nickel	Diesel fuel and gasoline, lubricating oil, metal plating, brake line wear, asphalt paving	Toxic to aquatic organisms, can bioaccumulate, and has the potential to contaminate drinking water supplies.
Copper	**Metal plating, bearing wear, engine parts, brake line wear, fungicides, and insecticides**	**Toxic to aquatic organisms, can bioaccumulate, and has the potential to contaminate drinking water supplies.**
Iron	Auto body rust, steel highway structures, engine parts	Toxic to aquatic organisms, can bioaccumulate, and has the potential to contaminate drinking water supplies.
Lead	Leaded gasoline, tire wear, lubricating oil and grease, bearing wear, atmospheric fallout	Toxic to aquatic organisms, can bioaccumulate, and has the potential to contaminate drinking water supplies.
Manganese	Engine parts	Toxic to aquatic organisms, can bioaccumulate, and has the potential to contaminate drinking water supplies.
Chromium	Metal plating, engine parts, brake lining wear	Toxic to aquatic organisms, can bioaccumulate, and has the potential to contaminate drinking water supplies.

Table 2-1 continued

Constituent	Source	Basis for Inclusion
Nitrite and nitrate nitrogen	Atmosphere, roadside fertilizer use, sediments	Can result in accelerated growth of vegetation or algae, resulting in impaired use of water; un-ionized ammonia can be toxic to freshwater fish.
Total phosphorus	Atmosphere, roadside fertilizer use, sediments	Can result in accelerated growth of vegetation or algae, resulting in impaired use of water.
Total coliforms/ fecal coliforms	Soil litter, bird droppings, truck hauling livestock/stockyard waste	Common bacteria found in stormwater that can lead to the closure of adjacent swimming areas, and may increase the cost of treating drinking water at supply reservoirs.
Polyaromatic hydrocarbon (PAH)	Fuels	Toxic to aquatic organisms. Toxicity of PAHs is additive where, even though no single PAH concentration exceeds a water quality standard, the sum of the PAHs can, under certain circumstances, be toxic.
Magnesium	Engine parts	Toxic to aquatic organisms, can bioaccumulate, and has the potential to contaminate drinking water supplies.
Sodium/Chloride	De-icing salts	Potentially detrimental to plants and animals. Can increase salinity that could impact groundwater, streams, and lakes.
Sulfates	Roadway beds, fuel, de-icing salts	Lowers pH (increases acidity) in streams, which stresses aquatic life and leaches toxic metals out of sediment and rocks. High acidity and concentrations of heavy metals can be fatal to aquatic organisms, and may eliminate entire aquatic communities.
Chemical oxygen demand	Oxygen-demanding substances include plant debris, street litter, animal waste, and organic matter commonly found in stormwater	An important water quality determinate because it estimates the level of oxygen demand in polluted waters, and is also indicative of the sustainable level of aquatic life.
Biological oxygen demand	Oxygen-demanding substances, including plant debris, street litter, animal waste and organic matter, commonly found in stormwater	Often used to determine the amount of organic pollution in surface waters.
Oil and grease	Spills, leaks, motor lubricants, antifreeze, hydraulic fluids, asphalt surface leachate.	Contain a wide array of hydrocarbon compounds, some of which are toxic to aquatic organisms at low concentrations.

Source: FHWA, “Evaluation and Management of Highway Water Quality,” Publication No. FHWA-PD-96-032, 1996.

3.0 METHODOLOGY

For the proposed roadway improvements, the Federal Highway Administration (FHWA) Driscoll Model was used to estimate potential water quality impacts from copper and zinc, two vehicle related constituents in roadway runoff that are indicative of other pollutants associated with roadways. The Driscoll Model is an empirical probabilistic dilution computer model used to estimate the impact that highway runoff has on a receiving water body. Site-specific information is entered into the model, following the procedure, and the model computes the magnitude and frequency of concentrations of a particular constituent for the receiving water body. The model compares the once-in-three-year concentration to the acute toxicity value defined by the EPA for that constituent. The comparison indicates whether a water quality problem is likely. The Driscoll Model is presented in "Pollutant Loadings and Impacts from Highway Stormwater Runoff" Volumes 1-3, FHWA, 1990.

For this analysis, the annual mass loadings of the existing and proposed conditions are calculated and compared, and a percent increase is estimated. This percent increase is used to provide guidance in selecting and sizing appropriate BMPs for mitigation of the estimated increases in pollutant loadings. It should be noted that the model is generally limited for use with drainage basins of one to two square miles or greater, as this is the size of the drainage areas in which data was collected to build the model. Each of the basins impacted by the 56th Avenue project is much less than one square mile in area, therefore relative concentrations of pollutants predicted by the Driscoll Model would tend be overestimated because there is little to no offsite runoff comingled with roadway runoff.

4.0 IMPACTS

4.1 Direct Impacts - No Action Alternative

The No Action Alternative is basically a proposal to leave the existing roadway in its current configuration. Under the No Action alternative, the analysis does not include water quality and water resources impacts for roadway service and facilities that would be constructed outside the 56th Avenue Improvements project area.

Under the No Action Alternative, other new roadway improvements would be necessary when compared to the demands on the current transportation network. The impacts associated with these future roadway improvements outside the 56th Avenue project area would be addressed separately.

This alternative requires no major roadway construction and consequently no direct impacts to the receiving waters within the project area along the 56th Avenue corridor.

4.2 Indirect Impacts - No Action Alternative

With the planned redevelopment of the adjacent Stapleton property and without the improvements to 56th Avenue, other roadways would be necessary to handle increases in traffic volume. Widening roadways and adding travel lanes to accommodate increases in traffic correlate to more potential for contaminants being delivered to local surface water features through urban runoff and non-point source pollution.

Other roadway improvements outside the corridor in the No Action Alternative would result in slightly more impervious surfaces within the respective direct impact area, due to the addition of travel lanes. These changes have the potential for increasing surface water runoff, thereby affecting the water quality in nearby streams if appropriate BMPs are not constructed at the same time.

Temporary Construction Impacts

Temporary construction impacts from proposed roadway improvements include possible temporary impacts to water quality from erosion of exposed soils and construction staging areas. Under the No Action Alternative, there will be no major roadway construction and consequently no direct impacts to the receiving waters within the project area along the 56th Avenue corridor.

4.3 Impact Results and Mitigation – Proposed Action

The major changes to the local drainage patterns under the Proposed Action Alternative would be limited to the increase in impervious surfaces associated with the project. Vehicle traffic moving on the proposed roadway surfaces would generate the majority of water pollutants; particulate matter settling out of the air would also generate pollutants. If unmitigated, the larger impervious areas would generate more runoff, carrying

contaminants into receiving waters. During winter months, the application of de-icers to paved surfaces may increase chloride levels in snowmelt.

The FHWA Driscoll Method was used to screen the impact of proposed roadway runoff on local surface waters into classes of mitigation. Four subcatchments were defined for this modeling for the existing and proposed conditions based on the four outfalls expected for the proposed action alternative. Two of the subcatchments outfall to existing regional retention ponds, one in Denver and one in Commerce City in Prairie Gateway. Two subcatchments outfall to the North Stapleton redevelopment area where regional detention is proposed when development occurs. Table 4-1 presents the results of this evaluation, and shows the predicted increase in annual mass loadings of copper and zinc from the project runoff.

To mitigate the potential increases in stormwater pollutants, runoff from proposed roadway surfaces will be retained in the two existing regional retention facilities, Existing NW Pond and Existing Quebec Pond, and two new temporary retention ponds, Pond #1 Southeast and Pond #2 Northwest, to be built as part of the project. Retention will be used because the existing terrain has poorly defined drainageways and the future detention facilities shown in the current planning documents, such as the Denver Drainage Master Plan, have not yet been constructed. This mitigation plan also includes using the existing retention basins. The two temporary retention basins would be constructed for the roadway improvements on Denver Aviation Department property adjacent to the new roadway, as shown in Figure 4-2.

Given existing and proposed storm water retention, the proposed action would have no impact on surface water quality. Implementing BMP's as part of the Proposed Action Alternative is an improvement over the No Action Alternative.

The water quality BMP's for this project comply with the CDOT Tier 2, Intermediate Design Criteria to remove 80% of Total Suspended solids (TSS) and detain 100% of the Water Quality Control Volume (WQCV).

Table 4-1
Driscoll Model Annual Mass Loading at Discharge Sites

56th Ave Subcatchments		Existing NW Pond	Existing Quebec Pond	Pond #1 Southeast	Pond #2 Northwest
Ultimate Receiving Stream after Retention.		S. Platte	Sand Creek	Sand Creek	S. Platte
Approximate Annual Mass Load of **copper** from Runoff to Receiving Stream (pounds/year)	No Action	1.3	0.6	0.3	0.2
	Build	1.5	0.7	1.1	1.0
Approximate Annual Mass Load of **zinc** from Runoff to Receiving Stream (pounds/year)	No Action	8.0	3.6	1.1	0.8
	Build	9.3	4.1	1.7	1.6

Source: URS Corporation

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FIGURE 4-1
Proposed Stormwater Retention Basins

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4.4 Indirect Impacts – Proposed Action

Indirect impacts of the Proposed Action Alternative include the impacts within the 300-foot buffer on either side of the centerline of the roadway, and impacts that will occur after the project is complete. No significant storm water quality impacts are expected within the 300-foot buffer during the project implementation. One active well owned by the South Adams County Water and Sanitation District exists in the buffer zone on the northwest corner of 56th Avenue and Quebec Street. However, since the area is already developed and the construction will occur only on the east side of Quebec Street, no impacts are expected.

After the project is complete, new land development may occur at a more rapid pace in the direct and indirect impact areas than may have occurred under the No Action Alternative. That is, development will occur under the Proposed Action and under the No Action Alternatives but it may occur at a different rate. In either case, the regulations of the local municipalities will require mitigation of the water quality impacts from the new developments.

4.5 Temporary Construction Impacts

Temporary construction impacts from the highway improvements associated with the Proposed Action Alternative would include possible temporary impacts to water quality from erosion of exposed soils and construction staging areas. These impacts will be mitigated through the use of BMP's that are required and specified by the City and County of Denver.