HIGHWAY 199 EXPRESSWAY UPGRADE PROJECT

Final Water Resources Technical Report

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Oregon Department of Transportation Region: 3

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Prepared for

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by Parsons Brinckerhoff Quade and Douglas, Inc.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY **1**

Area of Potential Impact 1
Methods and Coordination 2
Environmental Baseline Conditions 3
Effects and Benefits – Temporary 4
Effects and Benefits – Long Term 5
No Build Alternative *5*
Alternative A *5*
Alternative C *6*
Mitigation 8
Temporary Effects *8*
Long-Term Effects *8*

CHAPTER 1. PROJECT PURPOSE AND NEED **1**

Purpose 1
Project Need 1
Safety *1*
Access *3*
Capacity and Congestion *4*
Growth *5*
System Efficiency *5*

CHAPTER 2. PROJECT ALTERNATIVES **7**

No Build 7
Alternative A 9
Phase 1 ..... *9*
Phase 2 ..... *18*
Alternative C 19
Phase 1 ..... *19*
Phase 2 ..... *23*

CHAPTER 3. METHODS AND COORDINATION 25

Methods – Baseline Conditions 25
Methods – Water Resource Impacts 26
Methods – Water Quality Mitigation 29
Coordination 30

CHAPTER 4. BASELINE CONDITIONS 31

Water Quality 32
Floodplains 35
Drainage Tributary Areas 35
Permits and Approvals 41

CHAPTER 5. TEMPORARY EFFECTS AND BENEFITS 43

No Build 43
Alternatives A and C 43

CHAPTER 6. LONG-TERM EFFECTS AND BENEFITS 47

No Build 47
Alternative A 49
Drainage Tributary Area 1 50
Drainage Tributary Area 2 51
Drainage Tributary Area 3 51
303(d) Impacts to the Rogue River 52
Alternative C 56
Drainage Tributary Area 1 57
Drainage Tributary Area 2 57
Drainage Tributary Area 3 57
303(d) Impacts to the Rogue River 58

CHAPTER 7. INDIRECT AND CUMULATIVE EFFECTS 63

Indirect Effects and Benefits 63
Cumulative Effects and Benefits 64

CHAPTER 8. MITIGATION / CONSERVATION MEASURES 69

Measures for Construction Plans and Specifications 69
Temporary Effects 69
Long-Term Effects 70
General Measures 70

Temporary Effects *70*

Long-Term Effects *70*

CHAPTER 9. REFERENCES **73**

CHAPTER 10. GLOSSARY **75**

LIST OF EXHIBITS

EXHIBIT 1. PROJECT LOCATION AND AREA OF POTENTIAL IMPACT 2

EXHIBIT 2. COMPARISON OF EFFECTS AND BENEFITS BY ALTERNATIVE 10

EXHIBIT 3, COMPARISON OF 3-YEAR IN-STREAM CONCENTRATIONS OF POLLUTANTS BY ALTERNATIVE 11

EXHIBIT 4. COMPARISON OF ALTERNATIVES 12

EXHIBIT 5. HIGHWAY 199 CRASH SUMMARY BETWEEN TUSSEY LANE TO MIDWAY AVENUE 2

EXHIBIT 6. CRASHES OCCURRING ON HIGHWAY 199 EAST AND WEST OF DOWELL ROAD 2

EXHIBIT 7. V/C RATIOS FOR INTERSECTIONS ON HIGHWAY 199 (2005) 4

EXHIBIT 8. ALTERNATIVE A AND ALTERNATIVE C FROM MIDWAY AVENUE TO DOWELL ROAD 10

EXHIBIT 9. ALTERNATIVE A BETWEEN DOWELL ROAD AND FAIRGROUNDS ROAD 13

EXHIBIT 10. ALTERNATIVE A AND ALTERNATIVE C BETWEEN FAIRGROUNDS ROAD AND TUSSEY LANE 17

EXHIBIT 11. ALTERNATIVE C BETWEEN DOWELL ROAD AND FAIRGROUNDS ROAD 20

EXHIBIT 12. COMPARISON OF SITE MEDIAN CONCENTRATIONS 28

EXHIBIT 13. SOUTHERN OREGON COASTAL BASIN MAP 32

EXHIBIT 14. WATER RESOURCES AND DRAINAGE TRIBUTARY AREAS WITHIN THE API 37

EXHIBIT 15. DRAINAGE TRIBUTARY AREA CHARACTERISTICS 39

EXHIBIT 16. PERMITS AND APPROVALS - WATER RESOURCES 41

EXHIBIT 17. POLLUTANT CONCENTRATIONS IN RECEIVING WATER BODIES – NO BUILD ALTERNATIVE 48

EXHIBIT 18. ANNUAL POLLUTANT LOADINGS IN RECEIVING WATER BODIES – NO BUILD ALTERNATIVE 48

EXHIBIT 19. 3-YEAR POLLUTANT CONCENTRATIONS IN RECEIVING WATER BODIES – ALTERNATIVE A 54

EXHIBIT 20. ANNUAL POLLUTANT LOADINGS IN RECEIVING WATER BODIES – ALTERNATIVE A 55

EXHIBIT 21. 3-YEAR POLLUTANT CONCENTRATIONS IN RECEIVING WATER BODIES – ALTERNATIVE C 60

EXHIBIT 22. ANNUAL POLLUTANT LOADINGS IN RECEIVING WATER BODIES – ALTERNATIVE C 61

EXHIBIT 23. PLANNED AND CONSIDERED IMPROVEMENTS IN THE PROJECT AREA 66

EXHIBIT 24. LOCATIONS OF PLANNED AND CONSIDERED IMPROVEMENTS 68

ACRONYMS

Acronym or Abbreviation	Meaning
API	area of potential impact
ADT	average daily traffic
DEQ	Department of Environmental Quality
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESCP	Erosion and Sediment Control Plan
FEMA	Federal Emergency Management Agency
FIRM	flood insurance rate maps
mg/L	milligrams per liter
MP	mile post
MVM	million vehicle miles
NMFS	National Maries Fisheries Service
NPDES	National Pollution Discharge Elimination System
OAR	Oregon Administrative Rules
OHP	Oregon Highway Plan
PD	project delivery
SPCC	spill prevention, control, and countermeasures
SONC	Southern Oregon-Northern California
TMDL	total maximum daily loads
TSS	total suspended solids
v/c	volume to capacity

Executive Summary

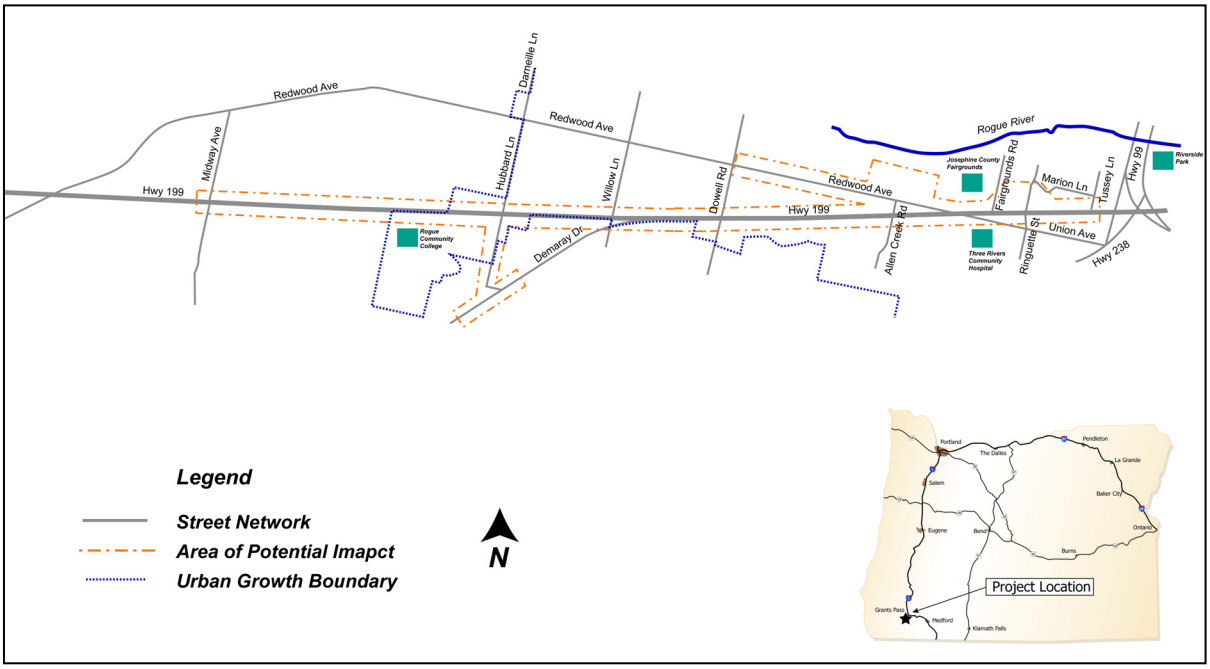
This technical report evaluates the potential temporary and long-term effects and benefits to water quality and water resources that would be affected by the implementation of the Highway 199 Expressway Upgrade Project. Measures are proposed to mitigate the potential temporary and long-term effects.

Area of Potential Impact

An area of potential impact (API) has been defined for the project and is depicted in Exhibit 1. The Project Management Team anticipates that impacts associated with this project would be contained within the API. Thus, the API serves as the boundary for evaluating environmental effects. Documented environmental constraints within the API were mapped and used by the design team to minimize impacts as alternatives, to address the project's purpose and need, were developed.

The API is defined as the general area of Highway 199 bounded by: Midway Avenue to the west and Tussey Lane to the east; Hubbard Lane from Highway 199 to Demaray Drive to the south; Redwood Avenue from Highway 199 to Dowell Road, and 500 feet north of Highway 199 along Ringuette Street.

EXHIBIT 1. PROJECT LOCATION AND AREA OF POTENTIAL IMPACT



Methods and Coordination

The methods used to assess the physical characteristics of the water resources within the API include review of available secondary data. This data included the water feature name, the Oregon Department of Environmental Quality (DEQ)-designated beneficial uses from Oregon Administrative Rules (OAR) Section 41 and DEQ records, 303(d) listings of concern, and river mile of interest for major waterways. Field reconnaissance was performed during February 21 and 22, 2005, to verify the existing water quality data that was collected. During the field reconnaissance potential stormwater treatment areas and stormwater conveyance features observed within the API were noted.

Water quality mitigation needs within the API were reviewed using ODOT's operational notice project delivery (PD)-05. Flood Insurance Rate Maps (FIRMs) were reviewed for the API to determine whether the roadway segments were likely within or near the 100-year or 500-year floodplain.

Pollutant loadings and impacts due to stormwater runoff from the impervious roadway surfaces within API were calculated

following the protocol developed by the Federal Highway Administration (Driscoll, *et al.* 1990).

Coordination for the preparation of this report was performed with the design team responsible for preparing the Highway 199 Stormwater Analysis Report. Coordination was also performed with ODOT's Geo-Environmental Section to ensure that the proper models were used to estimate impacts from pollutants in stormwater runoff for this project.

Environmental Baseline Conditions

The project API is in the Southern Oregon Coastal basin (3rd HUC 171003). The Middle Rogue subbasin (4th HUC 17100308) contains the project API. The Middle Rogue subbasin surrounds Grants Pass in Josephine County and includes the API.

Three drainage tributary areas (DA 1, DA 2, and DA 3) were identified as being up gradient (south) of Highway 199 in the API. The drainage tributary areas are delineated according to their topographical divide and discharge location to tributaries to the Rogue River. DA 1 extends slightly to the west of the API and generally drains to agricultural lands north of Highway 199, which eventually drain to Sparrowhawk Creek outside of the API. DA 2 drains into Sand Creek while DA 3 drains into Allen Creek. These three drainage tributary areas represent a total drainage area of 1,128 acres (1.76 square miles).

This API has important water quality considerations because it crosses two tributaries of the Rogue River, which support species listed under the Endangered Species Act (ESA) such as coho salmon, and because DEQ has determined that the Rogue River does not currently meet water quality standards.

DEQ has included the Rogue River on its 303(d) list because it does not meet water quality standards for temperature or fecal coliform during summer months. DEQ is also taking action to improve the water quality of the Rogue River by setting total maximum daily loads (TMDL) for temperature and fecal coliform, temperature, sedimentation, and biological criteria.

There are 48.5 acres of existing impervious surface associated with Highway 199 and between 10.9 and 11.6 acres of impervious surface associated with the local streets and driveways in the project area[1]. The existing stormwater infrastructure for Highway 199 and Redwood Avenue consists primarily of sheet flow off the roadway into adjacent pervious areas or roadside swales, with the swales allowing either evaporation/percolation or discharge to one of the natural surface waterbodies such as Allen or Sand Creeks. There are approximately 48 transverse culverts under Highway 199 that allow stormwater to pass from the south side of the roadway to the north. These are stormwater culverts that are in addition to the culverts for the creeks and canals.

The API crosses Sand and Allen Creeks and is relatively close to the Rogue River, but it is located outside of their floodplains.

Effects and Benefits – Temporary

During construction, erosion from exposed soils (either disturbed soil areas or soil stockpiles) could increase the amount of sediment, suspended solids, and turbidity entering Sand and Allen Creeks. Erosion could be prevented by the implementation of appropriate conservation measures in an Erosion and Sediment Control Plan (ESCP). ODOT also has an Erosion and Sediment Control Manual that provides guidelines for developing and implementing erosion and sediment controls.

Additional water quality concerns during construction could include increased stormwater runoff due to increases in impervious surfaces such as storage yards, contaminants at staging areas, and potential spillage of uncured concrete.

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[1] This is due to the differences between alternatives concerning the design of the intersection of westbound Highway 199 and northbound Allen Creek Boulevard. Alternative A has a total of 59.4 acres of existing impervious surface while Alternative C has a total of 60.1 acres.

Effects and Benefits – Long Term

No Build Alternative

Under the No Build Alternative, the existing Highway 199 facility would continue to treat stormwater as it does now. With a gradual but steady increase in traffic volumes over time, there would be a potential that highway runoff pollution would exceed the levels currently generated, which would lead to increases in sediment, pollutant loads including suspended solids, metals, and petroleum contaminants, primarily in Allen Creek, and to a lesser extent in Sand Creek. Under the No Build Alternative, the negative effects on water quality would be greater than either of the two build alternatives

Annual loading results for the No Build Alternative are provided in Exhibit 2 and the 3-year in-stream pollutant concentrations are presented in Exhibit 3. The 3-year in-stream pollutant concentrations and annual loads are generated from the existing 48.5 acres of impervious surface associated with Highway 199 assuming no stormwater treatment in accordance with existing conditions in the No Build Alternative.

The current condition of the roadway shows that Highway 199 is not contributing to water quality concerns for copper, zinc, and total suspended solids (TSS). The modeled 3-year in-stream concentrations of copper and zinc are very close to the acute ambient water quality criteria but are not predicted to exceed them for any of the three drainage tributary areas. In addition, since almost all of the roadway runoff currently enters either vegetated ditches or pervious (undeveloped) lands adjacent to the right-of-way, the predicted 3-year concentrations are not likely to be found in Sand or Allen Creeks. The existing vegetated areas adjacent to the right-of-way are providing some level of water quality treatment for roadway runoff.

Alternative A

The primary long-term effect to water resources would be a net increase in the amount of impervious surface and the resulting additional pollutant load on the water resources within the API.

Alternative A would result in 15 acres of new right of way[2], with 5.5 acres associated with expanding Highway 199 (bringing the total to 126.6 acres) and 9.5 acres associated with the modifications to the local street network including the new connection to Pansy Lane. Alternative A would result in 7.0 acres of net new impervious for Highway 199 and 4.2 acres of net new impervious for the local street network. The total amount of impervious surface associated with this project would be 70.6 acres. The total amount of net new impervious is 11.2 acres. A total of 10.3 acres of impervious surface would be routed through new stormwater treatment facilities. Stormwater conveyance, detention, and treatment would be designed, constructed, and maintained according to the recently updated ODOT Hydraulics Manual, 2006.

Water pollution concentrations and annual loads were calculated for tributary drainage areas for copper, zinc, and TSS using the same methods as the No Build Alternative. Water pollution concentrations and annual loads were calculated assuming both no treatment and treatment provided by vortex manhole units, bio-swales, and detention ponds/vaults. Annual loading results for each drainage tributary area for Alternative A are presented in Exhibit 2 and the 3-year in-stream pollutant concentrations are presented in Exhibit 3. In general, the water pollution concentrations and annual loads were greater for Alternative A with no mitigation than those predicted for the No Build Alternative. Mitigation provided by the stormwater treatment components would decrease the pollutant loads to levels less than baseline conditions. Mitigation provided by the stormwater treatment facilities would ensure that the 3-year, in-stream concentrations of copper and zinc remain below acute water quality criteria.

Alternative C

The primary long-term effect to water resources would be a net increase in the amount of impervious surface and the resulting additional pollutant load on the water resources within the API.

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[2] Based upon the Right-of-Way Technical Report. Includes both fee acquisition and slope and utility easements.

The difference between Alternative A and Alternative C is the proposed connection of Highway 199 with Allen Creek Road and the design of the connection to Pansy Lane.

Alternative C would result in 13 acres of new right of way[3], with 6 acres associated with expanding Highway 199 (bringing the total to 127.1 acres) and 7 acres associated with the modifications to the local street network including the new connection to Pansy Lane. Alternative C would result in 7.8 acres of net new impervious for Highway 199 and 2.7 acres of net new impervious for the local street network. The total amount of impervious surface associated with this project would be 69.1 acres. The total amount of net new impervious is 10.5 acres. A total of 10.7 acres of impervious surface would be routed through new stormwater treatment facilities. Stormwater conveyance, detention, and treatment would be designed, constructed, and maintained according to the recently updated ODOT Hydraulics Manual, 2006.

Water pollution concentrations and annual loads were calculated for tributary drainage areas for copper, zinc, and TSS using the same methods as the No Build Alternative. Water pollution concentrations and annual loads were calculated assuming both no treatment and treatment provided by vortex manhole units, bio-swales, and detention ponds/vaults. Annual loading results for each drainage tributary area for Alternative C are presented in Exhibit 2 and the 3-year in-stream pollutant concentrations are presented in Exhibit 3. In general, the water pollution concentrations and annual loads were greater for Alternative C with no mitigation than those predicted for the No Build Alternative. Mitigation provided by the stormwater treatment components would decrease the pollutant loads to levels less than baseline conditions. Mitigation provided by the stormwater treatment facilities would ensure that the 3-year, in-stream concentrations of copper and zinc remain below acute water quality criteria.

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[3] Based upon the Right-of-Way Technical Report. Includes both fee acquisition and slope and utility easements.

Mitigation

Temporary Effects

Aspects of construction may cause erosion and sedimentation that could affect Sand and Allen Creeks, which are tributaries to the Rogue River. The project includes constructing erosion and sediment control facilities that would mitigate these temporary effects; these erosion and sediment control facilities would be inspected, maintained, and modified (if necessary) to ensure their effectiveness. The project includes the preparation and implementation of an ESCP and a spill prevention, control, and countermeasures (SPCC) plan.

The project shall be bound by the requirements of ODOT's NPDES 1200-CA permit to take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. In addition to preparing and maintaining an ESCP, the 1200-CA permit requires the project to perform maintenance and monitoring of the erosion and sediment control facilities, perform turbidity monitoring, maintain written records of visual monitoring, and follow the reporting requirements of noncompliance incidents.

During the construction of the Highway 199 Expressway Upgrade Project, all erosion and stormwater control measures should either meet or exceed ODOT's Erosion Control Manual practices and be used along with other required erosion management techniques established for road construction in the ESCP. The project would include an SPCC plan to control pollutants throughout the project work areas. These areas can include but are not limited to staging, storage, maintenance, refueling areas, and waste sites.

Long-Term Effects

Increased stormwater runoff from new impervious surfaces would be treated with the stormwater treatment facilities. These facilities are part of the proposed action, and thus, no further mitigation would be necessary. All stormwater facilities

require routine inspection and maintenance and thus would be designed so that these functions could be easily conducted.

A comparison of effects (temporary, long-term direct, indirect, and cumulative) between the No Build and the two build alternatives is presented in Exhibit 4.

EXHIBIT 2. COMPARISON OF EFFECTS AND BENEFITS BY ALTERNATIVE

Effect/Benefit	No Build	Alternative A			Alternative C		
	Total of All Drainage Tributary Areas	Drainage Tributary Area 1	Drainage Tributary Area 2	Drainage Tributary Area 3	Drainage Tributary Area 1	Drainage Tributary Area 2	Drainage Tributary Area 3
Increase in Impervious Area	0.0 acre	1.7 acres	-0.2 acre	5.5 acres	1.7 acres	-0.2 acre	6.1 acres
Stormwater Treatment Facilities	None	1 Bio-swale treating 1.28 acres of impervious surface	None	1 Manhole Unit, 2 bio-swales, and a detention pond treating 9.0 acres of impervious surface	1 Bio-swale treating 1.28 acres of impervious surface	None	1 Manhole Unit, 2 bio-swales, and a detention pond treating 9.4 acres of impervious surface
Total Copper Loading	11.17 lbs/yr untreated	3.22 lbs/year untreated	5.59 lbs/year untreated	3.65 lbs/year untreated	3.22 lbs/year untreated	5.59 lbs/year untreated	3.79 lbs/year untreated
		3.08 lbs/year treated		2.46 lbs/year treated	3.08 lbs/year treated		2.55 lbs/year treated
Total Zinc Loading	89.4 lbs/yr untreated	25.8 lbs/year untreated	44.7 lbs/year untreated	29.2 lbs/year untreated	25.8 lbs/year untreated	44.7 lbs/year untreated	30.4 lbs/year untreated
		24.6 lbs/year treated		19.7 lbs/year treated	24.6 lbs/year treated		20.4 lbs/year treated
Total TSS Loading	69,863 lbs/yr untreated	20,121 lbs/year untreated	34,927 lbs/year untreated	22,831 lbs/year untreated	20,121 lbs/year untreated	34,927 lbs/year untreated	23,713 lbs/year untreated
		18,606 lbs/year treated		14,667 lbs/year treated	18,606 lbs/year treated		15,215 lbs/year treated

EXHIBIT 3, COMPARISON OF 3-YEAR IN-STREAM CONCENTRATIONS OF POLLUTANTS BY ALTERNATIVE

Effect/Benefit	No Build			Alternative A			Alternative C		
	Drainage Tributary Area 1	Drainage Tributary Area 2	Drainage Tributary Area 3	Drainage Tributary Area 1	Drainage Tributary Area 2	Drainage Tributary Area 3	Drainage Tributary Area 1	Drainage Tributary Area 2	Drainage Tributary Area 3
Increase in Impervious Area	0.0 acre	0.0 acre	0.0 acre	1.7 acres	-0.2 acre	5.5 acres	1.7 acres	-0.2 acre	6.1 acres
Stormwater Treatment Facilities	None	None	None	1 Bio-swale treating 1.28 acres of impervious surface	None	1 Manhole Unit, 2 bio-swales, and a detention pond treating 9.0 acres of impervious surface	1 Bio-swale treating 1.28 acres of impervious surface	None	1 Manhole Unit, 2 bio-swales, and a detention pond treating 9.4 acres of impervious surface
3-Year In-Stream Copper Concentration (mg/L)	0.008	0.008	0.009	0.008 No Treatment	0.008	**0.011**[a] No Treatment	0.008 No Treatment	0.008	**0.011**[a] No Treatment
				0.008 With Treatment		0.007 With Treatment	0.008 With Treatment		0.007 With Treatment
3-Year In-Stream Zinc Concentration (mg/L)	0.062	0.063	0.068	0.064 No Treatment	0.063	**0.082**[a] No Treatment	0.064 No Treatment	0.063	**0.083**[a] No Treatment
				0.061 With Treatment		0.055 With Treatment	0.061 With Treatment		0.056 With Treatment
3-Year In-Stream TSS Concentration (mg/L)	25.4	25.7	28.0	26.3 No Treatment	25.7	33.6 No Treatment	26.3 No Treatment	25.7	34.2 No Treatment
				23.7 With Treatment		17.3 With Treatment	23.7 With Treatment		17.6 With Treatment

a) Bolded values exceed acute water quality criteria (fresh water) for specific pollutant (assuming a 20 percent dissolved-phase concentration for both copper and zinc)

a. Acute Water Quality Criteria for Copper is 0.010 mg/L

b. Acute Water Quality Criteria for Zinc is 0.069 mg/L

c. Acute water quality criteria based upon a hardness level of 53.4 mg/L calcium carbonate ($CaCO_3$) in the receiving water

EXHIBIT 4. COMPARISON OF ALTERNATIVES

	No Build	Alternative A & Alternative C
Temporary Effects	N/A	During construction, erosion from exposed soils (either disturbed soil areas or soil stockpiles) could increase the amount of sediment, suspended solids, and turbidity entering Sand and Allen Creek. Water quality concerns during construction could include erosion from exposed soils in construction and staging areas, increased stormwater runoff due to increases in impervious surfaces, contaminants at staging areas, and potential spillage of uncured concrete.
Long-Term, Direct Effects	N/A	The primary long-term effect to water resources would be a net increase in the amount of impervious surface and the resulting additional pollutant load on the water resources within the API. Water quality treatment facilities in Drainage Tributary Area 3, between Allen Creek Boulevard and Tussey Lane, will provide a substantial benefit to runoff from Highway 199 entering Allen Creek by decreasing the pollutant load compared to the No Build Alternative.
Indirect Effects	N/A	Secondary impacts include water quality effects that propagate downstream. Since reaches of the Rogue River downgradient of the API are already listed by the DEQ as waters of concern for temperature and fecal coliform, potential water quality effects from the project could exacerbate these problems. Water quality can be affected by water quantity. Decreases in baseflow create higher concentrations because pollutants are less diluted. Because flow control design standards are included in the project, secondary impacts due to water quantity should be minimal.
Cumulative Effects	N/A	The project could also have impacts on stormwater runoff in the watershed by adding between 10.5 and 11.3 acres of new impervious surface. Impacts to water quality from this project would be cumulative with other projects taking place nearby. This project and other projects taking place nearby have turbidity and suspended solids as the primary water quality concern. Land conversion from pervious to impervious surfaces can cause increased stormwater runoff, with possible increased erosion, decreased infiltration, and decreased water quality. The larger road projects may have impacts from petroleum contaminants.

CHAPTER 1. Project Purpose and Need

Purpose

The purpose of the project is to address vehicular and pedestrian safety, and current and future congestion and operational deficiencies along Highway 199 between Midway Avenue and Tussey Lane.

Project Need

The need for the project is based on the crash history, congestion, access, growth of surrounding area, and system efficiency of Highway 199.

Safety

There have been 370 crashes reported within the limits of the project between January 1, 1999, and December 31, 2005. Of these reported crashes, 2 percent included fatalities, 55 percent involved injuries, and 43 percent involved property damage only (Exhibit 5).

Highway 199 from Tussey Lane to Midway Avenue has experienced a crash rate consistently higher than the statewide average for similar facilities. Along the eastern portion of Highway 199 from Tussey Lane to Dowell Road, the crash 2005 rate is 2.79 crashes per million vehicle miles (MVM) which is higher than other comparable Suburban Non-freeway Oregon highways (1.39 crashes per MVM). Within the western portion of Highway 199, from Dowell Road to Midway Avenue, the 2005 crash rate is 0.42 crashes per MVM which is lower than other comparable Rural, Non-freeway Oregon highways (1.01 crashes per MVM). Exhibit 6 shows the

number of crashes occurring on Highway 199 east and west of Dowell Road from January 1999 through December 2005.

EXHIBIT 5. HIGHWAY 199 CRASH SUMMARY BETWEEN TUSSEY LANE TO MIDWAY AVENUE

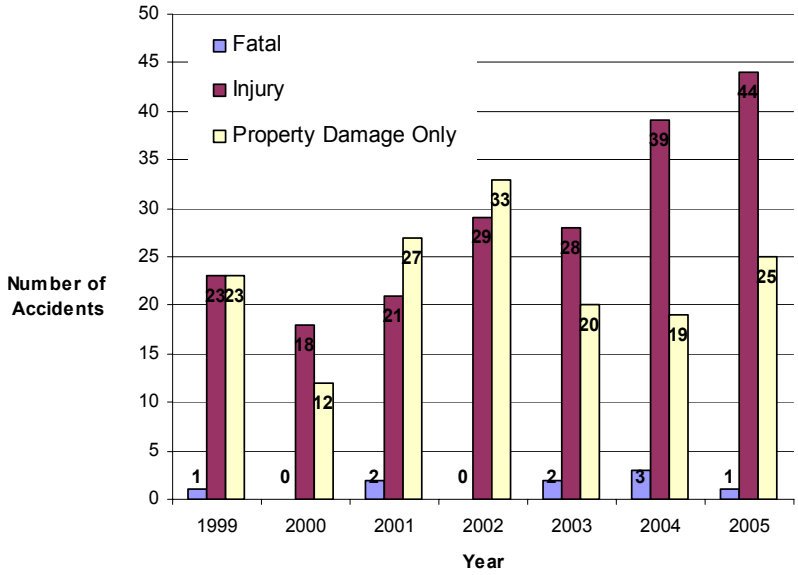
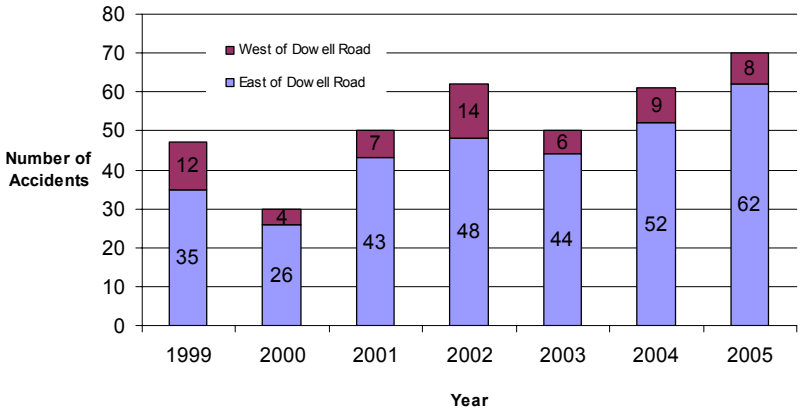


EXHIBIT 6. CRASHES OCCURRING ON HIGHWAY 199 EAST AND WEST OF DOWELL ROAD



The highest number of crashes occurred between Tussey Lane and Dowell Road. Crashes within this segment tend to be less severe than crashes west of Dowell Road. Between January 1, 1999, and December 31, 2005, there have been 310 crashes in this segment, one of which involved a fatality.

Between Dowell Road and Midway Avenue, there are less crashes, but the severity of the crashes is greater due to the higher speeds. From 1999 through December 2005 there have been 60 crashes, of which there were eight crashes that

included fatalities. There were 13 fatalities reported in Josephine County in 2005; one of these was in this project's API.

West of Dowell Road, there is a lack of safe areas for school buses to stop along the highway to pick up school children.

During peak traffic hours, vehicles at uncontrolled intersections have long waits to find gaps in traffic to safely enter the highway. This is especially difficult for vehicles attempting to make left turns across multiple lanes of traffic. In these situations, drivers wait long time periods, become frustrated, and take higher risks to enter the highway.

Controlled Intersection

An intersection that has signs or signals that establish who has the right-of-way. It includes traffic signals, stop signs on side streets, or all-way stop.

Uncontrolled Intersection

An intersection that has no signage or signals but where the basic right-of-way rule controls who has the right-of-way at the intersection (first at the intersection has the right-of-way, but yield to the right if two vehicles approach at the same time).

Partially Controlled Intersection

An intersection that has stop signs only on the side streets or the intersecting local roads.

Access

There are 15 intersections along Highway 199 in the API. Five of the intersections are controlled by 4-way signals, and ten are partially controlled by stop signs at the intersecting local roads. In addition to the controlled intersections, there are approximately 13 driveways that allow uncontrolled access to Highway 199. A particularly unsafe area occurs on westbound Highway 199 between Tussey Lane and Ringuette Street where there is no curb or defined driveway which allows uncontrolled access into dense commercial development. This presents a situation where traffic freely enters and exits the highway, increasing the crash risk.

The signals at Ringuette Street, Fairgrounds Road, and Redwood Avenue do not meet the standard signalized access spacing of at least 0.5 mile. Only the spacing from Allen Creek Road to Dowell Road signals currently meets this standard.

The current substandard spacing of signalized intersections, the multiple driveways and uncontrolled access along the highway, and the high traffic volumes during peak hour traffic have created an environment of stop-and-go traffic due to vehicles slowing and stopping to enter or exit the highway. These conditions diminish the ability of Highway 199 to function as an expressway where traffic should travel safely at efficient speeds and promote high-volume traffic movements.

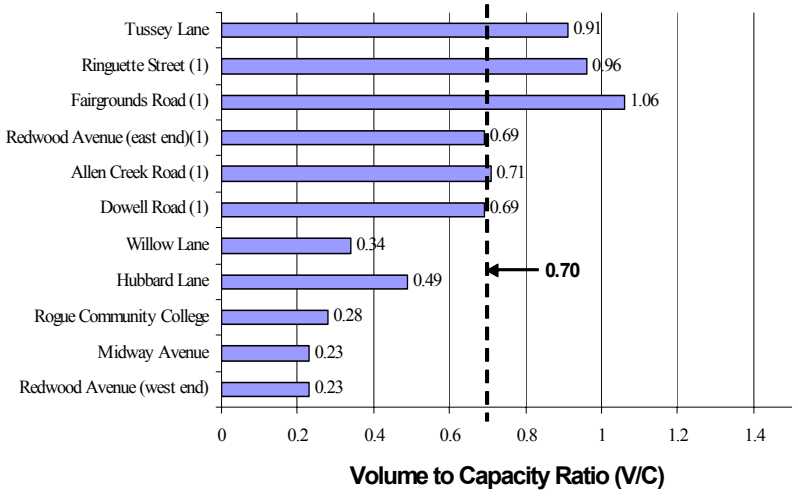
Capacity and Congestion

Volume to Capacity (v/c) Ratio

A measurement of highway/roadway service quality that compares the number of vehicles using or expected to use a given road or segment of road (the volume) with the number of vehicles that the facility is designed to handle safely (the capacity).

The average daily traffic (ADT) between Tussey Lane and Dowell Road ranges from 38,000 to 22,000 and from Dowell Road to Midway Avenue it ranges from 22,000 to 12,000. Congestion is occurring throughout the Highway 199 corridor. Currently, four intersections within the corridor are functioning at an unacceptable volume to capacity (v/c) level, and two intersections are nearly at the unacceptable level (Exhibit 7). A v/c ratio above 0.70 for highways such as Highway 199 is considered unacceptable per the 1999 Oregon Highway Plan and its amendments.

EXHIBIT 7. V/C RATIOS FOR INTERSECTIONS ON HIGHWAY 199 (2005)



(1) Signalized Intersection (assumed with 120 second cycle length)

Queue

A waiting line of vehicles.

Traffic simulations were developed to determine where delays and traffic queues may impact adjacent intersections along the corridor. The simulation analysis indicates that significant queues would form in both directions at Ringuette Street affecting traffic operations at adjacent intersections in both directions. Additionally, the intersection of Allen Creek Road with Redwood Avenue, which is currently a stop sign for traffic on Allen Creek Road and no stop sign or signal for Redwood Avenue traffic, in the future would likely queue through the Highway 199/Allen Creek Road intersection, affecting traffic operations along Highway 199. Congestion levels at the South Y Interchange would also continue to affect overall traffic

operations eastbound on Highway 199 approaching the Allen Creek Road intersection. Resolving the congestion at the South Y Interchange will be addressed in a separate study, which is expected to begin in 2007.

South Y Interchange

The South Y Interchange is located just east of the Highway 199 Expressway Upgrade project API. The South Y Interchange is the intersection of three state highways: Highway 199, Oregon 238, and Oregon 99.

Growth

The City of Grants Pass, the second largest city in Southern Oregon and the largest city in Josephine County, has experienced a high population growth rate, averaging 2.9 percent annual increase from 1996 to 2005. Over the last 10 years, the population of Grants Pass has increased by 29 percent. The current estimated population of Grants Pass is 26,085 (Portland State University 2006). Development is occurring at a high rate within and near the Highway 199 project limits. With the increase in population comes an increase in traffic. Traffic west of Dowell Road is growing at a rate of 1.5 to 2 percent per year. Looking ahead, growth in Grants Pass is likely to increase over the next several years and add traffic to the currently congested Highway 199.

System Efficiency

Highway 199 is currently not functioning as an expressway as defined by the Oregon Highway Plan (OHP). The 1999 OHP defines an expressway as a highway that provides for safe and efficient high speed and high volume traffic movements. The primary function of an expressway is for interurban travel and connections to ports and major recreation areas with minimal interruptions. Private access is discouraged and public access is highly controlled. Freight, commuters, and tourists cannot effectively move through the Highway 199 corridor due to high traffic congestion, slower speeds, and numerous access points that have negatively impacted inter-regional and regional travel.

High traffic volumes on Highway 199 also create a barrier for north-south local travelers trying to use local roads. Local users are also using Highway 199 to make short trips, such as to the hospital, local businesses, or to the community college located next to the highway. Local users are often making more turning movements onto and off of the highway, which puts local use

in conflict with through users and decreases the system's efficiency. This high level of local use conflicts with the through users who are using the expressway for inter-regional travel.

CHAPTER 2. Project Alternatives

The Highway 199 Expressway Upgrade Project considered a range of alternatives to rectify the safety, access, congestion, and future growth needs while minimizing effects to the community and environment. This range of alternatives was narrowed down to two build alternatives (Alternatives A and C) as well as the No Build Alternative. The alternatives are described below. For description and analysis purposes, each build alternative is broken into three segments (from west to east): Midway Avenue to Dowell Road, Dowell Road to the Josephine County Fairgrounds Road, and the Fairgrounds Road to Tussey Lane. Each build alternative would be constructed in two phases, Phase 1 and Phase 2; each phase is also described.

Safety Corridor Sign for Highway 199.

No Build

The No Build Alternative provides the basis for a comparative analysis of the build alternatives. The No Build Alternative assumes that roadway configurations along Highway 199 in the API would remain in their current configuration.

Currently, Highway 199 in the API has two travel lanes in each direction, with signalized intersections at Dowell Road, Allen Creek Road, Redwood Avenue, Fairgrounds Road, and Ringuette Street. Unsignalized intersections include: Midway Avenue, Rogue Community College, Hubbard Lane, Willow Lane, Henderson Lane, and Tussey Lane. In addition, Arbor Ridge Drive, Dawn Drive, and many private driveways currently have direct and uncontrolled access onto Highway 199. Between Allen Creek Road and Tussey Lane the westbound and eastbound travel lanes on Highway 199 are

separated by a large median. From Midway Avenue to Willow Lane, the wide paved median does not restrict vehicular movements across travel lanes. At the intersection of Highway 199 and Willow Lane there is a raised curb median, which provides westbound traffic on Highway 199 with one left-turn-only lane onto Willow Lane, prohibits eastbound Highway 199 traffic from turning left onto Willow Lane, and prohibits traffic on Willow Lane from crossing Highway 199.

There are limited and unconnected dedicated bicycle and pedestrian facilities in the API. There is an existing bicycle and pedestrian shared use path along the south side of Highway 199, beginning at the Rogue Community College entrance and continuing east until Nebraska Avenue. Along Redwood Avenue and most of Hubbard Lane, pedestrians and bicyclists use paved shoulders. A small section of sidewalk exists along the west side of Hubbard Lane just south of Highway 199.

The No Build Alternative also assumes that other programmed and funded projects in and adjacent to the API will occur, regardless of whether the Highway 199 Expressway Upgrade Project is constructed. The No Build Alternative assumes the following future improvements:

- Minor road realignment and signal installation at Park Street and Lewis Avenue
- Signal installation and lane modification at Harbeck Road and OR 238
- Construct eastbound passing lane on Highway 199 (mile post (MP) 10.4-11.2) about 6 miles west of the project API
- Repave and construct bicycle and pedestrian facilities on OR 99 (MP 0 to 1.39) and OR 238 (MP 0 to 1.7)
- Redwood Avenue improvements including reconstruction of two travel lanes, center turn lane, and bicycle and pedestrian facilities from Redwood Circle to Dowell Road
- Improve Redwood Avenue at Dowell Road intersection and install traffic signal.

Alternative A

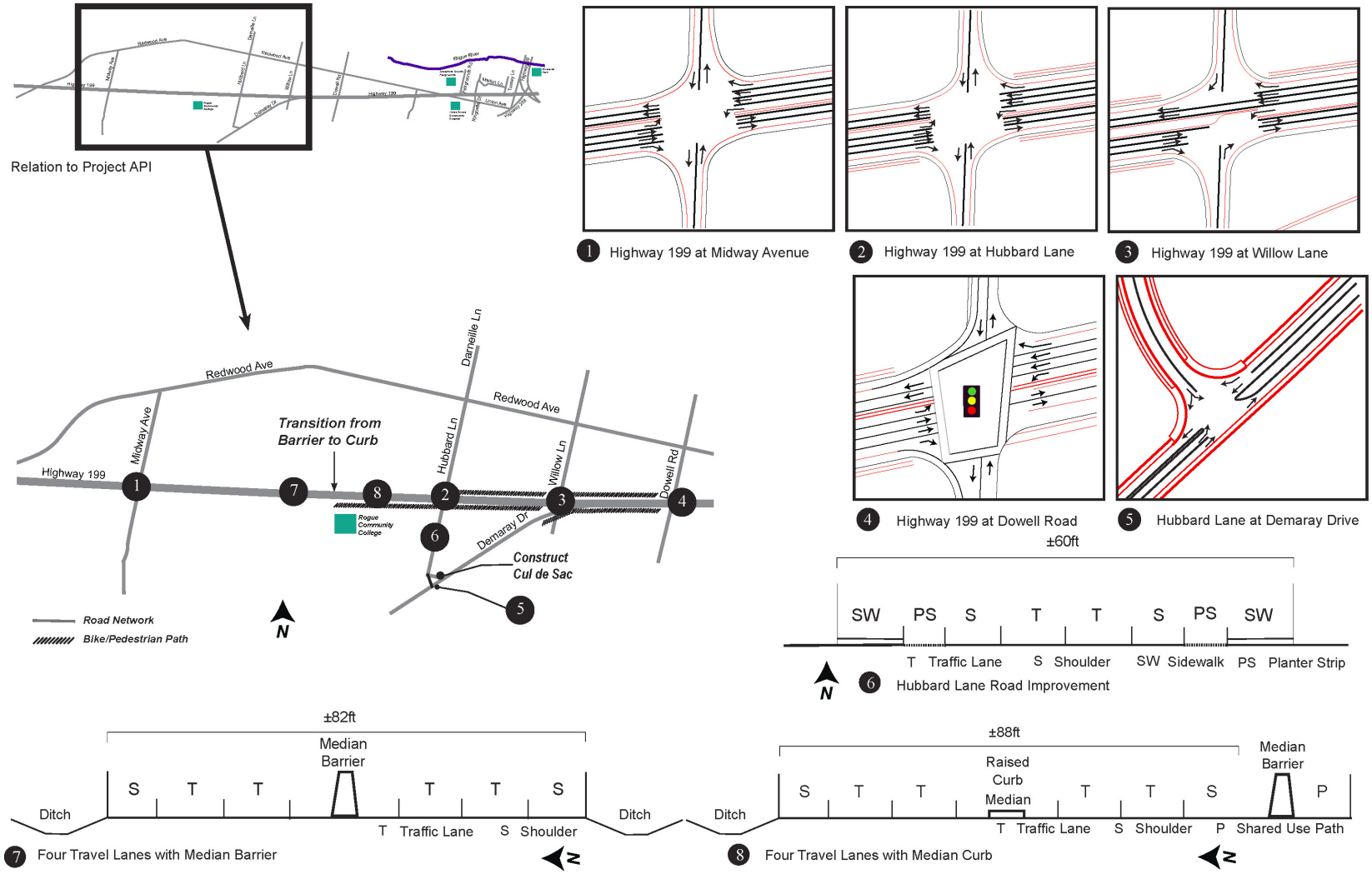
Alternative A would be constructed in two phases. Phase 1 would include improvements from Midway Avenue to Tussey Lane and a realignment of the Allen Creek Road intersection with Redwood Avenue. Phase 2 would include additional improvements north of Highway 199 from Pansy Lane to Tussey Lane.

Phase 1

Alterative A: Midway Avenue to Dowell Road
Exhibit 8 shows the general improvements proposed as part of Alternative A between Midway Avenue and Dowell Road, with insets to provide greater design detail at major intersections. This segment has the following design features:

- Highway 199 would continue to have four travel lanes (two in each direction) but a median barrier would be added between the eastbound and westbound lanes. From Midway Avenue to the Rogue Community College entrance, the barrier would be an approximately 42-inch-high concrete median barrier. This median barrier would transition to a raised curb median (approximately 8 inches high) in the vicinity of the Rogue Community College entrance. The raised curb median would continue east to Dowell Road. Insets 7 and 8 of Exhibit 8 illustrate these typical road sections.
- The existing configuration of the Highway 199 at Midway Avenue intersection would remain two through lanes in each direction and left-turn-only and right-turn-only lanes from Highway 199 north and south onto Midway Avenue (Exhibit 8, Inset 1). Traffic on Midway Avenue would be able to make left and right turns onto Highway 199. Improvements to this intersection would include widening Highway 199 to accommodate u-turn movements.
- Arbor Ridge Drive, Dawn Drive, and various private driveways would be restricted to right in/right out movements due to the median barrier along Highway

EXHIBIT 8. ALTERNATIVE A AND ALTERNATIVE C FROM MIDWAY AVENUE TO DOWELL ROAD



199. A new driveway collector nearly 500 feet long would also be constructed east from Dawn Drive.

- The entrance to Rogue Community College from eastbound Highway 199 would have a deceleration lane for right turns into the college. Entrance to the college from westbound on Highway 199 would be from a left-turn-only lane. Exit from the college would be right out only.
- A portion of the South Highline Canal adjacent to the southeast corner of the intersection of Highway 199 and the Rogue Community College entrance would be realigned for about 150 feet to accommodate the highway widening and modified connection of the multi-use path to the college access road.
- Highway 199 at the intersection with Hubbard Lane would include left-turn-only lanes, two through lanes, and right-turn-only lanes in both directions. Traffic on Hubbard Lane would be able to make left and right turns onto Highway 199. U-turns would be permissible. This intersection would be constructed to accommodate a future traffic signal once traffic conditions warrant signal installation (Exhibit 8, Inset 2).
- Hubbard Lane would be improved to City of Grants Pass design standards (including a planter strip and sidewalk along both sides) south of Highway 199 (Exhibit 8, Inset 6). The southern-most 400 feet of Hubbard Lane would be realigned to create a new intersection with Demaray Drive (Exhibit 8, Inset 5). The new intersection of Hubbard Lane and Demaray Drive would have a left-turn-only pocket on northbound Demaray Drive. The existing intersection of Hubbard Lane and Demaray Drive would be closed and made into a cul-de-sac.
- A separated bicycle and pedestrian shared use path would be constructed along the north side of Highway 199 between Hubbard Lane and Dowell Road. The existing bicycle and pedestrian shared use path along

the south side of Highway 199, beginning at the Rogue Community College entrance and continuing east past Dowell Road, would be reconstructed (Exhibit 8).

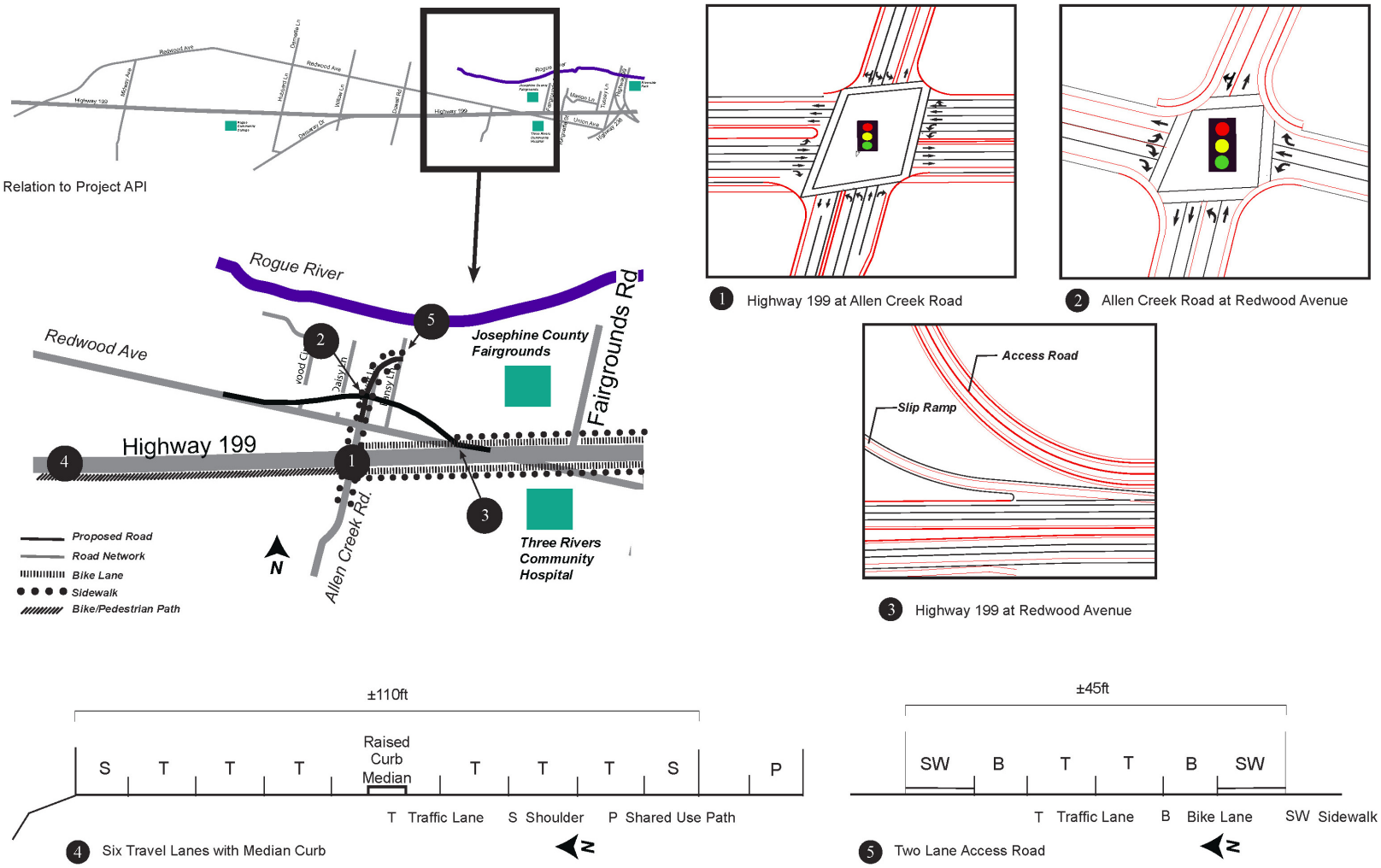
- Highway 199 at the intersection with Willow Lane would remain two through lanes in each direction, right-turn-only lanes in both directions, and raised curb median allowing left-turn-only from a dedicated turn pocket for westbound traffic (Exhibit 8, Inset 3). Eastbound traffic would continue to be prohibited from making left-turns. Willow Lane would continue to be right in/right out only north and south of Highway 199.
- Highway 199 at the intersection with Dowell Road would continue to be signalized. It would include left-turn-only and right-turn-only lanes off Highway 199. Traffic on Dowell Road would be able to make left and right turns onto Highway 199.

Alternative A: Dowell Road to Fairgrounds Road

Exhibit 9 shows the general improvements proposed as part of Alternative A between Dowell Road and Fairgrounds Road, with insets to provide greater design detail at major intersections. This segment of Alternative A has the following design features:

- At Dowell Road, Highway 199 would transition from four travel lanes to six travel lanes with raised curb median continuing between the eastbound and westbound lanes (see Exhibit 9, Inset 4). For westbound Highway 199 traffic, the right lane approaching Dowell Road would become a right-turn-only lane onto northbound Dowell Road.
- The intersection of Highway 199 and Allen Creek Road, as shown in Inset 1 of Exhibit 9, would remain signalized and include the following features:
  - Eastbound Highway 199 would have three through lanes, one left-turn-only lane, and one right-turn-only lane.

EXHIBIT 9. ALTERNATIVE A BETWEEN DOWELL ROAD AND FAIRGROUNDS ROAD



- Westbound Highway 199 would have three through lanes, with the right-hand lane also allowing for right turns, and two left-turn-only lanes.
- Northbound Allen Creek Road would have one through lane, two left-turn-only lanes, and one right-turn-only lane.
- Southbound Allen Creek Road would have one combined through and right-turn lane and two left-turn-only lanes.

- Allen Creek Road would be extended approximately 250 feet north of the existing Redwood Avenue where it currently ends at a "T" intersection (see Exhibit 9, Inset 2). Sidewalks would be added on both sides of Allen Creek Road and u-turns would be permissible at the intersection of Allen Creek Road, Redwood Avenue, and the new access road. This new intersection would be signalized and:
  - Northbound from Allen Creek Road would have one through lane and one left-turn-only lane.
  - Eastbound from a realigned Redwood Avenue would have no through lanes, one left-turn-only lane, and two right-turn-only lanes.
  - Southbound from a new access road would have a single combined through lane and right-turn lane.
  - Westbound from a realigned westbound Highway 199 slip ramp would have one through lane, one left-turn-only lane and one right-turn-only lane.
- To connect with the new extension of Allen Creek Road, Redwood Avenue would be realigned starting just west of Redwood Circle (Exhibit 9). The realigned portion of Redwood Avenue would curve to the north. The remaining portion of Redwood Avenue east of the new curve would cul-de-sac just before Allen Creek Road. Properties along this stretch would use this road to access the realigned Redwood Avenue at an

intersection with Redwood Circle. The City of Grants Pass may consider adding a signal at this intersection.

- A new local street would be constructed to connect Daisy Lane with Redwood Circle; thereby providing properties along Daisy Lane access to Redwood Avenue.
- Access to the Josephine County Fairgrounds, the YMCA, and other county-owned parcels east of the YMCA would be from a new access road and Pansy Lane (Exhibit 9). The access road would bulb out to the north of the new Allen Creek Road extension, curve east, and connect to Pansy Lane. An existing driveway on Pansy Lane would continue to provide access to the YMCA and the fairgrounds.
- The access road would have two lanes and a sidewalk on both sides of the road (Exhibit 9, Inset 5).
- A realigned one-way slip ramp from westbound Highway 199 would be constructed (Exhibit 9, Inset 3). This slip ramp would allow westbound traffic to either continue through the new Allen Creek Road intersection to the realigned Redwood Avenue, turn right onto the new access road, or turn left towards the Highway 199 at Allen Creek Road intersection.
- The existing signal at the Highway 199 and Redwood Avenue intersection would be removed.
- The existing separated bicycle and pedestrian shared use path along south side of Highway 199, which begins at the Rogue Community College entrance, would continue east to Nebraska Avenue. At this point, the pedestrian traffic would use the sidewalks on Union Avenue or Highway 199; the bicycle traffic would either use the paved shoulders on Highway 199 or Union Avenue.
- A bike lane along the north side of Highway 199 between the Redwood Avenue slip ramp and

Fairgrounds Road and continuing east to Tussey Lane, would be striped on the roadway shoulder.

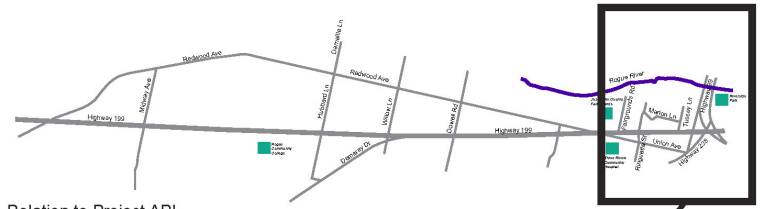
- A bike lane would be added along the south side of Highway 199 between Allen Creek Road and Ringuette Street and would be striped on the roadway shoulder.
- Sidewalk, separated by a planter strip, would be added to the north side of Highway 199 from the Redwood Avenue slip ramp to Tussey Lane. A sidewalk would be added to the south side of Highway 199 from Nebraska Avenue to Ringuette Street.

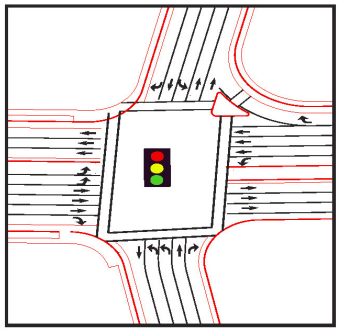
Alternative A: Fairgrounds Road to Tussey Lane

Exhibit 10 shows the general improvements proposed as part of Alternative A between Fairgrounds Road to Tussey Lane, with insets to provide greater design detail at major intersections. This segment has the following design features:

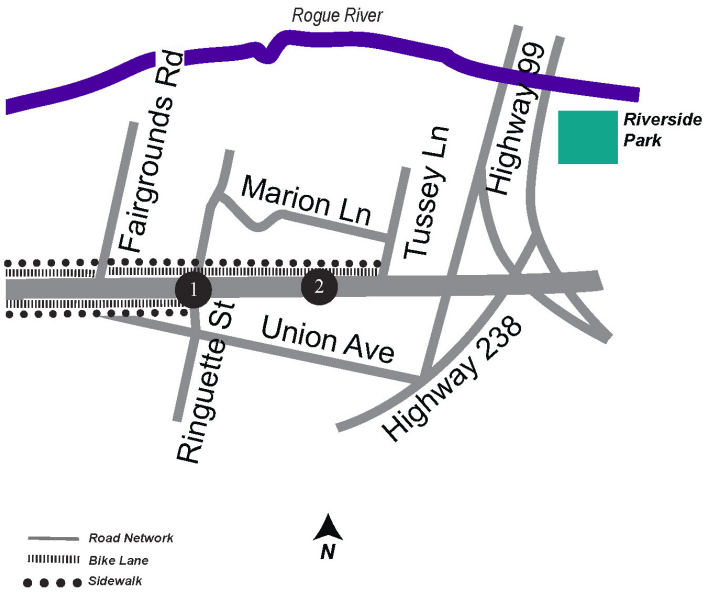
- This segment of Highway 199 would provide six travel lanes with raised curb median continuing between the eastbound and westbound lanes (Exhibit 10, Inset 2).
- Where permitted, direct access to Highway 199 would be right in/right out only. Curb and a detached sidewalk would be constructed along the westbound portion of Highway 199. Access would be defined by driveways with some shared between parcels.
- The existing signal at the intersection of Highway 199 and the Fairgrounds Road would be removed and traffic movements would be restricted to right in/right out. The new access road would provide a new, additional access point for fairgrounds traffic.
- The intersection of Highway 199 and Ringuette Street, as shown in Inset 1 of Exhibit 10, would continue to be signalized and include the following features:
  - Westbound Highway 199 would have three through lanes, one left-turn-only lane, and one free-flowing right-turn-only lane.

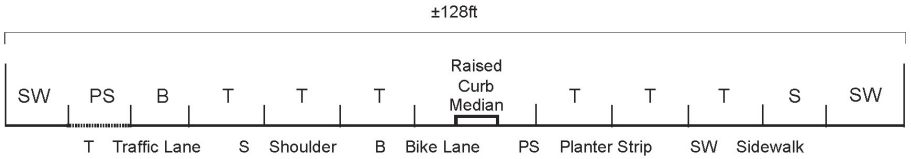
EXHIBIT 10. ALTERNATIVE A AND ALTERNATIVE C BETWEEN FAIRGROUNDS ROAD AND TUSSEY LANE





1 Highway 199 at Ringuette Street





2 Six Travel Lanes with Median Curb

- Eastbound Highway 199 would have three through lanes, two left-turn-only lanes, and one right-turn-only lane.
- Northbound Ringuette Street would have one through lane, two left-turn-only lanes, and one right-turn-only lane.
- Southbound Ringuette Street would have one through lane, one left-turn-only lane, and one right-turn-only lane.
- A left-turn-only lane would be added to southbound Ringuette Street at the intersection with Union Avenue.

- Henderson Lane and Tussey Lane would continue to provide access to Highway 199 and traffic would continue to be restricted to right in/right out movements due to raised curb median along Highway 199.
- A sidewalk, separated from Highway 199 by a planter strip, would continue along the north side of Highway 199 between Fairgrounds Road and Tussey Lane. A sidewalk would also be constructed along both sides of Ringuette Street north of Highway 199 for approximately 300 feet. A sidewalk along the south side of Highway 199 would continue from Nebraska Avenue to Ringuette Street.
- The bike lane striped on the roadway shoulder along north side of Highway 199, starting at Allen Creek Road, would continue between Fairgrounds Road and Tussey Lane. The bike lane striped on the roadway shoulder along the south side of Highway 199, starting at Allen Creek Road, would continue to Ringuette Street.

Phase 2

Phase 2 of Alternative A would extend the access road connecting to Pansy Lane in Phase 1. The extension would continue the access road from Pansy Lane east to Tussey Lane. This access road would relocate business and residential

driveways that are currently on Highway 199 to the new access road.

Construction of Phase 2, and the actual alignment, would not be set unless this access road concept is found to be part of the overall solution for the South Y Interchange Planning Study scheduled to begin in 2007.

Alternative C

Alternative C would also be constructed in two phases. Phase 1 would include improvements from Midway Avenue to Tussey Lane and a realignment of the Allen Creek Road intersection with Redwood Avenue. Phase 2 would include additional improvements north of Highway 199 from Pansy Lane to Tussey Lane.

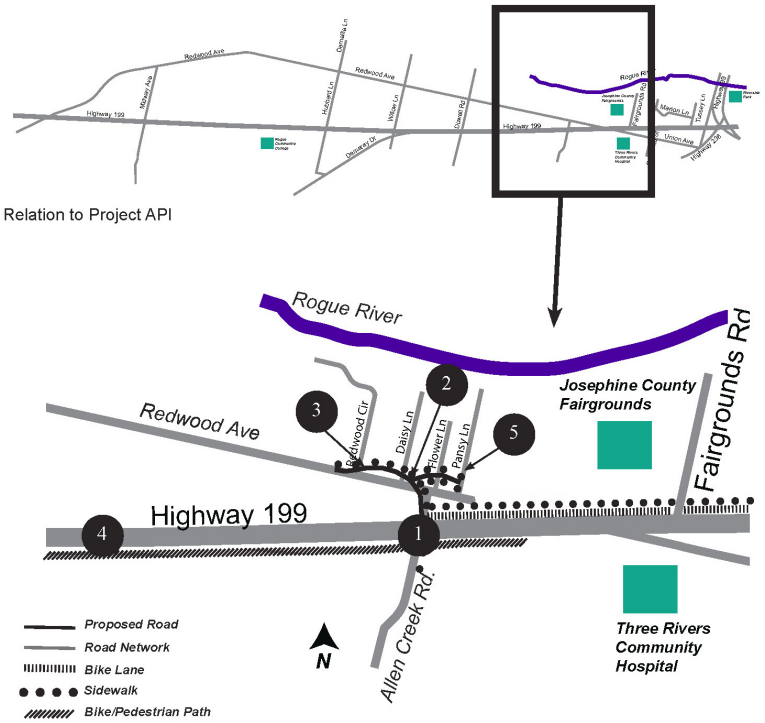
Phase 1

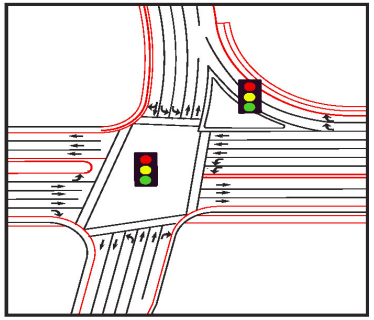
Alternative C: Midway Avenue to Dowell Road
This section of Alternative C has the same design features as Alternative A (see Exhibit 8).

Alternative C: Dowell Road to Fairgrounds Road
Exhibit 11 shows the general improvements proposed as part of Alternative C between Dowell Road and Fairgrounds Road, with insets to provide greater design detail at major intersections. This segment has the following design features:

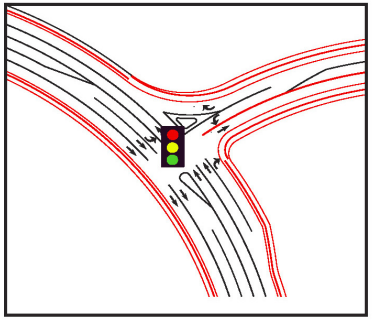
- At Dowell Road, Highway 199 would transition from four travel lanes to six travel lanes with raised curb median continuing between the eastbound and westbound lanes (see Exhibit 11, Inset 4). There would be no direct access to Highway 199 from businesses or residences. For westbound Highway 199 traffic, the right lane approaching Dowell Road would become a right-turn-only lane onto northbound Dowell Road.
- The intersection of Highway 199 and Allen Creek Road, as shown in Inset 1 of Exhibit 11, would be signalized and include the following features:

EXHIBIT 11. ALTERNATIVE C BETWEEN DOWELL ROAD AND FAIRGROUNDS ROAD

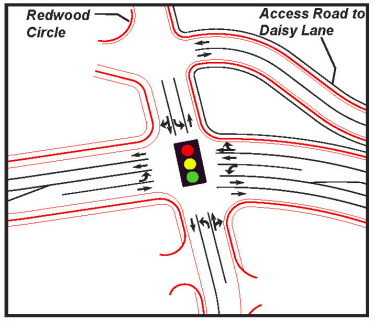




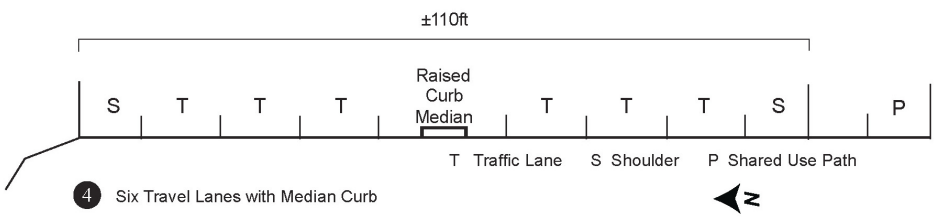
1 Highway199 at Allen Creek Road



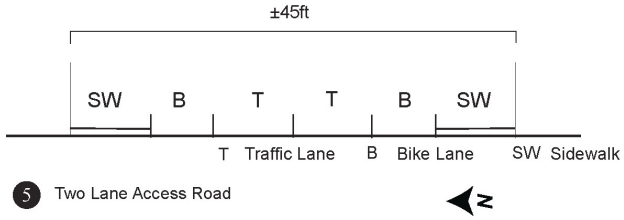
2 Allen Creek Road at Access Road



3 Redwood Avenue at Redwood Circle



4 Six Travel Lanes with Median Curb



5 Two Lane Access Road

- Eastbound Highway 199 would have three through lanes, one left-turn-only lane and one right-turn-only lane.
- Westbound Highway 199 would have three through lanes, two left-turn-only lanes and two right-turn-only lanes. The right-turn-only lanes would be signalized. The right-turn-only lanes would begin approximately 700 feet east of the intersection to enable vehicle queuing when the signal is red. This queuing distance would prevent traffic back-up on Highway 199.
- Northbound Allen Creek Road would have two through lanes, one left-turn-only lane, and one right-turn-only lane.
- Southbound Allen Creek Road would have one combined through and right-turn lane and two left-turn-only lanes.

- Allen Creek Road, north of Highway 199 would be curved slightly to the west to connect with a new three-legged intersection with a realigned Redwood Avenue and a new access road. The City of Grants Pass may consider adding a signal at this intersection. This intersection, as shown in Inset 2 of Exhibit 11, would include the following features:
  - Northbound Allen Creek Road would have two through lanes and one right-turn-only lane.
  - Southbound realigned Redwood Avenue would have two through lanes and one left-turn-only lane.
  - Westbound new access road would have one left-turn-only lane and one right-turn-only lane.
- To connect with the new Allen Creek Road intersection, Redwood Avenue would be realigned and curved north just west of Redwood Circle.
- A new four-legged intersection with Redwood Avenue and Redwood Circle would provide access to the

properties located along the old Redwood Avenue alignment between Redwood Circle and Allen Creek Road. This intersection would also provide access to those properties north along Redwood Circle. The City of Grants Pass may consider adding a signal at this intersection. In addition, a new local street would be constructed connecting Daisy Lane with Redwood Circle; thereby providing properties along Daisy Lane access to Redwood Avenue. This intersection, as shown in Inset 3 of Exhibit 11, would include the following features:

  - Eastbound realigned Redwood Avenue would have one through lane, one left-turn-only lane, and one right-turn-only lane.
  - Westbound realigned Redwood Avenue would have one through lane, one combined through and right-turn lane, and one left-turn-only lane.
  - Southbound Redwood Circle would include one combined through and right-turn lane and one left-turn-only lane.
  - Northbound Redwood Circle would have one combined through and right-turn lane and one left-turn-only lane.

- Access to the Josephine County Fairgrounds, the YMCA, and other Fairground parcels east of the YMCA would be from a new access road that connects to Pansy Lane. This access road would bulb out slightly to the north/northeast of the new three-legged intersection with Allen Creek Road and Redwood Avenue, and then curve south to Pansy Lane. An existing driveway on Pansy Lane would continue to provide access to the YMCA and the fairgrounds. The access road would have two travel lanes, bike lanes, and a sidewalk on both sides of the road (Exhibit 11, Inset 5).
- Pansy Lane would provide access to properties along the old Redwood Avenue alignment and east of Allen

Creek Road. Cul-de-sacs would be constructed on either end of this portion of the old Redwood Avenue alignment (See Exhibit 11).

- Properties along Flower Lane would have access via a new local street connection between Flower Lane and Pansy Lane (See Exhibit 11).
- The existing signal at the intersection of Redwood Avenue and Highway 199 would be removed and access to Redwood Avenue from westbound Highway 199 would be from the two right-turn-only lanes at the Allen Creek Road intersection.
- The existing separated bicycle and pedestrian shared use path along south side of Highway 199, which begins at the Rogue Community College entrance, would continue east to Nebraska Avenue.
- A bike lane would be added along north side of Highway 199 between the Allen Creek Road and Fairgrounds Road, and continuing east to Tussey Lane, would be striped on the roadway shoulder.
- A bike lane would be added along the south side of Highway 199 between Allen Creek Road and Ringuette Street and would be striped on the roadway shoulder.
- Sidewalk, separated by a planter strip, would be added to the north side of Highway 199 from Allen Creek Road to Tussey Lane. A sidewalk would be added to the south side of Highway 199 from Nebraska Avenue to Ringuette Street.

Alternative C: Fairgrounds Road to Tussey Lane
This section of Alternative C has the same design features as Alternative A, see Exhibit 10.

Phase 2

Phase 2 of Alternative C has the same design features and conditions as Phase 2 of Alternative A.

CHAPTER 3. Methods and Coordination

Methods – Baseline Conditions

The methods used to assess the physical characteristics of the water resources within the API include review of available secondary data. This data included the water feature name, the Oregon Department of Environmental Quality (DEQ)-designated beneficial uses from Oregon Administrative Rules (OAR) Section 41 and DEQ records, 303(d) listings of concern, and river mile of interest for major waterways. Field reconnaissance was performed during February 21 and 22, 2005, to verify the existing water quality data that was collected. During the field reconnaissance potential stormwater treatment areas and stormwater conveyance features observed within the API were noted.

Allen Creek, looking upstream, south of the eastbound lanes of Highway 199. February 2005

Water quality mitigation needs within the API were reviewed using ODOT's operational notice project delivery (PD)-05. General water quality concerns such as seepage and stormwater outfalls were noted in the field data. Evidence of potential pollutants was observed through water clarity, water flow, the presence of any surface sheen, benthic area conditions, water discoloration and water odor. Several observations were made for existing stormwater management: stormwater entering the waterbody; stormwater treatment methods/areas, if any; roadway stormwater collection manner; and other structures or developments discharging stormwater to the waterbodies within the API.

Flood Insurance Rate Maps (FIRMs) within the API, developed by the Federal Emergency Management Agency (FEMA) as planning tools to support floodplain management activities,

were also reviewed. The FIRMs were reviewed for the API to determine whether the roadway segments were likely within or near the 100-year or 500-year floodplain.

Methods – Water Resource Impacts

Pollutant loadings and impacts due to stormwater runoff from the impervious roadway surfaces of Highway 199 within the API were calculated following the protocol developed by the Federal Highway Administration (Driscoll, *et al.* 1990). In order to estimate the pollutant loadings and impacts associated with increases in the impervious roadway surfaces, this technical report relies heavily on the Highway 199 Expressway Upgrade Project Stormwater Report (referred hereafter as Stormwater Report) (Parsons Brinckerhoff 2006) prepared for this project. As part of the storm water analysis, the project area was divided into three drainage areas according to topographic drainage divides. The individual drainage areas are described in detail in Chapter 4, Baseline Conditions, of this technical report.

Pollutant loadings are not estimated from the changes in the local street network because the water quality data necessary as inputs to the Driscoll method are not available. Changes in impervious surface in the local street network, primarily involving the conversion of driveways and parking lots to local streets (and vice versa), and their impacts on water quality, will be discussed qualitatively.

The Driscoll method is a method for modeling impacts of highway runoff into lakes and streams. The Driscoll method combines storm hydrology, stream gage records, and stormwater runoff quality data into a single model predicting levels of pollutants expected in receiving waters.

The Driscoll method uses the runoff volume and the pollutant concentration in the runoff to calculate a mean pollutant mass loading. The annual mass load from the highway site is the product of the mass load from the mean storm and the number of storms per year. The Driscoll method also calculates the in-stream pollutant concentration using rainfall data, stream flow data and the pollutant concentration in the runoff. The 3-year

pollutant concentration in the stream (that is the pollutant concentration in the receiving waterbody that would be expected to occur once every 3 years) is then compared to the State of Oregon acute water quality criteria in order to determine if the project will have a deleterious effect on the waters of the State.

Pollutant concentrations were estimated for the existing impervious area associated with the No Build Alternative and the net new impervious area for both of the Build Alternatives. Rainfall data, streamflow data, and runoff pollution data for copper, zinc, and TSS were used to develop a statistical model of pollutant levels in receiving waters. The modeled 3-year pollutant concentrations for copper and zinc were compared against State of Oregon acute water quality criteria for freshwater aquatic life as presented in OAR 340-041-033(2)(a). There currently is no established ambient water quality criterion for TSS.

Pollutant loadings were also estimated for the impervious area using the Washington State Department of Transportation (WSDOT) method, for the sake of comparison. The WSDOT method uses Pollutant Yield Estimates from Pacific Northwest sites (Horner,1992), along with the impervious surface area, to calculate total annual yield of TSS, copper, and zinc in kilograms following the procedures for Method No. 1 in Exhibit 431-4 B (WSDOT, 2005).

A key parameter of both the Driscoll and WSDOT methods is the value selected for the site median concentration of a given pollutant in the runoff. In the original Driscoll report to FHWA, the authors collected water quality runoff data from 24 roadway sites across the United States; these roadways were further divided into “urban” and “rural” groupings according to traffic density. From this database, they calculated a site median concentration for 10 different water quality pollutants for both urban and rural roadways. The dividing line between urban and rural roadways corresponds to an average daily traffic (ADT) volume of 30,000 vehicles. The authors do recommend applying judgment in assigning a site median

concentration for use in the impact analysis, based upon knowledge of the local conditions.

The WSDOT method estimates pollutant loads based on highway runoff data collected in western Washington since 2001. The data is representative of runoff from high ADT volume highways (90,000 to 160,000) in western Washington. WSDOT recommends using the high ADT loading rates for lower ADT highways with the understanding that the data represents the worst-case scenario.

ODOT collected water quality samples in 1995 as part of their NPDES monitoring program along sections of Interstate 5 in Portland (ADT >100,000) and Eugene (ADT=50,000). The water sampling was performed in January, April, July, and October. A comparison of site median concentrations for TSS, copper, and zinc from both Driscoll report to FHWA and the ODOT NPDES monitoring are presented in Exhibit 12. The WSDOT values are not included in Exhibit 12 because they do not present actual water runoff concentrations but instead WSDOT uses mean loading rates expressed as pounds of pollutant per acre of impervious surface.

EXHIBIT 12. COMPARISON OF SITE MEDIAN CONCENTRATIONS

mg/L = milligram per liter

Pollutant of Concern	From Driscoll *et al* (mg/L)		From ODOT (mg/L)	
	Rural	Urban	Portland	Eugene
Total Suspended Solids (TSS)	41	142	211	125
Copper	0.022	0.054	0.039	0.02
Zinc	0.080	0.329	0.25	0.16

As shown in Exhibit 12, with the exception of TSS as measured in Portland and copper as measured in Eugene, the ODOT site median concentration values fall between the rural and urban values presented by Driscoll. For the purposes of this technical report, we will be using the ODOT values as measured in Eugene as input to the Driscoll method to assess water quality impacts for all roadway segments of the Highway

199 Expressway Upgrade Project. These values were measured in western Oregon and are associated with a traffic volume only slightly larger than the urbanized eastern portion of Highway 199. It is acknowledged that the ODOT values may overstate the severity of the impact of the modeled 3-year pollutant concentrations for those segments of Highway 199 that have traffic volumes substantially less than those measured on Interstate 5 in Eugene (i.e. the more rural areas in the western portion of the project area).

The State of Oregon acute water quality criteria for freshwater aquatic life as presented in OAR 340-041-033(2)(a); for copper and zinc, the water quality criteria is a function of the hardness (as measured by the concentration of calcium carbonate). This water quality analysis used the median concentration of hardness as measured by ODOT for the water quality samples collected in Eugene (53.4 milligrams per liter (mg/L)). The water quality monitoring performed by ODOT also determined that the soluble fraction for both copper and zinc was approximately 20 percent; this is half of the default value (40 percent) presented in the Driscoll report to FHWA. This water quality analysis used the soluble fraction measurements collected by ODOT in Eugene.

Methods – Water Quality Mitigation

As described above, pollutant loadings and impacts due to stormwater runoff from the impervious roadway surfaces within the API were analyzed. The primary water quality mitigation for long-term (operational) impacts is to route the stormwater runoff through water treatment facilities such as vegetated swales or manufactured filtering systems. These have the effect of reducing the concentration of the pollutant in the stormwater runoff before entering the natural waterbodies. For the purposes of the water quality analysis in this report, the site median concentrations are reduced through the use of water treatment facilities.

The proportional reduction is based on both the effectiveness of the water treatment facility at removing pollutants and the amount of impervious surface being routed to the water treatment facility. For example, vegetated swales can remove

approximately 40 percent of the dissolved copper in the stormwater that flows through it. If a drainage area has 50 percent of the impervious surface routed through vegetated swales, this will reduce the site median concentration by 20 percent (40% x 50%) for the stormwater draining from the impervious surface. Thus the pollutant loadings and impacts due to runoff are calculated for each alternative (No Build, Alternative A, and Alternative C) assuming no mitigation and with mitigation for each of the three pollutants of concern (TSS, copper, and zinc). This analysis will show the effect of the proposed mitigation and can be compared with the baseline condition (No Build) to demonstrate no net effect on the baseline conditions for the project.

Coordination

Coordination for the preparation of this report was performed with the design team responsible for preparing the Stormwater Report. Coordination was also performed with ODOT's Geo-Environmental Section to ensure that the proper models were used to estimate impacts from pollutants in stormwater runoff for this project.

CHAPTER 4. Baseline Conditions

The project API is in the Southern Oregon Coastal basin (3rd HUC 171003) (Exhibit 13). Major rivers in this basin include the Coquille, Rogue, and Umpqua rivers, all of which flow directly into the Pacific Ocean. Major cities located within the basin include Grants Pass, Medford, and Roseburg.

Please refer to the Highway 199 Expressway Upgrade Project, Final Water Resources Baseline Conditions Report for a detailed discussion of the existing water resources.

The Middle Rogue subbasin (4th HUC 17100308) contains the project API. The Middle Rogue subbasin surrounds Grants Pass in Josephine County and includes the API. The Applegate River, the main waterbody in the Applegate subbasin, flows into the Rogue River approximately 7 river miles west of Grants Pass.

HUC – Hydrologic Unit Code.

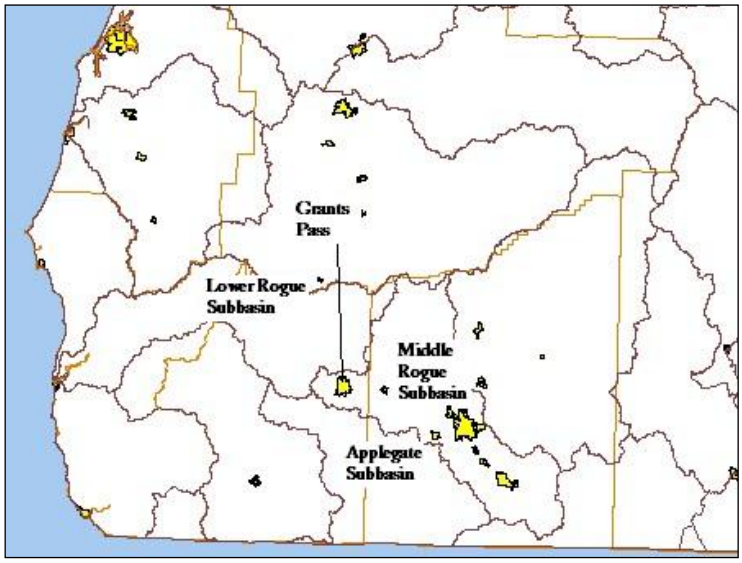
Hydrologic Units refer to the division of watersheds or drainage areas for all of the river systems in the United States. The HUC is the unique code assigned to a specific hydrologic unit.

Three drainage tributary areas (DA 1, DA 2, and DA 3) were identified as being up gradient (south) of Highway 199 in the API. Exhibit 14 shows the location of each drainage tributary area within the API. The drainage tributary areas are delineated according to their topographical divide and discharge location to tributaries to the Rogue River. Drainage tributary area 1 extends slightly to the west of the API and generally drains to agricultural lands north of Highway 199. Those agricultural lands eventually drain to Sparrowhawk Creek outside of the API. Drainage tributary area 2 drains into Sand Creek while drainage tributary area 3 drains into Allen Creek. These three drainage tributary areas represent a total drainage area of 1,128 acres (1.76 square miles).

Water Quality

The project API has important water quality considerations because it crosses two tributaries of the Rogue River, which support species listed under the Endangered Species Act (ESA)

EXHIBIT 13. SOUTHERN OREGON COASTAL BASIN MAP



such as coho salmon, and because DEQ has determined that the Rogue River does not currently meet water quality standards.

The roadway segments within the API cross two tributaries to the Rogue River as well as three canals (see sidebar and Exhibit 14). All of these tributaries are upstream (east) of the confluence the Rogue and Applegate Rivers. DEQ has identified the Rogue River as having existing water quality impairments (outlined below) that may warrant special protection measures. Please refer to the Final Water Resources Baseline Conditions Report for a description of the observations made of the water resources at each of these crossings.

Waterbody Crossings within the API

- Main Canal – At Highway 199 Mile Post (MP) 0.28
- Allen Creek – At Highway 199 MP 0.87
- South Main Canal – At Highway 199 MP 1.97
- Sand Creek – At Highway 199 MP 2.73
- South Highland Canal – At Highway 199 MP 3.17

Regulatory Status

In Oregon, water quality is regulated by DEQ (the Environmental Protection Agency (EPA) has delegated its authority to DEQ) by defining the designated beneficial uses and associated water quality standards, as required by the Clean Water Act. The designated beneficial uses for the Rogue

River Mainstem from the estuary (at the Pacific Ocean) to Lost Creek Dam (30 miles northeast of Medford, Oregon) include public and private domestic water supplies, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, and commercial navigation and transportation.

Section 303(d) of the Clean Water Act requires that DEQ prepare a listing of the surface waters in the state for which beneficial uses of the water are impaired by pollutants. DEQ has included the segment of the Rogue River in the vicinity of the project area (River Miles 94.9 to 110.7) on its 303(d) list because it does not meet water quality standards for fecal coliform during summer months or temperature (year round). DEQ is also taking action to improve the water quality of waterbodies in the Middle Rogue subbasin by setting total maximum daily loads (TMDL) for bacteria, sedimentation, and temperature. The target date for completing the TMDLs is 2007.

OAR 340-041-0271 details the beneficial uses and water quality standards for the Rogue River and its tributaries.

South Main Canal, facing west, along south side of Highway 199 just west of Dowell Road.

Sparrowhawk Creek, Sand Creek, and Allen Creek are not 303(d) listed waterbodies.

Stormwater Runoff

Stormwater runoff from road surfaces that enters nearby waterways can be a source of water pollution. Since Highway 199 crosses tributaries to the Rogue River, and has an ADT over 30,000, the proposed improvements will require water quality mitigation.

There is 48.5 acres of existing impervious surface associated with Highway 199 and between 10.9 and 11.6 acres of impervious surface associated with the local streets and driveways in the project area[4]. The existing stormwater infrastructure for Highway 199 and Redwood Avenue consists primarily of sheet flow off the roadway into adjacent pervious

[4] This is due to the differences between alternatives concerning the design of the intersection of westbound Highway 199 and northbound Allen Creek Boulevard. Alternative A has a total of 59.4 acres of existing impervious surface while Alternative C has a total of 60.1 acres.

Access restriction grate over the existing Allen Creek culvert.

areas or roadside swales, with the swales allowing either evaporation/percolation or discharge to one of the natural surface waterbodies such as Allen or Sand Creeks. There are approximately 48 transverse culverts under Highway 199 that allows stormwater to pass from the south side of the roadway to the north. These are stormwater culverts that are in addition to the culverts for the creeks and canals.

For the recently redeveloped portions of Highway 199, such as the area around the Josephine County Fairgrounds and recently constructed side streets, stormwater is conveyed by curbs and captured by in-curb inlets into subsurface pipes that convey the water into the nearby swales along Highway 199. Within the API, east of Allen Creek and along Union Avenue, stormwater is conveyed by standard curbs and captured by in-curb inlets and into subsurface pipes that convey the water for direct discharge into Allen Creek. For recently developed portions of Redwood Avenue stormwater is conveyed by curbs and captured by in-curb inlets into subsurface pipes that convey the water into the nearby swales along Redwood Avenue. Although no formal stormwater facilities treat runoff from ODOT and City of Grants Pass road facilities in the project area, the existing roadside ditches and pervious areas do provide some water quality treatment.

Local Stormwater Requirements

For the portions of the API within unincorporated Josephine County the standards and criteria for storm drainage facilities are presented in Article 83 of their Rural Development Code. Within the City of Grants Pass the standards and criteria for storm drainage facilities are presented in Article 28 of their Development Code. Both codes require that any new drainage facilities be consistent with the Master Storm Drain Facilities and Management Plan prepared by the City of Grants Pass. This plan is currently being updated.

Habitat Considerations

Good water quality is essential for the proper functioning of wetland, riparian, and other surface water habitats. Runs of salmon, in addition to other resident fish populations and other

aquatic organisms, are found within the subbasins within the API. NMFS stormwater guidance was prepared for the protection of aquatic species listed under the ESA; some components of the NMFS stormwater guidance go above and beyond the requirements contained in PD-05 in order to evaluate effects on listed fish species.

Floodplains

The API crosses Sand and Allen Creeks, and while it is relatively close to the Rogue River, the API is located outside of the mapped 500-year floodplain of the Rogue River. FEMA has not mapped the floodplains for Sand and Allen Creeks. Based upon a review of the FEMA FIRM maps, the API within the City of Grants Pass is designated as "outside the 500-year floodplain" for the Rogue River. For those portions of the API outside of the City limits and in unincorporated Josephine County, the API is designated on the FEMA FIRM maps as "Areas of minimal flooding" for the mapped Rogue River floodplain. Because Highway 199 crosses Sand and Allen Creeks, it is assumed that the roadway crosses their floodplains as well; however, FEMA has not determined the extent of their floodplains.

500-Year Floodplain

A floodplain is any land area susceptible to inundation (flooding) by water from any sources. The 500-year floodplain is the boundary of the flood that has a 0.2 percent chance of being equaled or exceeded in any given year.

Drainage Tributary Areas

Three drainage tributary areas (DA 1, DA 2, and DA 3) were identified as being up gradient (south) of Highway 199 in the API. Exhibit 14 shows the location of each drainage tributary area within the API. The drainage tributary areas are delineated according to their topographical divide and discharge location to tributaries to the Rogue River. Drainage tributary area 1 extends slightly to the west of the API and generally drains to agricultural lands north of Highway 199. Those agricultural lands eventually drain to Sparrowhawk Creek outside of the API. Drainage tributary area 2 drains into Sand Creek while drainage tributary area 3 drains into Allen Creek. These three drainage tributary areas represent a total drainage area of 1,128 acres (1.76 square miles).

Exhibit 15 presents a summary of the characteristics of each drainage tributary area including size, estimated average

discharge, highway impervious surface area, existing stormwater runoff infrastructure, and aquatic resources.

EXHIBIT 14. WATER RESOURCES AND DRAINAGE TRIBUTARY AREAS WITHIN THE API

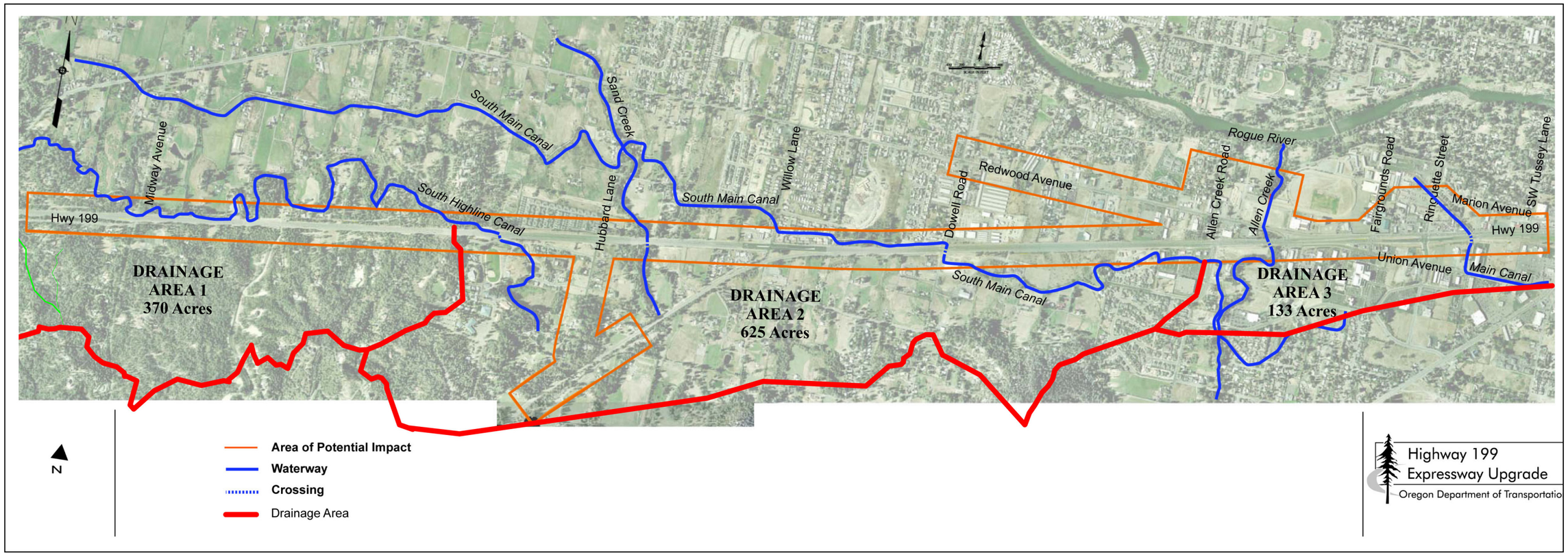


EXHIBIT 15. DRAINAGE TRIBUTARY AREA CHARACTERISTICS

Drainage Tributary Area Name	Size (acres/square miles)	Runoff Coefficient (dimensionless)	Estimated Average Discharge (cfs)[a]	Existing Right of Way Highway 199 Only (acres)	Existing Impervious Surface Highway 199 Only (acres)	Aquatic Resource	Fisheries Resource	Description of Stormwater Runoff Infrastructure
DA 1	370/0.58	0.55	25.4	47.3	10.2	None[b]	None	Highway 199 drains by sheet flow to the north. Southern half of Highway 199 drains to ditches adjacent to right-of-way (south side) and then transfers to ditches adjacent to right-of-way (north side) through transverse culverts under Highway 199. Some stormwater is also captured and conveyed by the adjacent South Highline Canal. Stormwater is treated by existing vegetation in roadside ditches and other pervious surfaces north of Highway 199.
DA 2	625/0.98	0.65	50.8	41.3	26.2	Sand Creek	SONC coho salmon known to occur	Highway 199 generally drains by sheet flow to the north, except where noted below. Southern half of highway 199 drains to ditches adjacent to right-of-way (south side) and then transfers to ditches adjacent to right-of-way (north side) through transverse culverts under Highway 199. Stormwater is treated by existing vegetation in roadside ditches and other pervious surfaces north of Highway 199, such as the adjacent wetlands between Hubbard Lane and Dowell Road. Some stormwater is also captured and conveyed by the adjacent South Main Canal. East of Hubbard Lane, in the vicinity of Sand Creek, the adjacent roadside ditches drain directly into Sand Creek.
DA 3	133/0.21	0.92	15.3	32.5	12.1	Allen Creek	SONC coho salmon likely to occur	Highway 199 drains by sheet flow to the north and south of Highway 199 to pervious areas adjacent to the right-of-way. Stormwater is also collected in the grassy swale in the median. Within the API, east of Allen Creek and along Union Avenue, stormwater is conveyed by standard curbs and captured by in-curb inlets and into subsurface pipes that convey the water for direct discharge into Allen Creek. Stormwater that is being treated is treated by existing vegetation in roadside ditches in the median and other pervious surfaces north and south of Highway 199.

a – Calculated using the Rational Method for the 2-year, 24-hour storm (3 inches) for rainfall.

b – Drains to agricultural lands which eventually drain to Sparrowhawk Creek outside of the API.

cfs – cubic feet per second

SONC – Southern Oregon – Northern California

Permits and Approvals

Exhibit 16 lists the permits or approvals that are known to be required for the project. The issuing agency and the estimated timeline for obtaining the permit or approval are also listed.

EXHIBIT 16. PERMITS AND APPROVALS - WATER RESOURCES

Type of Permit/Approval	Issuing Agency	Estimated Timeline
MS4 Stormwater Permit (covered under ODOT's program-wide NPDES stormwater permit)	Oregon Department of Environmental Quality	N/A
NPDES 1200-CA	Oregon Department of Environmental Quality	ODOT currently holds this permit; however, ODOT will need at least 30 days to review and approve the Contractor's Erosion and Sediment Control Plan to ensure compliance with the permit conditions.
Corps of Engineer Permits (Section 404)	U.S. Army Corps of Engineers	130 days (assuming issuance of a USACE General Permit)
DSL Fill and Removal Permits	Oregon Division of State Lands	130 days (assuming issuance of a state DSL General Authorization)
Water Quality Certification (Section 401)	Oregon Department of Environmental Quality	130 days (concurrent with General Authorization/General Permit processing)

CHAPTER 5. Temporary Effects and Benefits

No Build

The Highway 199 Expressway Upgrade would not be constructed, and therefore, no temporary effects or benefits would occur.

Alternatives A and C

The temporary effects and benefits from construction that are related to water quality and water resources are similar throughout the API and between the two build alternatives. Therefore, the temporary effects and benefits analysis is presented for the entire API and both build alternatives.

Construction of Alternatives A and C would not increase the number of existing culvert crossings. Replaced culverts, inlets, ditches, and other drainage features would be designed and constructed with the purpose of maintaining the existing drainage pattern, to the extent possible, in order to minimize the impacts on the hydrology and hydraulics of the drainage basins. The existing culvert crossings at Sand and Allen Creeks would remain.

During construction, erosion from exposed soils (either disturbed soil areas or soil stockpiles) could increase the amount of sediment, suspended solids, and turbidity entering Sand and Allen Creek. Erosion could be prevented by the implementation of appropriate conservation measures in an ESCP. ODOT also has an Erosion and Sediment Control

Manual that provides guidelines for developing and implementing erosion and sediment controls (Harza 2005).

Clearing and grading would occur in the API along Highway 199 and the proposed modifications to the surface street network. These areas would be the sources for any potential water quality problems, especially in the vicinity of Sand and Allen Creeks. In addition, water quality problems could develop from project staging areas, which can be sites of increased disturbance and erosion. It is unknown at this time where project staging areas would be located.

Increased stormwater runoff due to an increase of impervious surface from widening existing roads and constructing new roads could combine with erosion from grading, machine operation, and vegetation removal, until such time that these areas are stabilized and restored, to decrease water quality. The loss of vegetation would also have the additional negative effects including exposing soil to erosion, decreasing the pollutant filtering capacity, and loss of shading if adjacent to a stream. Stormwater runoff may also carry other contaminants, such as fuel or oil from construction machinery, particularly at staging areas. Pouring concrete near open water would create the potential for spills. Concrete spilled into open waters can impact local pH.

Erosion and sediment control facilities would be constructed and maintained to remain functional as needed during construction. An ESCP and an SPCC plan would be required for the project in order to comply with Oregon law which explicitly prohibits the discharge or placement of wastes into waters of the state, prohibits the discharge of waste that causes violations of water quality standards, and prohibits violations of permit conditions (ORS 468B.025).

The project shall be bound by the requirements of ODOT's NPDES 1200-CA permit to take all reasonable steps to minimize or prevent any discharge or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. In addition to preparing and maintaining an ESCP, the 1200-CA permit requires the project to perform maintenance and monitoring of

the erosion and sediment control facilities, perform turbidity monitoring, maintain written records of visual monitoring, and follow the reporting requirements of noncompliance incidents.

Construction for this project could occur at any time of the year. During the summer, waterways in the API contain low flows because of low precipitation rates, which results in fewer paths for pollutants to reach waterbodies and less erosion. However, if erosion or contaminants reach streams, they may occur in higher concentrations during summer because the amount of water present is low. Higher precipitation rates during fall, winter, and spring could cause erosion and stormwater runoff affecting water quality in surface waters. It is not known if there are existing seasonal effects to water quality on Sand and Allen Creeks.

In summary, water quality concerns during construction could include erosion from exposed soils in construction and staging areas, increased stormwater runoff due to increases in impervious surfaces, contaminants at staging areas, and potential spillage of uncured concrete. The project may include some in-water work where culverts are replaced or lengthened.

The project includes constructing erosion and sediment control facilities that would mitigate these temporary effects; these erosion and sediment control facilities would be inspected, maintained, and modified (if necessary) to ensure their effectiveness. The project includes the preparation and implementation of an ESCP and an SPCC plan. The project shall be bound by the requirements of ODOT's NPDES 1200-CA permit to take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

CHAPTER 6. Long-Term Effects and Benefits

No Build

Under the No Build Alternative, the existing Highway 199 facility would continue to treat stormwater as it does now. With a gradual but steady increase in traffic volumes over time, there would be a potential that highway runoff pollution would exceed the levels currently generated, which would lead to increases in sediment, metals, suspended solids, and petroleum contaminants, primarily in Allen Creek, and to a lesser extent in Sand Creek. Under the No Build Alternative, the negative effects on water quality would be greater compared to the two build alternatives.

Results for each drainage tributary area in the No Build Alternative are provided in Exhibit 17. These 3-year in-stream pollutant concentrations are generated from the existing 48.5 acres of impervious surface associated with Highway 199 assuming no stormwater treatment in accordance with existing conditions in the No Build Alternative.

Annual mass loading results for each drainage tributary area are provided in Exhibit 18 using both the Driscoll and WSDOT methods. Exhibit 14 shows the location of each drainage tributary area within the API.

The current condition of the roadway show that Highway 199 is not contributing to exceedances of water quality standards for copper, zinc, and TSS. The modeled 3-year in-stream concentrations of copper and zinc are very close to the acute ambient water quality criteria but are not predicted to exceed them for any of the three drainage tributary areas.

EXHIBIT 17. POLLUTANT CONCENTRATIONS IN RECEIVING WATER BODIES – NO BUILD ALTERNATIVE

Drainage Tributary Area Name	Existing Impervious Surface (acres)	New Impervious Surface (acres)	Total Impervious Surface (acres)	Percent Impervious in the Highway 199 Right-of-Way (%)	3-Year In-Stream Concentration of Copper (mg/L)[a,d]	Acute Water Quality Criteria for Copper (mg/L)[a,c]	3-Year In-Stream Concentration of Zinc (mg/L)[a,d]	Acute Water Quality Criteria for Zinc (mg/L)[a,c]	3-Year In-Stream Concentration of TSS[b] (mg/L)[a]
DA 1	10.2	0.0	10.2	21.6	0.008	0.010	0.062	0.069	25.4
DA 2	26.2	0.0	26.2	63.4	0.008	0.010	0.063	0.069	25.7
DA 3	12.1	0.0	12.1	37.2	0.009	0.010	0.068	0.069	28.0

Notes:

a) mg/L = milligrams per liter; 0.001 mg/L = 1 μg/L

b) TSS = Total Suspended Solids

c) Acute water quality criteria based upon a hardness level of 53.4 mg/L calcium carbonate ($CaCO_3$) in the receiving water

d) Assuming a 20 percent dissolved-phase concentration for both copper and zinc

EXHIBIT 18. ANNUAL POLLUTANT LOADINGS IN RECEIVING WATER BODIES – NO BUILD ALTERNATIVE

Drainage Tributary Area Name	Total Impervious Surface (acres)	Percent Impervious in the Highway 199 Right-of-Way (%)	Annual Load of Copper – Driscoll Method (lbs/yr)[a]	Annual Load of Copper – WSDOT[b] Method (lbs/yr)[a]	Annual Load of Zinc – Driscoll Method (lbs/yr)[a]	Annual Load of Zinc – WSDOT[b] Method (lbs/yr)[a]	Annual Load of TSS[c] – Driscoll Method (lbs/yr)[a]	Annual Load of TSS[c] – WSDOT[b] Method (lbs/yr)[a]
DA 1	10.2	21.6	2.92	2.04	23.4	11.2	18,287	8,956
DA 2	26.2	63.4	5.54	5.24	44.3	28.8	34,619	23,004
DA 3	12.1	37.2	2.71	2.32	21.7	12.8	16,957	10,185

Notes:

a) lbs/yr = pounds per year

b) WSDOT = Washington State Department of Transportation

c) TSS = Total Suspended Solids

Pollutant loading estimates for copper between the Driscoll and WSDOT methods are generally consistent for all three drainage tributary areas. Pollutant loading estimates for zinc and TSS are estimated to be higher for the Driscoll method than for the WSDOT method, for all three drainage tributary areas, differing by slightly more than a factor of 2 for drainage tributary area 1. This is likely due to the lower assumed site median concentration by WSDOT than to the additional rainfall experienced in Washington State.

Alternative A

The primary long-term effect to water resources would be a net increase in the amount of impervious surface and the resulting additional pollutant load on the water resources within the API. Stormwater runoff from road surfaces that enters nearby waterways is a source of water pollution. Because of this concern, the need for water quality mitigation for the Highway 199 Expressway Upgrade project was considered using the criteria in ODOT's PD-05 (effective 04/04/06). PD-05 outlines criteria when added impervious surface areas or increased traffic volume are likely to negatively impact water quality. PD-05 helps ODOT meet its responsibilities to manage stormwater and protect waters of the state that may be harmed by the operation of ODOT transportation facilities.

Because Highway 199 crosses tributaries to the Rogue River (listed species present), has an ADT greater than 30,000, and has an increase in impervious surface greater than 1,000 m^2 (0.25 acre), its upgrade requires water quality mitigation per PD-05. Mitigation would typically involve the following stormwater improvements:

- Adding a stormwater collection system (primarily in urbanized areas) consisting of curbs, gutters, inlets, pipes, and manholes to the new or repaired roadway
- Conveying stormwater to a stormwater facility such as a bioswale, wet pond, filtration chamber, detention pond, or similar systems or combinations thereof.

Stormwater runoff would pass through these facilities (removing stormwater pollutants and detaining the runoff, if

needed) before final discharge. The detention requirements for stormwater treatment (effectively a contact residence time to maximize pollutant removal) are different than the detention requirements needed to effect hydrologic mitigation, such as matching storm flows.

Alternative A would result in 15 acres of new right of way[5], with 5.5 acres associated with expanding Highway 199 (bringing the total to 126.6 acres) and 9.5 acres associated with the modifications to the local street network including the new access road to the fairgrounds. Alternative A would result in 7.0 acres of net new impervious for Highway 199 and 4.2 acres of net new impervious for the local street network. The total amount of impervious surface associated with this project would be 70.6 acres. The total amount of net new impervious is 11.2 acres. A total of 10.3 acres of impervious surface associated with Highway 199 would be routed through new stormwater treatment facilities. Stormwater conveyance, detention, and treatment would be designed, constructed and maintained according to the recently updated ODOT Hydraulics Manual, 2006.

Drainage Tributary Area 1

This portion of the API includes the portion of Highway 199 from west of Midway Avenue to just west of the Rogue Community College (RCC) main entrance. Alternative A would result in an increase of 1.8 acres of new impervious surface associated with Highway 199 and 0.7 acre of new impervious surface associated with the local streets within this portion of the API. One stormwater treatment facility, a bio-swale located near the RCC main entrance, and treating stormwater runoff from 1.28 acres of impervious surface, is proposed for Drainage Tributary Area 1. This represents approximately 11 percent of the total impervious surface associated with Highway 199 in Drainage Tributary Area 1. The swale is assumed to have a pollutant removal efficiency of 40 percent for copper and zinc and 70 percent for TSS. The remainder of

[5] Based upon the Right-of-Way Technical Report. Includes both fee acquisition and slope and utility easements.

stormwater runoff will continue to sheet flow to undeveloped lands as described in Exhibit 15.

Water pollution concentrations were calculated for Drainage Tributary Area 1 for copper, zinc, and TSS using the same methods as the No Build Alternative. Pollution concentration results for each drainage tributary area are provided in Exhibit 19 and Exhibit 20. Water pollution concentrations and annual loads were calculated for Alternative A assuming both no treatment and treatment provided by the single bio-swale.

Drainage Tributary Area 2

This portion of the API includes the portion of Highway 199 from just west of the RCC main entrance to Allen Creek Road. Alternative A would result in a decrease[6] of 0.2 acre of impervious surface associated with Highway 199 and an increase of 1.4 acres of new impervious surface associated with the local streets within this portion of the API. No stormwater treatment facilities are proposed for Highway 199 for Drainage Tributary Area 2. There is one stormwater treatment facility that will treat runoff from Hubbard Lane. The stormwater runoff from Highway 199 will continue to sheet flow to undeveloped lands as described in Exhibit 15.

Water pollution concentrations were calculated for Drainage Tributary Area 2 for copper, zinc, and TSS using the same methods as the No Build Alternative. Pollution concentration results for each drainage tributary area are provided in Exhibit 19 and Exhibit 20. Water pollution concentrations and annual loads were calculated for Alternative A assuming no treatment is being provided for Highway 199 in this portion of the API.

Drainage Tributary Area 3

This portion of the API includes the portion of Highway 199 from Allen Creek Road to east of Tussey Lane. Alternative A would result in an increase of 5.5 acres of new impervious surface associated with Highway 199 and 2.2 acres of new

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[6] This is due to an inter-basin transfer such that stormwater runoff from 3.5 acres of impervious surface in Drainage Tributary Area 2 is being transferred to Drainage Tributary Area 3 for detention and treatment.

impervious surface associated with the local streets within this portion of the API. A stormwater treatment train consisting of a pre-detention vortex manhole unit followed by a swale, a detention pond or vault, and finally a post–detention swale prior to discharge into Allen Creek would treat stormwater runoff from 8.0 acres of impervious surface in Drainage Tributary Area 3. This represents approximately 51 percent of the total impervious surface associated with Highway 199 in Drainage Tributary Area 3. The treatment train is assumed to have a pollutant removal efficiency of 64 percent for copper and zinc and 70 percent for TSS. Each vegetated swale is assumed to have a 40-percent treatment efficiency for the metals; the first swale would remove 40 percent of the metals and the second swale would remove an additional 40 percent from the output of the first swale. The remainder of stormwater runoff will continue to sheet flow to pervious areas as described in Exhibit 15.

Water pollution concentrations were calculated for Drainage Tributary Area 3 for copper, zinc, and TSS using the same methods as the No Build Alternative. Pollution concentration results for each drainage tributary area are provided in Exhibit 19 and Exhibit 20. Water pollution concentrations and annual loads were calculated for Alternative A assuming both no treatment and treatment provided by the stormwater treatment train.

The 4.2 acres of net new impervious surface associated with the surface street network would continue to be treated under baseline conditions which include sheet flow to adjacent vegetated ditches and pervious (undeveloped) lots adjacent to the streets. These streets are not expected (nor are they designed) to carry the same traffic volume as Highway 199. Consequently, the pollutant loading associated with the surface street network is expected to be substantially less than the pollutant loading associated with Highway 199.

303(d) Impacts to the Rogue River

The only listings on the 303(d) list for Rogue River are for fecal coliform and temperature, the project would not add to the problems associated with fecal coliform as roadways are

not typically sources of concern for fecal coliform. It is not likely that the project could increase those problems downstream as any water held in detention ponds would occur during the winter, which would not be warmed. The impacts would be small as the API is a relatively small area of the Middle Rogue River watershed.

EXHIBIT 19. 3-YEAR POLLUTANT CONCENTRATIONS IN RECEIVING WATER BODIES – ALTERNATIVE A

Drainage Tributary Area Name	Existing Impervious Surface Highway 199 (acres)	New Impervious Surface Highway 199 (acres)	Total Impervious Surface Highway 199 (acres)	3-Year In-Stream Concentration of Copper- No Treatment (mg/L)[a]	3-Year In-Stream Concentration of Copper- With Treatment (mg/L)[a]	3-Year In-Stream Concentration of Zinc - No Treatment (mg/L)[a]	3-Year In-Stream Concentration of Zinc - With Treatment (mg/L)[a]	3-Year In-Stream Concentration of TSS[b] – No Treatment (mg/L)[a]	3-Year In-Stream Concentration of TSS[b] – With Treatment (mg/L)[a]
DA 1	10.2	1.7	11.9	0.008	0.008	0.064	0.061	26.3	24.3
DA 2	26.2	- 0.2 [c]	26.0	0.008	0.008	0.063	0.063	25.7	25.7
DA 3	12.1	5.5	17.6	**0.011**[d]	0.007	**0.082**[d]	0.055	33.6	21.6

Notes:

a) mg/L = milligrams per liter; 0.001 mg/L = 1 μg/L

b) TSS = Total Suspended Solids

c) Net decrease of 0.2 acres as a result of 3.5 acres of impervious surface being transferred from Drainage Tributary Area 2 to Drainage Tributary Area 3 for detention and treatment

d) Bolded values exceed acute water quality criteria (fresh water) for specific pollutant (assuming a 20 percent dissolved-phase concentration for both copper and zinc)

   d. Acute Water Quality Criteria for Copper is 0.010 mg/L

   e. Acute Water Quality Criteria for Zinc is 0.069 mg/L

   f. Acute water quality criteria based upon a hardness level of 53.4 mg/L calcium carbonate ($CaCO_3$) in the receiving water

EXHIBIT 20. ANNUAL POLLUTANT LOADINGS IN RECEIVING WATER BODIES – ALTERNATIVE A

Drainage Tributary Area Name	Total Impervious Surface Highway 199 (acres)	Percent Impervious in the Highway 199 Right-of-Way (%)	Annual Load of Copper – Driscoll Method – No Treatment (lbs/yr)[a]	Annual Load of Copper – Driscoll Method – With Treatment (lbs/yr)[a]	Annual Load of Zinc – Driscoll Method – No Treatment (lbs/yr)[a]	Annual Load of Zinc – Driscoll Method – With Treatment (lbs/yr)[a]	Annual Load of TSS[b] – Driscoll Method – No Treatment (lbs/yr)[a]	Annual Load of TSS[b] – Driscoll Method – With Treatment (lbs/yr)[a]
DA 1	11.9	25.2	3.22	3.08	25.8	24.6	20,121	18,606
DA 2	26.0	58.2	5.59	5.59	44.7	44.7	34,927	34,927
DA 3	17.6	50.9	3.65	2.46	29.2	19.7	22,831	14,667

Notes:

a) lbs/yr = pounds per year

b) TSS = Total Suspended Solids

Alternative C

The primary long-term effect to water resources would be a net increase in the amount of impervious surface and the resulting additional pollutant load on the water resources within the API. Stormwater runoff from road surfaces that enters nearby waterways is a source of water pollution. Because of this concern, the need for water quality mitigation for the Highway 199 Expressway Upgrade project was considered using the criteria in ODOT's PD-05 (effective 04/04/06). PD-05 outlines when added impervious surface areas or increased traffic volume are likely to negatively impact water quality. Because Highway 199 crosses tributaries to the Rogue River, has an ADT greater than 30,000, and has an increase in impervious surface greater than 1,000 m^2 (0.247 acre), its upgrade requires water quality mitigation per PD-05.

The difference between Alternative A and Alternative C is the proposed connection of Highway 199 with Allen Creek Road and the design of the connection to Pansy Lane.

Alternative C would result in 13 acres of new right of way[7], with 6 acres associated with expanding Highway 199 (bringing the total to 127.1 acres) and 7 acres associated with the modifications to the local street network including the new connection to Pansy Lane. Alternative C would result in 7.8 acres of net new impervious for Highway 199 and 2.7 acres of net new impervious for the local street network. The total amount of impervious surface associated with this project would be 69.1 acres. The total amount of net new impervious is 10.5 acres. A total of 10.7 acres of impervious surface associated with Highway 199 would be routed through new stormwater treatment facilities. Stormwater conveyance, detention, and treatment would be designed, constructed, and maintained according to the recently updated ODOT Hydraulics Manual, 2006.

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[7] Based upon the Right-of-Way Technical Report. Includes both fee acquisition and slope and utility easements.

Drainage Tributary Area 1

The impacts for Alternative C are the same as presented for Alternative A within Drainage Tributary Area 1.

Water pollution concentrations were calculated for Drainage Tributary Area 1 for copper, zinc, and TSS using the same methods as the No Build Alternative. Pollution concentration results for each drainage tributary area are provided in Exhibit 21 and Exhibit 22. Water pollution concentrations and annual loads were calculated for Alternative C assuming both no treatment and treatment of 1.28 acres of impervious surface provided by the single bio-swale.

Drainage Tributary Area 2

The impacts for Alternative C are the same as presented for Alternative A within Drainage Tributary Area 2.

Water pollution concentrations were calculated for Drainage Tributary Area 2 for copper, zinc, and TSS using the same methods as the No Build Alternative. Pollution concentration results for each drainage tributary area are provided in Exhibit 21 and Exhibit 22. Water pollution concentrations and annual loads were calculated for Alternative C assuming no treatment is being provided for Highway 199 in this portion of the API.

Drainage Tributary Area 3

This portion of the API includes the portion of Highway 199 from Allen Creek Road to east of Tussey Lane. Alternative A would result in an increase of 6.3 acres of new impervious surface associated with Highway 199 and 0.6 acre of new impervious surface associated with the local streets within this portion of the API. A stormwater treatment train consisting of a pre-detention vortex manhole unit followed by a swale, a detention pond or vault, and finally a post–detention swale prior to discharge into Allen Creek would treat stormwater runoff from 9.4 acres of impervious surface in Drainage Tributary Area 3. This represents approximately 51 percent of the total impervious surface associated with Highway 199 in Drainage Tributary Area 3. The treatment train is assumed to have a pollutant removal efficiency of 64 percent for copper

and zinc and 70 percent for TSS. Each vegetated swale is assumed to have a 40-percent treatment efficiency for the metals; the first swale would remove 40 percent of the metals and the second swale would remove an additional 40 percent from the output of the first swale. The remainder of stormwater runoff will continue to sheet flow to undeveloped lands as described in Exhibit 15.

Water pollution concentrations were calculated for Drainage Tributary Area 3 for copper, zinc, and TSS using the same methods as the No Build Alternative. Pollution concentration results for each drainage tributary area are provided in Exhibit 21 and Exhibit 22. Water pollution concentrations and annual loads were calculated for Alternative C assuming both no treatment and treatment provided by the stormwater treatment train.

The 2.7 acres of net new impervious surface associated with the surface street network would continue to be treated under baseline conditions which include sheet flow to adjacent vegetated ditches and pervious (undeveloped) lots adjacent to the streets. These streets are not expected (nor are they designed) to carry the same traffic volume as Highway 199. Consequently, the pollutant loading associated with the surface street network is expected to be substantially less than the pollutant loading associated with Highway 199.

303(d) Impacts to the Rogue River

The only listings on the 303(d) list for Rogue River are for fecal coliform and temperature, the project would not add to the problems associated with fecal coliform as roadways are not typically sources of concern for fecal coliform. It is not likely that the project could increase those problems downstream as any water held in detention ponds would occur during the winter, which would not be warmed. The impacts would be small as the API is a relatively small area of the Middle Rogue River watershed.

Both Alternative C and Alternative A would provide better water quality treatment than the No Build Alternative. Hence

both build alternatives provide benefits to the water resources, including Sand and Allen Creeks.

EXHIBIT 21. 3-YEAR POLLUTANT CONCENTRATIONS IN RECEIVING WATER BODIES – ALTERNATIVE C

Drainage Tributary Area Name	Existing Impervious Surface Highway 199 (acres)	New Impervious Surface Highway 199 (acres)	Total Impervious Surface Highway 199 (acres)	3-Year In-Stream Concentration of Copper- No Treatment (mg/L)[a]	3-Year In-Stream Concentration of Copper- With Treatment (mg/L)[a]	3-Year In-Stream Concentration of Zinc - No Treatment (mg/L)[a]	3-Year In-Stream Concentration of Zinc - With Treatment (mg/L)[a]	3-Year In-Stream Concentration of TSS[b] – No Treatment (mg/L)[a]	3-Year In-Stream Concentration of TSS[b] – With Treatment (mg/L)[a]
DA 1	10.2	1.7	11.9	0.008	0.008	0.064	0.061	26.3	24.3
DA 2	26.2	- 0.2 [c]	26.0	0.008	0.008	0.063	0.063	25.7	25.7
DA 3	12.1	6.3	18.4	**0.011**[d]	0.007	**0.083**[d]	0.056	34.2	21.9

Notes:

a) mg/L = milligrams per liter; 0.001 mg/L = 1 μg/L

b) TSS = Total Suspended Solids

c) Net decrease of 0.2 acres as a result of 3.5 acres of impervious surface being transferred from Drainage Tributary Area 2 to Drainage Tributary Area 3 for detention and treatment

d) Bolded values exceed acute water quality criteria (fresh water) for specific pollutant (assuming a 20 percent dissolved-phase concentration for both copper and zinc)

   a. Acute Water Quality Criteria for Copper is 0.010 mg/L

   b. Acute Water Quality Criteria for Zinc is 0.069 mg/L

   c. Acute water quality criteria based upon a hardness level of 53.4 mg/L calcium carbonate ($CaCO_3$) in the receiving water

EXHIBIT 22. ANNUAL POLLUTANT LOADINGS IN RECEIVING WATER BODIES – ALTERNATIVE C

Drainage Tributary Area Name	Total Impervious Surface Highway 199 (acres)	Percent Impervious in the Highway 199 Right-of-Way (%)	Annual Load of Copper – Driscoll Method – No Treatment (lbs/yr)b	Annual Load of Copper – Driscoll Method – With Treatment (lbs/yr)b	Annual Load of Zinc – Driscoll Method – No Treatment (lbs/yr)b	Annual Load of Zinc – Driscoll Method – With Treatment (lbs/yr)b	Annual Load of TSSc – Driscoll Method – No Treatment (lbs/yr)b	Annual Load of TSSc – Driscoll Method – With Treatment (lbs/yr)b
DA 1	11.9	25.2	3.22	3.08	25.8	24.6	20,121	18,606
DA 2	26.0	58.2	5.59	5.59	44.7	44.7	34,927	34,927
DA 3	18.2	50.6	3.79	2.55	30.4	20.4	23,713	15,215

Notes:

a) AADT = Annual Average Daily Traffic

b) lbs/yr = pounds per year

c) TSS = Total Suspended Solids

CHAPTER 7. Indirect and Cumulative Effects

Indirect and cumulative effects and benefits may occur in the API. Generally, indirect effects and benefits occur as a result of a proposed project action, but take place later in time than the initial action. Cumulative effects and benefits occur as a result of the combined effects of several proposed or considered project actions that may take place in the project area before, during, or after the project timeframe.

Indirect Effects and Benefits

Indirect impacts related to project area water quality could include impacts to habitat and wetlands addressed in the Biology and Wetlands Technical Reports. In addition, secondary impacts include water quality effects that propagate downstream. Since reaches of the Rogue River downgradient of the API are already listed by the DEQ as waters of concern for temperature and fecal coliform, potential water quality effects from the project could exacerbate these problems. Decreased baseflow caused by an increase in impervious area in the watershed could generate conditions which would cause water temperatures to rise.

Water quality can be affected by water quantity. Decreases in baseflow create higher concentrations because pollutants are less diluted. Because flow control design standards are included in the project, secondary impacts due to water quantity should be minimal. Flow control would be applied to existing and new impervious surfaces, as well as converted pervious surfaces. All detention facilities were designed to

meet ODOT's current Hydraulics Manual. See the project's Stormwater Report for more information.

Flow control also minimizes hydrologic impacts due to long-term streamflow impairment and changes in stormwater quantities. However, there is potential for stream processes to be disrupted due to hydrologic impacts from stormwater facilities. Specifically, stormwater detention can lead to flow peak synchronization (increase the peak flow) or conversely, extend the period of high flow even though the peak is reduced. Proper choice of treatment facility type and sizing greatly reduces these impacts.

Cumulative Effects and Benefits

The project has potential impacts beyond the API boundaries. Because water quality should be considered at a watershed scale, changes in water quality in the API may be felt downstream. Because water quality impacts in the API would be expected to be minimal, downstream effects would also be minimal. In some cases, water quality increases downstream, sediment may settle out as streams reach lower gradient reaches, and some contaminants may degrade. However, sediment and contaminants can also combine with sediment and contaminants from other headwater streams to create high contaminant levels downstream. Since there are reaches of the Rogue River down-gradient of the API listed on the 303(d) list (see Chapter 4 Affected Environment for details), there is the potential that small impacts caused by the project could exacerbate water quality problems downstream. The only listings on the 303(d) list for Rogue River are for fecal coliform and temperature, the project would not add to the problems associated with fecal coliform as roadways are not typically sources of concern for fecal coliform. It is not likely that the project could increase those problems downstream as any water held in detention ponds would occur during the winter, which would not be warmed. The impacts would be small as the API is a relatively small area of the Middle Rogue River watershed.

The project could also have impacts on stormwater runoff in the watershed by adding between 7 and 7.8 acres of new

impervious surface to Highway 199 and between 2.7 and 4.2 acres of new impervious for the surface street network. However, because stormwater detention and treatment for runoff from Highway 199 would be part of the project, these effects would be mitigated. In fact, the project treats more net new impervious surface (between 10.3 and 10.7 acres) on Highway 199 than it creates, so it may provide a slight cumulative benefit to the watershed.

The 2.7 and 4.2 acres of net new impervious surface associated with the surface street network would continue to be treated under baseline conditions which include sheet flow to adjacent vegetated ditches and pervious (undeveloped) lots adjacent to the streets. These streets are not expected (nor are they designed) to carry the same traffic volume as Highway 199. Consequently, the pollutant loading associated with the surface street network is expected to be substantially less than the pollutant loading associated with Highway 199.

Impacts to water quality from this project would be cumulative with other projects taking place nearby. Known projects that are expected to occur within a similar timeframe as the Highway 199 Expressway Upgrade Project are listed in Exhibit 23 and are shown in relation to the API in Exhibit 24.

All of the projects described in Exhibit 23, as well as the Highway 199 Expressway Upgrade Project, have turbidity and suspended solids as the primary water quality concern. Land conversion from pervious to impervious surfaces can cause increased stormwater runoff, with possible increased erosion, decreased infiltration, and decreased water quality. The larger road projects may have impacts from petroleum contaminants. However, these projects would be designed, constructed, and maintained following ODOT's requirements and the resulting impacts should be minimal.

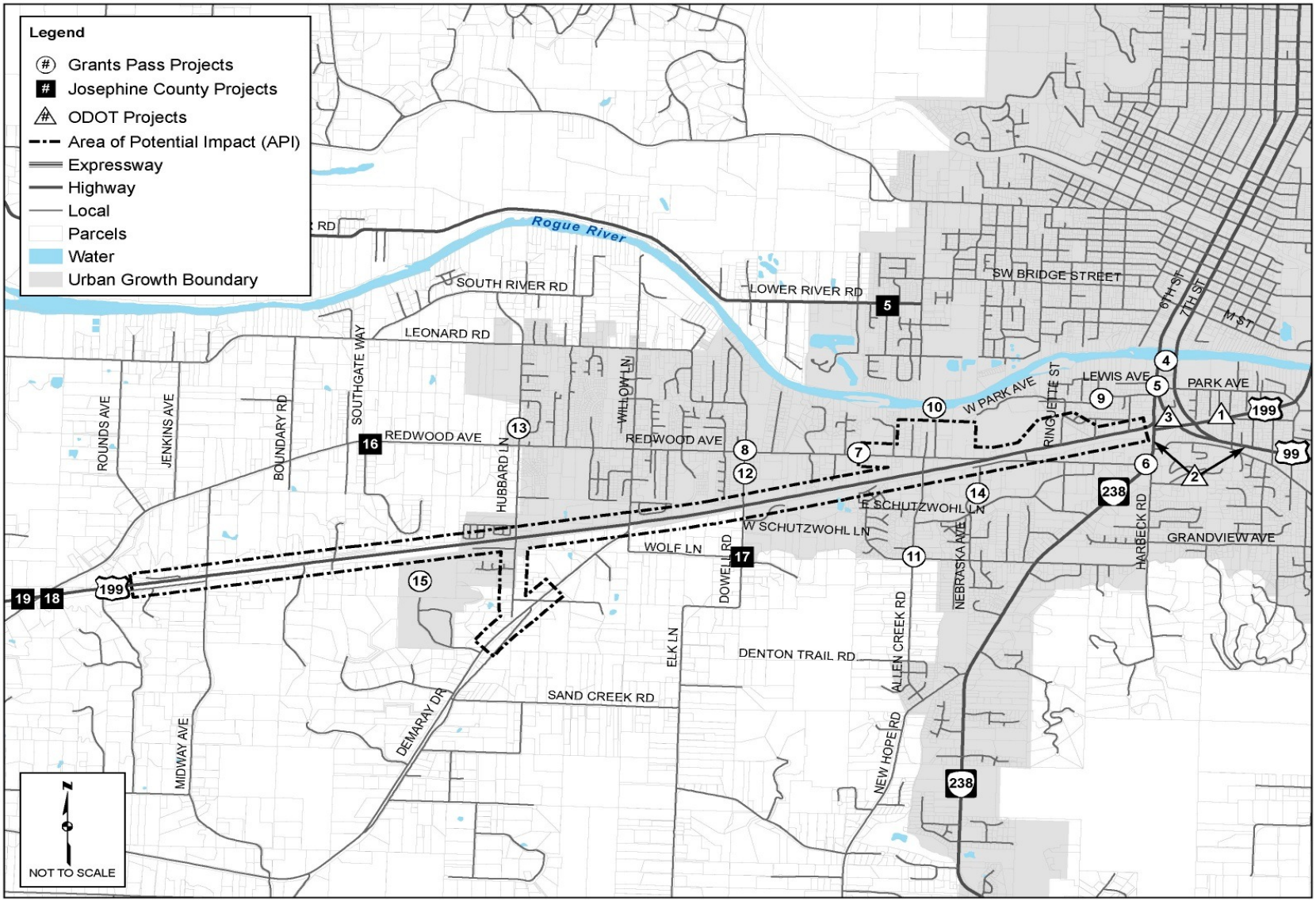
Though the project has potential for water quality impacts, because extensive stormwater detention and treatment would be part of the project, no significant impacts have been identified.

EXHIBIT 23. PLANNED AND CONSIDERED IMPROVEMENTS IN THE PROJECT AREA

Map Identification	Agency	Improvement	Approximate Location	Description
1	ODOT	Grants Pass Parkway Resurfacing	Highway 199 (MP 1.99-0.69)	Resurfacing from I-5 (exit 55) to the South Y on Highway 199
2	ODOT	OR 99/OR 238 Paving	OR 99 south of US 199 to MP 1.39 OR 238 south of US 199 to MP 1.7	Repave and construct bicycle and pedestrian facilities on OR 99 (MP 0 to 1.39) and OR 238 (MP 0 to MP 1.7)
3	ODOT	South Y	Grant Pass	Planning study underway to examine ways to address congestion at the South Y interchange (OR 238/ OR 99/ US 199). Potential solutions could include a complete rebuild of the interchange
4	ODOT & City of Grants Pass	6th/7th Street Grants Pass Bundle	Grants Pass	Repave 6th and 7th Streets from M Street to the South Y
5	ODOT & City of Grants Pass	6th/7th Street Grants Pass Bundle	Grants Pass	Minor road realignment and signal installation at Park Avenue and Lewis Avenue
6	ODOT & City of Grants Pass	6th/7th Street Grants Pass Bundle	Grants Pass	Signal installation at Harbeck Road and OR 238
7	City of Grants Pass	Redwood Avenue (Redwood Circle to Dowell Road)	Redwood Avenue, Grants Pass	Reconstruction of Redwood Avenue, to include two travel lanes, center turn lane, and bicycle and pedestrian facilities
8	City of Grants Pass	Redwood Avenue/Dowell Road	Intersection of Redwood Avenue/Dowell Road	Improve Redwood Avenue at Dowell Road intersection and install traffic signal
9	City of Grants Pass	West Park Improvement Project	West Park Street from 6th Street to Ringuette Street	Improve West Park Street from 6th Street to Ringuette Street by constructing curb, gutter, sidewalks and bicycle lanes
10	City of Grants Pass	Fourth Bridge	Rogue River between Allen Creek Road and Ironwood Drive in Grants Pass	New bridge across the Rogue River possibly connecting Allen Creek Road, Flower Lane, and Ironwood Drive
11	City of Grants Pass	Allen Creek Road Widening	Between Redwood Avenue and Denton Trail Road in both Grants Pass and Unincorporated Josephine County	Provide 70 feet right-of-way. Reconstruct as 48 foot wide arterial street with sidewalks and bike lanes on both sides from Redwood Avenue south to Denton Trail Road

Map Identification	Agency	Improvement	Approximate Location	Description
12	City of Grants Pass	Dowell Road Improvements	Between Leonard Avenue and Schutzwohl Road in Grants Pass.	Install Sidewalks on both sides from Leonard Avenue to Redwood Avenue. From Highway 199 to Schutzwohl Road full reconstruction providing a 48 foot wide collector with continuous two way left turn lanes, bike lanes, and side walks on both sides
13	City of Grants Pass	Hubbard Lane Improvements	Between Redwood Highway to Redwood Lane	Reconstruct street to 42 feet wide with bike lanes and sidewalks on both side
14	City of Grants Pass	Nebraska Avenue Improvements	Between Ramsey Avenue and McCarter Lane in Grants Pass	Build Sidewalks on both sides, and reconstruct east half of street to 36 feet wide
15	City of Grants Pass	Rogue Community College Multi-Use Path	Rogue Community College Campus in Grants Pass	Construct new multi-use path through the campus
16	Josephine County	Redwood Avenue at Southgate Way	Josephine county	Trim/eliminate trees obscuring site distance
17	Josephine County	Dowell Road at Wolf Lane	Josephine County	Intersection improvements
18	Josephine County	Highway 199 at Redwood Ave	Josephine County	Channelize northbound and southbound approaches to provide separate twin lanes
19	Josephine County	Highway 199 at Redwood Avenue	Josephine county	Install left turn lane on Redwood Avenue

EXHIBIT 24. LOCATIONS OF PLANNED AND CONSIDERED IMPROVEMENTS



CHAPTER 8. Mitigation / Conservation Measures

Measures for Construction Plans and Specifications

Temporary Effects

Potential mitigation measures to reduce temporary effects to surface water bodies occurring in the vicinity to be included in the Plans and Specifications.

Aspects of construction may cause erosion and sedimentation that could affect Sand and Allen Creeks, which are tributaries to the Rogue River. An ESCP will be prepared prior to the start of construction and adhered to throughout the process. During the construction of the Highway 199 Expressway Upgrade Project, all erosion and stormwater control measures should either meet or exceed ODOT's Erosion Control Manual practices and be used along with other required erosion management techniques established for road construction in the ESCP.

The project shall be bound by the requirements of ODOT's NPDES 1200-CA permit to take all reasonable steps to minimize or prevent any discharge or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. In addition to preparing and maintaining an ESCP, the 1200-CA permit requires the project to perform maintenance and monitoring of the erosion and sediment control facilities, perform turbidity monitoring, maintain written records of visual monitoring, and follow the reporting requirements of noncompliance incidents.

The project would include a SPCC plan to control pollutants throughout the project work areas. These areas can include but are not limited to staging, storage, maintenance, refueling areas, and waste sites. It would be the responsibility of ODOT and its contractors to structure their operations in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to waterbodies or wetlands. In addition, ODOT and its contractors would structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials.

Long-Term Effects

Mitigation for long-term effects is addressed by minimizing impacts through design of the facility and is discussed in the General Measures section below.

General Measures

Temporary Effects

Potential mitigation measures to reduce temporary effects to surface water bodies occurring in the vicinity include for Agency Compliance:

- Perform contract management activities, including environmental compliance oversight of ODOT's contractors, to ensure that the conditions and requirements of the ESPC and SPCC are being complied with.
- Perform contract management activities, including environmental compliance oversight of ODOT's contractors, to ensure that the conditions and requirements of environmental permits are being complied with.

Long-Term Effects

Where appropriate and feasible, mitigation measures such as the following would be employed by the Agency to partially or fully mitigate long-term effects.

Increased stormwater runoff from new impervious surfaces would be treated with the stormwater treatment facilities. These facilities are part of the proposed action, and thus no further mitigation would be necessary. The design of the facilities should be performed in such a way that the water quality (treatment) and the water quantity (detention) requirements presented in the Stormwater Technical Report are met. All stormwater facilities require routine inspection and maintenance, and thus, would be designed so that these functions could be easily conducted. Special attention should be placed upon access needs, specifically for detention ponds and manhole structures.

CHAPTER 9. References

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CHAPTER 10.Glossary

Term	Definition
500-year floodplain	This is the boundary of the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. Officially termed the 0.2 percent annual chance floodplain.
Clean Water Act 303(d) List	Section 303(d) of the federal Clean Water Act requires Oregon State to prepare a list of all surface waters in the state for which beneficial uses of the water – such as for drinking, recreation, aquatic habitat, and industrial use – are impaired by pollutants.
Sediment	A general term for any unconsolidated particulate material that is carried by or has been deposited by an agent of transport, such as water, ice or wind.
Stormwater runoff	Stormwater runoff is the portion of precipitation (rainwater or snowmelt) that does not naturally seep into the ground or evaporate, but flows overland via ditches, surface flow, pipes, or other features into a defined surface water or treatment facility.
Total Maximum Daily Loads (TMDLs)	A TMDL or Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources.

Appendix A

Water quality modeling outputs are presented in the following organizational hierarchy;

1) By pollutant type (copper, zinc, and Total Suspended Solids(TSS))
2) By drainage tributary area (DA1, DA2, and DA3)
3) By alternative (A and C)

Each output sheet has the No Build Alternative, the build alternative (A or C) with no water quality mitigation, and the build alternative with water quality mitigation, if any is proposed.

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Copper Alt A DA 1	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	47.3		47.3		47.3	
Paved Surface		ac	10.2		11.9		11.9	
% Impervious			21.6		25.2		25.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		11,000		14,000		14,000	
Pollutant			cu		cu		cu	
Site Median Conc.	table 3/npdes	mg/l	0.02		0.02		0.019139496	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0.04302521	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.01		0.01		0.01	
Threshold	table 4		0.007		0.007		0.007	
Soluable fraction			0.2		0.2		0.2	
Receiving Water								
Watershed Area	measured	sq. mi.	0.58		0.58		0.58	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	2		2		2	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.250951		0.276109937		0.276109937	
Mean Storm Qh		cfs	0.28488		0.31344		0.31344	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20682.29		22755.744		22755.744	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.02		0.02		0.019139496	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.02612		0.026119724		0.024995918	
Mean Event Mass		lb (kg)	0.033736	0.0153	0.037118641	0.0168	0.035521604	0.0161
Annual Mass		lb (kg)	2.926054	1.3272	3.219398992	1.4603	3.080883674	1.3975
Flow Ratio			8.14378		7.401735579		7.401735579	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.02973		2.103377744		2.103377744	
Site Med Conc		mg/l	0.02		0.02		0.019139496	
Soluable Frac			0.2		0.2		0.2	
Acure Criteria			0.01		0.01		0.01	
Threshold			0.007		0.007		0.007	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.008119		0.008413511		0.008051518	
Pollut Ratio			0.811892		0.841351097		0.80515179	
Exceed instream standard			borderline		borderline		borderline	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Copper Alt A DA 2	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	41.3		44.7		44.7	
Paved Surface		ac	26.2		26		26	
% Impervious			63.4		58.2		58.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		18,000		26,000		26,000	
Pollutant			cu		cu		cu	
Site Median Conc.	table 3/npdes	mg/l	0.02		0.02		0.02	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.01		0.01		0.01	
Threshold	table 4		0.007		0.007		0.007	
Soluable fraction			0.2		0.2		0.2	
Receiving Water								
Watershed Area	measured	sq. mi.	0.98		0.98		0.98	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	4		4		4	
WorkSheet B - Highway Runoff Characteristics								
Runoff Coef			0.544068		0.507158837		0.507158837	
Mean Storm Qh		cfs	0.53928		0.54408		0.54408	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	39151.73		39500.208		39500.208	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.02		0.02		0.02	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.02612		0.026119724		0.026119724	
Mean Event Mass		lb (kg)	0.063863	0.0290	0.064431822	0.0292	0.064431822	0.0292
Annual Mass		lb (kg)	5.539043	2.5125	5.588344193	2.5348	5.588344193	2.5348
Flow Ratio			7.268951		7.20482282		7.20482282	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.057342		2.058511984		2.058511984	
Site Med Conc		mg/l	0.02		0.02		0.02	
Soluable Frac			0.2		0.2		0.2	
Acure Criteria			0.01		0.01		0.01	
Threshold			0.007		0.007		0.007	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.008229		0.008234048		0.008234048	
Pollut Ratio			0.822937		0.823404793		0.823404793	
Exceed instream standard			borderline		borderline		borderline	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Copper Alt A DA 3	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	32.5		34.6		34.6	
Paved Surface		ac	12.1		17.6		17.6	
% Impervious			37.2		50.9		50.9	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		31,000		31,000		31,000	
Pollutant			cu		cu		cu	
Site Median Conc.	table 3/npdes	mg/l	0.02		0.02		0.013461818	
CoV			0.71		0.71		0.71	
Pollutant removal efficiency							0.326909091	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.01		0.01		0.01	
Threshold	table 4		0.007		0.007		0.007	
Soluable fraction			0.2		0.2		0.2	
Receiving Water								
Watershed Area	measured	sq. mi.	0.21		0.21		0.21	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	1		1		1	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.360615		0.456069364		0.456069364	
Mean Storm Qh		cfs	0.28128		0.37872		0.37872	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20420.93		27495.072		27495.072	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.02		0.02		0.013461818	
CoV			0.71		0.71		0.71	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.024528		0.024528351		0.01650981	
Mean Event Mass		lb (kg)	0.031281	0.0142	0.042116828	0.0191	0.028348454	0.0129
Annual Mass		lb (kg)	2.713058	1.2306	3.652905083	1.6569	2.458737203	1.1153
Flow Ratio			2.986348		2.217997465		2.217997465	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.239014		2.690035488		2.690035488	
Site Med Conc		mg/l	0.02		0.02		0.013461818	
Soluable Frac			0.2		0.2		0.2	
Acure Criteria			0.01		0.01		0.01	
Threshold			0.007		0.007		0.007	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.008956		0.010760142		0.007242554	
Pollut Ratio			0.895605		1.076014195		0.724255373	
Exceed instream standard			borderline		borderline		no	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Copper Alt C DA 1	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	47.3		47.3		47.3	
Paved Surface		ac	10.2		11.9		11.9	
% Impervious			21.6		25.2		25.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		11,000		14,000		14,000	
Pollutant			cu		cu		cu	
Site Median Conc.	table 3/npdes	mg/l	0.02		0.02		0.019139496	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0.04302521	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.01		0.01		0.01	
Threshold	table 4		0.007		0.007		0.007	
Soluable fraction			0.2		0.2		0.2	
Receiving Water								
Watershed Area	measured	sq. mi.	0.58		0.58		0.58	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	2		2		2	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.250951		0.276109937		0.276109937	
Mean Storm Qh		cfs	0.28488		0.31344		0.31344	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20682.29		22755.744		22755.744	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.02		0.02		0.019139496	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.02612		0.026119724		0.024995918	
Mean Event Mass		lb (kg)	0.033736	0.0153	0.037118641	0.0168	0.035521604	0.0161
Annual Mass		lb (kg)	2.926054	1.3272	3.219398992	1.4603	3.080883674	1.3975
Flow Ratio			8.14378		7.401735579		7.401735579	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.02973		2.103377744		2.103377744	
Site Med Conc		mg/l	0.02		0.02		0.019139496	
Soluable Frac			0.2		0.2		0.2	
Acure Criteria			0.01		0.01		0.01	
Threshold			0.007		0.007		0.007	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.008119		0.008413511		0.008051518	
Pollut Ratio			0.811892		0.841351097		0.80515179	
Exceed instream standard			borderline		borderline		borderline	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Copper Alt C DA 2	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	41.3		44.7		44.7	
Paved Surface		ac	26.2		26		26	
% Impervious			63.4		58.2		58.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		18,000		26,000		26,000	
Pollutant			cu		cu		cu	
Site Median Conc.	table 3/npdes	mg/l	0.02		0.02		0.02	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.01		0.01		0.01	
Threshold	table 4		0.007		0.007		0.007	
Soluable fraction			0.2		0.2		0.2	
Receiving Water								
Watershed Area	measured	sq. mi.	0.98		0.98		0.98	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	4		4		4	
WorkSheet B - Highway Runoff Characteristics								
Runoff Coef			0.544068		0.507158837		0.507158837	
Mean Storm Qh		cfs	0.53928		0.54408		0.54408	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	39151.73		39500.208		39500.208	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.02		0.02		0.02	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.02612		0.026119724		0.026119724	
Mean Event Mass		lb (kg)	0.063863	0.0290	0.064431822	0.0292	0.064431822	0.0292
Annual Mass		lb (kg)	5.539043	2.5125	5.588344193	2.5348	5.588344193	2.5348
Flow Ratio			7.268951		7.20482282		7.20482282	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.057342		2.058511984		2.058511984	
Site Med Conc		mg/l	0.02		0.02		0.02	
Soluable Frac			0.2		0.2		0.2	
Acure Criteria			0.01		0.01		0.01	
Threshold			0.007		0.007		0.007	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.008229		0.008234048		0.008234048	
Pollut Ratio			0.822937		0.823404793		0.823404793	
Exceed instream standard			borderline		borderline		borderline	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Copper Alt C DA 3	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	32.5		35.1		35.1	
Paved Surface		ac	12.1		18.4		18.4	
% Impervious			37.2		52.4		52.4	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		31,000		31,000		31,000	
Pollutant			cu		cu		cu	
Site Median Conc.	table 3/npdes	mg/l	0.02		0.02		0.013446957	
CoV			0.71		0.71		0.71	
Pollutant removal efficiency							0.327652174	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.01		0.01		0.01	
Threshold	table 4		0.007		0.007		0.007	
Soluable fraction			0.2		0.2		0.2	
Receiving Water								
Watershed Area	measured	sq. mi.	0.21		0.21		0.21	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	1		1		1	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.360615		0.466951567		0.466951567	
Mean Storm Qh		cfs	0.28128		0.39336		0.39336	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20420.93		28557.936		28557.936	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.02		0.02		0.013446957	
CoV			0.71		0.71		0.71	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.024528		0.024528351		0.016491583	
Mean Event Mass		lb (kg)	0.031281	0.0142	0.043744918	0.0198	0.029411801	0.0133
Annual Mass		lb (kg)	2.713058	1.2306	3.794113708	1.7210	2.550964103	1.1571
Flow Ratio			2.986348		2.135448444		2.135448444	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.239014		2.738491763		2.738491763	
Site Med Conc		mg/l	0.02		0.02		0.013446957	
Soluable Frac			0.2		0.2		0.2	
Acure Criteria			0.01		0.01		0.01	
Threshold			0.007		0.007		0.007	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.008956		0.010953967		0.007364876	
Pollut Ratio			0.895605		1.095396705		0.736487594	
Exceed instream standard			borderline		borderline		no	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Zinc Alt A DA 1	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	47.3		47.3		47.3	
Paved Surface		ac	10.2		11.9		11.9	
% Impervious			21.6		25.2		25.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		11,000		14,000		14,000	
Pollutant			zn		zn		zn	
Site Median Conc.	table 3/npdes	mg/l	0.16		0.16		0.153115966	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0.04302521	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.069		0.069		0.069	
Threshold	table 4		0.062		0.062		0.062	
Soluable fraction			0.19		0.19		0.19	
Receiving Water								
Watershed Area	measured	sq. mi.	0.58		0.58		0.58	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	2		2		2	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.250951		0.276109937		0.276109937	
Mean Storm Qh		cfs	0.28488		0.31344		0.31344	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20682.29		22755.744		22755.744	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.16		0.16		0.153115966	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.208958		0.208957795		0.199967342	
Mean Event Mass		lb (kg)	0.269892	0.1224	0.296949131	0.1347	0.284172832	0.1289
Annual Mass		lb (kg)	23.40843	10.6179	25.75519194	11.6824	24.64706939	11.1797
Flow Ratio			8.14378		7.401735579		7.401735579	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.02973		2.103377744		2.103377744	
Site Med Conc		mg/l	0.16		0.16		0.153115966	
Soluable Frac			0.19		0.19		0.19	
Acure Criteria			0.069		0.069		0.069	
Threshold			0.062		0.062		0.062	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.061704		0.063942683		0.061191536	
Pollut Ratio			0.894258		0.926705557		0.886833855	
Exceed instream standard			borderline		borderline		borderline	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Zinc Alt A DA 2	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	41.3		44.7		44.7	
Paved Surface		ac	26.2		26		26	
% Impervious			63.4		58.2		58.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		18,000		26,000		26,000	
Pollutant			zn		zn		zn	
Site Median Conc.	table 3/npdes	mg/l	0.16		0.16		0.16	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.069		0.069		0.069	
Threshold	table 4		0.062		0.062		0.062	
Soluable fraction			0.19		0.19		0.19	
Receiving Water								
Watershed Area	measured	sq. mi.	0.98		0.98		0.98	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	4		4		4	
WorkSheet B - Highway Runoff Characteristics								
Runoff Coef			0.544068		0.507158837		0.507158837	
Mean Storm Qh		cfs	0.53928		0.54408		0.54408	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	39151.73		39500.208		39500.208	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.16		0.16		0.16	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.208958		0.208957795		0.208957795	
Mean Event Mass		lb (kg)	0.510907	0.2317	0.515454579	0.2338	0.515454579	0.2338
Annual Mass		lb (kg)	44.31234	20.0997	44.70675354	20.2786	44.70675354	20.2786
Flow Ratio			7.268951		7.20482282		7.20482282	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.057342		2.058511984		2.058511984	
Site Med Conc		mg/l	0.16		0.16		0.16	
Soluable Frac			0.19		0.19		0.19	
Acure Criteria			0.069		0.069		0.069	
Threshold			0.062		0.062		0.062	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.062543		0.062578764		0.062578764	
Pollut Ratio			0.906423		0.906938613		0.906938613	
Exceed instream standard			borderline		borderline		borderline	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Zinc Alt A DA 3	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	32.5		34.6		34.6	
Paved Surface		ac	12.1		17.6		17.6	
% Impervious			37.2		50.9		50.9	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		31,000		31,000		31,000	
Pollutant			zn		zn		zn	
Site Median Conc.	table 3/npdes	mg/l	0.16		0.16		0.107694545	
CoV			0.71		0.71		0.71	
Pollutant removal efficiency							0.326909091	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.069		0.069		0.069	
Threshold	table 4		0.062		0.062		0.062	
Soluable fraction			0.19		0.19		0.19	
Receiving Water								
Watershed Area	measured	sq. mi.	0.21		0.21		0.21	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	1		1		1	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.360615		0.456069364		0.456069364	
Mean Storm Qh		cfs	0.28128		0.37872		0.37872	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20420.93		27495.072		27495.072	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.16		0.16		0.107694545	
CoV			0.71		0.71		0.71	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.196227		0.196226808		0.13207848	
Mean Event Mass		lb (kg)	0.250245	0.1135	0.336934624	0.1528	0.226787632	0.1029
Annual Mass		lb (kg)	21.70446	9.8450	29.22324066	13.2554	19.66989763	8.9221
Flow Ratio			2.986348		2.217997465		2.217997465	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.239014		2.690035488		2.690035488	
Site Med Conc		mg/l	0.16		0.16		0.107694545	
Soluable Frac			0.19		0.19		0.19	
Acure Criteria			0.069		0.069		0.069	
Threshold			0.062		0.062		0.062	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.068066		0.081777079		0.055043408	
Pollut Ratio			0.986464		1.185175056		0.797730556	
Exceed instream standard			borderline		borderline		borderline	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Zinc Alt C DA 1	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	47.3		47.3		47.3	
Paved Surface		ac	10.2		11.9		11.9	
% Impervious			21.6		25.2		25.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		11,000		14,000		14,000	
Pollutant			zn		zn		zn	
Site Median Conc.	table 3/npdes	mg/l	0.16		0.16		0.153115966	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0.04302521	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.069		0.069		0.069	
Threshold	table 4		0.062		0.062		0.062	
Soluable fraction			0.19		0.19		0.19	
Receiving Water								
Watershed Area	measured	sq. mi.	0.58		0.58		0.58	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	2		2		2	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.250951		0.276109937		0.276109937	
Mean Storm Qh		cfs	0.28488		0.31344		0.31344	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20682.29		22755.744		22755.744	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.16		0.16		0.153115966	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.208958		0.208957795		0.199967342	
Mean Event Mass		lb (kg)	0.269892	0.1224	0.296949131	0.1347	0.284172832	0.1289
Annual Mass		lb (kg)	23.40843	10.6179	25.75519194	11.6824	24.64706939	11.1797
Flow Ratio			8.14378		7.401735579		7.401735579	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.02973		2.103377744		2.103377744	
Site Med Conc		mg/l	0.16		0.16		0.153115966	
Soluable Frac			0.19		0.19		0.19	
Acure Criteria			0.069		0.069		0.069	
Threshold			0.062		0.062		0.062	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.061704		0.063942683		0.061191536	
Pollut Ratio			0.894258		0.926705557		0.886833855	
Exceed instream standard			borderline		borderline		borderline	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Zinc Alt C DA 2	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	41.3		44.7		44.7	
Paved Surface		ac	26.2		26		26	
% Impervious			63.4		58.2		58.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		18,000		26,000		26,000	
Pollutant			zn		zn		zn	
Site Median Conc.	table 3/npdes	mg/l	0.16		0.16		0.16	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.069		0.069		0.069	
Threshold	table 4		0.062		0.062		0.062	
Soluable fraction			0.19		0.19		0.19	
Receiving Water								
Watershed Area	measured	sq. mi.	0.98		0.98		0.98	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	4		4		4	
WorkSheet B - Highway Runoff Characteristics								
Runoff Coef			0.544068		0.507158837		0.507158837	
Mean Storm Qh		cfs	0.53928		0.54408		0.54408	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	39151.73		39500.208		39500.208	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.16		0.16		0.16	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.208958		0.208957795		0.208957795	
Mean Event Mass		lb (kg)	0.510907	0.2317	0.515454579	0.2338	0.515454579	0.2338
Annual Mass		lb (kg)	44.31234	20.0997	44.70675354	20.2786	44.70675354	20.2786
Flow Ratio			7.268951		7.20482282		7.20482282	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.057342		2.058511984		2.058511984	
Site Med Conc		mg/l	0.16		0.16		0.16	
Soluable Frac			0.19		0.19		0.19	
Acure Criteria			0.069		0.069		0.069	
Threshold			0.062		0.062		0.062	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.062543		0.062578764		0.062578764	
Pollut Ratio			0.906423		0.906938613		0.906938613	
Exceed instream standard			borderline		borderline		borderline	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 Zinc Alt C DA 3	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	32.5		35.1		35.1	
Paved Surface		ac	12.1		18.4		18.4	
% Impervious			37.2		52.4		52.4	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		31,000		31,000		31,000	
Pollutant			zn		zn		zn	
Site Median Conc.	table 3/npdes	mg/l	0.16		0.16		0.107575652	
CoV			0.71		0.71		0.71	
Pollutant removal efficiency							0.327652174	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		0.069		0.069		0.069	
Threshold	table 4		0.062		0.062		0.062	
Soluable fraction			0.19		0.19		0.19	
Receiving Water								
Watershed Area	measured	sq. mi.	0.21		0.21		0.21	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	1		1		1	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.360615		0.466951567		0.466951567	
Mean Storm Qh		cfs	0.28128		0.39336		0.39336	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20420.93		28557.936		28557.936	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	0.16		0.16		0.107575652	
CoV			0.71		0.71		0.71	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	0.196227		0.196226808		0.131932667	
Mean Event Mass		lb (kg)	0.250245	0.1135	0.349959347	0.1587	0.235294406	0.1067
Annual Mass		lb (kg)	21.70446	9.8450	30.35290966	13.7678	20.40771283	9.2568
Flow Ratio			2.986348		2.135448444		2.135448444	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.239014		2.738491763		2.738491763	
Site Med Conc		mg/l	0.16		0.16		0.107575652	
Soluable Frac			0.19		0.19		0.19	
Acure Criteria			0.069		0.069		0.069	
Threshold			0.062		0.062		0.062	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			0.068066		0.08325015		0.055973057	
Pollut Ratio			0.986464		1.206523907		0.811203726	
Exceed instream standard			borderline		borderline		borderline	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 TSS Alt A DA 1	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	47.3		47.3		47.3	
Paved Surface		ac	10.2		11.9		11.9	
% Impervious			21.6		25.2		25.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73		86.73	
ADT	proj des		11,000		14,000		14,000	
Pollutant			TSS		TSS		TSS	
Site Median Conc.	table 3/npdes	mg/l	125		125		115.5882353	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0.075294118	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		100		100		100	
Threshold	table 4		100		100		100	
Soluable fraction			0.1		0.1		0.1	
Receiving Water								
Watershed Area	measured	sq. mi.	0.58		0.58		0.58	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	2		2		2	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.250951		0.276109937		0.276109937	
Mean Storm Qh		cfs	0.28488		0.31344		0.31344	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20682.29		22755.744		22755.744	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	125		125		115.5882353	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	163.2483		163.2482772		150.9566422	
Mean Event Mass		lb (kg)	210.8529	95.6413	231.9915084	105.2296	214.5239125	97.3064
Annual Mass		lb (kg)	18287.84	8295.2243	20121.2437	9126.8432	18606.23241	8439.6456
Flow Ratio			8.14378		7.401735579		7.401735579	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.02973		2.103377744		2.103377744	
Site Med Conc		mg/l	125		125		115.5882353	
Soluable Frac			0.1		0.1		0.1	
Acure Criteria			100		100		100	
Threshold			100		100		100	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			25.37162		26.2922218		24.31257216	
Pollut Ratio			0.253716		0.262922218		0.243125722	
Exceed instream standard			no		no		no	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 TSS Alt A DA 2	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	41.3		44.7		44.7	
Paved Surface		ac	26.2		26		26	
% Impervious			63.4		58.2		58.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73		86.73	
ADT	proj des		18,000		26,000		26,000	
Pollutant			TSS		TSS		TSS	
Site Median Conc.	table 3/npdes	mg/l	125		125		125	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		100		100		100	
Threshold	table 4		100		100		100	
Soluable fraction			0.1		0.1		0.1	
Receiving Water								
Watershed Area	measured	sq. mi.	0.98		0.98		0.98	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	4		4		4	
WorkSheet B - Highway Runoff Characteristics								
Runoff Coef			0.544068		0.507158837		0.507158837	
Mean Storm Qh		cfs	0.53928		0.54408		0.54408	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	39151.73		39500.208		39500.208	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	125		125		125	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	163.2483		163.2482772		163.2482772	
Mean Event Mass		lb (kg)	399.1462	181.0497	402.6988895	182.6612	402.6988895	182.6612
Annual Mass		lb (kg)	34619.02	15702.92	34927.1512	15842.69	34927.1512	15842.69
Flow Ratio			7.268951		7.20482282		7.20482282	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.057342		2.058511984		2.058511984	
Site Med Conc		mg/l	125		125		125	
Soluable Frac			0.1		0.1		0.1	
Acure Criteria			100		100		100	
Threshold			100		100		100	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			25.71677		25.73139979		25.73139979	
Pollut Ratio			0.257168		0.257313998		0.257313998	
Exceed instream standard			no		no		no	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 TSS Alt A DA 3	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	32.5		34.6		34.6	
Paved Surface		ac	12.1		17.6		17.6	
% Impervious			37.2		50.9		50.9	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		31,000		31,000		31,000	
Pollutant			TSS		TSS		TSS	
Site Median Conc.	table 3/npdes	mg/l	125		125		80.30539773	
CoV			0.71		0.71		0.71	
Pollutant removal efficiency							0.357556818	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		100		100		100	
Threshold	table 4		100		100		100	
Soluable fraction			0.1		0.1		0.1	
Receiving Water								
Watershed Area	measured	sq. mi.	0.21		0.21		0.21	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	1		1		1	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.360615		0.456069364		0.456069364	
Mean Storm Qh		cfs	0.28128		0.37872		0.37872	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20420.93		27495.072		27495.072	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	125		125		80.30539773	
CoV			0.71		0.71		0.71	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	153.3022		153.3021934		98.4879489	
Mean Event Mass		lb (kg)	195.5043	88.6793	263.2301751	119.3992	169.1104312	76.7072
Annual Mass		lb (kg)	16956.61	7691.3892	22830.65677	10355.8124	14667.39978	6653.0211
Flow Ratio			2.986348		2.217997465		2.217997465	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.239014		2.690035488		2.690035488	
Site Med Conc		mg/l	125		125		80.30539773	
Soluable Frac			0.1		0.1		0.1	
Acure Criteria			100		100		100	
Threshold			100		100		100	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			27.98767		33.6254436		21.60243698	
Pollut Ratio			0.279877		0.336254436		0.21602437	
Exceed instream standard			no		no		no	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 TSS Alt C DA 1	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	47.3		47.3		47.3	
Paved Surface		ac	10.2		11.9		11.9	
% Impervious			21.6		25.2		25.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		11,000		14,000		14,000	
Pollutant			TSS		TSS		TSS	
Site Median Conc.	table 3/npdes	mg/l	125		125		115.5882353	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0.075294118	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		100		100		100	
Threshold	table 4		100		100		100	
Soluable fraction			0.1		0.1		0.1	
Receiving Water								
Watershed Area	measured	sq. mi.	0.58		0.58		0.58	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	2		2		2	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.250951		0.276109937		0.276109937	
Mean Storm Qh		cfs	0.28488		0.31344		0.31344	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20682.29		22755.744		22755.744	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	125		125		115.5882353	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	163.2483		163.2482772		150.9566422	
Mean Event Mass		lb (kg)	210.8529	95.6413	231.9915084	105.2296	214.5239125	97.3064
Annual Mass		lb (kg)	18287.84	8295.2243	20121.2437	9126.8432	18606.23241	8439.6456
Flow Ratio			8.14378		7.401735579		7.401735579	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.02973		2.103377744		2.103377744	
Site Med Conc		mg/l	125		125		115.5882353	
Soluable Frac			0.1		0.1		0.1	
Acure Criteria			100		100		100	
Threshold			100		100		100	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			25.37162		26.2922218		24.31257216	
Pollut Ratio			0.253716		0.262922218		0.243125722	
Exceed instream standard			no		no		no	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 TSS Alt C DA 2	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	41.3		44.7		44.7	
Paved Surface		ac	26.2		26		26	
% Impervious			63.4		58.2		58.2	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		18,000		26,000		26,000	
Pollutant			TSS		TSS		TSS	
Site Median Conc.	table 3/npdes	mg/l	125		125		125	
CoV			0.84		0.84		0.84	
Pollutant removal efficiency							0	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		100		100		100	
Threshold	table 4		100		100		100	
Soluable fraction			0.1		0.1		0.1	
Receiving Water								
Watershed Area	measured	sq. mi.	0.98		0.98		0.98	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	4		4		4	
WorkSheet B - Highway Runoff Characteristics								
Runoff Coef			0.544068		0.507158837		0.507158837	
Mean Storm Qh		cfs	0.53928		0.54408		0.54408	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	39151.73		39500.208		39500.208	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	125		125		125	
CoV			0.84		0.84		0.84	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	163.2483		163.2482772		163.2482772	
Mean Event Mass		lb (kg)	399.1462	181.0497	402.6988895	182.6612	402.6988895	182.6612
Annual Mass		lb (kg)	34619.02	15702.92	34927.1512	15842.69	34927.1512	15842.69
Flow Ratio			7.268951		7.20482282		7.20482282	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.057342		2.058511984		2.058511984	
Site Med Conc		mg/l	125		125		125	
Soluable Frac			0.1		0.1		0.1	
Acure Criteria			100		100		100	
Threshold			100		100		100	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			25.71677		25.73139979		25.73139979	
Pollut Ratio			0.257168		0.257313998		0.257313998	
Exceed instream standard			no		no		no	

FHWA Methodology for Assessing Highway Runoff Impacts

Worksheet A - Site Characteristics

Hwy 199 TSS Alt C DA 3	info source	units	pre		post		post w/mit	
Total Right of Way	proj des	ac	32.5		35.1		35.1	
Paved Surface		ac	12.1		18.4		18.4	
% Impervious			37.2		52.4		52.4	
Rainfall								
Volume	fig 2	in	0.48		0.48		0.48	
Intensity		in/hr	0.024		0.024		0.024	
Duration		hr	20		20		20	
Interval		hr	101		101		101	
CoV								
Volume	fig 2		1.61		1.61		1.61	
Intensity			0.84		0.84		0.84	
Duration			1.23		1.23		1.23	
Interval			1.21		1.21		1.21	
# Storms/Year			86.73		86.73267327		86.73	
ADT	proj des		31,000		31,000		31,000	
Pollutant			TSS		TSS		TSS	
Site Median Conc.	table 3/npdes	mg/l	125		125		80.20380435	
CoV			0.71		0.71		0.71	
Pollutant removal efficiency							0.358369565	
Hardness	fig 4 or monitoring		53.4		53.4		53.4	
Acute Criteria	table 4		100		100		100	
Threshold	table 4		100		100		100	
Soluable fraction			0.1		0.1		0.1	
Receiving Water								
Watershed Area	measured	sq. mi.	0.21		0.21		0.21	
Lake Surface Area	measured	acres			0		0	
Avg Annual Runoff	fig 3	cfs/sq.mi.	4		4		4	
CoV			1		1		1	
Avg Q		cfs	1		1		1	
Worksheet B - Highway Runoff Characteristics								
Runoff Coef			0.360615		0.466951567		0.466951567	
Mean Storm Qh		cfs	0.28128		0.39336		0.39336	
CoV			0.84		0.84		0.84	
Mean Storm Volume		cubic feet	20420.93		28557.936		28557.936	
CoV			1.61		1.61		1.61	
Site Med Conc		mg/l	125		125		80.20380435	
CoV			0.71		0.71		0.71	
Storms/Year			86.73267		86.73267327		86.73267327	
Mean Event Conc		mg/l	153.3022		153.3021934		98.363353	
Mean Event Mass		lb (kg)	195.5043	88.6793	273.4057395	124.0148	175.4254435	79.5716
Annual Mass		lb (kg)	16956.61	7691.3892	23713.21067	10756.1321	15215.11768	6901.4617
Flow Ratio			2.986348		2.135448444		2.135448444	
Worksheet C - Stream Impact Analysis								
storm event prob			0.384323		0.384322679		0.384322679	
Table 7 CU			2.239014		2.738491763		2.738491763	
Site Med Conc		mg/l	125		125		80.20380435	
Soluable Frac			0.1		0.1		0.1	
Acure Criteria			100		100		100	
Threshold			100		100		100	
Target Ratio			0.75		0.75		0.75	
Pollut Conce (3Y)			27.98767		34.23114704		21.96374576	
Pollut Ratio			0.279877		0.34231147		0.219637458	
Exceed instream standard			no		no		no	