SOUTH PARK BRIDGE PROJECT

Draft Environmental Impact Statement and Section 4(f) Evaluation

Appendix Volume IV

September 2005

U.S. Department of Transportation
Federal Highway Administration

Washington State
Department of Transportation

King County
Department of Transportation

printed on recycled paper

SOUTH PARK BRIDGE PROJECT

Draft Environmental Impact Statement and Section 4(f) Evaluation

Appendix Volume IV

September 2005

U.S. Department of Transportation
Federal Highway Administration

Washington State
Department of Transportation

King County
Department of Transportation

printed on recycled paper

This page intentionally blank

Appendix Volume IV—Table of Contents

Appendix R Air Quality Technical Report.....7

1. Executive Summary.....17
2. Introduction.....25
3. Studies and Coordination.....65
4. Methodology.....71
5. Affected Environment.....77
6. Impacts.....83
7. Mitigation.....87
8. Conformity Determination.....89
References.....91
Appendix.....95

Appendix S Noise Technical Report.....399

1. Executive Summary.....409
2. Introduction.....411
3. Studies and Coordination.....451
4. Methodology.....459
5. Affected Environment.....465
6. Impacts.....469
7. Mitigation.....475
References.....483
Appendices.....485

Appendix T Utilities Technical Report.....519

1. Executive Summary.....529
2. Introduction.....533
3. Studies and Coordination.....573
4. Methodology.....575
5. Affected Environment.....577
6. Impacts.....587
7. Mitigation.....599
References.....601

This page intentionally blank

Appendix R. Air Quality Technical Report

This page intentionally blank

South Park Bridge Project

Air Quality Technical Report

Prepared for the

King County
Department of Transportation
201 South Jackson Street
Seattle, Washington 98104

Prepared by

Parsons Brinckerhoff, Inc.
999 Third Avenue, Suite 2200
Seattle, Washington 98104

February 2004

This page intentionally blank

Technical Report
South Park Bridge Project

Air Quality

February 2004

Prepared for:
King County Department of Transportation
201 South Jackson Street
Seattle, Washington 98104

Prepared and Submitted by:
Parsons Brinckerhoff, Inc.
999 Third Avenue, Suite 2200
Seattle, Washington 98104

printed on recycled paper

This page intentionally blank

Table of Contents

CHAPTER 1 EXECUTIVE SUMMARY 1

1.1 Project Alternatives 1
1.1.1 No Action Alternative 1
1.1.2 Rehabilitation Alternative 2
1.1.3 Bascule Bridge Alternative 2
1.1.4 Mid-Level Fixed-Span Bridge Alternative 3
1.1.5 High-Level Fixed-Span Bridge Alternative 3

1.2 Conformity Determination 4

1.3 Methodology and Rationale 4

1.4 Impacts and Mitigation 5

CHAPTER 2 INTRODUCTION 9

2.1 Description of Existing Conditions 9
2.1.1 The Project Area 9
2.1.2 The Existing South Park Bridge 11
2.1.3 Bridge Condition 11
2.1.4 Roadway Network 15
2.1.5 Freight, Transit, and Pedestrians 15

2.2 History of Project 15
2.2.1 Overview of Studies 16
2.2.2 Summary of Key Engineering Reports 16
2.2.3 Continuing Deterioration 17

2.3 Purpose and Need of Project 18
2.3.1 Function and Role of the South Park Bridge 18
2.3.2 Purpose of Proposed Project 18
2.3.3 Need for the Proposed Project 18
2.3.4 Key Issues 19

2.4 Description of Alternatives 20
2.4.1 Design Criteria 21
2.4.2 The Alternatives 23
2.4.3 Construction Durations and Activities 43
2.4.4 Cost Estimates for the Alternatives 47

2.5 Project Coordination 48

CHAPTER 3 STUDIES AND COORDINATION 51

3.1 Climate 52

3.2 Carbon Monoxide 53

3.3 Particulate Matter 53

3.4 Ozone 54

3.5 Hazardous Air Pollutants 55

3.6 Greenhouse Gases 55

CHAPTER 4 METHODOLOGY 57

4.1 MOBILE5b Model 58

4.2 CAL3QHC Model 58

CHAPTER 5 AFFECTED ENVIRONMENT 63

5.1 Description of Study Area 63

5.2 Emission Trends 63

5.2.1 National Air Pollution Trends 64

5.2.2 Regional Air Pollution Trends 64

5.3 Air Quality Monitoring 66

5.3.1 Monitoring Results for Criteria Pollutants 66

5.3.2 Georgetown Air Toxics Monitoring 66

5.4 Localized Carbon Monoxide Concentrations 66

CHAPTER 6 IMPACTS 69

6.1 No Action Alternative 69

6.1.1 Construction 69

6.1.2 Operation 69

6.2 Bridge Alternatives 69

6.2.1 Construction 69

6.2.2 Operation 71

6.3 Secondary and Cumulative Impacts 71

CHAPTER 7 MITIGATION 73

7.1 Construction 73

7.2 Operation 74

CHAPTER 8 CONFORMITY DETERMINATION 75

CHAPTER 9 REFERENCES 77

APPENDIX A AIR QUALITY DATA FILES

List of Tables

Table 1 Summary of Air Quality Impacts and Mitigation 6
Table 2 Cost Estimates of the Project Alternatives 48
Table 3 Summary of Ambient Air Quality Standards....52
Table 4 Destination 2030 Regional Air Pollutant Emission Projections (metric tons per day) 65
Table 5 Maximum One-Hour Average CO Concentrations 67
Table 6 Maximum Eight-Hour Average CO Concentrations 68

List of Figures

Figure 1 Project Area and Vicinity 10
Figure 2 Existing South Park Bridge....13
Figure 3 Existing and Proposed Bridge Cross-Section Designs 22
Figure 4 Existing Conditions Street Network 25
Figure 5 No Action Alternative Street Network 25
Figure 6 Rehabilitation Alternative....28
Figure 7 Rehabilitation Alternative Street Network 32
Figure 8 Bascule Bridge Alternative Street Network....32
Figure 9 Bascule Bridge Alternative....33
Figure 10 Mid-Level Fixed-Span Bridge Alternative....37
Figure 11 Mid-Level Fixed-Span Bridge Alternative Street Network....39
Figure 12 High-Level Fixed-Span Bridge Alternative Street Network 39
Figure 13 High-Level Fixed-Span Bridge Alternative....41
Figure 14 Proposed Construction Staging Areas 45
Figure 15 Air Modeling Intersections....60
Figure 16 Typical Link and Receptor Geometry 61
Figure 17 Central Puget Sound Region Carbon Monoxide Trends 65

This page intentionally blank

Chapter 1 Executive Summary

The purpose of the South Park Bridge Project is to find the most feasible long-term solution to address the deteriorated condition and increasing seismic vulnerability of the South Park Bridge, while maintaining a vital transportation linkage for cars, trucks, buses, bicyclists, and pedestrians across the Duwamish River.

A total of five alternatives were selected for evaluation in the environmental review process: the No Action Alternative, the Rehabilitation Alternative, the Bascule Bridge Alternative, the Mid-Level Fixed-Span Bridge Alternative, and the High-Level Fixed-Span Bridge Alternative. These alternatives were selected from an initial group of nine preliminary project alternatives that also included a low-level fixed-span bridge alternative, a vertical-lift bridge alternative, a swing bridge alternative, and a tunnel alternative.[1] The alternatives proposed for evaluation in the environmental review process were selected because they had fewer potential environmental impacts than the other preliminary alternatives. The following sections describe each of the proposed project alternatives, conformity determination, methodology, impacts, and mitigation.

1.1 Project Alternatives

1.1.1 No Action Alternative

The No Action Alternative assumes that the poor condition of the existing bridge structure would require it to be closed at some time in the future. Deterioration due to use could allow the bridge to continue to operate for perhaps an additional 10 to 20 years. As such, for purposes of environmental review, it is assumed the existing bridge will be operational after 2009.

However, another earthquake could cause an unexpected emergency closure of the bridge at any time. The bridge's current condition could prevent operation of the bascule leaves. Or, the cost of maintaining the bridge could become more than local governments are willing to expend. Under any of these circumstances, the bridge would be closed.

At that time, no vehicular, bicycle, or pedestrian traffic would be allowed to use the bridge and all existing structural elements (e.g., moveable spans, abutments, piers, and mechanical elements) would be demolished and removed in order to prevent the bridge from collapsing into the river. In addition, the United States Coast Guard requires removal of non-functional structures within the navigation channel. As such, the Duwamish River and the navigational channel would be free of obstructions. Under this alternative, there would be no change in the local street network except for removal of the bridge.

---

[1] Parsons Brinckerhoff, Inc., *Summary Technical Memo: Alternatives Development and Screening*, September 6, 2002.

1.1.2 Rehabilitation Alternative

For the Rehabilitation Alternative, much of the existing bridge structure would be replaced, the steel trusses and bascule leaves would be refurbished or replaced, and the equipment used to operate the bridge would be refurbished and/or replaced. Because studies have confirmed the existing bridge support piers are shifting in the river bottom, the main focus of the construction work would be to rehabilitate the piers. Through various structural engineering analyses, it has been determined that the existing bascule piers must be replaced in order to ensure the long-term integrity of the bridge.

For the Rehabilitation Alternative, the new piers are proposed to be the same size and in the same location as the existing piers. These new bascule piers would extend into the riverbed to a depth exceeding the depth of the current timber pilings. The approach-span piers would be replaced. In addition, the bridge abutments would be reconstructed and the bridge deck would be reconstructed. Much of the remainder of the bridge would not require significant rehabilitation work. Any required construction activities would preserve the historic character of the existing bridge to the greatest extent possible.

To meet current road design standards, however, the road pavement would be restriped to accommodate the three standard 11- or 12-foot lanes. Bicycle and pedestrian traffic would continue to be able to use the bridge.

Following construction, the existing 118-foot navigable channel width would be preserved so tugs and barges currently using the navigation channel would be able to continue to use the waterway. There would be no change in the local street network and access to points north via the South Park Bridge would be maintained.

1.1.3 Bascule Bridge Alternative

The Bascule Bridge Alternative would result in the construction of a new movable bridge immediately downstream of the existing bridge. The bridge mechanism could be a Scherzer rolling lift type (no longer a common design for new movable bridges) or another type. The bridge length would be approximately 935 feet from abutment to abutment, not including roadway approaches. Road improvements would extend from a point just north of S. Cloverdale Street on the south side of the river north to a point opposite the northeast corner of Boeing Building 2-15. Unlike the existing bridge, the bridge deck of the bascule leaves would be solid to improve bridge safety.

Similar to the existing bascule bridge, this bridge profile would be approximately 34 feet above the Duwamish River. The mid-section span would be comprised of two movable leaves that could be raised to open the bridge. Opening and closing the bridge would take approximately four to six minutes each, exclusive of the time needed to let boats or barges pass the bridge. The navigation channel would be approximately 125 feet in width (slightly greater than the existing waterway channel). This two-leaf bascule bridge would not impose limitations to the height of river traffic passing the bridge.

For this alternative, there would be only a slight change in the local street network following construction. S. Thistle Street would be modified to continue to clear traffic to travel under the bridge. Access to points north via the South Park Bridge would be maintained.

1.1.4 Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge Alternative would result in the construction of a non-movable bridge. The bridge length would be approximately 1,660 feet abutment-to-abutment, not including roadway approaches. Road improvements would extend slightly north of S. Donovan Street and north to a point approximately 320 feet south of East Marginal Way S.

The mid-point of the bridge profile would be approximately 65 feet above Mean High Water (MHW) of the Duwamish River. The horizontal clearance would be approximately 125 feet, or slightly greater than the existing clearance. The vertical clearance, however, would restrict use of some river traffic, including some tugs and barges. Most vessels that currently pass the existing bridge would continue to be able to use the navigation channel.

Following construction, there would be changes in the local street network. The location of the abutment would require closure of S. Orr Street, and S. Sullivan Street would intersect Dallas Avenue S. instead of 14th Avenue S. Neither S. Sullivan Street or Dallas Avenue S. would allow direct access to the new South Park Bridge. A retaining wall supporting the bridge deck would be constructed immediately adjacent to properties fronting on the west side of 14th Avenue S. for the majority of the distance between S. Sullivan Street and S. Cloverdale Street. Traffic would be able to access the bridge at S. Cloverdale Street, which would be raised slightly at the intersection to meet the descending grade of the bridge.

1.1.5 High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative is a non-movable bridge. The bridge length would be approximately 2,332 feet abutment-to-abutment, not including roadway approaches. Road improvements would extend from S. Trenton Street and continue north to East Marginal Way S. This alternative would require minor modification of the 16th Avenue S./East Marginal Way S. intersection and of the existing railroad track crossing immediately south of this intersection.

The bridge design would allow for a 100-foot minimum vertical clearance above the MHW of the Duwamish River. The horizontal clearance would be approximately 125 feet, which is slightly greater than the existing 118-foot clearance (fender-to-fender). The bridge's vertical clearance would not be expected to limit the height of boats and barges currently passing the bridge. However, vessels larger than those currently using the navigation channel may not be able to pass the bridge in the future.

Following construction, there would be numerous changes in the local street network. The location of the bridge abutment would require Dallas Avenue S., S. Sullivan Street, and S. Cloverdale Street to be converted to underpasses under the new South Park Bridge. A retaining wall supporting the bridge deck would be constructed immediately adjacent to properties fronting on the west side of 14th Avenue S. for the majority of the two-block distance between S. Cloverdale Street and S. Trenton Street. S. Donovan Street would be closed at 14th Avenue S. due to the obstruction of the bridge abutment. A vehicle turn-

around would be constructed on either side of the abutment. To allow local traffic to access the new South Park Bridge, a new road would need to be constructed between S. Trenton Street and 12th Avenue S. and road improvements would be required on 12th Avenue S. north to S. Cloverdale Street. This new route would allow local traffic, trucks, and buses to continue to use the new South Park Bridge and continue west on S. Cloverdale Street.

1.2 Conformity Determination

The Federal Highways Administration (FHWA) and Washington Department of Transportation (WSDOT) projects must comply with the project-level conformity criteria of the Environmental Protection Agency (EPA) Conformity Rule and with Washington Administrative Code (WAC) Chapter 173-420. Regionally significant projects must be included in a conforming Metropolitan Transportation Plan (MTP) and Transportation Improvement Plan (TIP) by the regional Metropolitan Planning Organization (MPO).

The South Park Bridge project does not need to be included operationally in the MTP and TIP because it maintains or replaces an existing regionally significant connection without substantially changing the capacity of the facility. Should the bridge removal alternative be selected (No Action Alternative), the MTP would require revision to reflect removal of the regionally significant link. As stated in 40 Code of Federal Regulation (CFR) Part 93, specific criteria must be met when determining project conformity. A summary of the project's conformity to the State Implementation Plan (SIP) is discussed in Chapter 8. If the project does not make timely progress, as defined in Chapter 8, the conformity determination would require updating to the latest planning assumptions prior to construction.

1.3 Methodology and Rationale

The methodology for air quality analysis of the South Park Bridge project follows the U.S. EPA *Guideline for Modeling Carbon Monoxide (CO) From Roadway Intersections* (U.S. EPA, 1990) and the *Puget Sound Regional Council Guidebook for Conformity and Air Quality Analysis Assistance for Nonattainment Areas* (PSRC, 1995).

Predictions of existing and future localized air pollution concentrations in the project vicinity for this and most other roadway air quality studies are made for CO only. Most other pollutants must be monitored and dealt with regionally. This is done for four reasons:

- Total CO emissions in the atmosphere from automobiles are greater than the emissions of all other pollutants combined. For example, in 2015 an average automobile traveling at 35 mph is expected to emit approximately 13.6 grams of CO per mile of travel, but only 1.5 and 2.2 grams of hydrocarbons (HC) and oxides of nitrogen (NO_x), respectively (Mobile 5a results).
- Motor vehicles are the greatest source of CO emissions, accounting for more than 90 percent of total CO emissions in urban areas; therefore, it is generally not necessary to account for other, often unquantified, sources of CO near the project area (U.S. EPA, 1993).

- The complex reactive natures of some of the other pollutants are such that accurate predictions of local ambient concentrations cannot be made using current modeling procedures (Wayne, 1991).
- CO emissions from motor vehicles may be high enough to affect the health of individuals in the immediate area, while concentrations of most other pollutants would not be high enough to have this effect (Erlich, 1977).

For the South Park Bridge Project, average carbon monoxide peak-hour concentrations (in parts per million: ppm) were calculated using the PM peak hour traffic volumes presented in the South Park Transportation Technical Report (Parsons Brinckerhoff, 2004) using Mobile 5b emission factors and CAL3QHC software. Two air quality models were developed for the South Park project corridor. The first model included the 16th Avenue S. and East Marginal Way S. intersection. The second model covered the 14th Avenue S. and S. Cloverdale Street intersection and the 14th Avenue S. and S. Trenton Street intersection. The two models were created because the distance between East Marginal Way S. and S. Cloverdale and S. Trenton streets is great enough so that compounded emissions from the intersections at S. Cloverdale and S. Trenton streets would have minimal effect on and would be minimally affected by East Marginal Way S. The traffic data used for each model considered the effects of the upstream and/or downstream intersections that may not have been included in the air model.

Localized CO concentrations were modeled using 2000, 2007, and 2027 Puget Sound Regional Council (PSRC) emissions factors and standardized U.S. EPA modeling procedures. Air quality impacts were not analyzed for 2030 because the air analysis for this project was completed prior to the summer of 2003, when the PSRC extended the horizon year to 2030. Predicted worst-case one-hour and eight-hour average CO concentrations were evaluated for the project. The operational impacts of other pollutants would be less than concentrations for CO. Predicted 2027 CO emission levels were substantially lower than CO emission standards. Based on existing information, no violation of the CO emission standards are anticipated in 2030. For all alternatives, , the one-hour and eight-hour average CO concentrations would be below the National Ambient Air Quality Standards. Based on existing information, no violation of the CO emission standards are anticipated in 2030.

1.4 Impacts and Mitigation

As described above, air quality impacts were modeled for both the construction and operation phases of the project alternatives. Air quality impacts and mitigation measures for this project are summarized in Table 1.

Consideration of construction impacts evaluated changes in concentrations of particulate matter (PM), NO_x, and CO. Construction activities would result in temporary pollutant emissions, including dust and odors. To reduce dust emissions, Best Management Practices (BMPs) accepted by the Associated General Contractors of Washington for dust abatement would be used during construction.

Table 1. Summary of Air Quality Impacts and Mitigation

Alternative	Construction Impacts	Operation Impacts	Mitigation Measures
No Action	Demolition activities of the existing bridge would result in temporary emissions of pollutants (estimated approximately 8 months)	Worst-case 8-hour CO concentrations would range between 3.2 and 3.6 ppm in 2007 and 2.6 and 2.9 ppm in 2027	Use of BMPs during demolition would control particulate emissions.
Rehabilitation	Construction activities (estimated approximately 32 months) would result in temporary emissions of pollutants	Worst-case 8-hour CO concentrations would range between 3.2 and 4.8 ppm in 2007 and 2.8 and 3.7 ppm in 2027	Use of BMPs during construction would control particulate emissions. No mitigation would be required during operation.
Bascule Bridge	Construction activities (estimated approximately 33 months) would result in temporary emissions of pollutants	Worst-case 8-hour CO concentrations would range between 3.2 and 4.8 ppm in 2007 and 2.8 and 3.7 ppm in 2027	Use of BMPs during construction would control particulate emissions. No mitigation would be required during operation.
Mid-Level Fixed-Span Bridge	Construction activities (estimated approximately 20 months) would result in temporary emissions of pollutants	Worst-case 8-hour CO concentrations would range between 3.2 and 4.8 ppm in 2007 and 2.8 and 3.7 ppm in 2027	Use of BMPs during construction would control particulate emissions. No mitigation would be required during operation.
High-Level Fixed-Span Bridge	Construction activities (estimated approximately 24 months) would result in temporary emissions of pollutants	Worst-case 8-hour CO concentrations would range between 4.2 and 5.1 ppm in 2007 and 3.2 and 3.6 ppm in 2027	Use of BMPs during construction would control particulate emissions. No mitigation would be required during operation.

Particulate emissions (in the form of fugitive dust during construction activities) are regulated by the Puget Sound Clean Air Agency (PSCAA). BMPs direct operators of fugitive dust sources to take reasonable precautions to prevent dust from becoming airborne and to maintain and operate the source to minimize emissions. Construction impacts could be reduced by incorporating the mitigation measures outlined in the Associated General Contractor of Washington Guidelines into the project's construction specifications. Possible mitigation measures to control PM_{10} (10 parts per million), deposition of particulate matter, and emissions of CO and NO_x during construction of each alternative are listed below:

- Spray exposed soil with water or other dust palliatives to reduce emissions of PM_{10} and deposition of particulate matter.
- Cover all materials transported by trucks, wet materials transported in trucks, or provide adequate freeboard (space between the top of the material and the top of the truck) to prevent the release of dust. This would reduce PM_{10} and deposition of particulates during transportation.

- Provide wheel washers to remove particulate matter that would otherwise be carried off-site. This would decrease deposition of particulate matter on area roadways,
- Remove particulate matter deposited on paved, public roads to reduce mud on area roadways.
- Route and schedule construction trucks to reduce traffic delays during peak travel times. This would reduce secondary air quality impacts caused by a reduction in traffic speeds while waiting for construction trucks.
- Place quarry spall aprons where trucks enter public roads to reduce mud track-out.
- Gravel or pave haul roads to reduce the generation of particulate emissions.
- Require appropriate emission-control devices on all construction equipment powered by gasoline or diesel fuel to reduce CO and NO_x emissions in vehicular exhaust. Use relatively new, well-maintained equipment to reduce CO and NO_x emissions.
- Plant vegetative cover as soon as possible after grading to reduce windblown particulates in the area.
- Route construction trucks away from residential areas to minimize dust.
- Use specific retrofit technology for emission reduction on diesel construction equipment; also use Ultra Low Sulfur Diesel fuel to the greatest extent possible.

This page intentionally blank

Chapter 2 Introduction

Chapter 2 is an introduction to the technical analysis contained in this discipline report. This chapter describes existing conditions, the history of the project, the purpose and need for the project, and the five project alternatives being considered for environmental review. In addition, this chapter summarizes project coordination conducted to date with agencies, local governments, the community advisory group, and members of the public.

2.1 Description of Existing Conditions

This first section describes existing conditions pertinent to the proposed South Park Bridge Project. The project area is defined. The existing bridge and its current condition are described. The local roadway network in the South Park community is described. Non-vehicular transportation in the community is also summarized.

2.1.1 The Project Area

The South Park community is about four miles south of downtown Seattle (see Figure 1). The community lies south of the Duwamish Waterway, the man-made channel portion of the Duwamish River as it enters Elliott Bay. Though originally incorporated as its own city in 1905, much of the area was annexed by the City of Seattle in 1907.[2] The project area lies south of the industrial Georgetown area of Seattle and the King County International Airport (known as Boeing Field). It encompasses the roadway corridor defined by 16th Avenue S. between East Marginal Way S. and the South Park Bridge and 14th Avenue S. between the bridge and S. Trenton Street. Residents and business owners in the project area generally identify with the City of Seattle.

The project area, however, is governed by three local government jurisdictions. The area north of the Duwamish Waterway (between East Marginal Way S. and the waterway) lies within the city limits of both the City of Seattle (northern portion) and the City of Tukwila (southern portion). The area south of the Duwamish Waterway (between the waterway and S. Trenton Street) lies within unincorporated King County and the City of Seattle. The two-block area between the riverbank and Dallas Avenue S. is in King County, and the city blocks to the south are in the City of Seattle.

Land uses in the project area are mixed residential, retail commercial, and industrial. The Boeing Company's Plant 2 dominates the north side of the Duwamish Waterway. On the south side, retail commercial and light industrial land uses front on 14th Avenue S. and along the south bank upstream of the South Park Bridge. Single-family residences, however, generally characterize the area off of this main transportation artery.

[2] City of Seattle, *South Park Residential Urban Village Plan*, 1998.

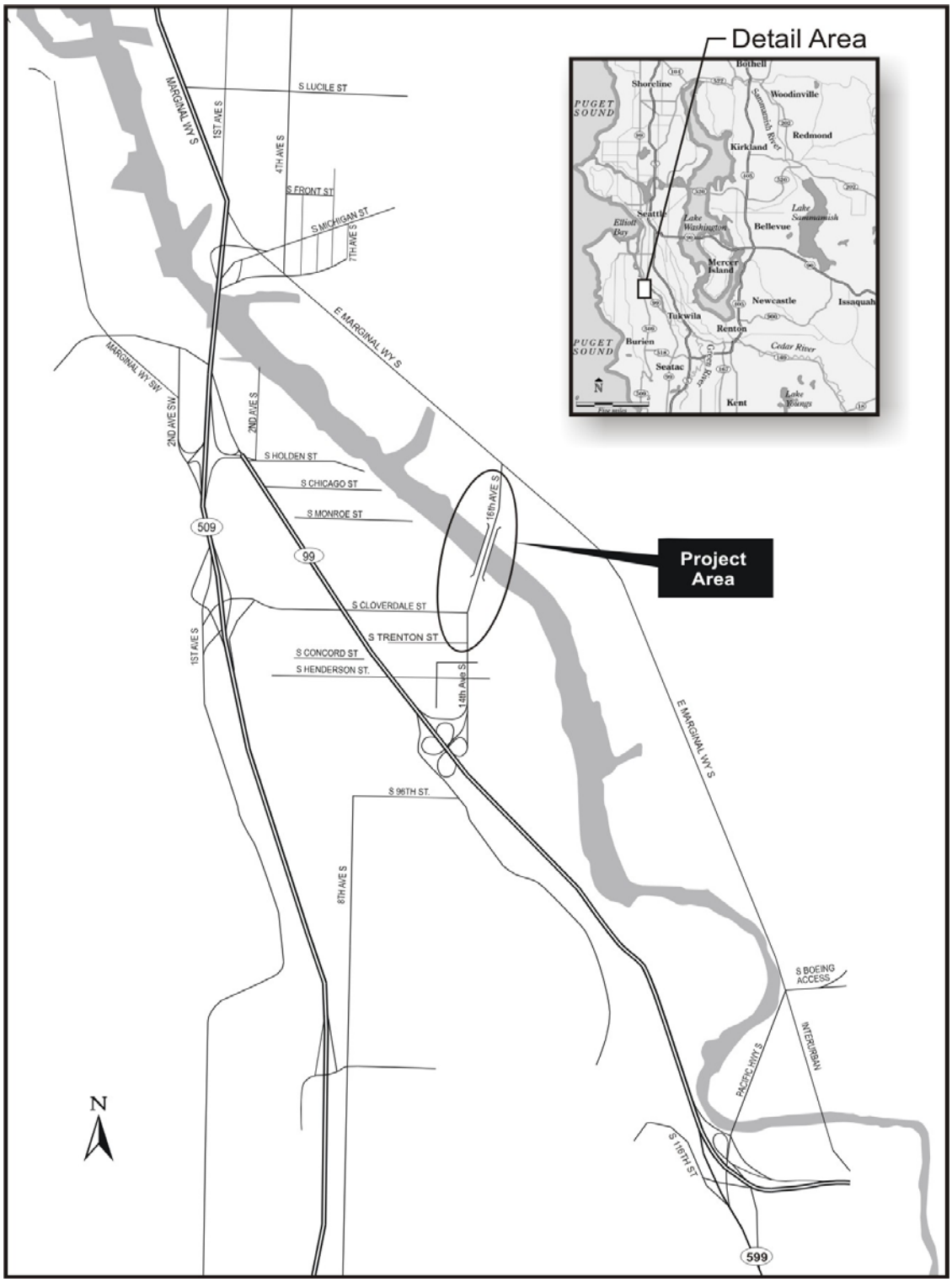


Figure 1
Project Area and Vicinity

2.1.2 The Existing South Park Bridge

The South Park Bridge was constructed in 1929-1931 (see Figure 2). The existing structure consists of a Scherzer rolling-lift double-leaf bascule movable span. Because it is the only operational example of a Scherzer rolling-lift bascule bridge in Washington, the bridge is listed on the National Historic Register.[3]

Each side is flanked by two truss approach spans and twelve concrete slab approach spans. The overall length of the bridge is approximately 1,045 feet abutment-to-abutment and approximately 1,340 feet in entirety to the grade match points. The double-leaf bascule movable span has a center-to-center distance between the front bearing points of approximately 190 feet. The roadway consists of four 9.5-foot lanes. The pavement is 38 feet with 6-foot sidewalks on both sides. Reinforced concrete piers founded on timber piling support the bascule span. Two large in-water piers support the counterweights, track supports, and racks for the rolling lift. The attached towers house the operating machinery, electrical equipment, and operator control room.

The South Park Bridge spans the Duwamish Waterway, which is used for industrial, commercial, and recreational purposes. The bridge is near the upstream limit of heavy industrial uses along the Duwamish Waterway, but it is within the section of the navigation channel maintained by the U.S. Army Corps of Engineers. The existing maximum vertical clearance of the bridge when closed is approximately 34 feet at Mean High Water (MHW). Bridge openings occur approximately three times per day on average to accommodate waterway traffic, although on some days the bridge does not open at all. The existing navigable horizontal clearances is approximately 118 feet at the water level (fender-to-fender), but narrows to 92 feet approximately 114 feet above the water between the open bascule leaves. The depth of the navigation channel is approximately 15 feet at Mean Lower Low-Water (MLLW).

2.1.3 Bridge Condition

In spite of substantial on-going maintenance and repairs, the South Park Bridge has suffered considerable deterioration over the past 70 years. In particular, the bascule piers are cracked and unstable resulting in the misalignment of the movable spans. Consequently, the center lock and glide tracks require on-going modifications and adjustments to allow the bridge to operate properly. Long-term, the stability of the entire bridge is at risk due to the original shallow placement of the supporting piles, which has resulted in movement of the bridge piers over the decades. The condition of the bridge worsened significantly following the Nisqually Earthquake in February 2001, and it remains vulnerable to future seismic events. A 2002 bridge inspection conducted by King County resulted in an existing condition rating of 6.0 out of a possible score of 100 (based on Federal Highway Administration criteria).[4] This was among the lowest ratings given any bridge structure in the State of Washington in 2002.

---

[3] King County Landmarks and Heritage Commission. *Findings and Fact Decision – 14th Avenue South Bridge*, decision made December 19, 1996 and filed January 2, 1997.

[4] King County, *Bridge Inspection Report*, August 1, 2002.

This page intentionally blank

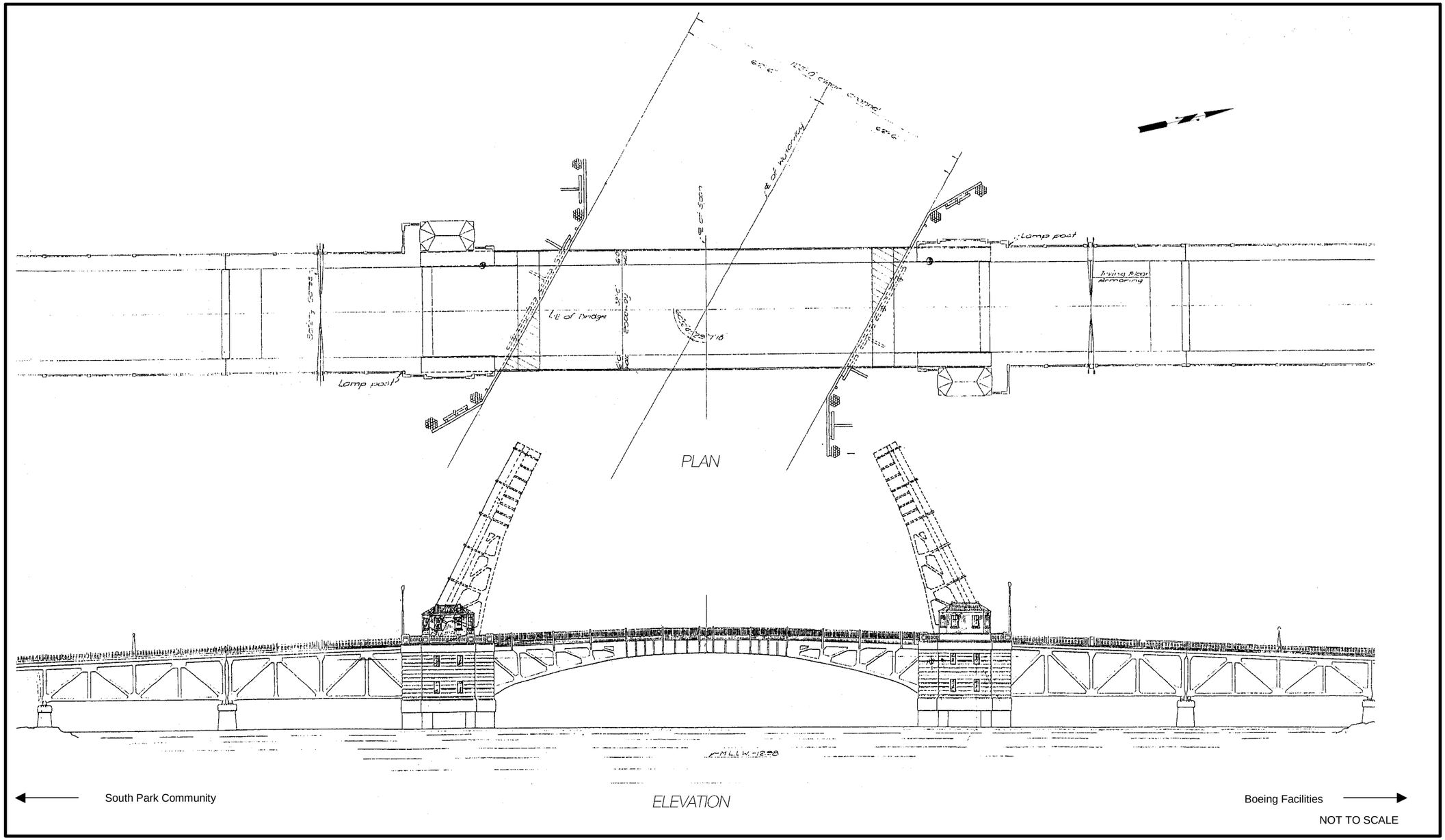


Figure 2
Existing South Park Bridge

This page intentionally blank

2.1.4 Roadway Network

The bridge presently accommodates an average daily traffic volume of approximately 20,000 vehicles per day, based on 2001 City of Seattle traffic counts. Many of the vehicle trips originate in residential neighborhoods in the communities of West Seattle, White Center, and SeaTac. For South Park community residents, the bridge is the primary direct means of access to the north, downtown Seattle, and I-5.

The existing roadway network surrounding the South Park Bridge consists of a variety of roadway types. They range from local two-lane streets to major limited-access highways. Regional traffic movement in the South Park area is concentrated to three nearby north-south corridors including SR-99, SR-509, and East Marginal Way S. Local circulation is provided through a system of local and collector streets. Features such as the Duwamish Waterway and large-scale facilities such as Boeing Field and the Boeing Plant 2 create barriers within the road network and limit opportunities for access to and from the major regional routes.

2.1.5 Freight, Transit, and Pedestrians

Freight movement in peripheral areas of the South Park community is significant due to the high concentration of industrial and manufacturing uses in the general area. Major truck traffic is primarily directed along East Marginal Way S. and SR-99. The South Park Bridge and S. Cloverdale Street are also designated truck routes for oversized vehicles. Trucks use S. Cloverdale Street to access the City of Seattle South Recycling and Disposal Station located at 8105 Fifth Avenue S. as well as SR-509 and SR-99 located on the western edge of the South Park community. With respect to rail movements, the only train crossing in the study area exists immediately south of the intersection of East Marginal Way S. and 16th Avenue S.

Bus routes serving the South Park community are primarily located along major north-south corridors, including East Marginal Way S., 14th and 16th Avenues S., and S. Cloverdale Street. Six major King County Metro bus routes serve the area. Routes 60 and 130 cross the South Park Bridge and four of the six bus routes travel along S. Cloverdale Street.

Pedestrians and bicyclists are commonly seen in the South Park area, especially near the community's center near the intersection of 14th Avenue S. and S. Cloverdale Street. Mid-day pedestrian volumes are higher than the morning or evening commute periods due to shopping, transit use, and lunch-related walking trips.

2.2 History of Project

Since 1931, the moveable bridge has crossed the Duwamish Waterway in the South Park community of the City of Seattle. The following sections contain an overview of the studies preceding the start of the current environmental review effort, a summary of two key documents that framed the initial development of project alternatives, and ongoing reports documenting the changing condition of the bridge.

2.2.1 Overview of Studies

In recent history, over 20 engineering studies have been prepared on the South Park Bridge. Starting in 1987, when the bridge was 56-years-old, King County contracted for the preparation of a general engineering investigation report to assess the condition of the bridge. In 1991 and 1993, additional studies were completed including a geotechnical study, foundation design report, and a life-cycle cost analysis. This information led King County to undertake a series of studies in 1994 addressing liquefaction risks as well as the condition of the concrete, substructures, approach span joints and loading rating. In addition, a study was conducted to evaluate potential replacement alternatives for the bridge and another study investigated community issues related to the bridge. Since 1994, King County has recognized that the bridge required either rehabilitation or replacement and has continued to investigate the condition and vulnerabilities of the bridge in an effort to evaluate these options.

2.2.2 Summary of Key Engineering Reports

Two key engineering studies were conducted that helped to frame the current pursuit to evaluate potential alternatives to rehabilitate or replace the South Park Bridge. A 1994 Sverdrup study evaluated potential design options and a 1999 Entranco study researched and presented the likely steps required to conduct the necessary environmental review of the project alternatives and to complete necessary permitting. These studies are summarized below.

2.2.2.1 Sverdrup Study

In November 1994, Sverdrup Civil, Inc. completed a report titled *14th/16th Avenue South Park Bridge Rehabilitation/Replacement – Design Report* for the King County Department of Public Works. The objective of that report was to evaluate alternative alignments and bridge types, impacts of the alternatives studied and to present to King County results, findings, conclusions, and recommendations of a preferred replacement bridge for the existing South Park Bridge.

The 1994 design report studied five alternatives: rehabilitation of the existing bridge; two fixed-span bridge replacements (a 100-foot vertical clearance bridge and a 60-foot vertical clearance bridge); a new moveable bridge (double-leaf bascule bridge); and bridge closure (permanent closure and demolition of the existing bridge). Other alternatives that had been evaluated but were not carried forward, according to this report were: locating the replacement bridge immediately east (upstream) of the existing alignment; matching the existing alignment; and locating the northbound and southbound lanes on separate structures. These three alternatives were not considered feasible and thus were not studied further.

The 1994 design report concluded that the 60-foot vertical clearance fixed-span bridge design could be used to replace the existing South Park Bridge, with consideration of mitigation of impacts to some users.

2.2.2.2 Entranco Study

In July 1999, Entranco completed the *16th Avenue S. Bridge Replacement Project: Environmental Review Report* for the King County Department of Transportation. The objective of this report was to present to King County a summary of environmental review and permitting activities that would likely be required for replacing the bridge.

The report identified the proposed project as a replacement of the existing bridge, including improvements to the approach road – 14th Avenue S. to the south and 16th Avenue S. to the north of the Duwamish Waterway. The project limits were identified as East Marginal Way S. on the north and S. Cloverdale Street on the south. The report asserted three build alternatives should be selected for evaluation in the EIS, including alternatives with differing alignments and bridge types. It was further noted that three alternatives would be the least number needed to provide a reasonable range of alternatives under National Environmental Policy Act (NEPA) and Washington State Environmental Policy Act (SEPA) regulations.

Entranco outlined the various tasks that would be required under the WSDOT Environmental Procedures Manual and Federal Highway Administration (FHWA) guidelines. The report identified these tasks to include the following: the development of bridge alternatives, screening, and selection of alternatives for analysis in the EIS; preliminary engineering design, including an update to the1994 rehabilitation/replacement report; survey and mapping work; hydraulic and geotechnical studies, and conceptual-level design documentation. The report concluded that the alternatives proposed, including rehabilitation of the existing bridge, had not been designed in enough detail to make a decision regarding a preferred alternative. Related to the environmental review process, the report recommended the public involvement program include coordination with an Interdisciplinary Team (IDT) of agency representatives and a community advisory committee. The report also listed 17 specific environmental discipline reports that would likely be required for the preparation of the EIS.

The findings and recommendations presented in the Entranco report formed the basis from which King County staff developed the current contracted scope of work for environmental review. The scope includes engineering, environmental review, agency coordination, and public involvement tasks.

2.2.3 Continuing Deterioration

Since 1999, King County has continued to move forward to develop alternatives for rehabilitating or replacing the existing South Park Bridge. Bridge conditions have worsened since the engineering studies were conducted in the mid-1990s. In February 2001, the Puget Sound Nisqually Earthquake caused significant and widespread damage to the bridge. Over $740,000 was required to repair the bridge in order to keep it operational.[5] The King County 2001 bridge inspection report recorded a rating of 8.0 out of a total possible score of 100 (based on FHWA criteria).[6] The following year, this rating decreased to 6.0.[7]

---

[5] Tim Lane, King County Department of Transportation, Telephone Conversation, September 23, 2002.

[6] King County, *Bridge Inspection Report*, August 21, 2001.

2.3 Purpose and Need of Project

As a required element of the EIS, a Purpose and Need Statement was developed for the South Park Bridge Project to clarify the underlying basis for the proposed action. The development of the initial draft Purpose and Need Statement involved review and comment by a number of parties including King County staff and the Project Advisory Committee (PAC) that includes agencies with jurisdiction over the proposed project. The draft Purpose and Need Statement was also revised based on comments received at several public involvement events. In April 2002, King County forwarded the draft Purpose and Need Statement to the Federal Highways Administration (FHWA) for review and approval. The text of the FHWA-approved version of the Propose and Need Statement is presented in the following sub-sections, although minor revisions and footnotes have been included for clarification.

2.3.1 Function and Role of the South Park Bridge

The King County Department of Transportation (KCDOT) is proposing the rehabilitation or replacement of the South Park Bridge located in King County, Washington. Since 1931 the moveable span bridge has carried traffic along the 14th Avenue South and 16th Avenue South corridor across the Duwamish Waterway. On a typical workday, a mix of approximately 20,000 cars, trucks and buses use the bridge to access employment centers in downtown Seattle and the Duwamish industrial area. Many of the vehicle trips originate in residential neighborhoods in the communities of West Seattle, White Center, and SeaTac. For residents of the community of South Park, the bridge is the only immediate means of access to and from destinations east of the community. The moveable structure spans the navigation channel of the Duwamish Waterway. When open, large-size industrial and recreational vessels have access to upriver destinations. The South Park Bridge is also a major route for heavy truck traffic traveling to and from large industrial manufacturers including the Boeing Company.

2.3.2 Purpose of Proposed Project

The purpose of the proposed action is to find the most feasible long-term solution to address the deteriorated condition and increasing seismic vulnerability of the South Park Bridge. The proposed action must also maintain the vital transportation linkage for cars, trucks, buses, bicyclists and pedestrians across the Duwamish Waterway.

2.3.3 Need for the Proposed Project

In spite of substantial ongoing maintenance and repairs, the South Park Bridge has suffered substantial deterioration over the past 70 years. Existing problems with the bridge worsened significantly following the Nisqually Earthquake in February 2001 and the bridge remains vulnerable to future seismic events. A recent 2002 bridge inspection conducted by King County resulted in an existing condition rating of 6.0 out of a possible

---

[7] King County, *Bridge Inspection Report*, August 1, 2002.

score of 100 (based on FHWA criteria).[8] This is among the lowest ratings given any bridge structure in the State of Washington.

The bridge could be closed as a consequence of excessive structural deterioration or failure of the moveable span operations (particularly in the event of another seismic event). Closure of the bridge would have a significant impact on the transportation system and traffic conditions throughout the lower Duwamish industrial area-- including SR-99, SR-509, First Avenue S. and East Marginal Way S. Improvements are required in the near future to protect public safety and to maintain a transportation corridor that is critical to the local and regional economy.

2.3.3.1 Seismic Vulnerability

The February 28, 2001 Nisqually earthquake (magnitude 6.8, located 35 miles from Seattle and deep below the surface) caused significant damage to the South Park Bridge. Since the earthquake, operation of the moveable span has been less reliable, requiring the bridge to be closed for repairs intermittently for several days. The continuing periodic closure of the bridge for repairs has heightened the awareness of the need for rehabilitation or replacement of the existing bridge.

2.3.3.2 Roadway Design Deficiencies

The South Park Bridge does not meet current roadway design standards and has many design deficiencies. For example, the overall bridge width including lane widths, shoulders and sidewalks should be 64 feet according to current design standards. The existing bridge width is currently only 52 feet (measured outside-to-outside).

2.3.3.3 Transportation Issues

An average of 20,000 daily vehicle trips cross the Duwamish Waterway on the South Park Bridge. It is a significant link between the east and west side of the Duwamish, both locally and regionally. The South Park Bridge is also a route for heavy and oversize truck traffic. According to previous studies, closure of the bridge would have a significant noticeable impact on the transportation system and traffic conditions throughout the lower Duwamish industrial area – including the Highway 99 and East Marginal Way S. corridors.

2.3.4 Key Issues

2.3.4.1 Community Impacts

The existing South Park Bridge is a highly valued feature of the South Park community. There is widespread concern in the community that changes to the bridge could have a significant adverse impact on the community and the emerging economic vitality of the South Park business district centered along 14th Avenue South. The South Park Residential Urban Village Plan of 1998 (the neighborhood plan) identified one of its primary objectives as “finding a solution for the South Park Bridge that is sensitive to the needs of the community.”

---

[8] The original text of the FHWA-approved Purpose and Need Statement cited the condition rating of 8.0 from the 2001 King County Bridge Inspection Report. The current cited condition rating of 6.0 is from the King County *Bridge Inspection Report* dated August 1, 2002.

The South Park community is also ethnically diverse. Approximately 30 percent of the populations' primary language is not English. These factors require greater emphasis on the consideration of environmental justice[9] in order to ensure that the potential adverse effects from the proposed project do not have a disproportionate impact on lower-income or minority populations.

2.3.4.2 Aquatic Habitat Protection

The Duwamish Waterway is an important route for juvenile and adult salmon migrating between the upper Green River, Elliott Bay and the Pacific Ocean. However, much of the waterway in the vicinity of the South Park Bridge currently provides poor habitat for chinook salmon (listed as threatened under the Endangered Species Act) and other marine organisms. The armored shoreline along the waterway in the project area provides minimal habitat for young chinook salmon during their critical rearing period. Recovery plans now underway for threatened and endangered salmon will address potential means of enhancing habitat favorable to the survival and growth of young salmon from the Duwamish/Green River system. Restoration of the shoreline in the vicinity of the project would address immediate and long-term needs for habitat improvement along the Duwamish Waterway.[10]

2.3.4.3 Duwamish Waterway Navigation

The Duwamish Waterway is used for industrial, commercial and recreational purposes. The South Park Bridge is near the upstream limit of heavy industrial uses along the waterway, but it is within the section of the waterway maintained by the U.S. Army Corps of Engineers as a navigation channel. A number of local businesses, as well as the U.S. Coast Guard, have emphasized to King County that any engineering solutions for the South Park Bridge must maintain navigational access upstream of the existing bridge.

2.4 Description of Alternatives

This section describes the No Action Alternative, the Rehabilitation Alternative, and the three replacement bridge alternatives (Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridge alternatives). The first section explains the transportation engineering criteria and standards used to design the Rehabilitation Alternative and the three replacement bridge alternatives. The second section describes the horizontal and vertical profile of the bridge alternatives, navigation channel clearances, and impacts to the local road network. The last section describes construction activities associated with each of the five alternatives for the South Park Bridge Project.

---

[9] Environmental justice concerns the need to avoid disproportionate, significant adverse impact on minority and/or low-income communities.

[10] This section highlights the importance of addressing aquatic habitat values in the project area, as well as the implications for species currently listed under the ESA; however, it is not intended as a complete characterization of the factors that need to be considered in this regard.

2.4.1 Design Criteria

Except for the No Action Alternative, construction of any of the project alternatives would incorporate current transportation engineering design criteria for the cross-section, alignment, design speed, maximum grade, and transition segment. The road cross-section design is a key design element that would change for any of the build alternatives (see Figure 3). The existing bridge cross-section incorporates four 9.5-foot travel lanes, raised curbs on both sides of the pavement, and a 6-foot sidewalk on either side of the roadway. The outside-to-outside dimension of the existing bridge is 52 feet. These lane widths are non-standard and would be changed for the Rehabilitation Alternative and for the three replacement bridge alternatives.

For the Rehabilitation Alternative, the pavement would remain approximately the same width as it is currently, but would be reconfigured for three standard lanes. There would be two 12-foot lanes on the outside and one 11-foot lane in the middle of the roadway. Traffic would use one 12-foot lane for northbound travel and the other two lanes for southbound travel. The 6-foot sidewalk on either side of the roadway would be enlarged to approximately 7.5 feet. In contrast, each of the replacement bridge alternatives would be designed with four standard 11-foot lanes, traffic barriers or a painted median down the center, a traffic barrier on each side of the pavement, and a single combined 13-foot pedestrian/bike path on the west (downstream) side of the bridge. The width of the cross-section for the new replacement bridge alternatives including the exterior barriers would total approximately 68 feet (outside-to-outside of the bridge structure).

An initial range of potential bridge alternatives and alignments was considered based on earlier studies,[11] current input from stakeholders, and the project team. During the course of this initial alternatives development process, it was determined that there were no practical alternative alignments for a replacement bridge other than to parallel the existing bridge. It was determined that replacement bridge alternatives should be aligned to the west (downstream) of the existing bridge in order to minimize impacts to existing land uses. Conceptual engineering for the replacement bridge alternatives set the alignment for these bridges at approximately 80 feet to the west of the centerline of the existing bridge (i.e., as close to the existing structure as practicable without compromising constructability). The initial alignment of the new roadway was the same as the existing road alignment on the south side of the waterway. The existing roadway is quite narrow. Matching the centerline of the new bridge alternatives to the existing would require acquisition of both land and buildings on both sides of 14th Avenue S. To minimize these impacts, the alignment of the new transition segment was shifted slightly to the east of the existing road alignment because there are fewer parcels and buildings located on the east side of the road compared to the west. In addition, more of the buildings located on the east side are set back from the existing sidewalk than on the west side. In this way, the proposed alignment for the replacement alternatives has been developed to avoid or minimize potential land use and relocation impacts.

---

[11] Entranco, Inc., *Environmental Review Report: 16th Avenue S. Bridge Replacement*, July 1999.

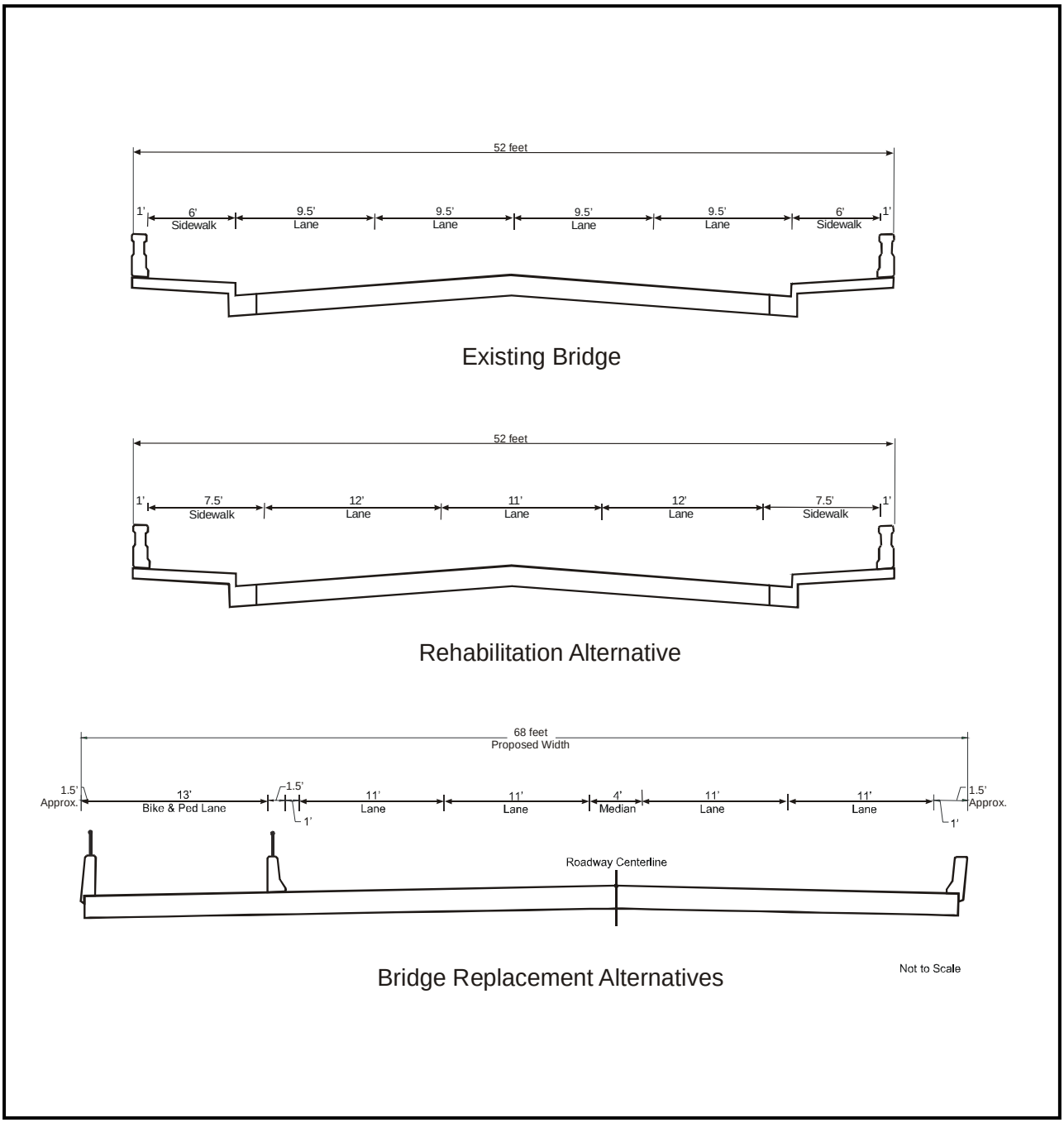


Figure 3
Existing and Proposed
Bridge Cross-Section Designs

Other design factors affecting impacts to adjacent properties include the new bridge's design speed and maximum grade. King County road standards call for a 35 mph design speed and a maximum of 8 percent grade. Initially, these standards were incorporated into each of the alternatives. Implementation of an 8 percent maximum grade for the High-Level Fixed-Span Bridge Alternative, however, would have resulted in a very long bridge (project terminus to terminus). For example, the north terminus would have extended across East Marginal Way S. and into Boeing Field. To reduce impacts to land use, the maximum grade for the High-Level Fixed-Span Bridge Alternative would need to slightly exceed 8 percent. In this manner, the north side of the bridge would terminate south of East Marginal Way S. This grade change reduced the overall length of the bridge on both south and north ends of the bridge by several hundred feet for the High-Level Fixed-Span Alternative.

Community impacts would also be affected depending on the design of the transition segment. This is the segment of the roadway that merges the differing widths of the new roadway and the existing narrow roadway. Typically, transition segments begin at the point the grade of the bridge matches the grade of the existing roadway and extends beyond some distance. The actual rate at which the width of the roadway is reduced is defined by transportation engineering design standards. To minimize impacts to land uses along 14th Avenue S., King County proposes to start the transition segment from the abutment for all alternatives. This means that by the time the bridge matches the grade of the existing roadway, the width of the new bridge is nearly the same width as the existing road. As a result, the total length of the roadway is reduced potentially several hundred feet in length. In addition, the width of the transition segment for the Mid-Level Fixed-Span Alternative is further reduced by having the single combined 13-foot pedestrian/bike path split off from the main bridge structure at approximately S. Orr Street and descended to ground level in a zigzag fashion. This design modification further reduced the overall impact of the Mid-Level Fixed-Span Alternative.

Together, the design criteria discussed in this section would allow for the construction of a replacement bridge that provides increased safety for vehicles, bicyclists, and pedestrians.

2.4.2 The Alternatives

A total of five alternatives were selected for evaluation in the environmental review process including: the No Action Alternative, the Rehabilitation Alternative, the Bascule Bridge Alternative, the Mid-Level Fixed-Span Bridge Alternative, and the High-Level Fixed-Span Bridge Alternative. These alternatives were selected from an initial group of nine preliminary project alternatives.[12] The alternatives proposed for evaluation in the environmental review process were selected because they had fewer potential impacts than the other preliminary alternatives.

[12] Parsons Brinckerhoff. *South Park Bridge Project: Summary Technical Memo - Alternatives Development and Screening*, September 6, 2002.

Based on comparison ratings for seven evaluation criteria (regional mobility, local access, navigation, community impacts, aquatic habitat, construction impacts, and estimated project costs), the following preliminary alternatives were dropped from further consideration: a low-level fixed-span bridge, a movable swing bridge, a vertical lift movable bridge, and a tunnel option. The following sections describe each of the proposed project alternatives to be considered in the environmental review process based on conceptual civil and structural engineering.[13] [14]

2.4.2.1 No Action Alternative

The No Action Alternative assumes that the existing bridge structure's poor condition would require it to be closed at some time in the future. Deterioration due to use could allow the bridge to continue to operate for the foreseeable future, but at some time in the future, the bridge would need to be closed. As such, for purposes of environmental review, it is assumed the existing bridge would be closed permanently sometime before 2027.

However, the bridge could be closed for other reasons than simply deteriorated condition. Another earthquake could cause an unexpected emergency closure of the bridge at any time. The on-going movement of the bridge foundations could eventually cause the moveable spans to become misaligned to the extent that repairs would be infeasible. Or, the cost of maintaining the bridge could become more than King County is willing to expend. Under any of these circumstances, the bridge would be closed.

When closed, no vehicular, bicycle, or pedestrian traffic would be allowed to use the bridge. As a navigable waterway, the U.S. Coast Guard regulates bridges that span waterways such as the Duwamish Waterway. If the bridge were no longer operating, the U.S. Coast Guard regulations would require demolition and removal of the bridge. With no structures remaining, there would be no potential navigation obstructions in the Duwamish Waterway.

Under this alternative, there would be no change in the local street network except 14th and 16th Avenue S. would be dead-ended on both the south and north shores of the Duwamish Waterway. Figure 4 shows the existing local street network and Figure 5 shows the local street network following the removal of the existing bridge in the No Action Alternative. As the road does not currently provide direct access to the adjacent Boeing Company properties, the exact location of the road closure on the north side would need to be negotiated with Boeing as well as the owner of the railroad tracks immediately south of East Marginal Way S. In addition, the site of the removed bridge would be restored.

---

[13] Parsons Brinckerhoff. *South Park Bridge Project: Conceptual Plans*, June 2003.

[14] Parsons Brinckerhoff. *South Park Bridge Project: Structural Alternatives Study*, November 2003.

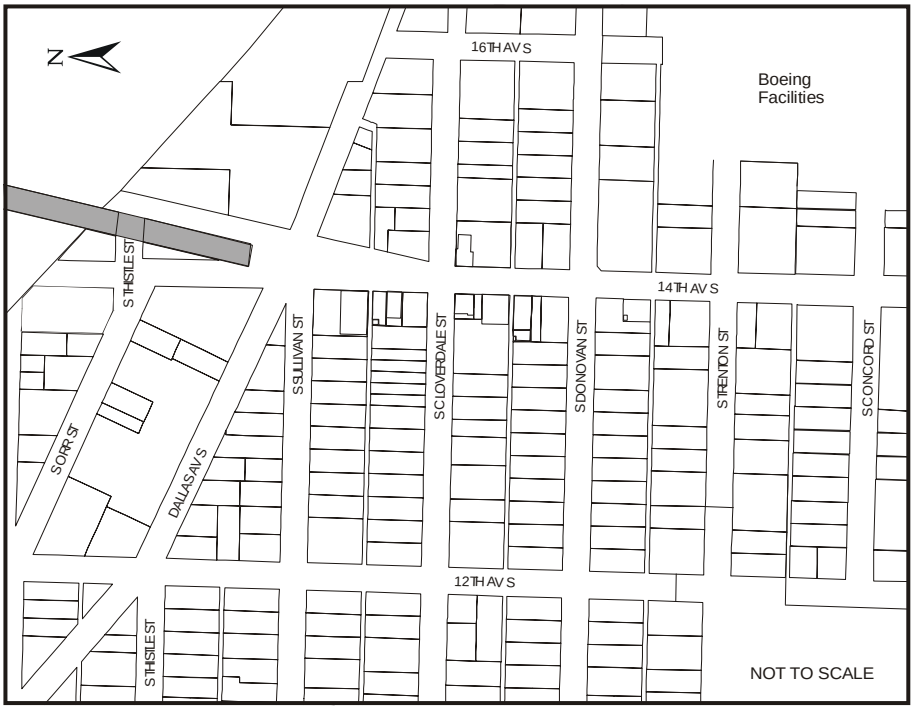


Figure 4
Existing Conditions Street Network

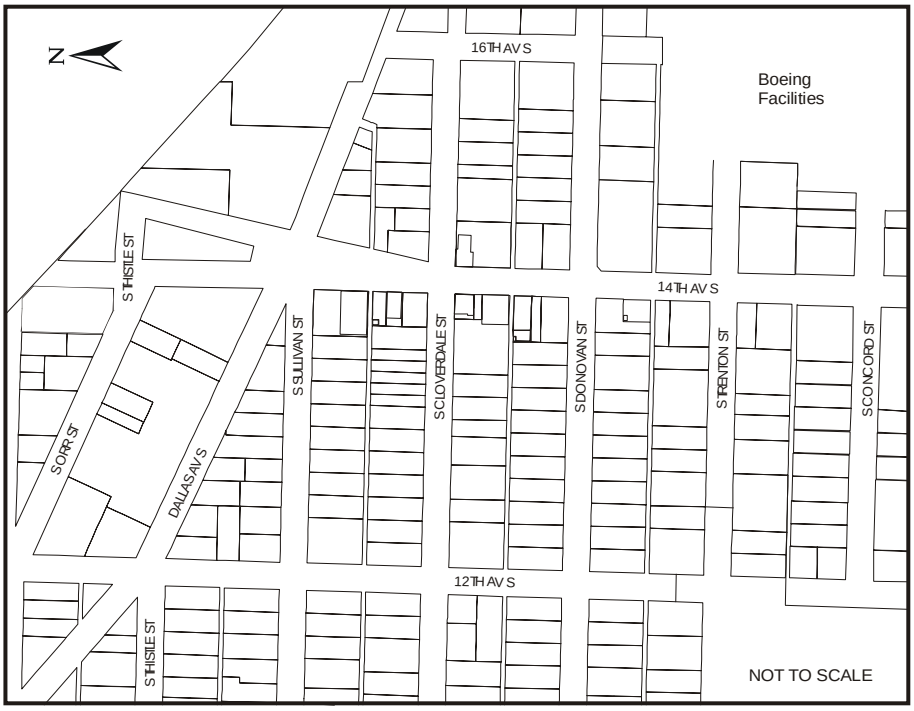


Figure 5
No Action Alternative Street Network

2.4.2.2 Rehabilitation Alternative

For the Rehabilitation Alternative, much of the existing bridge structure would need to be replaced. The existing steel trusses of the approach spans and the bascule leaves would be refurbished and reused. The mechanical and electrical operating systems would be refurbished and/or replaced. Studies have confirmed the existing bridge piers are gradually shifting because the foundation pilings were not originally driven to a sufficient depth. Although the initial goal was to rehabilitate the existing piers, the design team's structural analyses determined that the existing bascule piers and truss approach span piers must be replaced in order to ensure the long-term (approximately 75 years) integrity of the bridge. If the bascule piers were reconstructed, the longevity of the Rehabilitation Alternative would be similar to the expected minimum life of a new bridge structure.

For the Rehabilitation Alternative, the new bascule piers are proposed to be approximately the same size, location, and historic character as the existing piers (see Figure 6). To construct the new bascule piers, the bascule leaves and steel approach spans would need to be removed. The steel truss elements of the bridge structure would be taken to another site for repair, refurbishment, and/or painting before they are re-installed following the construction of the new piers. The concrete shafts or pilings supporting the foundations of the new piers would extend below the existing pilings to a depth beneath the riverbed where stable soils exist. The removal of the steel truss spans would also allow for replacement of the steel approach piers.

The concrete approach spans and bridge abutments would be replaced and the bridge deck would be reconstructed. Like the existing bridge, there would be piers both on land and in the water. The first on-land piers would be only an estimated 20 feet from the top of the south embankment and the closest in-water piers would be approximately 20 feet from the top of the embankment. The piers on the north shoreline would extend through the existing Boeing dock. The conceptual engineering analysis also determined that the mechanical and electrical systems should be replaced. Any required construction activities, including replacement of the bridge railings, bridge tender towers, and lamp posts, would be done in a manner that preserves the historic character of the existing bridge to the greatest extent possible.

To meet current roadway design standards, the new bridge deck would remain approximately the same as the existing, but the pavement would be striped to accommodate three standard traffic lanes. Bicycle and pedestrian traffic would continue to be able to use the bridge via a 7.5-foot pedestrian path on each side of the bridge.

Following construction, the existing 118-foot navigable channel width would be preserved so existing waterway users would be able to continue to use the navigation channel to travel upriver of the South Park Bridge. The extended closure of the bridge during construction, however, would have a significant temporary impact on access to the South Park community.

Following construction, there would be only slight changes in the local street network. Figure 7 shows the local street network in the South Park community following construction activities for the rehabilitation of the existing bridge.

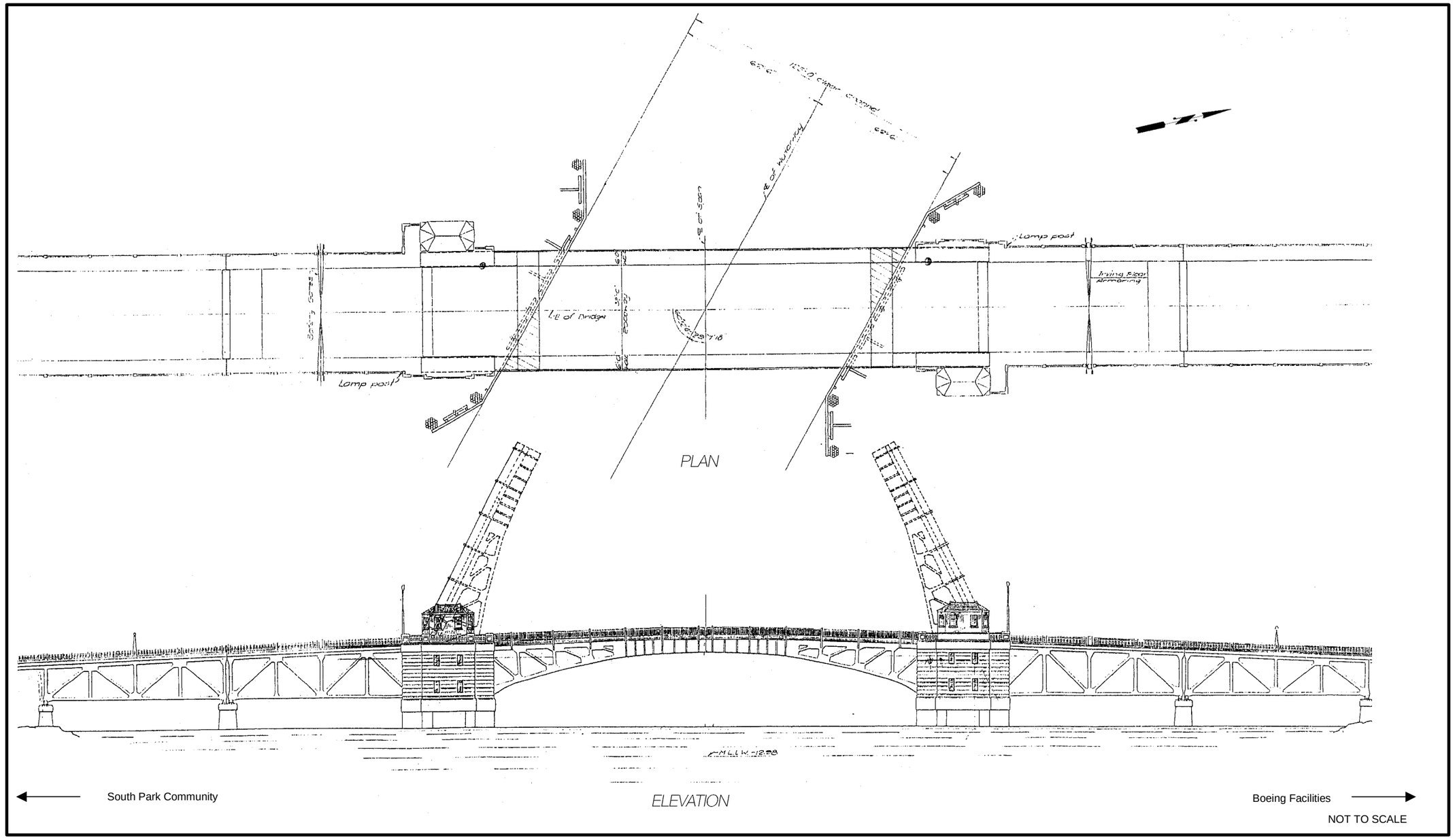


Figure 6
Rehabilitation Alternative

This page intentionally blank

The figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. (For comparison, Figure 8 shows the local street network following the construction of the Bascule Bridge Alternative.) To improve vehicular safety, S. Sullivan Street would intersect Dallas Avenue S., which would become the main cross street intersection with 14th Avenue S. The 16th Avenue S. (immediately east of the bridge) intersection with Dallas Avenue S. as well as 14th Avenue S. may also need to be reconfigured. Access to points north via the South Park Bridge would be maintained.

2.4.2.3 Bascule Bridge Alternative

The Bascule Bridge Alternative would result in the construction of a new movable bridge immediately downriver of the existing bridge (see Figure 9). The bridge mechanism could be a Scherzer rolling lift type (no longer a common design for new movable bridges) or another type. The bridge length would be approximately 935 feet from abutment-to-abutment, not including roadway approaches. Road improvements would extend from a point just north of S. Cloverdale Street on the south side of the waterway and north to a point opposite the northeast corner of Boeing Building 2-15. The interior walls of the bridge abutments would be approximately 200 feet from the top of the embankment, or approximately 50 feet closer to the shore than the existing bridge. With fewer piers than the existing bridge, the first on-land piers of this alternative would be approximately 55 feet from the top of the south embankment at the shortest distance and the closest in-water piers would be approximately 65 feet away.

On the north shoreline, the closest in-water piers would be approximately 95 feet from the top of the embankment and the closest on-land piers would be approximately 30 feet away. Unlike the existing bridge's grated bascule leaves, the bridge deck of the bascule leaves would be solid surface to improve vehicle traction and to control stormwater runoff.

Similar to the existing bascule bridge, this bridge profile would be approximately 34 feet above the Duwamish Waterway when in the closed position. The mid-section span would be comprised of two movable leaves that could be raised to open the bridge. The navigation channel would be approximately 125 feet in width (slightly greater than the existing 118-foot-wide channel). This two-leaf bascule bridge would not impose limitations to the height of waterway users passing the bridge, because the new bridge would be approximately 125 feet between the tips of the raised spans.

Following construction, there would be some change in the local street network (see Figure 8). S. Sullivan Street would be permanently closed or reconfigured to improve traffic safety and vehicular and truck turning movements from the new bascule bridge to Dallas Avenue S. S. Sullivan Street would no longer have direct access to 14th Avenue S. and the bridge. The intersection of 16th Avenue S. (immediately east of the bridge) and Dallas Avenue S. may also need to be reconfigured. To ensure adequate vertical clearance for vehicles, S. Thistle Street would need to be slightly realigned further to the north and closer to the Duwamish Waterway.

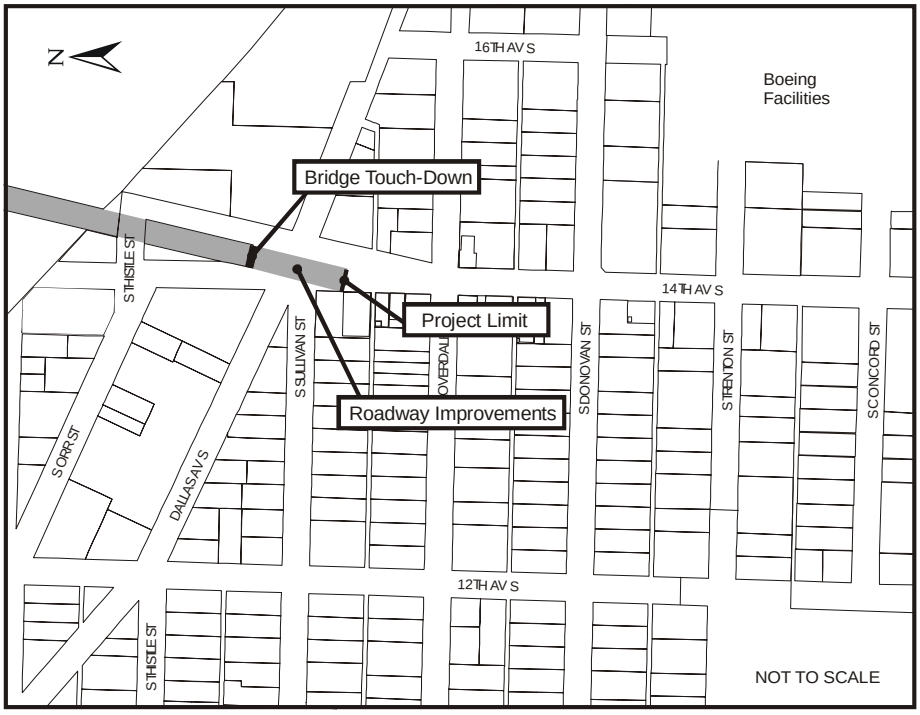


Figure 7
Rehabilitation Alternative Street Network

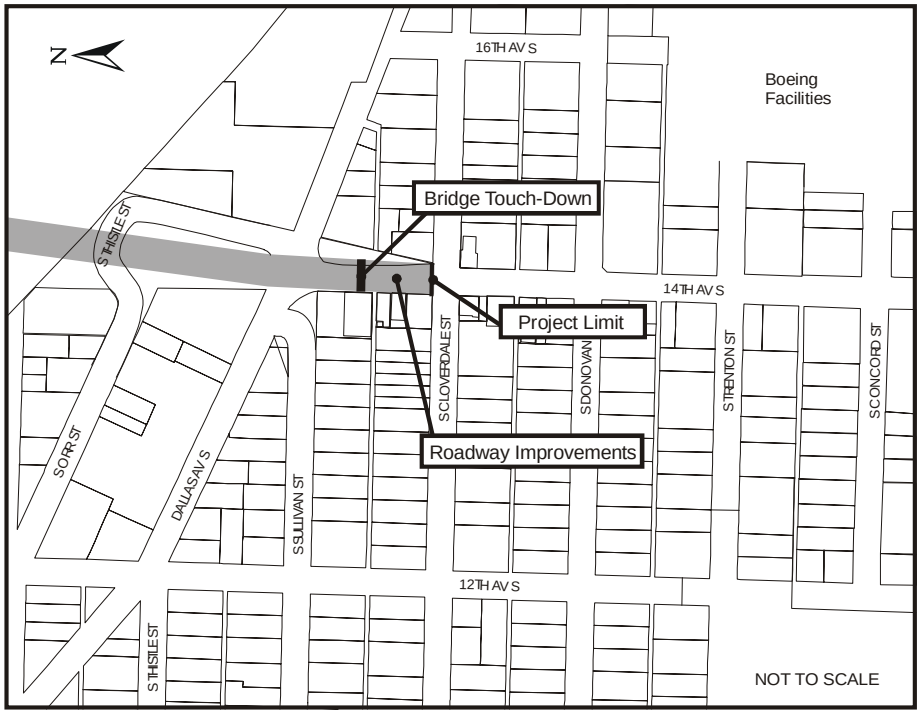


Figure 8
Bascule Bridge Alternative Street Network

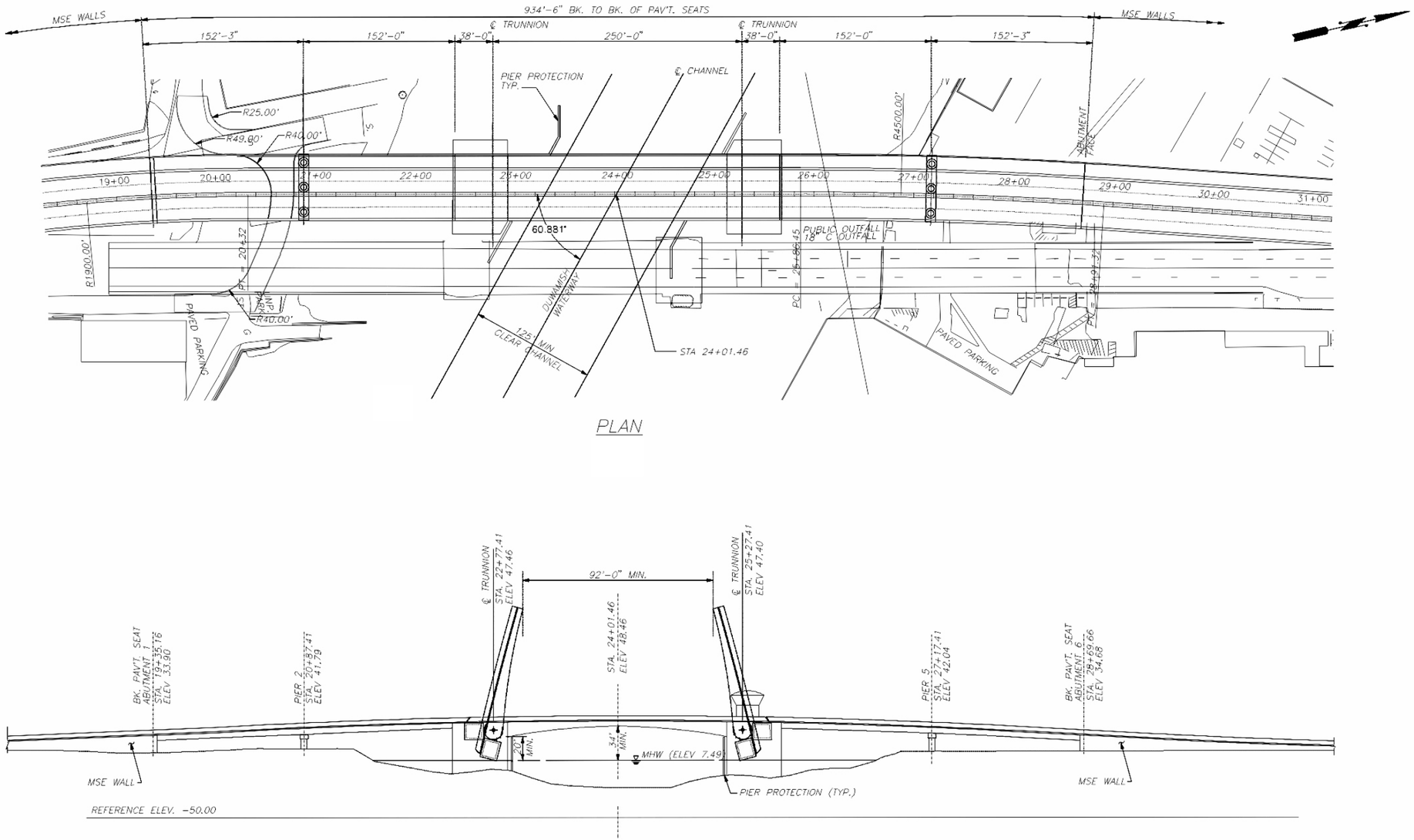


Figure 9
Bascule Bridge Alternative

This page intentionally blank

This figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. Access to points north via the South Park Bridge would be maintained. Following construction and transfer of the traffic to the new bridge, the existing bridge would be demolished and removed as described for the No Action Alternative.

2.4.2.4 Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge Alternative would result in the construction of a non-movable bridge (see Figure 10). The bridge length would be approximately 1,660 feet abutment-to-abutment, not including roadway approaches. The interior walls of the abutments would be approximately 550 feet from the top of the Duwamish Waterway embankment, or 300 feet further setback than the existing bridge. The closest on-land piers would be approximately 85 feet from the south embankment and the closest in-water piers would be approximately 100 feet away. On the north side, the closest in-water piers would be approximately 130 feet from the top of the embankment and the closest on-land piers would be approximately 65 feet away. Road improvements would extend slightly north of S. Donovan Street and north to a point approximately 320 feet south of East Marginal Way S.

The mid-point of the bridge profile across the Duwamish Waterway would be approximately 65 feet above MHW of the Duwamish Waterway. The horizontal clearance would be approximately 125 feet, or slightly greater than the existing clearance. The vertical clearance, however, would restrict use of some waterway traffic, including some tugs and barges. Most vessels that currently pass the existing bridge would continue to be able to use the navigation channel. As described earlier in the discussion of the design considerations, the width of the new mid-level bridge is reduced when the bike-pedestrian path is separated from the elevated approach roadway near the south side abutment. This design feature reduces land use and relocation impacts.

Following construction, there would be changes in the local street network (see Figure 11). (For comparison, Figure 12 shows the local street network following the construction of the High-Level Fixed-Span Bridge Alternative.) The location of the south abutment and its vertical clearance would require modification of Dallas Avenue S. and S. Sullivan Street. S. Sullivan Street would likely be merged into Dallas Avenue S. just west of the new structure and a new roadway would be constructed under the new bridge. The alignment of this roadway would be slightly to the north to ensure it would have a minimum allowable vertical clearance. Neither street would have direct access to the new South Park Bridge. Figure 11 also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. A retaining wall supporting the elevated approach roadway would be constructed immediately adjacent to properties fronting on the both sides of 14th Avenue S. for the majority of the distance between S. Sullivan Street and S. Cloverdale Street. Traffic would be able to access the bridge at S. Cloverdale Street, which would be raised a maximum of approximately 5 feet at the intersection to meet the descending grade of the bridge. This change in the intersection

would allow traffic on S. Cloverdale Street to continue to have direct access to 14th Avenue S. though a retaining wall would also need to be constructed around the four corners of the intersection of S. Cloverdale Street and 14th Avenue S. due to the grade change. S. Orr Street would be closed due to the location of the support structures for the proposed separated pedestrian/bike path, which would allow bicyclists and pedestrians to descend from the bridge level to the street level. In addition, S. Thistle Street would be closed as it would no longer be able to connect to S. Orr Street. Following construction and transfer of the traffic to the new bridge, the existing bridge would be demolished and removed as described for the No Action Alternative.

2.4.2.5 High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative is a non-movable bridge (see Figure 13). The bridge length would be approximately 2,332 feet abutment-to-abutment, not including roadway approaches. The interior walls of the abutments would be approximately 900 feet from the top of the Duwamish Waterway embankment, or 650 feet further set back than the existing bridge. The on-land and in-water piers of this alternative are approximately in the same location as proposed for the Mid-Level Fixed-Span Bridge Alternative. Road improvements would extend from S. Trenton Street and continue north to East Marginal Way S. This alternative would require minor modification of the 16th Avenue S. East Marginal Way S. intersection and of the existing railroad track crossing immediately south of this intersection.

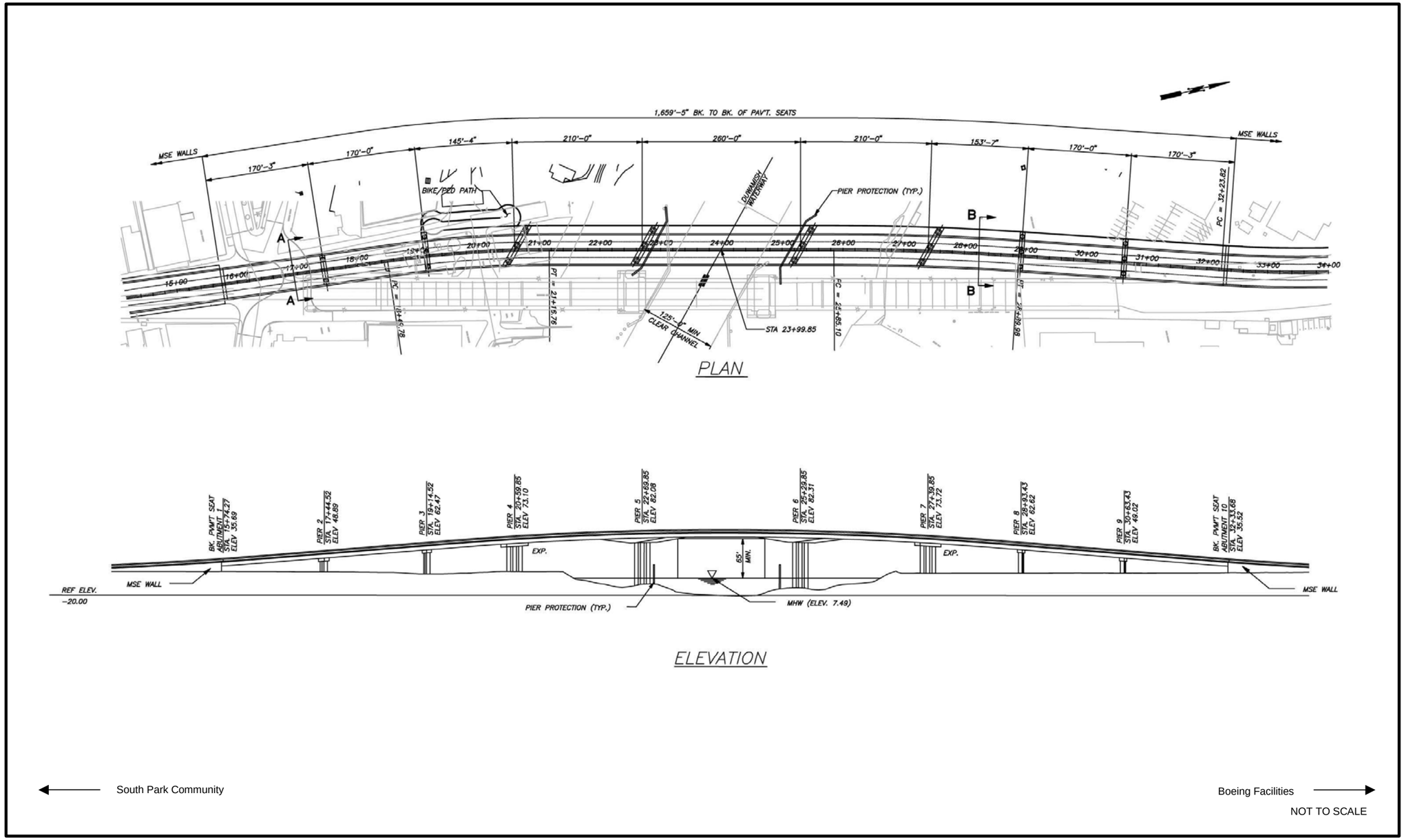


Figure 10
Mid-Level Fixed-Span
Bridge Alternative

This page intentionally blank

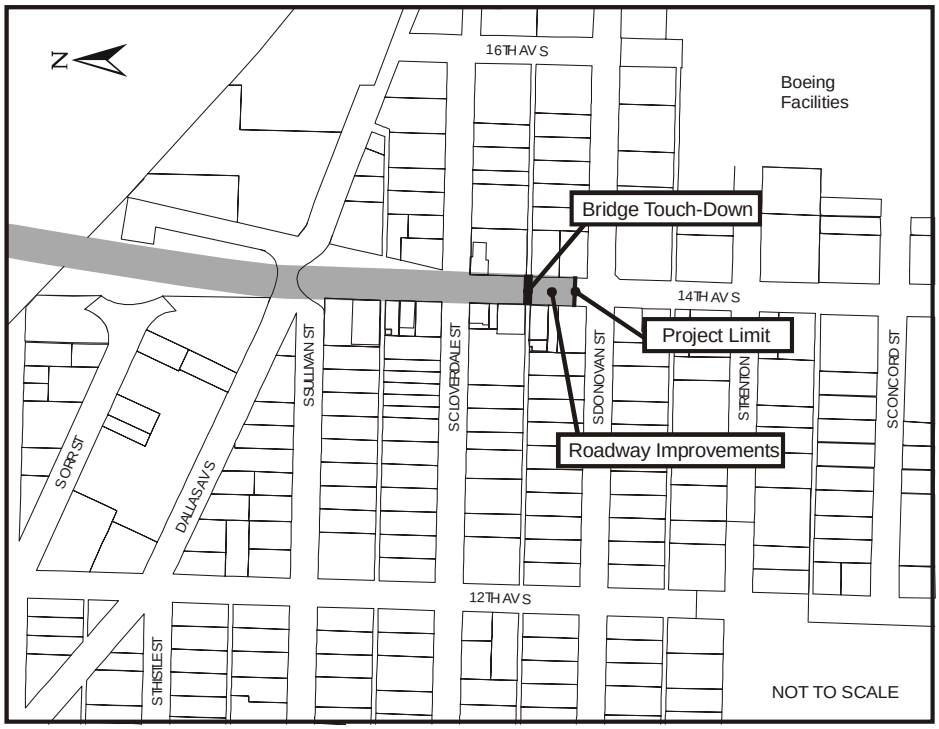


Figure 11
Mid-Level Fixed-Span Bridge Alternative Street Network

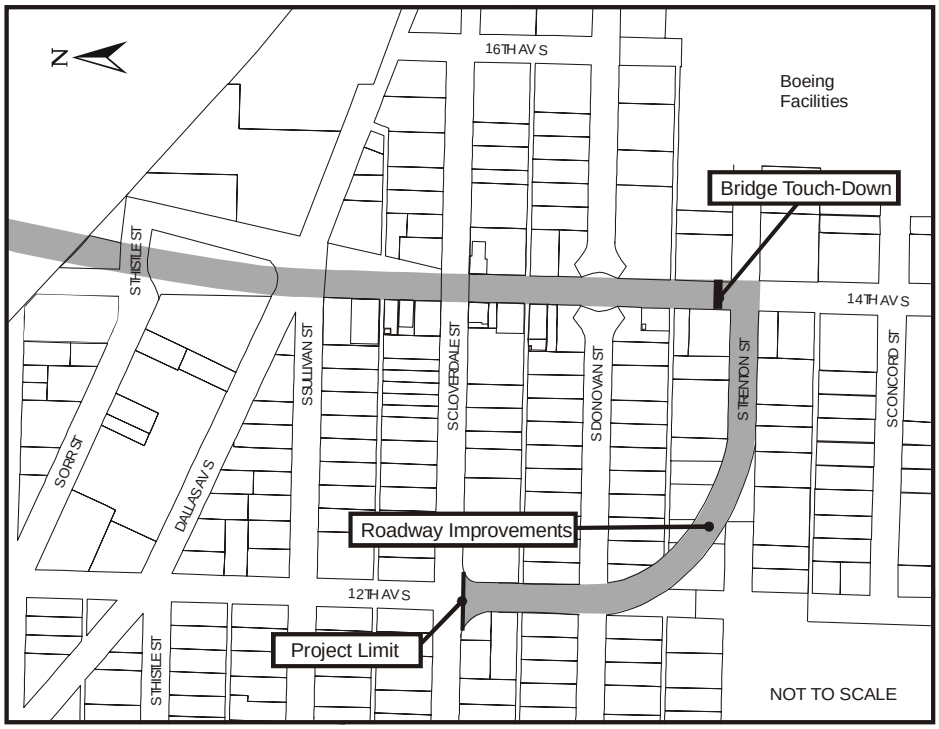
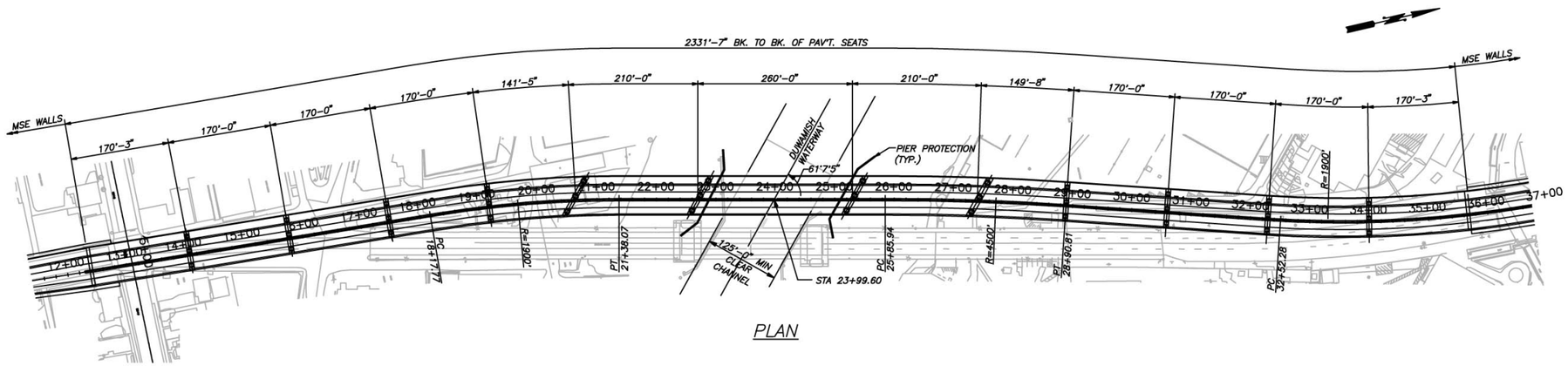
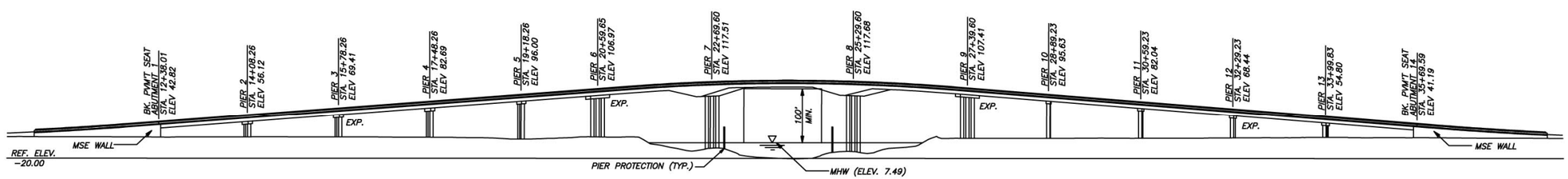


Figure 12
High-Level Fixed-Span Bridge Alternative Street Network

This page intentionally blank



PLAN



ELEVATION

South Park Community

Boeing Facilities

NOT TO SCALE

Figure 13
High-Level Fixed-Span Bridge Alternative

This page intentionally blank

The bridge design would allow for approximately 100 feet of vertical clearance above the MHW of the Duwamish Waterway as requested by the U.S. Coast Guard. The horizontal waterway clearance for the navigation channel would be approximately 125 feet, which is slightly greater than the existing 118-foot clearance (fender-to-fender). The bridge's vertical clearance would not be expected to limit the height of boats and barges currently passing the bridge. However, vessels larger than those currently using the navigation channel might not be able to pass the bridge in the future.

Following construction, there would be numerous changes in the local street network as shown in Figure 12. The figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. The bridge south abutment would require Dallas Avenue S., S. Sullivan Street, and S. Cloverdale Street to be converted to underpasses under the new South Park Bridge. A retaining wall supporting the elevated approach roadway would be constructed immediately adjacent to properties fronting on both sides of 14th Avenue S. for the majority of the two-block distance between S. Cloverdale Street and S. Trenton Street. S. Donovan Street would be closed at 14th Avenue S. due to obstruction from the bridge abutment and a vehicle turn-around would be constructed on either side of the abutment on S. Donovan Street. To allow traffic to access the new South Park Bridge, a new principle arterial roadway would need to be constructed between S. Trenton Street and 12th Avenue S. and road improvements would be required on 12th Avenue S. north to S. Cloverdale Street. This new route would allow traffic, trucks, and buses to continue to access the new South Park Bridge from S. Cloverdale Street via 12th Avenue S. and S. Trenton Street. Following construction and transfer of the traffic to the new bridge, the existing bridge would be demolished and removed as described for the No Action Alternative.

2.4.3 Construction Durations and Activities

Construction of a rehabilitation or replacement bridge for the existing South Park Bridge is planned to take approximately two to three years, including the demolition and removal of the existing bridge. Construction is anticipated to start within the next several years and opening of the rehabilitation or a replacement bridge is currently anticipated to occur by 2009. The actual time required for construction activities vary for each of the alternatives. Construction activities associated with the No Action Alternative involves only demolition of the existing bridge and restoration of the site. The construction period for this alternative would be the shortest of all alternatives, approximately 8 months. The other alternatives would additionally require rehabilitation or construction of a new replacement bridge. Anticipated construction durations (demolition of existing and construction of new) would be approximately 32 months for the Rehabilitation Alternative, 33 months for the Bascule Bridge Alternative, 20 months for the Mid-Level Fixed-Span Bridge Alternative, and 24 months for the High-Level Fixed-Span Bridge Alternative.[15]

[15] Parsons Brinckerhoff. *South Park Bridge Project: Structural Alternatives Study*, November 2003.

From a construction perspective, the five project alternatives include three different types of construction activities. The No Action Alternative assumes the existing bridge condition would eventually require closure and removal of the bridge structures. Construction activities would focus on demolishing the existing bridge and restoring the project area. The Rehabilitation Alternative would require bridge closure for approximately 30 months for rehabilitation or replacement of various elements of the existing bridge. The Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridge alternatives would all result in constructing a replacement bridge approximately 80 feet downstream of the existing bridge. For these three alternatives, the new bridge would be constructed while the existing bridge continues to be operational. When the new bridge is connected to the existing road, there would be short-term temporary bridge closures. These closures could be limited to weekends or could extend for approximately one month, depending on the alternative. Once the new bridge is completed, traffic would be rerouted to the new bridge and then the existing bridge structure would be demolished in a similar fashion as described for the No Action Alternative.

Rehabilitation of the existing bridge would require closure of the existing bridge for approximately 30 months, although efforts would be made to minimize the closure period as much as possible. Reconstruction activities would begin as soon as possible after completion of design engineering and acquisition of construction permits. Traffic would be given advance notice to take alternate routes prior to closure of the existing bridge. The construction of a temporary dock and a construction staging area would be required on both banks of the waterway (see Figure 14). Construction of the new bascule piers would likely be the first major construction activity. This would entail removing the existing pier protection fenders, installing temporary supports for the bridge superstructure, removing the bascule leaves as well as the steel truss spans, installing cofferdams around the existing steel truss approach piers and bascule piers, and demolishing the existing piers.

The bascule leaves and steel truss approach spans would be removed from the construction site for refurbishment. Construction of the new piers would involve drilling shafts through the existing timber piles, constructing the pile cap, dewatering the construction area inside the cofferdam, constructing the upper portions of the pier, removing the cofferdam, and finally reconstructing the upper portions of the bascule pier and bridge towers. Workers would reconstruct the concrete approach spans and replace the abutments. Workers would also reconstruct the bridge deck and replace the mechanical and electrical systems used to operate the bridge. Replacement of the piers, bridge tender towers, bridge railings, and lamp posts would be done in a manner that would preserve the historic character of these features of the existing bridge.

Major construction activities and sequencing would be similar for the Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridge alternatives. The construction duration and the impact area for each of these three alternatives, however, would clearly differ. Following completion of design engineering, acquisition of construction permits, purchase of needed property, and relocation of residents and businesses, construction

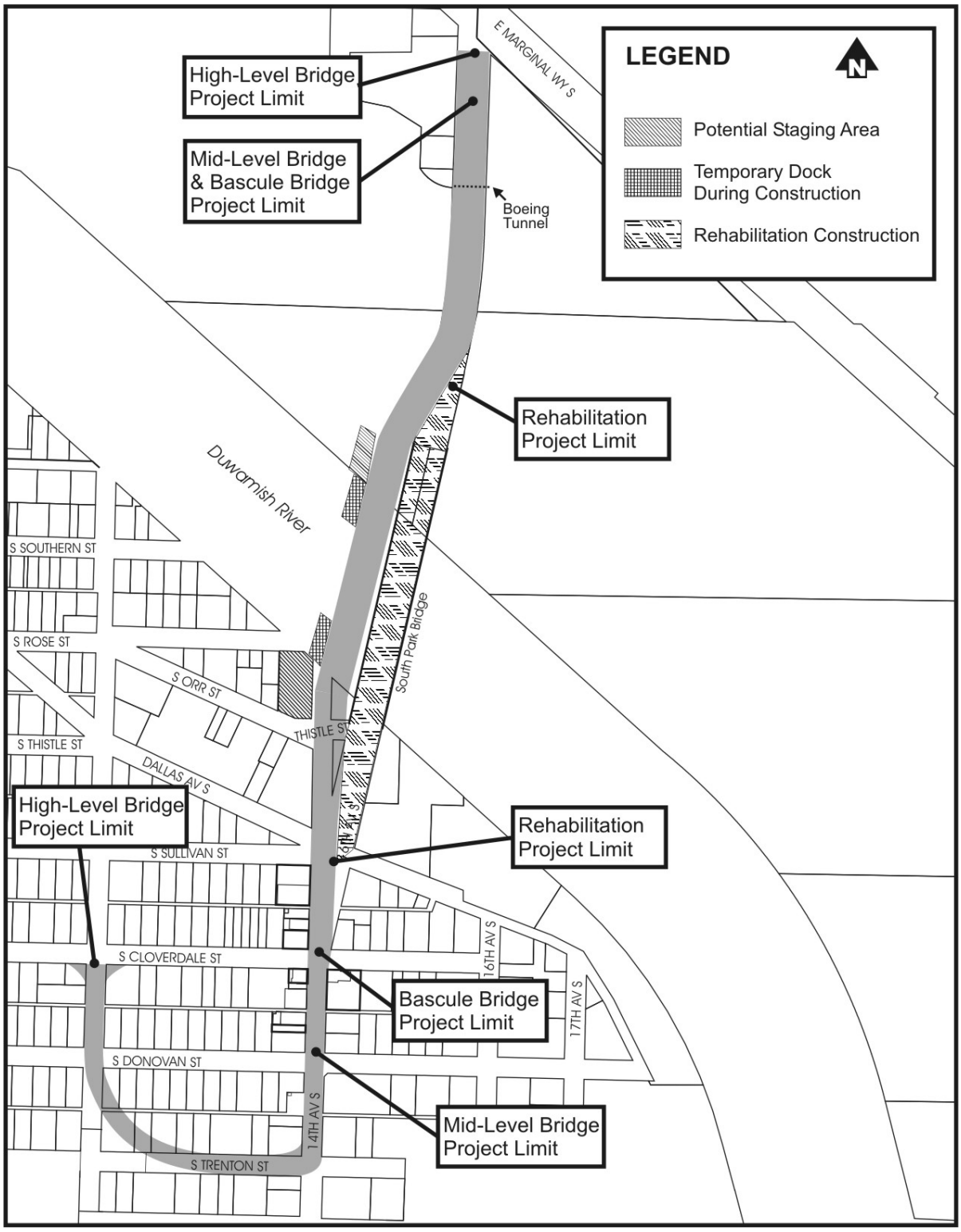


Figure 14
Proposed Construction Staging Areas

activities would begin. The first activities would include establishing the construction staging areas and constructing temporary docks with pilings on both sides of the waterway (see Figure 14).

Buildings affected by the construction activities would be demolished and utilities would be either temporarily or permanently relocated. To minimize traffic impacts, construction activities would begin with the construction of the in-water piers. Construction activities would progress landward from the central portion of each bridge alternative. Both in-water and on-land construction would begin with construction of the sub-structures (piers and abutment) and would be followed by placement of the superstructure (beams, deck, rails). On-land construction of the piers, abutment, retaining walls, and transition segments at either end of the bridge would likely require temporary closure of adjacent or nearby roads and rerouting of local traffic. If possible, these temporary closures would be limited to weekend and/or night times to minimize impacts to the community. Construction activities on the north and south portions of the new bridge structures could also occur either separately or concurrently. The last of the construction activities would be the construction of the new curb and gutter of the at-grade roadway, and paving the roadway to match the existing width of 14th Avenue S. Figure 14 shows the project limits, or start and end points, of construction activities for each of the project build alternatives.

For the rehabilitation and new bridge alternatives, new girders and other oversized materials would most likely be delivered to the project site by barge. Large cranes located on the barges or temporary docks would off-load the materials and place them in the nearby construction staging area. Removal of the existing bridge pier foundations and construction of the new bascule and steel truss piers would all require the use of cofferdams to isolate the construction activities. Construction of the new approach-span piers would use drilled shafts, which would likely incorporate the use of temporary casings to isolate the construction activities. This in-water work would be performed by equipment operated from the temporary docks or from barges.

Demolition of the existing bridge would involve disassembly and removal of the existing bascule leaves, superstructure, bridge piers, protection fenders, and abutment. Cranes would use the existing bridge structure and approaches as much as possible to remove the various elements of the bridge. Barges would likely be used to remove oversized materials. At this time, this demolition work is not planned to require construction of temporary docks or the acquisition or temporary use of property on the banks of the Duwamish Waterway for a staging area. Removal of the abutment foundations, however, would likely require temporary short-term closure of adjacent and/or nearby streets. During this time, local traffic would be temporarily rerouted from the immediate area.

Following the completion of the construction activities associated with any of the project alternatives, disturbed areas would be restored. Conceptual site restoration plans would be developed for each alternative based on additional consultation with resource agencies and other stakeholders.

2.4.4 Cost Estimates for the Alternatives

Cost estimates for each of the proposed project alternatives have been prepared by the project engineers (see Table 2).[16] The cost estimate for each project alternative, including the No Action alternative, is broken down into the following components: 1) plans, specifications, and estimates (PS&E), 2) right-of-way costs, and 3) construction and construction-related costs. The total cost estimates are provided in 2003 dollars as well as estimated costs escalated for 2008, the anticipated mid-point of the project construction period. These cost estimates were calculated based on the conceptual engineering plans that were prepared for each of the alternatives.[17]

Clearly, the No Action Alternative is the least expensive as the existing bridge would not be rehabilitated nor would a new replacement bridge be constructed. The cost to remove the existing bridge structure would be approximately $7,000,000 (2003 dollars). The estimated costs to either rehabilitate or replace the existing bridge structure range between approximately $62 million to $77 million in 2003 dollars. The least costly of the build alternatives is the proposed Mid-Level Fixed-Span Alternative, which is estimated to cost approximately $61,523,000 to design and construct. The Rehabilitation Alternative is estimated to cost approximately $63,930,000 and the High-Level Fixed-Span Alternative is estimated to cost approximately $70,460,000. The most costly of the build alternatives is the Bascule Bridge Alternative, which is estimated to cost $77,334,000. The escalated 2008 dollar estimates to design and construction the project alternatives are also shown in the table.

2.5 Project Coordination

Coordination to date for the South Park Bridge Project has involved members of the public, a special community advisory group, and representatives of government agencies. Formal scoping was initiated through publication of the NEPA Notice of Intent and the SEPA Determination of Significance and Scoping Notice on February 7, 2002 and February 14, 2002, respectively. Separate scoping meetings were conducted in the South Park community for relevant agencies and members of the public. Both meetings were held on February 28, 2002. Written and verbal comments received through the scoping process were reviewed by King County and used in the development of the project alternatives and topics for environmental impact assessment.

---

[16] Parsons Brinckerhoff. *South Park Bridge Project: Structural Alternatives Study*, November 2003.

[17] Parsons Brinckerhoff. *South Park Bridge Project: Conceptual Plans*, June 2003.

Table 2. Cost Estimates of the Project Alternatives

	PS&E	Right-of-Way	Construction	Total (2003 dollars)	Total (2008 dollars)
No Action	$250,000	$0	$6,750,000	$7,000,000	$9 M
Rehabilitation	$6,843,000	$754,000	$56,333,000	$63,930,000	$74 M
Bascule	$8,253,000	$3,655,000	$65,426,000	$77,334,000	$90 M
Mid-Level Fixed-Span	$4,235,000	$6,377,000	$50,911,000	$61,523,000	$71 M
High-Level Fixed-Span	$5,261,000	$15,310,000	$49,889,000	$70,460,000	$82 M

Source: Parsons Brinckerhoff, November 2003.

A public involvement plan for the proposed South Park Bridge Project was developed during the initial stages of project planning. The Project Advisory Committee (PAC) and the Community Advisory Group (CAG) reviewed this document and provided comments to King County. The first public involvement efforts began prior to the formal scoping period. A public workshop was held in the South Park community on January 17, 2002. At this meeting, the nine preliminary project alternatives were presented. A second public workshop was held on June 19, 2002. At this meeting, the five proposed project alternatives were presented. Members of the public were encouraged to provide comments at both of these meetings. To facilitate participation and input from Hispanic persons living in the community, a bilingual translator attended all meetings. In addition, handouts and newsletters for the project were published in English and Spanish, and public notices were published in “Siete Dias”, a local Spanish-speaking newspaper. Future opportunities for public involvement are also planned, including a public hearing and workshop following publication of the Draft Environmental Impact Statement in 2004.

Establishing a CAG was a significant component of the public involvement plan. A total of 17 individuals were chosen to participate in the CAG to represent community stakeholder interests and public concerns. The CAG meets periodically to be briefed on the progress of the project and to provide input to the South Park Bridge project team. Again, a bilingual English-Spanish translator attends the meeting to facilitate communication with Spanish-speaking individuals on the CAG. To date, CAG meetings have been held on April 10, May 21, June 4, June 11, and October 29 of 2002 and on January 7 and November 18, 2003. Additional CAG meetings are planned for the future.

As part of the environmental review process, King County periodically meets with the Project Advisory Committee (PAC) to give a status report of the project, answer questions, and to solicit comments. This committee is comprised of members of various agencies that have potential jurisdiction over the proposed South Park Bridge Project. The committee is the Interdisciplinary Team (IDT) required under NEPA implementation

guidelines and provides technical support to King County staff. To date, the PAC has met on January 10, February 20, May 9, May 23, and October 10 of 2002. Coordination with the PAC is planned at critical future steps in the environmental review process.

A non-scientific survey was also conducted of South Park businesses located on 14th Avenue S. during the late spring of 2003.[18] The goal of the survey was to help assess potential impacts to businesses, especially minority-owned and –operated (employees) businesses. The survey respondents were also asked to identify their particular concerns about the proposed rehabilitation or replacement of the existing South Park Bridge. A total of 18 businesses were successfully surveyed. Spanish and Vietnamese translators were provided, as needed, to assist business representatives understand and respond to the questions. In addition, the data was used to assess the potential effects displaced businesses and jobs would have on the South Park community. The analysis of the survey findings are discussed in detail in the Economic, Social, and Relocation technical reports supporting the analysis in the EIS.

As key issues have arisen during development of the project alternatives and in assessing potential environmental impacts, special meetings have also been held with key stakeholders and organizations in the South Park community, as well as with other government agencies and jurisdictions with an interest in the project. For example, on December 3, 2002, King County met with owners of property along 14th Avenue S, and information booths were set up at the Sea-Mar Community Health Center-sponsored annual Fiesta Patrias on September 14, 2002 and at a family night event held at the Concord Elementary School on September 27 and November 22 of 2002. Periodic coordination meetings have also been held with representatives of the City of Seattle and the City of Tukwila, and other government agencies. These coordination activities will continue to occur on an on-going basis as the EIS is prepared and finally adopted.

[18] Parsons Brinckerhoff. *South Park Bridge Project: Survey of 14th Avenue South Businesses*, August 22, 2003.

This page intentionally blank

Air quality in the project area is regulated by the U.S. EPA, Washington State Department of Ecology (WADOE), and Puget Sound Clean Air Agency (PSCAA). Under the Clean Air Act, the EPA has established the National Ambient Air Quality Standards (NAAQS), which specify maximum concentrations for CO, particulate matter less than 10 micrometers in size (PM_{10}), particulate matter less than 2.5 micrometers in size ($PM_{2.5}$), ozone, sulfur dioxide, lead, and nitrogen dioxide. These regulated pollutants are referred to as criteria pollutants. The standards applicable to transportation projects are summarized in Table 3.

The eight-hour ozone and $PM_{2.5}$ standards were upheld by a federal appeals court March 26, 2002, following a ruling on February 27, 2001, by the U.S. Supreme Court that the Clean Air Act's requirement for EPA to establish NAAQS at a level "requisite" to protect public health is within the constitutional scope of discretion that Congress can delegate to a federal agency (*Whitman v. American Trucking Associations*, U.S., No. 99-1257, 2/27/00). Because there is not yet sufficient background monitoring data, the new standards have not yet been implemented by EPA. The one-hour ozone standard will be phased out and replaced by the new eight-hour standard.

The eight-hour CO standard of 9 parts per million (ppm) is the standard most likely to be exceeded as the result of transportation projects. Nonconformance with NAAQS may threaten federal funding of transportation projects in the state.

Nonattainment areas are geographical regions where air pollutant concentrations exceed the NAAQS. Air quality maintenance areas are regions that have recently attained compliance with the NAAQS. South Park and the study area lie within the Puget Sound ozone, particulates, and CO air quality maintenance areas. Air quality emissions in the Puget Sound Region are currently being managed under the provisions of Air Quality Maintenance Plans (AQMPs) for ozone and CO. PSCAA and WADOE developed the current plans, and the EPA approved the plans in 1996. Any regionally significant transportation project in the Puget Sound Air Quality Maintenance areas must conform to the AQMPs. Conformity is demonstrated by showing that the project would not cause or contribute to any new violation of any NAAQS, increase the frequency or severity of any existing NAAQS violations, or delay timely attainment of the NAAQS. Information regarding the Conformity Determination can be found in Chapter 8 of this report.

Table 3. Summary of Ambient Air Quality Standards

Pollutant	National Primary Standard	Washington State Standard	PSCAA Regional Standard
CARBON MONOXIDE (CO)			
One-Hour Average (not to be exceeded more than once per year)	35 ppm	35 ppm	35 ppm
Eight-Hour Average (not to be exceeded more than once per year)	9 ppm	9 ppm	9 ppm
PM_{10}			
Annual Arithmetic Mean	50 µg/m^3	50 µg/m^3	50 µg/m^3
24-Hour Average Concentration (not to be exceeded more than once per year)	150 µg/m^3	150 µg/m^3	150 µg/m^3
$PM_{2.5}$			
Annual Arithmetic Mean	15 µg/m^3	NS	NS
24-Hour Average Concentration (not to be exceeded more than once per year)	65 µg/m^3	NS	NS
TOTAL SUSPENDED PARTICULATES (TSP)			
Annual Arithmetic Mean	NS	60 µg/m^3	60 µg/m^3
24-Hour Average Concentration (not to be exceeded more than once per year)	NS	150 µg/m^3	150 µg/m^3
OZONE			
One-Hour Average (not to be exceeded more than once per year)	0.12 ppm	0.12 ppm	0.12 ppm
Eight-Hour Average (not to be exceeded more than once per year)	0.08 ppm	NS	NS

Notes: ppm = parts per million
µg/m^3 = micrograms per cubic meter
NS = No Standard

Sources: PSCAA Regulation 1 (1994); 40 CFR Part 50 (1997), WAC chapters 173-470, 173-474, 173-175 (1987)

3.1 Climate

Weather directly influences air quality. Important meteorological factors include wind speed and direction, atmospheric stability, temperature, sunlight intensity, and mixing depth. Temperature inversions, which are associated with higher air pollution concentrations, occur when warmer air overlies cooler air. During temperature inversions in late fall and winter, particulates and CO from wood stoves and vehicle sources can be trapped close to the ground, which can lead to violations of the NAAQS. In the Puget Sound area, the highest ozone concentrations occur from mid-May until mid-September, when urban emissions are trapped by temperature inversions and followed by intense sunlight and high temperatures.

In 1999, the Department of Ecology replaced their Pollutant Standards Index (a scale of daily concentrations of individual air pollutants) with the Air Quality Index (AQI) that has been standardized by the EPA. Using forecast meteorology and real-time pollutant monitoring, WADOE and PSCAA forecast the AQI to be one of six levels: good, moderate, unhealthy to sensitive populations, unhealthy, very unhealthy, and hazardous. Since adoption of the AQI in the Puget Sound Region, there have been several instances of air quality in the moderate category. Between June1999 and December 2001, air quality was declared "unhealthy for sensitive groups" in western Washington eleven times, most often in Tacoma. It was declared unhealthy in Tacoma once during that period.

Regional climate conditions observed in this section are applicable to climate conditions observed in the project area.

3.2 Carbon Monoxide

CO is a colorless, odorless, poisonous gas that reduces the blood's oxygen-carrying capability by bonding with hemoglobin and forming carboxyhemoglobin, which prevents oxygenation of the blood. Exposure to CO concentrations of 80 ppm over eight hours results in a carboxyhemoglobin level of approximately 15 percent (Erlich, 1977). Acute health effects, such as headaches, slowed reflexes, weakened judgment, and impaired perception begins at about 3 percent carboxyhemoglobin (carbon monoxide bonding with 3 percent of the hemoglobin). Chronic effects include aggravation of pre-existing cardiovascular disease and increased heart disease risk in healthy individuals. At carboxyhemoglobin levels of approximately 30 percent, individuals become nauseous and collapse, and at very high levels (above 50 percent carboxyhemoglobin) individuals die.

The major source of CO is vehicular traffic, industry, wood stoves, and slashburns. In urban areas, motor vehicles are often the source of over 90 percent of the CO emissions that cause ambient levels to exceed the NAAQS (EPA, 1992).

Areas of high CO concentrations are usually localized. They occur near congested roadways and intersections in fall and winter and are associated with light winds, cool temperatures, and stable atmospheric conditions. These localized areas of elevated CO levels are referred to as hot spots. CO concentration decreases in most areas have resulted from stringent federal emission standards for new vehicles and the gradual replacement of older, more polluting vehicles. CO levels have declined in urban areas, but are leveling off or increasing in areas experiencing rapid growth in traffic volumes, including remote suburbs in the Puget Sound region. Emission factors used for analysis presented in this report were obtained from PSRC.

3.3 Particulate Matter

Particulate matter includes small particles of dust, soot, and organic matter suspended in the atmosphere. Particulates less than 100 micrometers in diameter are measured as Total Suspended Particulates (TSP). Particles less than 10 micrometers in size are measured as PM_{10}, a component of TSP. Particles less than 2.5 micrometers in size are measured as

$PM_{2.5}$, a component of PM_{10} and TSP. The smaller $PM_{2.5}$ and PM_{10} particles can be inhaled deeply into the lungs, potentially leading to respiratory diseases and cancer because particulate matter may carry absorbed toxic substances, and the particle itself may be inherently toxic.

Particulate matter can affect visibility, plant growth, and building materials. Sources of particulates include motor vehicles, industrial boilers, wood stoves, open burning, and dust from roads, quarries, and construction activities. Most vehicular emissions are in the $PM_{2.5}$-size range, while road and construction dust is often in the larger PM_{10} range. Most vehicle fine particulate emissions result from diesel vehicles, which release fine particulates both directly, mostly as carbon compounds, and indirectly, in the form of sulfur dioxide (SO_2), a gas that reacts in the atmosphere to form sulfate particulates. High $PM_{2.5}$ and PM_{10} concentrations occur in fall and winter during periods of air stagnation and high use of wood for heat. In the Puget Sound Region, fireplaces and woodstoves account for almost two-thirds of winter $PM_{2.5}$ emissions (PSCAA, 1999). On-road vehicle emissions contribute approximately 12 percent of the region's $PM_{2.5}$ emissions, while construction and other dust sources contribute approximately 6 percent.

Particulates emitted from diesel vehicles pose specific health risks when compared to other types of particulate matter. The EPA's Clean Air Scientific Advisory Committee is currently reviewing recent health assessment data on diesel emissions; however, the data is not yet available for citation. Previous EPA research (EPA, 1993) found that components of diesel particulates, primarily high-molecular-weight organic compounds, have several negative health effects, including carcinogenisis, accumulation of particles in the lungs, tissue inflammation, respiratory irritation, and other related effects. Health effects associated with diesel particulates was one of the major contributing factors to establishing the new $PM_{2.5}$ standard.

3.4 Ozone

Ozone is a highly toxic form of oxygen and is a major component of the complex chemical mixture that forms photochemical smog. Ozone is not produced directly, but is formed by a reaction between sunlight, NO_x, and HC. Ozone primarily is a product of regional vehicular traffic, point source, and fugitive emissions of the ozone precursors. Tropospheric (ground-level) ozone, which results from ground-level precursor emissions, is a health-risk, while stratospheric (upper-atmosphere) ozone, which is produced through a different set of chemical reactions that only require oxygen and intense sunlight, protects people from harmful solar radiation. In the remainder of this report, the term ozone refers to tropospheric ozone.

Ozone irritates the eyes and respiratory tract and increases the risk of respiratory and heart diseases. Ozone reduces the lung function of healthy people during exercise, can cause breathing difficulty in susceptible populations, such as asthmatics and the elderly, and damages crops, trees, paint, fabric, and synthetic rubber products. The severity of the health effects is both dose and exposure-duration related (National Research Council, 1992). As with $PM_{2.5}$, the EPA has adopted a new eight-hour ozone standard (see Table 4); however,

the old one-hour standard is still applicable for current nonconformity and maintenance areas. Regional ozone planning efforts by PSCAA consider both standards.

In the Puget Sound area, the highest ozone concentrations occur from mid-May until mid-September, when urban emissions are trapped by temperature inversions followed by intense sunlight and high temperatures. Maximum ozone levels generally occur between noon and early evening at locations several miles downwind from the sources, after NO_x and HC have had time to mix and react under sunlight. Light, northeasterly winds arising during these conditions result in high ozone concentrations near the Cascade foothills, to the south and southeast of major cities.

3.5 Hazardous Air Pollutants

Other chemicals or classes of chemicals in motor vehicle emissions that are considered hazardous by EPA include benzene, formaldehyde, 1,3-butadiene, acetaldehyde, and gasoline vapors (EPA, 1993). Benzene emissions in the Puget Sound region are substantially higher than the national average. The emissions of all of the transportation-related hazardous air pollutants are much lower than the emissions of the criteria pollutants evaluated in this study and would vary in a similar fashion from the pollutants presented here.

3.6 Greenhouse Gases

Automobiles also emit greenhouse gases, primarily CO_2. CO_2 emissions are proportional to fuel consumption. Passenger cars emit on average 225 grams CO_2 per kilometer traveled (0.8 pounds per mile) and sport-utility vehicles and light trucks emit about 50 percent more CO_2 per mile because they are less efficient. These are an order of magnitude greater than the emissions of CO and would vary between the alternatives in a similar fashion to CO emissions.

This page intentionally blank

Chapter 4 Methodology

The methodology for air quality analysis of the South Park Bridge project follows the U.S. EPA *Guideline for Modeling Carbon Monoxide From Roadway Intersections* (U.S. EPA, 1990) and the Puget Sound Regional Council *Guidebook for Conformity and Air Quality Analysis Assistance for Nonattainment Areas* (PSRC, 1995).

Predictions of existing and future localized air pollution concentrations in the project vicinity for this and most other roadway air quality studies are made for CO only. Most other pollutants must be monitored and dealt with regionally. This is done for four reasons:

- Total CO emissions in the atmosphere from automobiles are greater than the emissions of all other pollutants combined. For example, in 2015 an average automobile traveling at 35 mph is expected to emit approximately 13.6 grams of CO per mile of travel, but only 1.5 and 2.2 grams of HC and NO_x, respectively (Mobile 5a results).

- Motor vehicles are the greatest source of CO emissions, accounting for more than 90 percent of total CO emissions in urban areas; therefore, it is generally not necessary to account for other, often unquantified, sources of CO near the project area (U.S. EPA, 1993).

- The complex reactive natures of some of the other pollutants are such that accurate predictions of local ambient concentrations cannot be made using current modeling procedures (Wayne, 1991).

- CO emissions from motor vehicles may be high enough to affect individuals in the immediate area, while most other pollutants are not (Erlich, 1977).

Average CO peak-hour concentrations (in parts per million: ppm) were calculated using the PM peak hour traffic volumes presented in the South Park Transportation Technical Report using Mobile 5b emission factors and CAL3QHC software. Two air quality models were developed for the South Park project corridor. The first model included at the 16th Avenue S. and East Marginal Way S. intersection. The second model covered the 14th Avenue S. and S. Cloverdale Street intersection and the 14th Avenue S. and S. Trenton Street intersection. Two models were created because the distance between East Marginal Way S. and S. Cloverdale and S. Trenton streets is great enough so that compounded emissions from the intersections at S. Cloverdale and S. Trenton streets would have minimal effect on and would be minimally affected by East Marginal Way S. The traffic data used for each model considered the effects of the upstream and/or downstream intersections that may not have been included in the model.

4.1 MOBILE5b Model

MOBILE5b is an updated version of the Mobile Source Emission Factor Model computer program developed by the EPA to calculate emission factors from highway motor vehicles in the units of grams of pollutant per mile traveled. Because MOBILE5b accounts for gradual replacement of older vehicles with newer, less-polluting vehicles, the predicted emission rates for future years are lower than current emission rates.

MOBILE5b emission factors for analysis of the 2000 existing conditions and the 2007 and 2027 bridge and no-bridge scenarios were provided by PSRC (Tier II Adjusted CO Mobile5b Output Files, February 2001).

4.2 CAL3QHC Model

CAL3QHC Version 2 is a line-source dispersion model that predicts pollutant concentrations near roadways. CAL3QHC input variables include MOBILE5b free flow and calculated idle emission factors, roadway geometries, traffic volumes, site characteristics, background pollutant concentrations, signal timing, and meteorological conditions. CAL3QHC predicts inert pollutant concentrations in ppm averaged over a one-hour period near roadways. CAL3QHC was used to predict CO concentrations at affected study-area intersections.

Carbon monoxide levels were modeled at all three signalized project area intersections, including 16th Avenue S. and East Marginal Way S., 14th Avenue S. and S. Cloverdale Street, and 14th Avenue S. and S. Trenton Street (see Figure 15) within the study area. All three intersections were modeled for 2000, 2007, and 2027 for each alternative. Air quality impacts were not analyzed for 2030 because the air analysis for this project was completed prior to the summer of 2003, when the PSRC extended the horizon year to 2030. The air analysis completed for this project is consistent to the current WSDOT checklist requirements.

CAL3QHC predicts peak one-hour pollutant concentrations based on stable meteorology and peak-hour traffic flow. This study assumed a wind speed of 1 meter (3 feet) per second and evaluated wind directions in 10-degree increments to select the worst-case wind angle. Background CO concentrations were assumed to be 3 ppm averaged over one-hour to represent typical urban background concentrations in Puget Sound (Ecology, 1995). An atmospheric stability class of D (urban land use) was modeled per EPA Guidance (EPA, 1992). These conditions usually do not persist for an eight-hour period; therefore, the worst-case eight-hour CO concentrations are lower than the maximum one-hour concentrations. The eight-hour average CO concentration is calculated by multiplying the maximum one-hour concentration by a persistence factor, which accounts for the time variance in traffic and meteorological conditions. EPA recommends a persistence factor of 0.7 (EPA, 1992).

Free-flow traffic was modeled at the posted speed limit. Traffic volumes were obtained from the South Park Bridge Project Transportation Technical Report (February 2004). Traffic operations data, including turn movements, signal times, and saturation flow

rates, were taken from the HCS 3.1c runs that were completed as part of the transportation study.

Specific locations where CO concentrations are predicted are known as *receptors*. Receptors are modeled in locations where maximum concentrations likely would occur because of traffic congestion and where the general public would have access (EPA, 1992). For this analysis, receptors were located in areas accessible to the general public at mid-sidewalk distance from the edge of the travel lane and 6 feet off the ground. At each intersection, individual receptors were modeled at the corners and at 75-foot intervals to a distance of 10 feet from the intersection. Only the highest concentration of CO at each intersection was reported for each modeled scenario.

Typical link and receptor geometry is illustrated in Figure 16. Unsignalized operations were approximated by modeling stopped traffic using a short-duration signal cycle. Unstopped traffic was modeled as free-flowing.

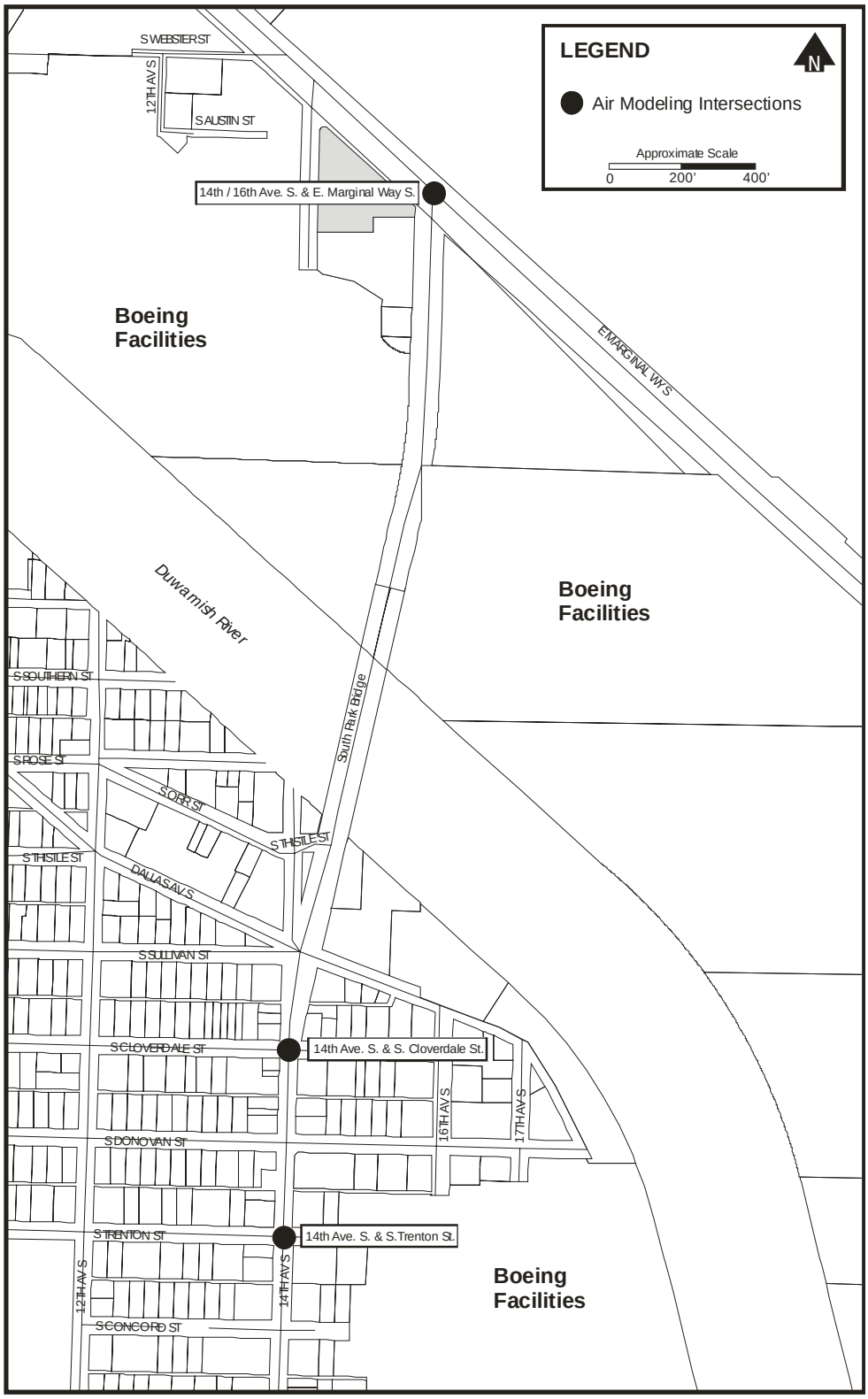


Figure 15
Air Modeling Intersections

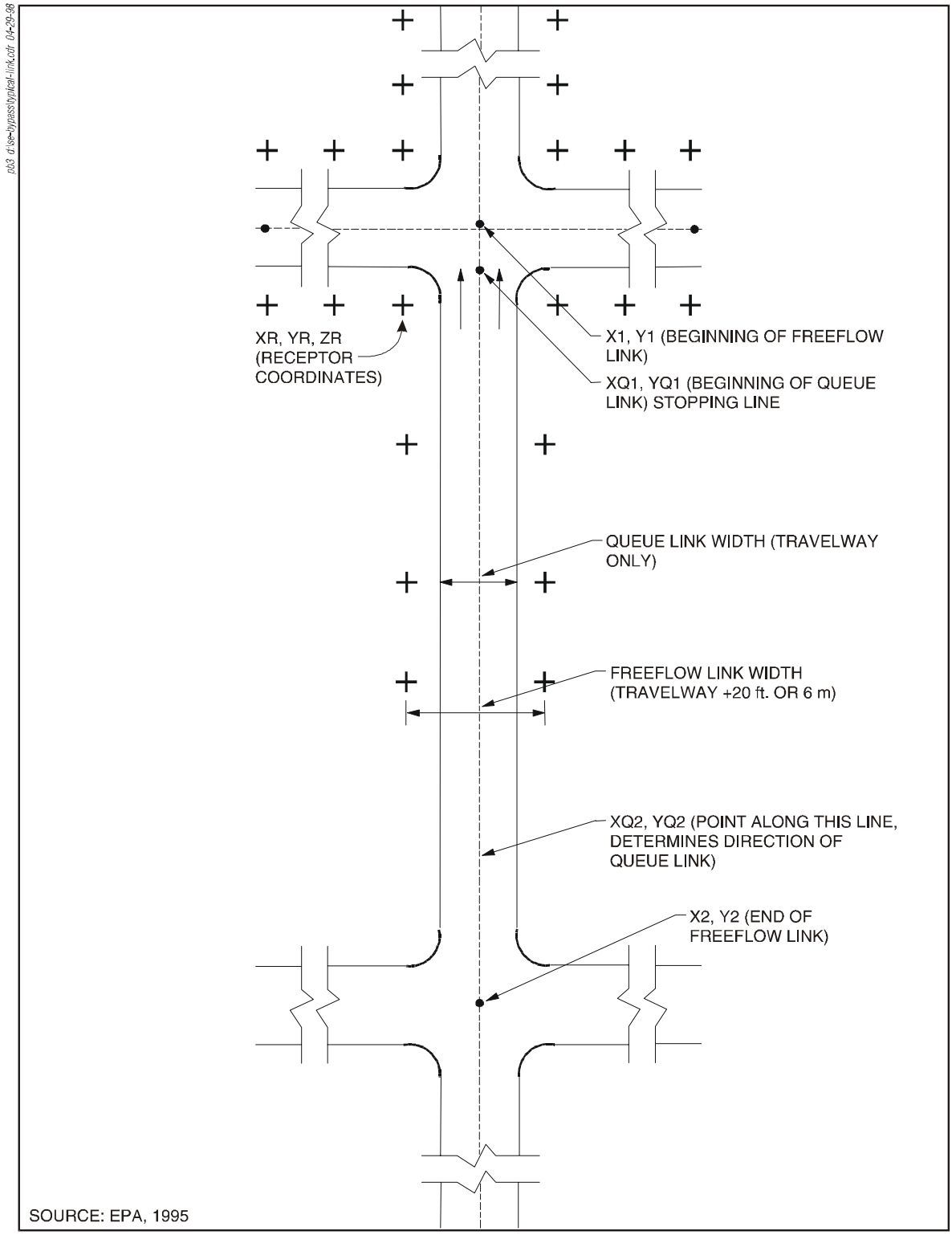


Figure 16
Typical Link and Receptor Geometry

This page intentionally blank

Chapter 5 Affected Environment

This chapter of the report describes the study area, emission trends, air quality monitoring, and localized carbon monoxide concentrations. Section 5.3.2 of this report identifies a more detailed discussion of current hazardous pollutants ambient health affects in the Georgetown community within two miles of the South Park study area. Air quality in the two communities is similar because of their relative distances from one another. Data from the Georgetown area (see Chapter 3) also details health affects of specific hazardous pollutants.

5.1 Description of Study Area

Land use adjacent to the study area is a mixture of residential, commercial, light industrial/manufacturing, and limited undeveloped land. Topography in the study area generally slopes west to east towards the Duwamish River. North of the Duwamish River is primarily commercial and industrial uses. The current South Park Bridge spans the Duwamish River. South of the Duwamish River is the community of South Park.

South Park is comprised of commercial businesses along 14th Avenue S. with residential homes located to the west and east. A residential home and a storage building are currently located adjacent to the west of the South Park Bridge. Single-family residential housing is predominant in the South Park community with a limited number of multi-family apartment buildings. Sea Mar Community Health Center buildings are located along 14th Avenue S. between S. Donovan, S. Trenton, and S. Concord streets. The Sea Mar Community Health Center is located approximately one-quarter mile southwest of the study area atop a nearby hill. Chapter 2 contains a more detailed description of the study area.

Existing and recommended intersection channelization plans identified for the South Park Bridge project are defined in the South Park Bridge Project Transportation Technical Report (February 2004).

5.2 Emission Trends

Fuel combustion by motor vehicles and other sources releases CO_2, which is a "greenhouse gas" that traps heat within the earth's atmosphere. CO_2 is not directly harmful to human health and is not a criteria pollutant. Considerable progress has been made in the U.S. and in the Puget Sound Region to reduce criteria air pollutant emissions from motor vehicles and improve air quality since the 1970s, even as vehicle travel has increased rapidly.

Nationally, emissions of criteria pollutants decreased 25 percent between 1970 and 2001. In general, the air is noticeably cleaner than in 1970, and all criteria pollutant emissions from motor vehicles are less than they were in 1970, despite the fact that vehicle miles of travel have more than doubled. Still, challenges remain. Based on monitored data,

approximately 46 million people in the U.S. reside in counties that did not meet the air quality standard for at least one NAAQS pollutant in 1996 (EPA, 1996, and EPA, 2002).

5.2.1 National Air Pollution Trends

Nationwide, motor vehicle air pollutant emissions have dropped considerably since 1970. Volatile Organic Compound emissions (also referred to as HC emissions) are down 38 percent, NO_x emissions have increased 15 percent, emissions from particulate matter less than 10 micrometers in size (PM_{10}) are down 76 percent, and CO emissions are down 19 percent. These reductions have occurred along with increasing population, economic growth, and vehicle travel (EPA, 2002).

5.2.2 Regional Air Pollution Trends

Regional air pollutant trends have generally followed national patterns over the last 20 years. While the average weekday vehicle miles traveled in the central Puget Sound region has increased from 30 million miles in 1981 to 65 million in 1999 (PSRC, 2000), pollutant emissions associated with transportation sources have decreased. CO is the criteria pollutant most closely tied to transportation, with over 90 percent of the CO emissions in the Puget Sound urban areas coming from transportation sources. Regionally, the maximum measured CO concentrations have decreased over the past 20 years (see Figure 17). Other transportation pollutants have followed similar, but less pronounced trends.

CO levels reported for the 1999 PSCAA Air Quality Report used here are the most recently tabulated quality assured data from Ecology and PSCAA at the time of this report. The monitoring station used to compile the information for CO emissions is located within one mile of the South Park study area.

The PSRC completed the regional emission analysis to evaluate the air quality effects of *Destination 2030*, the new MTP for the central Puget Sound region through 2030. The emission analysis includes updates to reflect new EPA emission requirements, including the Tier II Gasoline/Sulfur Rule. The revised emission budget from the latest AQMP and the most recent emission trend modeling are shown in Table 4.

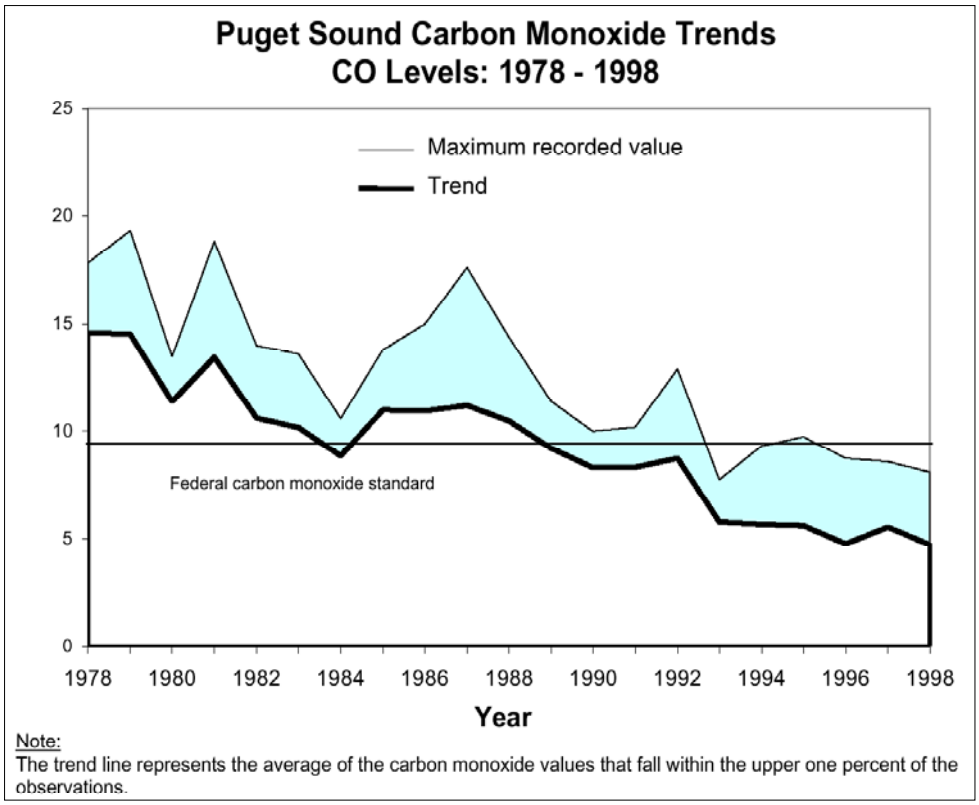


Figure 17
Central Puget Sound Region Carbon Monoxide Trends

Table 4. Destination 2030 Regional Air Pollutant Emission Projections (metric tons per day)

Pollutant	AQMP Budget	2010 PSRC MTP Forecast	2020 PSRC MTP Forecast	2030 PSRC MTP Forecast
Carbon Monoxide	1,497	860	718	735
Hydrocarbons	248	164	171	202
Nitrogen Oxides	263	206	199	217

Source: PSRC, 2001

Based on the *Destination 2030* analysis, none of the future transportation emissions scenarios is expected to exceed the regional AQMP transportation emission budgets. The downward trend in CO is expected to continue for the Puget Sound region through 2020, but is expected to begin increasing again by 2030 because of increases in vehicle miles traveled. For ozone, the future trend is not as positive. Hydrocarbon emissions, which largely drive ozone formation in the central Puget Sound region, are projected to increase between 2010 and 2020 and continue to increase to 2030. However, hydrocarbon emissions are expected to be below the emissions budget through 2030.

5.3 Air Quality Monitoring

5.3.1 Monitoring Results for Criteria Pollutants

The evaluation of existing air quality is based on ambient air quality data collected and published by the Department of Ecology and the PSCAA. WADOE and PSCAA have established air pollution monitoring stations throughout Washington State. In general, these stations are located where air quality problems have been identified. No exceedances of NAAQS for CO were observed at this location from 1993 through 1999. One exceedance of the eight-hour NAAQS for CO was observed in 1995. Because of the local nature of CO impacts, concentrations measured at this location are not representative of the project site. The Department of Ecology also monitors ozone, and the nearest monitoring station is at Lake Sammamish State Park, approximately 15 miles east of the project area. No exceedances of NAAQS for ozone were observed at this location in 1995, 1996, or 1997. Two exceedances were observed in 1994, one exceedance in 1998, and three exceedances were observed in 1999, based on the new eight-hour standards. However, no exceedances were observed based on the previous one-hour standard. The closest PM_{10} monitoring station to the study area is located at 723 S. Concord Street in South Park. Both 24-maximum and annual levels at this monitoring station were well below the primary standards from 1995 to 1998.

5.3.2 Georgetown Air Toxics Monitoring

During 2000, the US EPA, WSDOE, and PSCAA conducted air quality monitoring in the Georgetown area (two miles north of the South Park neighborhood) for eighteen toxic air pollutants as part of a regional air toxics study. The monitoring results for the Georgetown site were similar to the other five sites monitored within the Seattle urban area (US EPA, 2000, Ecology, 2000). The cumulative cancer risk for monitored air toxics in Georgetown was 7.0 per hundred thousand individuals while the other sites ranged between 6.6 and 7.7 per hundred thousand. The monitored pollutants include emissions from industrial, airport, and roadway traffic sources. Approximately 60 percent of the air toxic risk estimated for Georgetown is from pollutants associated with transportation sources (traffic and aircraft). The greatest single air toxic risk was associated with diesel particulate emissions.

5.4 Localized Carbon Monoxide Concentrations

One-hour and eight-hour average CO concentrations for the 2000 existing conditions scenario were modeled using the same methodology as 2007 and 2027 predictions (see Tables 5 and 6, respectively). Because consistent methodology and assumptions were utilized, modeled CO concentration for 2000 can be compared with those predicted for future alternatives to show the trend in air quality expected in the project area.

Table 5. Maximum One-Hour Average CO Concentrations

	Intersection		
Scenario	**East Marginal Way S./16th Avenue S.**	**S. Cloverdale Street/ 14th Avenue S.**	**S. Trenton Street/ 14th Avenue S.**
2000 Existing Conditions	10.2	8.0	6.0
2007 No Action Alternative	5.2	5.2	4.5
2007 Rehabilitation Alternative	6.8	5.6	4.5
2007 Bascule Bridge Alternative	6.8	5.6	4.5
2007 Mid-Level Fixed-Span Bridge Alternative	6.8	5.6	4.5
2007 High-Level Fixed-Span Bridge Alternative	7.3	N/A	6.0
2027 No Action Alternative	4.2	4.2	3.7
2027 Rehabilitation Alternative	5.3	4.6	4.0
2027 Bascule Bridge Alternative	5.3	4.6	4.0
2027 Mid-Level Fixed-Span Bridge Alternative	5.3	4.6	4.0
2027 High-Level Fixed-Span Bridge Alternative	5.2	N/A	4.5

Notes:
NA = Not Applicable (the intersection would not exist under this alternative)
Concentration values are in parts per million (ppm).
The one-hour average NAAQS for CO is 35 ppm.

Table 6. Maximum Eight-Hour Average CO Concentrations

	Intersection		
Scenario	**East Marginal Way S./16th Avenue S.**	**S. Cloverdale Street/ 14th Avenue S.**	**S. Trenton Street/ 14th Avenue S.**
2000 Existing Conditions	7.1	5.6	4.2
2007 No Action Alternative	3.6	3.6	3.2
2007 Rehabilitation Alternative	4.8	3.9	3.2
2007 Bascule Bridge Alternative	4.8	3.9	3.2
2007 Mid-Level Fixed-Span Bridge Alternative	4.8	3.9	3.2
2007 High-Level Fixed-Span Bridge Alternative	5.1	N/A	4.2
2027 No Action Alternative	2.9	2.9	2.6
2027 Rehabilitation Alternative	3.7	3.2	2.8
2027 Bascule Bridge Alternative	3.7	3.2	2.8
2027 Mid-Level Fixed-Span Bridge Alternative	3.7	3.2	2.8
2027 High-Level Fixed-Span Bridge Alternative	3.6	N/A	3.2

Notes:
NA = Not Applicable (the intersection would not exist under this alternative)
Concentration values are in parts per million (ppm).
The eight-hour NAAQS for CO is 9 ppm.

Chapter 6 Impacts

This chapter details construction and operation impacts and secondary and cumulative impacts resulting from the South Park Bridge Project.

6.1 No Action Alternative

6.1.1 Construction

Bridge construction would not take place under this alternative; therefore, there would be no construction air quality impact. However, under the No Action Alternative, demolition air quality impacts would be experienced. Demolition air quality impacts would be similar to construction air quality impacts of the bridge alternatives to follow. Demolition air quality impacts would be primarily limited to the area surrounding the bridge.

6.1.2 Operation

Estimated worst-case CO concentrations under the No Action Alternative would be lower than existing conditions at all three intersections studied in both the year 2007 and 2027 scenarios. The predicted lower CO concentrations are primarily due to reductions in vehicle emissions, as newer vehicles replace older, polluting vehicles. No exceedance of the one-hour average NAAQS of 35 ppm for CO was predicted at any location under the No Action Alternative for either year 2007 or 2027 (see Table 5). Additionally, no exceedance of the eight-hour average NAAQS of 9 ppm for CO was predicted at any location for the No Action Alternative (see Table 6).

Shifts in traffic patterns that would result from closure of the South Park Bridge would increase traffic congestion at other intersections in the project vicinity, resulting in increases in CO concentrations in those areas. None of the resulting increases are expected to be significant.

6.2 Bridge Alternatives

Construction and operation air impacts to the South Park community are expected to be similar for all bridge alternatives: Rehabilitation Alternative, Bascule Bridge Alternative, Mid-Level Fixed-Span Bridge Alternative, and High-Level Fixed-Span Bridge Alternative.

6.2.1 Construction

Fugitive emissions from particulate matter less than 10 micrometers in size (PM_{10}) would be associated with demolition, land clearing, ground excavation, cut-and-fill operations, and construction of the bridge alternatives. Construction emissions would be greatest during the earthwork phase, because most emissions would be associated with moving dirt on the site.

PM_{10} emissions would vary from day to day depending on the level of activity, specific operations, and weather conditions. PM_{10} emissions would depend on soil

moisture, silt content of soil, wind speed, and amount and type of operating equipment. Larger dust particles would settle near the source, and fine particles would be dispersed over greater distances from the construction site.

The quantity of particulate emissions would be proportional to the area of the construction operations and the level of activity. Based on field measurements of suspended dust emissions from construction projects, an approximate emission factor for construction operations would be 1.2 tons per acre of construction per month of activity (U.S. EPA, 1985). Emissions would be reduced if less of the site was disturbed or mitigation was performed.

Several residences are within 200 feet of the construction area for the proposed improvements. At that distance, fugitive PM_{10} emissions from construction activities would be noticeable, if uncontrolled. Mud and particulates from trucks would also be noticeable if construction trucks are routed through residential neighborhoods. Construction would require mitigation measures to comply with PSCAA regulations that require dust control during construction and prevent the deposition of mud on paved streets (PSCAA Regulation 1, Article 9). Measures to reduce the deposition of mud and emissions of particulates are identified in Chapter 7 (Mitigation).

In addition to particulate emissions, heavy trucks and construction equipment powered by gasoline and diesel engines would generate small particulates, CO, and NO_x in exhaust emissions. If construction traffic were to reduce the speed of other vehicles in the area, emissions from traffic would increase slightly while those vehicles are delayed. These emissions would be temporary and limited to the immediate area surrounding the construction site. It would contribute a small amount compared with automobile traffic in the project area, because construction traffic would be a very small fraction of the total traffic in the area.

Impacts experienced during the construction of the High-Level Fixed-Span Bridge Alternative would be greater than other bridge alternatives due to the extended alignment. Construction impacts resulting from the Mid-Level Fixed-Span Bridge Alternative would only be slightly greater than the Bascule Bridge Alternative.

Some construction phases (particularly during paving operations using asphalt) would result in short-term odors. These odors might be detectable to some people near the project site and would be diluted as distance from the site increases.

6.2.2 Operation

The predicted worst-case CO concentrations under all bridge alternatives for years 2007 and 2027 would not exceed the one-hour average NAAQS of 35 ppm for CO at any location (see Table 5). Vehicle emission factors will be higher in 2007 than later years; therefore, the analysis is conservative of potential impacts.

The proposed year 2007 High-Level Fixed-Span Bridge Alternative is anticipated to have the highest CO concentration at the 16th Avenue S. and East Marginal Way S. intersection and the 14th Avenue S. and S. Trenton Street intersection. The 14th Avenue S. and S. Cloverdale Street intersection no longer exists in the High-Level Fixed-Span Bridge Alternative. The 2007 High-Level Fixed-Span Bridge Alternative is anticipated to have the highest CO concentration because volumes served in 2007 by the High-Level Fixed-Span Bridge Alternative are substantially greater than what would be served by the No Action Alternative and slightly greater than the other bridge alternatives. Between years 2007 and 2027, the emissions per automobile would decrease as a result of implementing new, planned emissions technology. With a lower emissions factor, air quality would improve, resulting in the 2027 bridge alternatives having lower predicted CO concentrations than the 2007 bridge scenarios in most locations.

The predicted maximum eight-hour average CO concentrations for all bridge alternatives for the year 2007 and 2027 would not exceed the eight-hour average NAAQS CO of 9 ppm or the one-hour average NAAQS of 35 ppm for CO at any location. Since predicted 2027 CO emission levels were substantially lower than CO emission standards, no violation of the CO emission standards are anticipated in 2030.

6.3 Secondary and Cumulative Impacts

The air quality analysis described in this report was performed using projected traffic volumes for the future years. These projected traffic volumes incorporate anticipated traffic generation from planned development in the project area. The traffic model used anticipates future development and future traffic volumes in the area. Therefore, the air quality analysis includes the secondary and cumulative affects of the project and other traffic growth that would be associated with the project.

This page intentionally blank

Chapter 7 Mitigation

This chapter discusses mitigation measures involved in the construction and operation of the South Park Bridge.

7.1 Construction

Particulate emissions (in the form of fugitive dust during construction activities) are regulated by PSCAA. Operators of fugitive dust sources shall take reasonable precautions to prevent this dust from becoming airborne and shall maintain and operate the source to minimize emissions. Construction impacts could be reduced by incorporating the mitigation measures outlined in the Associated General Contractor of Washington Guidelines into the project's construction specifications. Possible mitigation measures to control PM_{10}, deposition of particulate matter and CO and NO_x emissions during construction include:

- Spray exposed soil with water or other dust palliatives to reduce PM_{10} emissions and deposition of particulate matter.
- Cover all trucks transporting materials, wet materials in trucks, or provide adequate freeboard (space from the top of the material to the top of the truck). This would reduce PM_{10} and deposition of particulates during transportation.
- Provide wheel washers to remove particulate matter that would otherwise be carried off-site. This would decrease deposition of particulate matter on area roadways.
- Remove particulate matter deposited on paved, public roads to reduce mud on area roadways.
- Route and schedule construction trucks to reduce traffic delays during peak travel times. This would reduce secondary air quality impacts caused by a reduction in traffic speeds while waiting for construction trucks.
- Place quarry spall aprons where trucks enter public roads to reduce mud track-out.
- Gravel or pave haul roads to reduce particulate emissions.
- Require appropriate emission-control devices on all construction equipment powered by gasoline or diesel fuel to reduce CO and NO_x emissions in vehicular exhaust. Use relatively new, well-maintained equipment to reduce CO and NO_x emissions.
- Plant vegetative cover as soon as possible after grading to reduce windblown particulates in the area.

- Route construction trucks away from residential areas to minimize annoyance from dust.

- Use specific retrofit technology for emission reduction on diesel construction equipment; also use Ultra Low Sulfur Diesel fuel to the greatest extent possible.

7.2 Operation

Operation of the bridge reduces travel distances resulting in a reduction in regional pollution. Optimized traffic signals would be used to reduce congestion. Because no exceedances of NAAQS are predicted, no design or operational changes would be required. All alternatives evaluated included optimized traffic control signal operations to reduce vehicle queuing and associated air pollution emissions.

Chapter 8 Conformity Determination

FHWA and WSDOT projects must comply with the project-level conformity criteria of the EPA Conformity Rule and with WAC Chapter 173-420. Regionally significant projects must be included in a conforming MTP and TIP by the regional MPO. The South Park Bridge project does not need to be included operationally in the MTP and TIP because it maintains or replaces an existing regionally significant connection without substantially changing the capacity of the facility. Should the No Action Alternative be selected, the MTP would require revision to reflect removal of the regionally significant link. As stated in 40 CFR Part 93, the following criteria must be met when determining project conformity. A brief summary of the project's conformity to the SIP is discussed with each criterion (criteria are indicated by italics).

- *The conformity determination must be based on the latest planning assumptions*. The project hot-spot analysis was completed using the latest version (February 2001) of the Puget Sound Region MOBILE 5b emission files used by PSRC. The project hot-spot locations are those locations known to have high traffic volumes or poor traffic operations, which would result in high air pollution concentration.

- *The conformity determination must be based on the latest emission estimation model available*. Emissions to determine conformity to the MTP and TIP were calculated using MOBILE 5b, the emission model used to model conformity to the current Puget Sound Air Quality Maintenance Plans.

- *The MPO must make the conformity determination according to the consultation procedures of this rule and the implementation plan revision required by Section 51.396*. The project is included in the PSRC's MTP and TIP. PSRC completed the conformity determination on the MTP and TIP in consultation with FHWA and U.S. EPA.

- *There must be a current conforming plan and a current conforming TIP at the time of project approval.* There is a current conforming MTP (*Destination 2030* adopted May 2001) and a current TIP (August, 2001).

- *The project must come from a conforming transportation plan and program.* The project is consistent with PSRC's MTP and TIP. The No Action Alternative would require change to the MTP to reflect removal of a regionally significant transportation link.

- *The FHWA project must not cause or contribute to any new localized (hot spots) CO or PM_{10} violation in CO and PM_{10} nonattainment or maintenance areas*. The project is located in a CO maintenance area. The project would not create any new regional violations or contribute to the frequency or severity of any existing violations of the NAAQS. The project area is in conformity for PM_{10}.

- *The FHWA project must comply with PM_{10} control measures in the applicable implementation plan*. The area is in conformity for PM_{10} so no implementation plan is required.

All alternatives except for the No Action Alternative are consistent with the PSRC's MTP and TIP, which have been demonstrated to conform to the SIP. Therefore, they would meet the regional conformity requirements. The project meets the local hot-spot conformity requirements of the date of analysis (October 2002). If the No Action Alternative is selected, the MTP and TIP would require revision and modeling to determine conformity. All alternatives meet the requirements of 40 CFR Part 93 and WAC 173-420 and conform to the SIP.

Air quality conformity analysis remains valid unless more than three years have elapsed since the most recent major project step, such as completion of environmental process, start of final design, acquisition of a significant portion of the right-of-way, or approval of the plans, specifications, and estimates (40 CFR Part 93.102[c]). Should the conformity analysis lapse as a result of lack of project progress, the analysis would have to be updated to the MTP horizon year using the latest planning assumptions available at the time of the conformity update.

Chapter 9 References

Associated General Contractors of Washington. *Guide to Handling Fugitive Dust from Construction Projects*. Seattle, WA, 1997.

Benson, Paul E., 1979. *CALINE3—A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets.*

California Department of Transportation, 1979. *Report Number FHWA/CA/TL-79/23*. November 1979.

Code of Federal Regulations, 1997. 40 CFR Part 93 Determining Conformity of Federal Actions to State or Federal Implementation Plans. Washington, D.C., 1997.

Erlich, P.R., Erlich, A. H., and Holdren, J. P., 1977. *Ecoscience*. W. H. Freeman and Company. San Francisco, 1977.

National Research Council. *Rethinking the Ozone Problem in Urban and Regional Air Pollution.* Washington, D.C., 1992.

Parsons Brinckerhoff Quade & Douglas, Inc, 2002. *South Park Bridge Project Transportation Technical Report*. Seattle, Washington, 2004.

Puget Sound Clean Air Agency, 2002. *Draft Puget Sound Air Toxics Evaluation*. Seattle, Washington, 2002.

Puget Sound Clean Air Agency (formerly Puget Sound Air Pollution Control Agency), 1993. *Regulation 1 of the Puget Sound Air Pollution Control Agency*. Seattle, Washington, 1993.

Puget Sound Clean Air Agency (formerly Puget Sound Air Pollution Control Agency), 1997. *Techniques for Improving Project Level Conformity Analyses in the Puget Sound Metropolitan Area*. Seattle, Washington, 1997.

Puget Sound Clean Air Agency, 1999. *Final Report of the Puget Sound Clean Air Agency $PM_{2.5}$ Stakeholder Group.* Seattle, Washington, 1999.

Puget Sound Regional Council, 1995. *Guidebook for Conformity and Air Quality Analysis Assistance for Nonattainment Areas*. Seattle, Washington, 1995.

Puget Sound Regional Council, 2001. *Guidelines for the Interim Use of Adjusted CO Mobile Output Files for Project Level Conformity*. Seattle, Washington, 2001.

Puget Sound Regional Council, 1998. *Metropolitan Transportation Plan, 1998 Progress Report.* Seattle, Washington, 1998.

Puget Sound Regional Council, 2000. *Puget Sound Trends: Growth in Traffic and Vehicle Miles Traveled.* Seattle, Washington, August 2000.

Puget Sound Regional Council, 2001. *Destination 2030 Metropolitan Transportation Plan for the Central Puget Sound Region.* Seattle, Washington, 2001.

Puget Sound Regional Council, 2001. *Guidelines for the Interim Use of Adjusted CO Mobile Output Files for Project Level Conformity.* Seattle, Washington, 2001.

U.S. Environmental Protection Agency, 2002. *Latest Findings on National Air Quality 2001 Status and Trends*. Report Number EPA-454/K-02-001.

U.S. Environmental Protection Agency, 2000. *Air Quality Index: A Guide to Air Quality and Your Health.* Report Number EPA-454/R00-R005.

U.S. Environmental Protection Agency, 1999. *Transportation Air Quality*. March 1999.

U.S. Environmental Protection Agency, 1995. *Compilation of Air Pollutant Emission Factors,* Fifth Edition (AP-42), 1995.

U.S. Environmental Protection Agency, 1994. *Users Guide to MOBILE5*. Report Number EPA-AA-AQAB-94-01. Ann Arbor, Michigan, 1994.

U.S. Environmental Protection Agency, 1993. *Motor Vehicle-Related Air Toxics Study*. Report Number EPA-420-R-93-005. Ann Arbor, Michigan, 1993.

U.S. Environmental Protection Agency, 1992. *Automobiles and Carbon Monoxide, Fact Sheet Number EPA-400-F-92-005*. Ann Arbor, Michigan, 1992.

U.S. Environmental Protection Agency, 1986. *Guideline on Air Quality Models* (Revised, 1993) Report Number EPA-450/2-78-027R, 1986.

U.S. Environmental Protection Agency, 1990. *Clean Air Act Amendments of 1990: Detailed Summary of Titles,* 1990.

U.S. Environmental Protection Agency, 1992. *Guideline for Modeling Carbon Monoxide From Roadway Intersections*. Report Number EPA-454/R-92-005. Research Triangle Park, North Carolina, November 1992.

U.S. Environmental Protection Agency, 1993. *MOBILE5 Information Sheet #2: Estimating Idle Emission Factors Using Mobile5,* July 30, 1993.

U.S. Environmental Protection Agency, 1995. *User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*. Report Number EPA-454/R-92-006. Research Triangle Park, North Carolina, September 1995.

Washington Administrative Code, 1996. Chapter 173-420. *Conformity of Transportation Activities to Air Quality Implementation Plans*. Olympia, Washington, 1996.

Washington State Department of Ecology, 1995. *Guidebook for Conformity and Air Quality Analysis Assistance for Nonattainment Areas.* Olympia, Washington, 1995.

Washington State Department of Ecology, 1999. *1998 Air Quality Data Summary*. Olympia, Washington, 1999.

Washington State Department of Ecology, 2000. *1999 Air Quality Trends in Washington*. Olympia, Washington, 2000.

Washington State Department of Ecology, 1999. *1998 Washington State Air Quality Report*. Publication 98-213. Olympia, Washington, April 1999

Wayne, Richard, 1991. *Chemistry of Atmospheres*. Oxford University Press, Oxford, England, 1991.

This page left intentionally blank

Appendix A Air Quality Data Files

This page intentionally blank

EXISTING CONDITIONS – 16TH AVENUE S. / EAST MARGINAL WAY S.

```
1                    CAL3QHC - (DATED 95221)


              CAL3QHC  PC (32 BIT) VERSION 3.0.0

             (C) COPYRIGHT 1993-2000, TRINITY CONSULTANTS


 Run Began on  9/06/2002 at 14:29:50


      JOB: SOUTHPARK PROJECT                                    RUN: EXISTING MARGINAL WAY


      DATE : 09/06/   0

      TIME : 14:29:50


         The MODE flag has been set to C for calculating CO averages.


       SITE & METEOROLOGICAL VARIABLES

       -------------------------------

       VS =   0.0 CM/S       VD =   0.0 CM/S       Z0 = 108. CM
```

U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)			(G/MI)	(FT)	(FT)		(VEH)
1. 16TH NB	*	625.0	-750.0	0.0	0.0	*	976.	320.	AG	530.	20.1	0.0	60.0		
2. 16TH QUE LT	*	66.7	-88.6	115.9	-147.6	*	77.	140.	AG	2316.	100.0	0.0	30.0	0.46	3.9
3. 16TH QUE RT	*	82.6	-76.0	101.5	-98.7	*	30.	140.	AG	772.	100.0	0.0	10.0	0.19	1.5
4. 16TH SB	*	-18.0	-42.6	607.0	-792.6	*	976.	140.	AG	930.	20.1	0.0	40.0		
5. MARGINAL SE 1	*	-1000.0	-16.0	0.0	-16.0	*	1000.	90.	AG	1375.	15.2	0.0	52.0		
6. MAR SE QUE TH RT	*	-60.0	-10.0	-204.4	-10.0	*	144.	270.	AG	943.	100.0	0.0	20.0	0.65	7.3
7. MAR SE QUE E RT	*	-60.0	-26.0	-116.7	-26.0	*	57.	270.	AG	214.	100.0	0.0	10.0	0.42	2.9
8. MARGINAL SE 2	*	0.0	-12.0	1000.0	-12.0	*	1000.	90.	AG	605.	15.2	0.0	24.0		
9. MARGINAL NW 1	*	1000.0	22.0	0.0	22.0	*	1000.	270.	AG	595.	15.2	0.0	64.0		
10. MAR NW QUE LT	*	60.0	6.0	111.9	6.0	*	52.	90.	AG	815.	100.0	0.0	12.0	0.39	2.6
11. MAR NW QUE TH	*	60.0	28.0	87.1	28.0	*	27.	90.	AG	772.	100.0	0.0	32.0	0.16	1.4
12. MAR NW 2	*	0.0	16.0	-1000.0	16.0	*	1000.	270.	AG	965.	15.2	0.0	52.0		

PAGE 2

JOB: SOUTHPARK PROJECT RUN: EXISTING MARGINAL WAY

DATE : 09/06/ 0

TIME : 14:29:50

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 16TH QUE LT	120	90	2.0	470	1562	383.70	1	3
3. 16TH QUE RT	120	90	2.0	60	1487	383.70	1	3
6. MAR SE QUE TH RT	120	55	2.0	960	1447	383.70	1	3
7. MAR SE QUE E RT	120	25	2.0	415	1315	383.70	1	3
10. MAR NW QUE LT	120	95	2.0	100	1466	383.70	1	3
11. MAR NW QUE TH	120	30	2.0	495	1405	383.70	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z

```
 1. RECEPTOR 1          *        75.7      -43.5        0.0   *
 2. RECEPTOR 2          *       123.6     -101.1        0.0   *
 3. RECEPTOR 3          *       171.6     -158.8        0.0   *
 4. RECEPTOR 4          *       219.6     -216.4        0.0   *
 5. RECEPTOR 5          *       267.6     -274.1        0.0   *
 6. RECEPTOR 6          *       315.6     -331.7        0.0   *
 7. RECEPTOR 7          *       363.5     -389.3        0.0   *
 8. RECEPTOR 10         *        -7.5      -87.5        0.0   *
 9. RECEPTOR 11         *        40.4     -145.1        0.0   *
10. RECEPTOR 12         *        88.4     -202.8        0.0   *
11. RECEPTOR 13         *       136.4     -260.4        0.0   *
12. RECEPTOR 14         *       184.3     -318.1        0.0   *
13. RECEPTOR 15         *       232.3     -375.7        0.0   *
14. RECEPTOR 16         *       280.3     -433.4        0.0   *
15. RECEPTOR 20         *      -424.8       41.6        0.0   *
16. RECEPTOR 21         *      -349.8       41.6        0.0   *
17. RECEPTOR 22         *      -274.8       41.6        0.0   *
18. RECEPTOR 23         *      -199.8       41.6        0.0   *
19. RECEPTOR 24         *      -124.8       41.6        0.0   *
20. RECEPTOR 25         *       -49.8       41.6        0.0   *
21. RECEPTOR 26         *         0.8       54.4        0.0   *
22. RECEPTOR 27         *        75.8       54.4        0.0   *
```

23. RECEPTOR 28	*	150.8	54.4	0.0	*
24. RECEPTOR 29	*	225.8	54.4	0.0	*
25. RECEPTOR 30	*	300.8	54.4	0.0	*
26. RECEPTOR 31	*	375.8	54.4	0.0	*
27. RECEPTOR 32	*	450.8	54.4	0.0	*
28. RECEPTOR 34	*	-424.8	-41.5	0.0	*
29. RECEPTOR 35	*	-349.8	-41.5	0.0	*
30. RECEPTOR 36	*	-274.8	-41.5	0.0	*
31. RECEPTOR 37	*	-199.8	-41.5	0.0	*
32. RECEPTOR 38	*	-124.8	-41.5	0.0	*
33. RECEPTOR 39	*	-49.8	-41.5	0.0	*
34. RECEPTOR 40	*	0.1	-24.2	0.0	*
35. RECEPTOR 41	*	75.1	-24.2	0.0	*
36. RECEPTOR 42	*	150.1	-24.2	0.0	*
37. RECEPTOR 43	*	225.1	-24.2	0.0	*
38. RECEPTOR 44	*	300.1	-24.2	0.0	*
39. RECEPTOR 45	*	375.1	-24.2	0.0	*

JOB: SOUTHPARK PROJECT RUN: EXISTING MARGINAL WAY

DATE : 09/06/ 0

TIME : 14:29:50

```
RECEPTOR LOCATIONS
------------------
                        *          COORDINATES (FT)         *
  RECEPTOR              *      X          Y          Z       *
-------------------------*-------------------------------------*
40. RECEPTOR 46          *       450.1      -24.2        0.0   *
```



```
JOB: SOUTHPARK PROJECT                                  RUN: EXISTING MARGINAL WAY

MODEL RESULTS
-------------

REMARKS : In search of the angle corresponding to
          the maximum concentration, only the first
          angle, of the angles with same maximum
          concentrations, is indicated as maximum.

WIND ANGLE RANGE:   0.-350.
```

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	5.1	3.5	3.2	3.2	3.2	3.2	3.1	4.3	4.9	8.7	5.7	4.6	4.3	4.2	3.1	3.1	3.1	3.1	3.1	3.1
10.	5.0	3.3	3.2	3.2	3.2	3.2	3.1	4.4	5.8	8.3	4.6	4.3	4.2	4.1	3.0	3.0	3.0	3.0	3.0	3.0
20.	4.7	3.2	3.2	3.2	3.2	3.1	3.1	4.4	6.5	7.0	4.2	4.1	4.0	3.9	3.0	3.0	3.0	3.0	3.0	3.0
30.	4.3	3.2	3.2	3.2	3.2	3.2	3.1	4.5	7.5	5.8	4.1	4.1	4.0	4.0	3.1	3.1	3.1	3.1	3.1	3.1
40.	3.9	3.2	3.2	3.2	3.2	3.2	3.1	4.7	8.3	4.9	4.1	4.1	4.0	4.0	3.1	3.1	3.1	3.1	3.1	3.1
50.	3.7	3.2	3.2	3.2	3.2	3.2	3.0	4.9	8.7	4.4	4.2	4.2	4.1	4.0	3.1	3.1	3.1	3.1	3.1	3.1
60.	3.6	3.2	3.2	3.2	3.2	3.0	3.0	4.6	8.6	4.1	4.1	4.1	3.9	3.9	3.1	3.1	3.1	3.1	3.1	3.1
70.	3.6	3.3	3.2	3.2	3.0	3.0	3.0	4.9	8.3	4.1	4.1	3.9	3.9	3.9	3.2	3.2	3.2	3.1	3.1	3.3
80.	3.5	3.2	3.2	3.0	3.0	3.0	3.0	5.5	7.7	3.9	3.9	3.9	3.9	3.9	3.7	3.7	3.5	3.5	3.6	3.7
90.	3.3	3.1	3.0	3.0	3.0	3.0	3.0	6.7	6.8	4.1	4.1	4.1	4.1	4.1	4.6	4.7	4.7	4.4	4.1	4.3
100.	3.1	3.0	3.0	3.0	3.0	3.0	3.0	7.4	5.7	4.2	4.2	4.2	4.2	4.2	5.4	5.7	5.8	5.2	4.7	4.7
110.	3.1	3.1	3.1	3.1	3.1	3.1	3.1	7.4	4.9	4.3	4.3	4.3	4.3	4.3	5.3	5.5	6.3	6.4	5.2	4.7
120.	3.1	3.1	3.1	3.1	3.1	3.1	3.1	6.6	4.7	4.4	4.4	4.4	4.4	4.4	4.7	5.2	6.0	6.9	6.1	5.1
130.	3.8	3.4	3.4	3.3	3.3	3.2	3.2	5.6	4.6	4.6	4.6	4.5	4.4	4.4	4.3	4.6	5.4	6.7	6.7	5.6
140.	5.2	3.7	3.7	3.7	3.7	3.7	3.6	4.5	4.3	4.3	4.2	4.1	4.1	4.1	4.1	4.2	4.5	6.2	6.7	6.0
150.	7.3	4.0	4.0	3.9	3.9	3.9	3.9	3.7	3.7	3.7	3.6	3.5	3.5	3.5	4.0	4.0	4.1	5.7	6.1	5.5
160.	9.1	4.4	4.0	4.0	4.0	4.0	4.0	3.2	3.2	3.2	3.2	3.2	3.2	3.2	4.0	4.0	4.0	5.5	5.8	4.7
170.	9.5	5.1	3.9	3.9	3.9	3.9	3.9	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.0	4.0	4.0	5.3	5.7	4.3

180.	*	8.5	6.2	3.8	3.8	3.8	3.8	3.8	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.1	4.1	4.1	5.1	5.8	4.7
190.	*	7.0	7.4	3.8	3.8	3.8	3.8	3.8	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.0	4.0	4.0	4.6	5.6	4.9
200.	*	5.5	8.3	3.7	3.7	3.7	3.7	3.7	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.0	4.0	4.0	4.3	5.6	5.3
210.	*	4.4	8.9	3.6	3.6	3.6	3.6	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.0	4.0	4.0	4.1	5.6	5.6
220.	*	3.9	9.4	3.7	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	4.1	4.1	4.1	5.7	5.9
230.	*	3.7	9.6	3.7	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	4.2	4.2	4.2	5.5	6.1
240.	*	3.7	9.5	3.7	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	4.3	4.3	4.3	5.1	5.9
250.	*	3.8	9.6	3.8	3.6	3.6	3.6	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.5	4.5	4.5	4.5	4.9	5.7
260.	*	4.4	10.0	4.3	3.7	3.7	3.7	3.7	3.2	3.1	3.1	3.1	3.1	3.1	3.1	4.4	4.5	4.5	4.6	4.7	5.2
270.	*	5.2	10.2	5.3	3.8	3.7	3.7	3.7	3.6	3.3	3.2	3.1	3.1	3.1	3.1	4.0	4.1	4.1	4.1	4.1	4.4
280.	*	5.6	10.1	7.0	4.4	4.0	3.9	3.9	4.1	3.6	3.4	3.3	3.2	3.1	3.1	3.5	3.5	3.5	3.5	3.5	3.5
290.	*	5.0	8.9	8.5	5.2	4.5	4.3	4.1	4.7	3.9	3.5	3.4	3.3	3.3	3.3	3.2	3.2	3.2	3.2	3.2	3.2
300.	*	4.5	7.0	8.5	6.0	5.2	4.7	4.5	5.1	4.2	3.9	3.7	3.6	3.5	3.5	3.1	3.1	3.1	3.1	3.1	3.1
310.	*	4.0	5.4	7.1	6.0	5.3	4.9	4.6	5.2	4.6	4.1	4.1	4.1	4.0	3.9	3.1	3.1	3.1	3.1	3.1	3.1
320.	*	3.8	4.5	5.6	5.4	4.8	4.5	4.2	5.0	4.7	4.6	4.9	4.9	4.9	4.9	3.1	3.1	3.1	3.1	3.1	3.1
330.	*	3.9	4.1	4.1	4.2	3.9	3.7	3.6	4.7	4.6	5.0	6.0	5.8	5.5	5.1	3.1	3.1	3.1	3.1	3.1	3.1
340.	*	4.4	4.1	3.6	3.6	3.5	3.3	3.2	4.4	4.4	6.4	6.5	5.7	5.2	4.9	3.0	3.0	3.0	3.0	3.0	3.0
350.	*	4.8	3.9	3.5	3.3	3.3	3.3	3.2	4.3	4.7	7.9	6.5	5.3	4.7	4.4	3.0	3.0	3.0	3.0	3.0	3.0
MAX	*	9.5	10.2	8.5	6.0	5.3	4.9	4.6	7.4	8.7	8.7	6.5	5.8	5.5	5.1	5.4	5.7	6.3	6.9	6.7	6.1
DEGR.	*	170	270	300	310	310	310	310	100	50	0	350	330	330	330	100	100	110	120	130	230

JOB: SOUTHPARK PROJECT RUN: EXISTING MARGINAL WAY

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	4.1	4.1	5.6	6.3	4.4	4.2	6.2	3.7	3.7	3.7	3.7	3.7
10.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	5.9	6.3	4.2	4.3	6.0	3.6	3.6	3.6	3.6	3.6
20.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	6.1	6.4	4.0	4.2	5.6	3.6	3.6	3.6	3.6	3.6
30.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	4.1	4.1	6.3	6.6	4.1	4.2	5.4	3.7	3.7	3.7	3.7	3.7
40.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	4.1	4.2	6.4	6.8	4.3	4.7	5.1	3.7	3.7	3.7	3.7	3.7

50.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	4.3	4.7	6.8	6.9	4.5	5.2	4.8	3.8	3.8	3.8	3.8	3.8
60.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.6	4.7	5.3	6.9	6.9	4.9	5.7	4.5	3.9	3.9	3.9	3.9	3.9
70.	*	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.9	5.1	6.1	7.1	6.6	4.9	5.7	4.3	4.1	4.1	4.1	4.1	4.0
80.	*	3.3	3.2	3.2	3.2	3.2	3.2	3.2	5.5	5.8	6.4	6.6	5.9	4.9	5.5	4.3	4.0	4.0	4.0	4.0	4.0
90.	*	3.9	3.5	3.5	3.5	3.5	3.5	3.5	5.2	5.5	5.8	5.6	5.1	4.7	4.7	3.8	3.8	3.8	3.8	3.8	3.8
100.	*	4.4	3.7	3.7	3.7	3.7	3.7	3.6	4.2	4.4	4.6	4.8	5.0	5.2	4.4	3.5	3.5	3.5	3.5	3.5	3.5
110.	*	4.8	3.8	3.7	3.7	3.7	3.7	3.7	3.6	3.9	4.0	4.1	4.8	5.7	4.8	3.2	3.2	3.2	3.2	3.2	3.2
120.	*	4.7	3.9	3.6	3.6	3.6	3.6	3.6	3.3	3.4	3.5	3.8	4.4	6.0	6.1	3.1	3.1	3.1	3.1	3.1	3.1
130.	*	5.0	4.2	3.6	3.6	3.6	3.6	3.6	3.2	3.2	3.3	3.5	3.9	5.5	7.4	3.3	3.1	3.1	3.1	3.1	3.1
140.	*	5.4	4.8	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.2	3.4	4.6	7.4	4.0	3.2	3.0	3.0	3.0	3.0
150.	*	5.7	5.9	3.6	3.6	3.4	3.4	3.4	3.1	3.1	3.1	3.1	3.2	3.7	6.5	5.5	3.4	3.2	3.0	3.0	3.0
160.	*	5.4	7.2	3.7	3.6	3.6	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.2	5.3	7.2	3.4	3.3	3.2	3.1	3.0
170.	*	4.6	8.5	3.8	3.7	3.6	3.6	3.5	3.1	3.1	3.1	3.1	3.1	3.1	4.4	7.9	3.5	3.3	3.2	3.2	3.2
180.	*	4.3	8.6	4.2	3.7	3.6	3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	4.1	7.3	3.8	3.3	3.3	3.2	3.2
190.	*	4.0	7.8	4.9	3.7	3.6	3.6	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.9	6.0	4.5	3.3	3.2	3.2	3.2
200.	*	4.2	6.4	5.3	4.0	3.6	3.6	3.6	3.1	3.1	3.1	3.1	3.1	3.1	4.1	4.6	5.4	3.4	3.2	3.2	3.2
210.	*	4.2	5.7	5.1	4.6	3.8	3.6	3.6	3.1	3.1	3.1	3.1	3.1	3.1	4.1	3.9	6.0	3.7	3.2	3.2	3.2
220.	*	4.5	5.0	5.0	4.8	4.2	3.9	3.7	3.1	3.1	3.1	3.1	3.1	3.1	4.0	3.7	6.0	4.2	3.4	3.2	3.2
230.	*	5.1	4.8	4.9	4.7	4.6	4.2	4.0	3.1	3.1	3.1	3.1	3.1	3.1	4.0	3.6	5.4	4.9	3.8	3.5	3.3
240.	*	5.4	5.0	5.3	4.8	4.6	4.5	4.2	3.1	3.1	3.1	3.1	3.1	3.1	4.0	3.8	4.5	5.0	4.3	3.7	3.5
250.	*	5.2	5.1	5.4	5.0	4.6	4.7	4.6	3.2	3.3	3.3	3.3	3.3	3.3	4.6	3.9	4.1	4.6	4.3	4.1	3.8
260.	*	4.7	4.8	5.3	4.9	4.6	4.4	4.5	3.7	3.7	3.7	3.7	3.7	4.0	6.0	4.9	4.3	4.6	4.8	4.6	4.3

270.	*	3.9	4.2	4.5	4.2	4.1	4.2	4.1	4.3	4.3	4.4	4.4	4.6	5.5	7.2	5.8	5.3	5.3	5.2	4.9	4.6
280.	*	3.3	3.5	3.5	3.6	3.6	3.5	3.5	4.7	4.8	4.8	4.8	5.5	6.8	7.5	5.9	5.8	5.4	4.9	4.7	4.6
290.	*	3.0	3.1	3.1	3.1	3.1	3.1	3.1	4.6	4.6	4.6	4.6	6.0	7.5	6.7	4.9	5.6	4.7	4.4	4.3	4.0
300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	4.5	4.5	4.5	6.5	7.6	5.4	4.3	5.4	4.3	3.9	3.9	3.9
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	4.3	4.3	4.3	6.6	7.2	4.7	4.0	4.9	3.9	3.8	3.8	3.8
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	4.2	4.2	4.3	6.5	6.7	4.3	4.1	4.4	3.7	3.7	3.7	3.7
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	4.1	4.1	4.3	6.3	6.0	4.4	4.6	3.9	3.7	3.7	3.7	3.7
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.5	6.2	5.3	4.4	5.2	3.6	3.6	3.6	3.6	3.6
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	5.0	6.2	4.8	4.2	5.8	3.6	3.6	3.6	3.6	3.6
MAX	*	5.7	8.6	5.4	5.0	4.6	4.7	4.6	5.5	5.8	6.4	7.1	6.9	7.6	7.5	7.9	6.0	5.4	5.2	4.9	4.6
DEGR.	*	150	180	250	250	260	250	250	80	80	80	70	50	300	280	170	220	280	270	270	280

THE HIGHEST CONCENTRATION OF 10.20 PPM OCCURRED AT RECEPTOR REC2 .

PAGE 6

JOB: SOUTHPARK PROJECT RUN: EXISTING MARGINAL WAY

DATE : 09/06/ 0

TIME : 14:29:50

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	170	270	300	310	310	310	310	100	50	0	350	330	330	330	100	100	110	120	130	230
1	0.5	0.4	0.5	0.6	0.6	0.6	0.6	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.0
2	4.8	5.3	3.8	1.7	1.0	0.6	0.4	2.9	4.1	3.7	1.7	1.0	0.7	0.5	0.2	0.2	0.4	0.6	0.8	0.0
3	0.8	0.8	0.2	0.1	0.1	0.0	0.0	0.3	0.4	0.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0
4	0.4	0.3	0.2	0.2	0.2	0.3	0.3	0.9	0.8	0.9	1.0	1.1	1.2	1.2	0.1	0.1	0.1	0.2	0.4	0.0
5	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.4	0.4	0.5	0.5	0.5	0.5
6	0.0	0.1	0.4	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.5	0.7	1.3	1.5	1.0	1.8
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.9	0.9	0.8	0.7	0.6	0.7

PAGE 7

JOB: SOUTHPARK PROJECT RUN: EXISTING MARGINAL WAY

DATE : 09/06/ 0

TIME : 14:29:50

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	150	180	250	250	260	250	250	80	80	80	70	50	300	280	170	220	280	270	270	280
1	0.4	0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.4	0.2	0.1	0.1	0.1	0.0
2	1.3	1.4	0.0	0.1	0.0	0.4	0.4	0.1	0.1	0.1	0.0	0.0	0.0	0.0	3.5	2.2	0.0	0.2	0.2	0.1
3	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.4	0.0	0.0	0.0	0.0
4	0.4	0.2	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.0	0.1	0.1	0.0
5	0.0	0.0	0.3	0.2	0.3	0.1	0.1	1.3	1.3	1.2	1.1	0.9	1.1	1.6	0.0	0.0	0.3	0.3	0.2	0.1
6	0.0	0.0	0.4	0.3	0.3	0.1	0.1	0.5	0.8	1.4	2.2	2.1	2.5	1.8	0.0	0.0	0.3	0.3	0.2	0.1
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.6	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0
8	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.7	0.6	0.6	0.7
9	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.3

```
10  *   0.1   1.0   0.4   0.4   0.2   0.1   0.1   0.1   0.1   0.1   0.1   0.0   0.0   0.0   0.0   0.0   0.4   0.2   0.1   0.1
11  *   0.0   2.2   0.5   0.2   0.1   0.0   0.0   0.0   0.0   0.1   0.1   0.0   0.0   0.0   0.0   0.0   0.2   0.1   0.1   0.1
12  *   0.0   0.0   0.2   0.1   0.2   0.0   0.0   0.3   0.3   0.2   0.3   0.3   0.4   0.6   0.0   0.0   0.2   0.2   0.1   0.1
```

EXISTING CONDITIONS – 14TH AVENUE SOUTH / SOUTH CLOVERDALE AND SOUTH TRENTON STREETS

```
1                    CAL3QHC - (DATED 95221)


             CAL3QHC  PC (32 BIT) VERSION 3.0.0

            (C) COPYRIGHT 1993-2000, TRINITY CONSULTANTS


 Run Began on  9/06/2002 at 14:36:51


      JOB: SOUTHPARK BRIDGE PROJECT                          RUN: EXISTING CLOVERDALE & TRENTON


      DATE : 09/06/   0

      TIME : 14:36:51


         The MODE flag has been set to C for calculating CO averages.


       SITE & METEOROLOGICAL VARIABLES
```

```
-------------------------------

VS =   0.0 CM/S       VD =   0.0 CM/S       Z0 = 108. CM

 U =  1.0 M/S         CLAS =   4  (D)     ATIM =  60. MINUTES     MIXH =  1000. M   AMB =  3.0 PPM


LINK VARIABLES

--------------

  LINK DESCRIPTION     *         LINK COORDINATES (FT)          *    LENGTH  BRG TYPE   VPH    EF      H   W    V/C QUEUE

                       *   X1        Y1        X2        Y2     *     (FT)  (DEG)           (G/MI)  (FT) (FT)       (VEH)

------------------------*----------------------------------------*-------------------------------------------------------

 1. 14TH NB 1          *     10.0   -1000.0      10.0       0.0 *    1000.   360. AG    510.  20.1   0.0 40.0

 2. 14TH NB QUE ALL    *     10.0     -30.0      10.0     -64.9 *      35.   180. AG    515. 100.0   0.0 20.0 0.22   1.8

 3. 14TH NB 2          *     10.0       0.0      10.0     600.0 *     600.   360. AG    500.  20.1   0.0 40.0

 4. 14TH NB QUE ALL    *     10.0     560.0      10.0     491.2 *      69.   180. AG   1070. 100.0   0.0 20.0 0.34   3.5

 5. 14TH NB 3          *     10.0     600.0      10.0    1600.0 *    1000.   360. AG    510.  20.1   0.0 40.0

 6. 14TH SB 1          *    -10.0    1600.0     -10.0     600.0 *    1000.   180. AG    926.  20.1   0.0 40.0

 7. 14TH SB QUE ALL    *    -10.0     630.0     -10.0    1100.0 *     132.   360. AG   1070. 100.0   0.0 20.0 0.67   6.7

 8. 14TH SB 2          *    -10.0     600.0     -10.0       0.0 *     600.   180. AG    710.  20.1   0.0 40.0

 9. 14TH SB QUE ALL    *    -10.0      30.0     -10.0     500.0 *      47.   360. AG    515. 100.0   0.0 20.0 0.29   2.4

10. 14TH SB 3          *    -10.0       0.0     -10.0   -1000.0 *    1000.   180. AG    720.  20.1   0.0 40.0

11. TRENTON EB 1       *  -1000.0      -6.0       0.0      -6.0 *    1000.    90. AG     20.  24.1   0.0 32.0

12. TRENTON EB QUE ALL *    -40.0      -6.0     -48.2      -6.0 *       8.   270. AG    772. 100.0   0.0 12.0 0.06   0.4

13. TRENTON EB 2       *      0.0      -6.0    1000.0      -6.0 *    1000.    90. AG     40.  24.1   0.0 32.0
```

14. TRENTON WB 1	*	1000.0	6.0	0.0	6.0	*	1000.	270.	AG	110.	24.1	0.0	32.0	
15. TRENTON WB QUE ALL	*	40.0	6.0	85.1	6.0	*	45.	90.	AG	772.	100.0	0.0	12.0 0.32	2.3
16. TRENTON WB 2	*	0.0	6.0	-1000.0	6.0	*	1000.	270.	AG	35.	24.1	0.0	32.0	
17. CLOVERDALE EB 1	*	-1000.0	590.0	0.0	590.0	*	1000.	90.	AG	315.	20.1	0.0	40.0	
18. CLOVERDALE EB QUE LT	*	-40.0	595.0	-97.6	595.0	*	58.	270.	AG	700.	100.0	0.0	10.0 0.35	2.9
19. CLOVERDALE EB QUE AL	*	-40.0	585.0	-99.5	585.0	*	59.	270.	AG	700.	100.0	0.0	10.0 0.40	3.0
20. CLOVERDALE EB 2	*	0.0	595.0	1000.0	595.0	*	1000.	90.	AG	11.	20.1	0.0	30.0	
21. CLOVERDALE WB 1	*	1000.0	605.0	0.0	605.0	*	1000.	270.	AG	20.	20.1	0.0	30.0	
22. CLOVERDALE WB QUE AL	*	40.0	605.0	48.7	605.0	*	9.	90.	AG	823.	100.0	0.0	10.0 0.08	0.4
23. CLOVERDALE WB 2	*	0.0	605.0	-1000.0	605.0	*	1000.	270.	AG	505.	20.1	0.0	30.0	

PAGE 2

JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

DATE : 09/06/ 0

TIME : 14:36:51

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE

2. 14TH NB QUE ALL	*	100	25	2.0	510	1641	383.70	1	3
4. 14TH NB QUE ALL	*	100	52	2.0	485	1622	383.70	1	3
7. 14TH SB QUE ALL	*	100	52	2.0	926	1564	383.70	1	3
9. 14TH SB QUE ALL	*	100	25	2.0	695	1689	383.70	1	3
12. TRENTON EB QUE ALL	*	100	75	2.0	20	1658	383.70	1	3
15. TRENTON WB QUE ALL	*	100	75	2.0	110	1641	383.70	1	3
18. CLOVERDALE EB QUE LT	*	100	68	2.0	155	1594	383.70	1	3
19. CLOVERDALE EB QUE AL	*	100	68	2.0	160	1444	383.70	1	3
22. CLOVERDALE WB QUE AL	*	100	80	2.0	20	1524	383.70	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC1	75.0	620.0	6.0
2. REC2	150.0	620.0	6.0
3. REC3	225.0	620.0	6.0
4. REC4	300.0	620.0	6.0
5. REC5	375.0	620.0	6.0
6. REC6	450.0	620.0	6.0
7. REC7	-75.0	620.0	6.0

```
 8. REC8                 *      -150.0      620.0        6.0   *

 9. REC9                 *      -225.0      620.0        6.0   *

10. REC10                *      -300.0      620.0        6.0   *

11. REC11                *      -375.0      620.0        6.0   *

12. REC12                *      -450.0      620.0        6.0   *

13. REC13                *        75.0      580.0        6.0   *

14. REC14                *       150.0      580.0        6.0   *

15. REC15                *       225.0      580.0        6.0   *

16. REC16                *       300.0      580.0        6.0   *

17. REC17                *       375.0      580.0        6.0   *

18. REC18                *       450.0      580.0        6.0   *

19. REC19                *       -75.0      570.0        6.0   *

20. REC20                *      -150.0      570.0        6.0   *

21. REC21                *      -225.0      570.0        6.0   *

22. REC22                *      -300.0      570.0        6.0   *

23. REC23                *      -375.0      570.0        6.0   *

24. REC24                *      -450.0      570.0        6.0   *

25. REC25                *        30.0      525.0        6.0   *

26. REC26                *        30.0      675.0        6.0   *

27. REC27                *        30.0      750.0        6.0   *

28. REC28                *        30.0      825.0        6.0   *

29. REC29                *        30.0      900.0        6.0   *
```

30. REC30	*	30.0	975.0	6.0	*
31. REC31	*	30.0	1050.0	6.0	*
32. REC32	*	-30.0	525.0	6.0	*
33. REC33	*	-30.0	675.0	6.0	*
34. REC34	*	-30.0	750.0	6.0	*
35. REC35	*	-30.0	825.0	6.0	*
36. REC36	*	-30.0	900.0	6.0	*

JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

DATE : 09/06/ 0

TIME : 14:36:51

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
37. REC37	-30.0	975.0	6.0
38. REC38	-30.0	1050.0	6.0

```
39. REC39                *        30.0      375.0        6.0   *

40. REC40                *        30.0      450.0        6.0   *

41. REC41                *       -30.0      375.0        6.0   *

42. REC42                *       -30.0      450.0        6.0   *

43. REC43                *        75.0       22.0        6.0   *

44. REC44                *       150.0       22.0        6.0   *

45. REC45                *       225.0       22.0        6.0   *

46. REC46                *       300.0       22.0        6.0   *

47. REC47                *       375.0       22.0        6.0   *

48. REC48                *       450.0       22.0        6.0   *

49. REC49                *       -75.0       22.0        6.0   *

50. REC50                *      -150.0       22.0        6.0   *

51. REC51                *      -225.0       22.0        6.0   *

52. REC52                *      -300.0       22.0        6.0   *

53. REC53                *      -375.0       22.0        6.0   *

54. REC54                *      -450.0       22.0        6.0   *

55. REC55                *        75.0      -22.0        6.0   *

56. REC56                *       150.0      -22.0        6.0   *

57. REC57                *       225.0      -22.0        6.0   *

58. REC58                *       300.0      -22.0        6.0   *

59. REC59                *       375.0      -22.0        6.0   *

60. REC60                *       450.0      -22.0        6.0   *
```

```
61. REC61                *       -75.0      -22.0        6.0   *

62. REC62                *      -150.0      -22.0        6.0   *

63. REC63                *      -225.0      -22.0        6.0   *

64. REC64                *      -300.0      -22.0        6.0   *

65. REC65                *      -375.0      -22.0        6.0   *

66. REC66                *      -450.0      -22.0        6.0   *

67. REC67                *        30.0       75.0        6.0   *

68. REC68                *        30.0      150.0        6.0   *

69. REC69                *        30.0      225.0        6.0   *

70. REC70                *        30.0      300.0        6.0   *

71. REC71                *        30.0      -75.0        6.0   *

72. REC72                *        30.0     -150.0        6.0   *

73. REC73                *        30.0     -225.0        6.0   *

74. REC74                *        30.0     -300.0        6.0   *

75. REC75                *        30.0     -375.0        6.0   *

76. REC76                *        30.0     -450.0        6.0   *

77. REC77                *       -30.0       75.0        6.0   *

78. REC78                *       -30.0      150.0        6.0   *

79. REC79                *       -30.0      225.0        6.0   *

80. REC80                *       -30.0      300.0        6.0   *

81. REC81                *       -30.0      -75.0        6.0   *

82. REC82                *       -30.0     -150.0        6.0   *
```

```
83. REC83                *       -30.0     -225.0        6.0   *

84. REC84                *       -30.0     -300.0        6.0   *

85. REC85                *       -30.0     -375.0        6.0   *

86. REC86                *       -30.0     -450.0        6.0   *
```


JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) * REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	3.4	3.2	3.1	3.1	3.1	3.1	3.5	3.2	3.1	3.1	3.1	3.1	3.4	3.2	3.1	3.1	3.1	3.1	7.0	3.6

10.	*	3.1	3.1	3.1	3.1	3.1	3.1	3.7	3.4	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	7.1	3.7
20.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.4	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	7.2	3.8
30.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	7.2	3.8
40.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.3	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	7.1	3.9
50.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.3	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	6.9	4.3
60.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.4	3.4	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	6.1	4.8
70.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.4	3.4	3.3	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	5.3	5.1
80.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.6	3.7	3.8	3.6	3.5	3.0	3.0	3.0	3.0	3.0	3.0	4.6	5.3
90.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.3	4.3	4.0	4.1	4.2	3.0	3.0	3.0	3.0	3.0	3.0	4.1	4.8
100.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.2	5.2	4.9	4.5	4.4	4.4	3.0	3.0	3.0	3.0	3.0	3.0	4.4	4.2
110.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.7	5.7	4.8	4.5	4.3	4.1	3.0	3.0	3.0	3.0	3.0	3.0	4.5	3.9
120.	*	3.0	3.0	3.0	3.0	3.0	3.0	5.3	5.7	4.4	4.0	4.0	3.8	3.0	3.0	3.0	3.0	3.0	3.0	4.6	3.6
130.	*	3.0	3.0	3.0	3.0	3.0	3.0	6.2	5.0	4.0	3.9	3.9	3.8	3.0	3.0	3.0	3.0	3.0	3.0	4.3	3.4
140.	*	3.0	3.0	3.0	3.0	3.0	3.0	6.9	4.4	3.8	3.8	3.7	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.3
150.	*	3.0	3.0	3.0	3.0	3.0	3.0	7.0	4.0	3.8	3.7	3.6	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.3
160.	*	3.0	3.0	3.0	3.0	3.0	3.0	6.6	3.8	3.7	3.7	3.6	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.4
170.	*	3.0	3.0	3.0	3.0	3.0	3.0	6.6	3.9	3.7	3.6	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3
180.	*	3.4	3.1	3.0	3.0	3.0	3.0	6.4	3.7	3.6	3.6	3.6	3.6	3.4	3.1	3.0	3.0	3.0	3.0	3.4	3.1
190.	*	3.8	3.4	3.2	3.1	3.0	3.0	5.9	3.5	3.5	3.5	3.5	3.5	3.6	3.4	3.2	3.1	3.0	3.0	3.0	3.0
200.	*	4.1	3.3	3.3	3.2	3.2	3.1	5.6	3.5	3.5	3.5	3.5	3.5	3.7	3.3	3.4	3.2	3.2	3.1	3.0	3.0
210.	*	4.5	3.4	3.2	3.2	3.1	3.1	5.4	3.6	3.6	3.6	3.6	3.6	4.1	3.3	3.2	3.2	3.1	3.1	3.0	3.0
220.	*	4.6	3.6	3.2	3.2	3.2	3.1	4.9	3.6	3.6	3.6	3.6	3.6	4.5	3.4	3.2	3.2	3.2	3.0	3.0	3.0

230.	*	4.3	3.8	3.4	3.2	3.2	3.2	4.4	3.7	3.7	3.7	3.7	3.7	4.7	3.6	3.3	3.2	3.2	3.1	3.0	3.0
240.	*	4.5	3.7	3.5	3.4	3.3	3.2	4.0	3.7	3.7	3.7	3.7	3.7	4.6	3.7	3.4	3.3	3.2	3.2	3.0	3.0
250.	*	4.8	4.1	3.7	3.4	3.4	3.2	4.0	3.9	3.9	3.9	3.9	3.9	4.3	3.8	3.5	3.4	3.3	3.3	3.1	3.1
260.	*	4.9	4.2	3.8	3.7	3.7	3.3	4.0	4.0	4.0	4.0	4.0	4.0	4.5	4.1	4.0	3.6	3.5	3.2	3.3	3.3
270.	*	4.5	3.9	3.7	3.6	3.6	3.4	3.8	3.8	3.8	3.8	3.8	3.8	4.7	4.4	3.8	3.7	3.5	3.5	3.7	3.5
280.	*	4.0	3.7	3.4	3.3	3.3	3.1	3.5	3.4	3.4	3.4	3.4	3.4	4.6	4.1	3.7	3.6	3.4	3.2	4.0	3.7
290.	*	3.6	3.3	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	4.3	3.6	3.3	3.2	3.2	3.1	4.5	3.7
300.	*	3.5	3.3	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.8	3.3	3.2	3.2	3.2	3.2	4.9	3.6
310.	*	3.5	3.3	3.3	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.3	3.3	3.2	3.2	3.2	5.6	3.6
320.	*	3.5	3.3	3.3	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3	3.3	3.2	3.2	3.2	6.0	3.5
330.	*	3.6	3.3	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3	3.3	3.2	3.2	3.1	6.4	3.5
340.	*	3.6	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3	3.2	3.2	3.1	3.0	6.5	3.4
350.	*	3.6	3.4	3.3	3.1	3.1	3.1	3.2	3.1	3.1	3.1	3.1	3.1	3.5	3.3	3.2	3.0	3.0	3.0	6.6	3.4
MAX	*	4.9	4.2	3.8	3.7	3.7	3.4	7.0	5.7	4.9	4.5	4.4	4.4	4.7	4.4	4.0	3.7	3.5	3.5	7.2	5.3
DEGR.	*	260	260	260	260	260	270	150	120	100	110	100	100	270	270	260	270	270	270	20	80

JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	3.5	3.5	3.5	3.5	4.4	4.1	4.3	4.0	3.9	3.9	3.9	4.9	4.3	4.5	4.2	4.2	4.2	4.2	4.7	5.1
10.	3.5	3.5	3.4	3.4	3.6	3.6	3.7	3.5	3.4	3.4	3.4	4.9	4.6	4.7	4.5	4.5	4.5	4.4	3.7	3.9
20.	3.7	3.6	3.5	3.4	3.2	3.1	3.2	3.1	3.1	3.1	3.1	4.6	4.5	4.6	4.5	4.5	4.5	4.5	3.2	3.2
30.	3.8	3.7	3.7	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.5	4.2	4.2	4.2	4.2	4.2	4.2	3.1	3.0
40.	3.8	3.7	3.7	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.7	4.1	4.1	4.1	4.1	4.1	4.1	3.0	3.0

50.	*	3.9	3.8	3.8	3.8	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.1	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0
60.	*	4.1	3.8	3.8	3.8	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.5	3.9	3.9	3.9	3.9	3.9	3.9	3.0	3.0
70.	*	4.2	4.0	3.8	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.5	3.8	3.8	3.8	3.8	3.8	3.8	3.0	3.0
80.	*	4.4	4.3	4.1	4.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.7	3.8	3.8	3.8	3.8	3.8	3.8	3.0	3.0
90.	*	4.3	4.1	3.9	3.8	3.0	3.0	3.0	3.0	3.1	3.0	3.0	5.7	3.8	3.8	3.8	3.9	3.8	3.8	3.0	3.0
100.	*	3.9	3.9	3.8	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.7	3.8	3.8	3.8	4.0	3.8	3.8	3.0	3.0
110.	*	3.6	3.4	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.5	3.8	3.8	3.9	3.9	3.9	3.9	3.0	3.0
120.	*	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.4	4.0	3.9	3.9	3.9	3.9	3.9	3.0	3.0
130.	*	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.9	4.1	4.0	4.0	4.0	4.0	4.0	3.0	3.0
140.	*	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	4.2	4.1	4.1	4.1	4.1	4.1	3.0	3.0
150.	*	3.2	3.1	3.1	3.1	3.1	3.1	3.0	3.1	3.1	3.1	3.1	4.3	4.7	4.3	4.2	4.2	4.2	4.2	3.1	3.1
160.	*	3.3	3.2	3.2	3.1	3.1	3.3	3.2	3.1	3.1	3.2	3.1	4.2	5.0	4.6	4.6	4.4	4.5	4.3	3.1	3.1
170.	*	3.2	3.1	3.0	3.0	3.5	3.8	3.7	3.6	3.7	3.8	3.6	4.4	5.5	5.2	4.9	4.7	4.9	4.8	3.7	3.6
180.	*	3.0	3.0	3.0	3.0	4.2	4.8	4.6	4.2	4.3	4.5	4.3	4.1	5.4	5.4	4.8	4.6	5.0	4.8	4.0	4.1
190.	*	3.0	3.0	3.0	3.0	4.8	5.0	5.0	4.6	4.7	4.8	4.7	3.6	4.8	4.4	4.2	4.0	4.2	4.0	4.2	4.2
200.	*	3.0	3.0	3.0	3.0	5.4	4.8	4.8	4.5	4.7	4.5	4.2	3.2	4.5	3.8	3.5	3.5	3.4	3.2	4.1	4.1
210.	*	3.0	3.0	3.0	3.0	6.1	4.8	4.8	4.4	4.4	4.2	4.1	3.1	4.3	3.5	3.2	3.2	3.2	3.1	3.9	4.0
220.	*	3.0	3.0	3.0	3.0	6.5	4.7	4.5	4.3	4.0	4.0	4.0	3.1	4.1	3.3	3.3	3.2	3.2	3.2	3.8	3.8
230.	*	3.0	3.0	3.0	3.0	6.9	4.9	4.3	4.1	4.0	4.0	4.0	3.0	3.7	3.3	3.3	3.2	3.2	3.2	3.8	3.8
240.	*	3.0	3.0	3.0	3.0	6.8	4.6	4.0	4.0	3.9	3.9	3.8	3.0	3.4	3.2	3.2	3.1	3.1	3.0	3.7	3.7
250.	*	3.1	3.1	3.1	3.1	6.6	4.2	4.0	4.0	3.9	3.8	3.8	3.0	3.3	3.2	3.1	3.1	3.0	3.0	3.6	3.6
260.	*	3.3	3.3	3.3	3.3	6.5	4.0	3.9	3.7	3.9	3.7	3.7	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.6	3.6

270.	*	3.5	3.5	3.5	3.5	6.8	4.1	3.9	3.9	4.0	3.9	3.9	3.2	3.2	3.0	3.0	3.1	3.0	3.0	3.6	3.6
280.	*	3.7	3.7	3.7	3.7	7.0	3.7	3.7	3.8	3.7	3.7	3.7	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.8
290.	*	3.7	3.7	3.7	3.7	7.5	3.8	3.8	3.8	3.8	3.8	3.8	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.8
300.	*	3.6	3.6	3.6	3.6	7.9	3.8	3.8	3.8	3.8	3.8	3.8	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.9	4.1
310.	*	3.6	3.6	3.6	3.6	8.0	3.9	3.9	3.9	3.9	3.9	3.9	4.0	3.1	3.1	3.1	3.1	3.1	3.1	4.0	4.6
320.	*	3.5	3.5	3.5	3.5	7.2	3.9	3.9	3.9	3.9	3.9	3.9	4.4	3.1	3.1	3.1	3.1	3.1	3.1	4.2	5.2
330.	*	3.5	3.5	3.5	3.5	6.7	4.1	4.1	4.1	4.1	4.1	4.1	4.7	3.1	3.1	3.1	3.1	3.1	3.1	4.6	5.9
340.	*	3.4	3.4	3.4	3.4	5.7	4.2	4.3	4.2	4.2	4.2	4.2	4.6	3.2	3.3	3.2	3.2	3.2	3.2	4.9	6.2
350.	*	3.4	3.4	3.4	3.4	5.0	4.4	4.5	4.3	4.2	4.2	4.2	4.6	3.8	3.9	3.6	3.6	3.6	3.6	5.1	6.2
MAX	*	4.4	4.3	4.1	4.1	8.0	5.0	5.0	4.6	4.7	4.8	4.7	5.7	5.5	5.4	4.9	4.7	5.0	4.8	5.1	6.2
DEGR.	*	80	80	80	80	310	190	190	190	200	190	190	100	170	180	170	170	180	170	350	350

PAGE 6

JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum

concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	* REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
0.	* 4.8	5.0	3.5	3.1	3.0	3.0	3.0	3.0	3.5	3.1	3.1	3.0	3.0	3.0	4.9	3.2	3.1	3.1	3.1	3.1
10.	* 5.1	5.3	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.4	3.2	3.1	3.1	3.0	4.2	3.1	3.1	3.1	3.1	3.1
20.	* 4.9	5.5	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.5	3.4	3.3	3.2	3.1	3.9	3.1	3.1	3.1	3.1	3.1
30.	* 4.4	5.5	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.4	3.3	3.3	3.2	3.1	3.5	3.1	3.1	3.1	3.1	3.1
40.	* 4.0	5.2	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.2	3.3	3.2	3.1	3.3	3.1	3.1	3.1	3.1	3.1
50.	* 3.8	4.6	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.2	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1
60.	* 3.8	4.2	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1
70.	* 3.6	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.2	3.2	3.2	3.1	3.2	3.2	3.2	3.2	3.2	3.2
80.	* 3.7	3.7	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.3	3.3	3.2	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.2
90.	* 3.7	3.7	3.2	3.2	3.2	3.2	3.2	3.1	3.7	3.5	3.3	3.2	3.2	3.0	3.2	3.2	3.2	3.2	3.2	3.2
100.	* 3.7	3.7	3.2	3.2	3.2	3.2	3.2	3.2	3.9	3.7	3.4	3.4	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0
110.	* 3.6	3.6	3.2	3.2	3.2	3.2	3.2	3.2	3.8	3.5	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0
120.	* 3.8	3.8	3.3	3.1	3.1	3.1	3.1	3.1	4.0	3.4	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0
130.	* 3.8	3.8	3.6	3.1	3.1	3.1	3.1	3.1	4.0	3.4	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0

140.	*	3.9	3.9	3.9	3.1	3.1	3.1	3.1	3.1	4.0	3.3	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0
150.	*	4.0	4.0	4.3	3.1	3.1	3.1	3.1	3.1	3.8	3.3	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0
160.	*	4.2	4.1	4.6	3.1	3.1	3.1	3.1	3.1	3.7	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
170.	*	4.4	4.5	4.9	3.1	3.1	3.1	3.1	3.1	3.5	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
180.	*	4.1	4.1	5.3	3.1	3.1	3.1	3.1	3.1	3.3	3.1	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0
190.	*	3.6	3.6	5.6	3.3	3.3	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.5	3.2	3.2	3.0	3.0	3.0
200.	*	3.1	3.2	5.9	3.4	3.3	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.2	3.2	3.0	3.0
210.	*	3.1	3.1	5.9	3.4	3.3	3.3	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.2	3.2	3.2	3.1
220.	*	3.1	3.1	6.0	3.4	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.2	3.2	3.2	3.2
230.	*	3.0	3.0	5.8	3.6	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.3	3.2	3.2	3.2	3.2
240.	*	3.0	3.0	5.3	3.8	3.4	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3	3.2	3.2	3.2	3.2
250.	*	3.0	3.0	4.9	3.9	3.5	3.6	3.4	3.3	3.1	3.1	3.1	3.1	3.0	3.0	3.9	3.3	3.3	3.2	3.2	3.2
260.	*	3.0	3.0	4.2	4.2	3.7	3.5	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.8	3.5	3.4	3.4	3.2	3.1
270.	*	3.0	3.0	3.7	3.8	3.5	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.7	3.6	3.5	3.4	3.3	3.3
280.	*	3.0	3.2	3.4	3.5	3.4	3.4	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.2	3.6	3.4	3.4	3.4
290.	*	3.2	3.2	3.4	3.3	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.0	3.6	3.5	3.4	3.3
300.	*	3.2	3.2	3.4	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.7	3.4	3.3	3.3	3.3
310.	*	3.2	3.2	3.4	3.3	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	4.4	3.5	3.3	3.3	3.3	3.2
320.	*	3.3	3.5	3.4	3.3	3.2	3.3	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	4.7	3.5	3.3	3.3	3.4	3.3
330.	*	3.5	3.7	3.5	3.3	3.3	3.4	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.4	3.4	3.5	3.3	3.3
340.	*	3.5	4.0	3.6	3.4	3.4	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	5.1	3.5	3.5	3.4	3.3	3.2
350.	*	4.2	4.4	3.7	3.5	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.3	3.6	3.4	3.2	3.2	3.1

MAX	5.1	5.5	6.0	4.2	3.7	3.6	3.4	3.4	4.0	3.7	3.4	3.4	3.2	3.2	5.3	4.2	3.6	3.5	3.4	3.4
DEGR.	10	30	220	260	260	250	250	260	140	100	20	100	20	50	350	280	290	330	280	280

JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC61	REC62	REC63	REC64	REC65	REC66	REC67	REC68	REC69	REC70	REC71	REC72	REC73	REC74	REC75	REC76	REC77	REC78	REC79	REC80
0.	3.6	3.1	3.1	3.0	3.0	3.0	4.1	4.3	4.3	4.4	4.6	4.6	4.3	4.3	4.2	4.2	4.2	4.6	4.7	4.5

10.	*	3.7	3.5	3.2	3.1	3.1	3.0	3.6	3.6	3.7	3.7	3.9	3.7	3.6	3.7	3.6	3.4	4.5	4.6	4.5	4.7
20.	*	3.6	3.5	3.3	3.3	3.1	3.1	3.1	3.1	3.1	3.2	3.6	3.3	3.2	3.2	3.1	3.1	4.2	4.2	4.2	4.5
30.	*	3.6	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.5	3.1	3.1	3.1	3.1	3.1	4.0	4.0	4.0	4.1
40.	*	3.7	3.3	3.2	3.3	3.2	3.2	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.9	3.9	3.9	3.9
50.	*	3.7	3.3	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.8	3.8
60.	*	3.9	3.3	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.8	3.8
70.	*	4.2	3.4	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6
80.	*	4.3	3.7	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7
90.	*	3.9	3.5	3.4	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7
100.	*	3.9	3.4	3.3	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.7	3.7	3.7
110.	*	3.8	3.3	3.2	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.6	3.6	3.6
120.	*	3.7	3.3	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	3.8	3.8	3.8
130.	*	3.6	3.3	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	3.9	3.8	3.8
140.	*	3.5	3.3	3.2	3.2	3.2	3.2	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	4.1	4.0	3.9
150.	*	3.5	3.3	3.2	3.2	3.2	3.1	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.3	4.2	4.1	4.1
160.	*	3.6	3.3	3.2	3.2	3.1	3.0	3.7	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	4.4	4.3	4.3	4.2
170.	*	3.5	3.2	3.1	3.0	3.0	3.0	4.0	3.8	3.6	3.6	3.4	3.4	3.4	3.4	3.4	3.4	4.7	4.6	4.5	4.3
180.	*	3.3	3.1	3.0	3.0	3.0	3.0	4.4	4.3	4.2	4.2	3.9	3.9	3.9	3.8	3.8	3.8	4.2	4.2	4.1	4.1
190.	*	3.1	3.0	3.0	3.0	3.0	3.0	4.4	4.4	4.3	4.3	4.2	4.2	4.2	4.1	4.1	4.0	3.6	3.6	3.5	3.5
200.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.3	4.2	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	3.3	3.1	3.1	3.1
210.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.2	4.0	3.9	3.9	4.0	4.0	4.0	4.0	4.0	4.0	3.1	3.1	3.1	3.1
220.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.0	3.1	3.1	3.1

230.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	3.9	3.8	3.8	3.8	3.8	3.8	3.0	3.0	3.0	3.0
280.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	3.9	3.6	3.6	3.6	3.6	3.6	3.0	3.0	3.0	3.0
290.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.8	4.1	3.7	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.8	3.8	4.6	3.7	3.7	3.7	3.7	3.7	3.0	3.0	3.1	3.1
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.9	3.9	3.9	5.0	3.8	3.8	3.8	3.8	3.8	3.0	3.0	3.1	3.1
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.9	3.9	5.1	3.8	3.8	3.8	3.8	3.8	3.1	3.1	3.2	3.2
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.3	5.1	4.1	3.9	3.9	4.0	4.0	3.1	3.1	3.2	3.2
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.1	4.3	4.4	4.5	5.0	4.3	4.1	4.0	4.1	4.1	3.2	3.2	3.3	3.5
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.4	4.6	4.7	4.9	4.9	4.8	4.4	4.4	4.2	4.2	3.7	3.9	3.9	3.9
MAX	*	4.3	3.7	3.4	3.3	3.2	3.2	4.4	4.6	4.7	4.9	5.1	4.8	4.4	4.4	4.2	4.2	4.7	4.6	4.7	4.7
DEGR.	*	80	80	90	100	30	40	180	350	350	350	330	350	350	350	350	350	170	170	0	10

PAGE 8

JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

MODEL RESULTS

```
      REMARKS : In search of the angle corresponding to
                the maximum concentration, only the first
                angle, of the angles with same maximum
                concentrations, is indicated as maximum.


WIND ANGLE RANGE:   0.-350.


WIND  * CONCENTRATION
ANGLE *      (PPM)
(DEGR)* REC81 REC82 REC83 REC84 REC85 REC86
------*-----------------------------------
  0.  *   4.4   4.6   4.3   4.3   4.2   4.2
 10.  *   4.6   4.8   4.7   4.6   4.5   4.5
 20.  *   4.4   4.6   4.5   4.3   4.2   4.1
 30.  *   4.5   4.4   4.2   4.1   4.0   4.0
 40.  *   4.7   4.2   3.9   3.9   3.9   3.9
 50.  *   4.9   3.9   3.8   3.8   3.8   3.8
 60.  *   4.8   3.8   3.8   3.8   3.8   3.8
 70.  *   4.4   3.6   3.6   3.6   3.6   3.6
 80.  *   4.1   3.7   3.7   3.7   3.7   3.7
 90.  *   3.9   3.7   3.7   3.7   3.7   3.7
```

100.	*	3.8	3.7	3.7	3.7	3.7	3.7
110.	*	3.8	3.8	3.8	3.8	3.8	3.8
120.	*	3.8	3.8	3.8	3.8	3.8	3.8
130.	*	3.8	3.8	3.8	3.8	3.8	3.8
140.	*	3.9	3.9	3.9	3.9	3.9	3.9
150.	*	4.0	4.0	4.0	4.0	4.0	4.0
160.	*	4.2	4.2	4.2	4.2	4.1	4.1
170.	*	4.2	4.2	4.2	4.2	4.2	4.2
180.	*	4.0	4.0	4.0	4.0	4.0	3.9
190.	*	3.5	3.5	3.5	3.5	3.5	3.5
200.	*	3.2	3.2	3.2	3.2	3.2	3.2
210.	*	3.1	3.1	3.1	3.1	3.1	3.1
220.	*	3.1	3.1	3.1	3.1	3.1	3.1
230.	*	3.0	3.0	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.0	3.0	3.0	3.0
280.	*	3.0	3.0	3.0	3.0	3.0	3.0
290.	*	3.0	3.0	3.0	3.0	3.0	3.0
300.	*	3.0	3.0	3.0	3.0	3.0	3.0
310.	*	3.0	3.0	3.0	3.0	3.0	3.0

```
320.  *   3.1   3.1   3.1   3.1   3.1   3.1

330.  *   3.2   3.1   3.1   3.1   3.1   3.1

340.  *   3.3   3.1   3.1   3.2   3.2   3.2

350.  *   3.8   3.7   3.5   3.5   3.6   3.6

------*-----------------------------------

MAX   *   4.9   4.8   4.7   4.6   4.5   4.5

DEGR. *   50    10    10    10    10    10


THE HIGHEST CONCENTRATION OF    8.00 PPM OCCURRED AT RECEPTOR REC25.
```

JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

DATE : 09/06/ 0

TIME : 14:36:51

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	260	260	260	260	260	270	150	120	100	110	100	100	270	270	260	270	270	270	20	80
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.1
4	0.0	0.1	0.2	0.2	0.2	0.1	0.6	0.5	0.2	0.2	0.2	0.1	0.2	0.3	0.4	0.2	0.1	0.1	0.0	0.1
5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
6	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.5	0.1
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

8	*	0.1	0.1	0.1	0.1	0.1	0.0	0.3	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.1
9	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	*	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.3
18	*	0.3	0.2	0.1	0.1	0.1	0.0	1.3	0.5	0.3	0.1	0.1	0.1	0.3	0.2	0.1	0.1	0.1	0.1	1.3	0.6
19	*	0.3	0.2	0.1	0.1	0.1	0.0	1.0	0.7	0.3	0.1	0.1	0.1	0.3	0.2	0.1	0.1	0.1	0.1	1.8	0.8
20	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	*	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
23	*	0.3	0.2	0.1	0.1	0.1	0.1	0.4	0.5	0.6	0.6	0.7	0.7	0.3	0.2	0.1	0.1	0.1	0.1	0.2	0.2

PAGE 10

JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

DATE : 09/06/ 0

TIME : 14:36:51

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	80	80	80	80	310	190	190	190	200	190	190	100	170	180	170	170	180	170	350	350
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.4	0.3	0.2	0.1	0.0	0.1	0.1	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.5	0.5
4	0.1	0.1	0.1	0.1	3.1	0.7	0.4	0.2	0.1	0.1	0.1	2.0	0.6	0.3	0.2	0.2	0.1	0.1	0.7	1.8
5	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.5	0.6	0.6	0.6	0.0	0.1	0.1	0.2	0.3	0.2	0.3	0.1	0.2
6	0.1	0.1	0.1	0.1	0.0	0.1	0.3	0.4	0.6	0.5	0.5	0.0	0.6	0.7	1.0	1.0	0.9	1.1	0.3	0.4
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0
8	0.1	0.0	0.0	0.0	0.4	0.4	0.3	0.2	0.1	0.1	0.1	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.3	0.2
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

14	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	*	0.3	0.4	0.4	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
18	*	0.3	0.2	0.1	0.1	0.4	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.0	0.1	0.1
19	*	0.3	0.2	0.1	0.1	0.4	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.0	0.1	0.0
20	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	*	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	*	0.2	0.3	0.3	0.3	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0

PAGE 11

JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

DATE : 09/06/ 0

TIME : 14:36:51

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

LINK #	REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
	ANGLE (DEGREES)																			
	10	30	220	260	260	250	250	260	140	100	20	100	20	50	350	280	290	330	280	280
1	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.3	0.1	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
3	0.2	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.0	0.0
4	0.6	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0
5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.8	0.7	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.3	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
14	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
15	0.0	0.0	2.1	0.6	0.2	0.1	0.0	0.1	0.0	0.2	0.0	0.1	0.0	0.0	1.5	0.5	0.2	0.0	0.1	0.1
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

19	*	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

DATE : 09/06/ 0

TIME : 14:36:51

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	*	REC61	REC62	REC63	REC64	REC65	REC66	REC67	REC68	REC69	REC70	REC71	REC72	REC73	REC74	REC75	REC76	REC77	REC78	REC79	REC80
	*	80	80	90	100	30	40	180	350	350	350	330	350	350	350	350	350	170	170	0	10
1	*	0.1	0.0	0.1	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.4	0.5	0.5	0.6	0.6	0.6	0.3	0.2	0.0	0.0
2	*	0.1	0.1	0.1	0.1	0.0	0.0	0.2	0.0	0.0	0.0	1.1	0.3	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.0

3	*	0.1	0.1	0.0	0.0	0.0	0.0	0.3	0.6	0.6	0.6	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
4	*	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.2	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4
5	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
6	*	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.2	0.2	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.2
7	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	*	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.4	0.4	0.4	0.2	0.3	0.2	0.1	0.1	0.1	0.5	0.7	0.7	0.8
9	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
10	*	0.2	0.1	0.1	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.3	0.2	0.3	0.4	0.4	0.4	0.5	0.3	0.0	0.0
11	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	*	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
13	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	*	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	*	0.3	0.2	0.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0
16	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
19	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
20	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

PAGE 13

JOB: SOUTHPARK BRIDGE PROJECT RUN: EXISTING CLOVERDALE & TRENTON

DATE : 09/06/ 0

TIME : 14:36:51

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

LINK #	CO/LINK (PPM) ANGLE (DEGREES) REC81	REC82	REC83	REC84	REC85	REC86
	50	10	10	10	10	10
1	0.3	0.2	0.2	0.3	0.3	0.3
2	0.7	0.2	0.1	0.1	0.1	0.0
3	0.0	0.2	0.1	0.1	0.1	0.1
4	0.0	0.1	0.1	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.1	0.1	0.1	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.2	0.2	0.1	0.1	0.1

```
 9  *   0.0   0.0   0.0   0.0   0.0   0.0
10  *   0.5   0.7   0.8   0.8   0.8   0.9
11  *   0.0   0.0   0.0   0.0   0.0   0.0
12  *   0.0   0.0   0.0   0.0   0.0   0.0
13  *   0.0   0.0   0.0   0.0   0.0   0.0
14  *   0.0   0.0   0.0   0.0   0.0   0.0
15  *   0.4   0.1   0.1   0.1   0.1   0.1
16  *   0.0   0.0   0.0   0.0   0.0   0.0
17  *   0.0   0.0   0.0   0.0   0.0   0.0
18  *   0.0   0.0   0.0   0.0   0.0   0.0
19  *   0.0   0.0   0.0   0.0   0.0   0.0
20  *   0.0   0.0   0.0   0.0   0.0   0.0
21  *   0.0   0.0   0.0   0.0   0.0   0.0
22  *   0.0   0.0   0.0   0.0   0.0   0.0
23  *   0.0   0.0   0.0   0.0   0.0   0.0
```

2007 NO ACTION – 16TH AVENUE SOUTH / EAST MARGINAL WAY

```
                    CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1


 (C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.

      JOB: SOUTHPARK PROJECT                                    RUN: 2007 NO BRIDGE MARGINAL WAY
```

DATE : 9/13/ 2

TIME : 17: 6:46

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM

U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. 16TH NB	633.9	-745.4	8.9	4.6	976.	320.	AG	70.	10.6	.0	40.0		
2. 16TH QUE LT	74.4	-81.9	90.1	-100.8	25.	140.	AG	381.	100.0	.0	10.0	.14	1.3
3. 16TH QUE RT	82.6	-76.0	88.9	-83.6	10.	140.	AG	381.	100.0	.0	10.0	.06	.5
4. 16TH SB	-18.0	-42.6	607.0	-792.6	976.	140.	AG	50.	10.6	.0	40.0		
5. MARGINAL SE 1	-1000.0	-16.0	.0	-16.0	1000.	90.	AG	1140.	7.8	.0	52.0		
6. MAR SE QUE TH	-60.0	-10.0	-180.3	-10.0	120.	270.	AG	338.	100.0	.0	20.0	.54	6.1

7. MAR SE QUE E RT	*	-60.0	-26.0	-79.7	-26.0	*	20.	270.	AG	381.	100.0	.0	10.0	.13	1.0
8. MARGINAL SE 2	*	.0	-12.0	1000.0	-12.0	*	1000.	90.	AG	1120.	7.8	.0	24.0		
9. MARGINAL NW 1	*	1000.0	22.0	.0	22.0	*	1000.	270.	AG	680.	7.8	.0	64.0		
10. MAR NW QUE LT	*	60.0	6.0	65.2	6.0	*	5.	90.	AG	402.	100.0	.0	12.0	.04	.3
11. MAR NW QUE TH	*	60.0	28.0	96.6	28.0	*	37.	90.	AG	381.	100.0	.0	32.0	.22	1.9
12. MAR NW 2	*	.0	16.0	-1000.0	16.0	*	1000.	270.	AG	720.	7.8	.0	52.0		

PAGE 2

JOB: SOUTHPARK PROJECT RUN: 2007 NO BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 6:46

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 16TH QUE LT	*	120	90	2.0	50	1662	189.20	1	3
3. 16TH QUE RT	*	120	90	2.0	20	1487	189.20	1	3
6. MAR SE QUE TH	*	120	40	2.0	1100	1616	189.20	1	3

7. MAR SE QUE E RT	*	120	90	2.0	40	1446	189.20	1	3
10. MAR NW QUE LT	*	120	95	2.0	10	1466	189.20	1	3
11. MAR NW QUE TH	*	120	30	2.0	670	1405	189.20	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. RECEPTOR 1	75.7	-43.5	.0
2. RECEPTOR 2	123.6	-101.1	.0
3. RECEPTOR 3	171.6	-158.8	.0
4. RECEPTOR 4	219.6	-216.4	.0
5. RECEPTOR 5	267.6	-274.1	.0
6. RECEPTOR 6	315.6	-331.7	.0
7. RECEPTOR 7	363.5	-389.3	.0
8. RECEPTOR 10	-7.5	-87.5	.0
9. RECEPTOR 11	40.4	-145.1	.0
10. RECEPTOR 12	88.4	-202.8	.0
11. RECEPTOR 13	136.4	-260.4	.0
12. RECEPTOR 14	184.3	-318.1	.0
13. RECEPTOR 15	232.3	-375.7	.0

14. RECEPTOR 16	*	280.3	-433.4	.0	*
15. RECEPTOR 20	*	-424.8	41.6	.0	*
16. RECEPTOR 21	*	-349.8	41.6	.0	*
17. RECEPTOR 22	*	-274.8	41.6	.0	*
18. RECEPTOR 23	*	-199.8	41.6	.0	*
19. RECEPTOR 24	*	-124.8	41.6	.0	*
20. RECEPTOR 25	*	-49.8	41.6	.0	*
21. RECEPTOR 26	*	.8	54.4	.0	*
22. RECEPTOR 27	*	75.8	54.4	.0	*
23. RECEPTOR 28	*	150.8	54.4	.0	*
24. RECEPTOR 29	*	225.8	54.4	.0	*
25. RECEPTOR 30	*	300.8	54.4	.0	*
26. RECEPTOR 31	*	375.8	54.4	.0	*
27. RECEPTOR 32	*	450.8	54.4	.0	*
28. RECEPTOR 34	*	-424.8	-41.5	.0	*
29. RECEPTOR 35	*	-349.8	-41.5	.0	*
30. RECEPTOR 36	*	-274.8	-41.5	.0	*
31. RECEPTOR 37	*	-199.8	-41.5	.0	*
32. RECEPTOR 38	*	-124.8	-41.5	.0	*
33. RECEPTOR 39	*	-49.8	-41.5	.0	*
34. RECEPTOR 40	*	.1	-24.2	.0	*
35. RECEPTOR 41	*	75.1	-24.2	.0	*

```
36. RECEPTOR 42          *       150.1      -24.2         .0   *

37. RECEPTOR 43          *       225.1      -24.2         .0   *

38. RECEPTOR 44          *       300.1      -24.2         .0   *

39. RECEPTOR 45          *       375.1      -24.2         .0   *
```


JOB: SOUTHPARK PROJECT RUN: 2007 NO BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 6:46

RECEPTOR LOCATIONS

```
                         *           COORDINATES (FT)          *

   RECEPTOR              *      X          Y          Z        *

-------------------------*-------------------------------------*

40. RECEPTOR 46          *       450.1      -24.2         .0   *
```


JOB: SOUTHPARK PROJECT RUN: 2007 NO BRIDGE MARGINAL WAY

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	3.8	3.3	3.2	3.1	3.1	3.0	3.0	3.2	3.3	3.3	3.1	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1
10.	3.7	3.2	3.2	3.1	3.1	3.0	3.0	3.3	3.3	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
20.	3.5	3.2	3.2	3.1	3.1	3.0	3.0	3.3	3.4	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
30.	3.4	3.2	3.2	3.1	3.1	3.0	3.0	3.3	3.6	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
40.	3.3	3.2	3.2	3.1	3.1	3.1	3.0	3.4	3.5	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
50.	3.4	3.2	3.2	3.2	3.1	3.1	3.0	3.3	3.4	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
60.	3.4	3.2	3.2	3.1	3.1	3.0	3.0	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
70.	3.5	3.2	3.2	3.1	3.0	3.0	3.0	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1

80.	*	3.4	3.2	3.1	3.0	3.0	3.0	3.0	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.2	3.3	3.3
90.	*	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.6	3.5	3.6
100.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.8	3.9	3.9	3.7	3.8
110.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.7	3.8	4.1	3.7	3.6
120.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.6	3.8	4.2	3.8	3.5
130.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.5	4.0	3.9	3.5
140.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.9	4.0	3.4
150.	*	3.3	3.1	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.8	4.0	3.4
160.	*	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.6	4.1	3.4
170.	*	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.5	4.0	3.4
180.	*	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	4.0	3.6
190.	*	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	4.0	3.9
200.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	4.0	4.0
210.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.9	4.0
220.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.8	4.1
230.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.7	4.0
240.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	3.6	4.0
250.	*	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.6	3.6	3.6	3.6	4.0
260.	*	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	3.6	3.8
270.	*	3.7	3.4	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.4	3.5
280.	*	3.9	3.9	3.1	3.1	3.0	3.0	3.0	3.4	3.2	3.1	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2	3.2	3.3
290.	*	3.6	4.0	3.4	3.3	3.1	3.1	3.0	3.5	3.3	3.2	3.1	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1

300.	*	3.5	3.8	3.4	3.3	3.2	3.1	3.1	3.8	3.4	3.3	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0
310.	*	3.4	3.5	3.3	3.3	3.1	3.1	3.1	3.8	3.4	3.3	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0
320.	*	3.3	3.4	3.3	3.1	3.0	3.0	3.0	3.7	3.5	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
330.	*	3.5	3.3	3.2	3.2	3.1	3.0	3.0	3.6	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
340.	*	3.6	3.4	3.3	3.1	3.1	3.0	3.0	3.4	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
350.	*	3.7	3.3	3.2	3.1	3.1	3.0	3.0	3.2	3.1	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
MAX	*	3.9	4.0	3.4	3.3	3.2	3.1	3.1	3.8	3.6	3.3	3.2	3.2	3.2	3.1	3.7	3.8	3.9	4.2	4.1	4.1
DEGR.	*	280	290	290	290	300	40	300	300	30	0	300	310	310	300	90	100	100	120	160	220

JOB: SOUTHPARK PROJECT RUN: 2007 NO BRIDGE MARGINAL WAY

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	4.2	3.5	3.6	4.2	3.5	3.5	3.5	3.5	3.5
10.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.5	4.2	3.4	3.5	4.1	3.5	3.5	3.5	3.5	3.5
20.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.6	4.2	3.4	3.5	3.9	3.5	3.5	3.5	3.5	3.5
30.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.7	4.2	3.4	3.6	3.8	3.5	3.5	3.5	3.5	3.5
40.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	4.1	4.3	3.5	3.9	3.7	3.6	3.6	3.6	3.6	3.6
50.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.6	4.2	4.4	3.7	4.0	3.7	3.7	3.7	3.7	3.7	3.7
60.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.7	4.4	4.5	3.7	4.3	3.7	3.7	3.7	3.7	3.7	3.7
70.	3.1	3.1	3.1	3.1	3.1	3.0	3.0	3.7	3.7	3.9	4.7	4.4	3.7	4.1	3.8	3.8	3.8	3.8	3.8	3.8
80.	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.9	4.0	4.2	4.5	4.2	3.8	4.1	3.9	3.9	3.9	3.9	3.9	3.9
90.	3.6	3.4	3.3	3.3	3.3	3.3	3.3	3.7	3.9	3.9	3.8	3.8	3.5	3.7	3.7	3.7	3.7	3.7	3.7	3.7
100.	3.8	3.6	3.5	3.5	3.4	3.4	3.4	3.3	3.3	3.4	3.4	3.4	3.3	3.5	3.5	3.5	3.4	3.4	3.3	3.3
110.	3.9	3.7	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1	3.1	3.2	3.3	3.2	3.2	3.2	3.2	3.2	3.1
120.	3.7	3.7	3.4	3.4	3.4	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.4	3.1	3.1	3.1	3.1	3.1	3.1
130.	3.6	3.9	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.0
140.	3.4	4.0	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.0
150.	3.4	4.2	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.0	3.0	3.0	3.0
160.	3.2	4.4	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.3	3.0	3.0	3.0	3.0	3.0

170.	*	3.2	4.6	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.3	3.0	3.0	3.0	3.0	3.0
180.	*	3.4	4.7	3.3	3.3	3.3	3.3	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.3	3.0	3.0	3.0	3.0	3.0
190.	*	3.3	4.5	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.2	3.0	3.0	3.0	3.0	3.0
200.	*	3.3	4.3	3.4	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0
210.	*	3.6	4.1	3.4	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.1	3.0	3.0	3.0	3.0
220.	*	3.7	3.9	3.4	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.2	3.0	3.0	3.0	3.0
230.	*	3.9	3.8	3.5	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.2	3.0	3.0	3.0	3.0
240.	*	3.8	3.9	3.8	3.4	3.4	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.1	3.3	3.2	3.1	3.1	3.1
250.	*	3.7	3.8	4.0	3.7	3.7	3.5	3.5	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.2	3.1	3.2	3.1	3.1	3.1
260.	*	3.6	3.7	4.0	3.8	3.8	3.8	3.6	3.2	3.3	3.3	3.3	3.3	3.4	4.2	3.7	3.5	3.5	3.5	3.4	3.3
270.	*	3.3	3.4	3.6	3.6	3.6	3.6	3.4	3.6	3.6	3.6	3.6	3.6	3.9	4.6	4.2	4.0	4.0	3.9	4.0	3.9
280.	*	3.1	3.2	3.2	3.2	3.1	3.1	3.1	3.7	3.7	3.7	3.7	3.9	4.5	4.6	4.3	4.2	4.1	4.3	4.3	4.0
290.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	4.0	5.0	4.2	3.9	4.2	3.9	3.9	3.8	3.8
300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	4.2	5.2	3.8	3.8	4.0	3.8	3.7	3.7	3.7
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	4.2	5.0	3.6	3.6	4.0	3.7	3.7	3.7	3.7
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	4.3	4.8	3.4	3.7	3.8	3.6	3.6	3.6	3.6
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	4.2	4.4	3.5	3.8	3.6	3.5	3.5	3.5	3.5
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	4.2	4.0	3.4	4.0	3.5	3.5	3.5	3.5	3.5
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	4.2	3.8	3.4	4.1	3.5	3.5	3.5	3.5	3.5
MAX	*	3.9	4.7	4.0	3.8	3.8	3.8	3.6	3.9	4.0	4.2	4.7	4.5	5.2	4.6	4.3	4.2	4.1	4.3	4.3	4.0
DEGR.	*	110	180	250	260	260	260	260	80	80	80	70	60	300	270	280	280	280	280	280	280

```
THE HIGHEST CONCENTRATION OF    5.20 PPM OCCURRED AT RECEPTOR REC33.
```

JOB: SOUTHPARK PROJECT RUN: 2007 NO BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 6:46

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	280	290	290	290	300	40	300	300	30	0	300	310	310	300	90	100	100	120	160	220
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.4	.1	.0	.0	.0	.0	.0	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5	.3	.2	.1	.1	.1	.0	.1	.2	.0	.0	.1	.1	.1	.1	.1	.2	.1	.2	.2	.2
6	.3	.2	.1	.1	.1	.0	.0	.4	.0	.0	.1	.1	.1	.0	.1	.2	.3	.6	.6	.6
7	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1

8	*	.1	.0	.0	.0	.0	.1	.0	.0	.1	.1	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0
9	*	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.1	.0	.1	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.1	.1	.1	.1	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.3	.3	.3	.3	.2	.2

JOB: SOUTHPARK PROJECT RUN: 2007 NO BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 6:46

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	110	180	250	260	260	260	260	80	80	80	70	60	300	270	280	280	280	280	280	280
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

5	*	.0	.0	.1	.1	.1	.1	.1	.6	.5	.5	.5	.4	.5	.7	.3	.2	.1	.1	.1	.1
6	*	.0	.0	.1	.1	.1	.1	.1	.1	.2	.4	.8	.6	.9	.5	.3	.1	.1	.1	.1	.0
7	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.6	.2	.0	.0	.0	.0	.0	.0
8	*	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.5	.6	.6	.7	.7	.7
9	*	.3	.2	.2	.2	.3	.3	.3	.0	.1	.1	.1	.1	.0	.0	.0	.1	.1	.2	.2	.2
10	*	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.4	1.2	.4	.2	.1	.1	.0	.0	.0	.0	.1	.1	.0	.0	.0	.1	.1	.1	.1	.0
12	*	.0	.0	.1	.1	.1	.1	.0	.1	.1	.1	.1	.1	.2	.2	.2	.1	.1	.1	.1	.0

2007 NO ACTION – 14TH AVENUE SOUTH / SOUTH CLOVERDALE AND SOUTH TRENTON STREETS

```
                CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1


(C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.

     JOB: SOUTHPARK BRIDGE PROJECT                            RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON


     DATE :  9/13/ 2

     TIME : 17:34:52


        The MODE flag has been set to C for calculating CO averages.


      SITE & METEOROLOGICAL VARIABLES

      -------------------------------
```

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM

U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)			(G/MI)	(FT)	(FT)		(VEH)
1. 14TH NB 1	*	10.0	-1000.0	10.0	.0	*	1000.	360.	AG	541.	10.6	.0	40.0		
2. 14TH NB QUE ALL	*	10.0	-30.0	10.0	-66.9	*	37.	180.	AG	254.	100.0	.0	20.0	.23	1.9
3. 14TH NB 2	*	10.0	.0	10.0	600.0	*	600.	360.	AG	550.	10.6	.0	40.0		
4. 14TH NB QUE LT	*	5.0	560.0	5.0	467.6	*	92.	180.	AG	325.	100.0	.0	10.0	.53	4.7
5. 14TH NB QUE ALL	*	15.0	560.0	15.0	465.2	*	95.	180.	AG	325.	100.0	.0	10.0	.54	4.8
6. 14TH NB 3	*	10.0	600.0	10.0	1600.0	*	1000.	360.	AG	70.	10.6	.0	40.0		
7. 14TH SB 1	*	-10.0	1600.0	-10.0	600.0	*	1000.	180.	AG	91.	10.6	.0	40.0		
8. 14TH SB QUE ALL	*	-10.0	630.0	-10.0	669.3	*	39.	360.	AG	401.	100.0	.0	10.0	.33	2.0
9. 14TH SB 2	*	-10.0	600.0	-10.0	.0	*	600.	180.	AG	500.	10.6	.0	40.0		
10. 14TH SB QUE ALL	*	-10.0	30.0	-10.0	65.1	*	35.	360.	AG	254.	100.0	.0	20.0	.21	1.8
11. 14TH SB 3	*	-10.0	.0	-10.0	-1000.0	*	1000.	180.	AG	532.	10.6	.0	40.0		
12. TRENTON EB 1	*	-1000.0	-6.0	.0	-6.0	*	1000.	90.	AG	17.	12.9	.0	32.0		
13. TRENTON EB QUE ALL	*	-40.0	-6.0	-47.0	-6.0	*	7.	270.	AG	381.	100.0	.0	12.0	.05	.4
14. TRENTON EB 2	*	.0	-6.0	1000.0	-6.0	*	1000.	90.	AG	32.	12.9	.0	32.0		

```
15. TRENTON WB 1        *   1000.0       6.0        .0       6.0 *    1000.   270. AG     97.  12.9    .0 32.0
16. TRENTON WB QUE ALL  *     40.0       6.0      79.8       6.0 *      40.    90. AG    381. 100.0    .0 12.0  .28   2.0
17. TRENTON WB 2        *       .0       6.0   -1000.0       6.0 *    1000.   270. AG     36.  12.9    .0 32.0
18. CLOVERDALE EB 1     *  -1000.0     590.0        .0     590.0 *    1000.    90. AG    420.  10.6    .0 40.0
19. CLOVERDALE EB QUE AL*    -40.0     595.0     -94.7     595.0 *      55.   270. AG    370. 100.0    .0 10.0  .41   2.8
20. CLOVERDALE EB QUE RT*    -40.0     585.0     -97.3     585.0 *      57.   270. AG    188. 100.0    .0 10.0  .34   2.9
21. CLOVERDALE EB 2     *       .0     595.0    1000.0     595.0 *    1000.    90. AG     16.  10.6    .0 30.0
22. CLOVERDALE WB 1     *   1000.0     605.0        .0     605.0 *    1000.   270. AG     20.  10.6    .0 30.0
23. CLOVERDALE WB QUE AL*     40.0     605.0      49.2     605.0 *       9.    90. AG    426. 100.0    .0 10.0  .11    .5
24. CLOVERDALE WB 2     *       .0     605.0   -1000.0     605.0 *    1000.   270. AG    525.  10.6    .0 30.0
```

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:34:52

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 14TH NB QUE ALL	*	100	25	2.0	540	1641	189.20	1	3
4. 14TH NB QUE LT	*	100	64	2.0	264	1564	189.20	1	3
5. 14TH NB QUE ALL	*	100	64	2.0	271	1576	189.20	1	3
8. 14TH SB QUE ALL	*	100	79	2.0	91	1644	189.20	1	3
10. 14TH SB QUE ALL	*	100	25	2.0	514	1689	189.20	1	3
13. TRENTON EB QUE ALL	*	100	75	2.0	17	1676	189.20	1	3
16. TRENTON WB QUE ALL	*	100	75	2.0	97	1630	189.20	1	3
19. CLOVERDALE EB QUE AL	*	100	73	2.0	137	1456	189.20	1	3
20. CLOVERDALE EB QUE RT	*	100	37	2.0	283	1426	189.20	1	3
23. CLOVERDALE WB QUE AL	*	100	84	2.0	20	1524	189.20	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC1	75.0	620.0	6.0
2. REC2	150.0	620.0	6.0
3. REC3	225.0	620.0	6.0
4. REC4	300.0	620.0	6.0
5. REC5	375.0	620.0	6.0
6. REC6	450.0	620.0	6.0
7. REC7	-75.0	620.0	6.0
8. REC8	-150.0	620.0	6.0
9. REC9	-225.0	620.0	6.0
10. REC10	-300.0	620.0	6.0
11. REC11	-375.0	620.0	6.0
12. REC12	-450.0	620.0	6.0
13. REC13	75.0	580.0	6.0
14. REC14	150.0	580.0	6.0
15. REC15	225.0	580.0	6.0
16. REC16	300.0	580.0	6.0

17. REC17	*	375.0	580.0	6.0	*
18. REC18	*	450.0	580.0	6.0	*
19. REC19	*	-75.0	570.0	6.0	*
20. REC20	*	-150.0	570.0	6.0	*
21. REC21	*	-225.0	570.0	6.0	*
22. REC22	*	-300.0	570.0	6.0	*
23. REC23	*	-375.0	570.0	6.0	*
24. REC24	*	-450.0	570.0	6.0	*
25. REC25	*	30.0	525.0	6.0	*
26. REC26	*	30.0	675.0	6.0	*
27. REC27	*	30.0	750.0	6.0	*
28. REC28	*	30.0	825.0	6.0	*
29. REC29	*	30.0	900.0	6.0	*
30. REC30	*	30.0	975.0	6.0	*
31. REC31	*	30.0	1050.0	6.0	*
32. REC32	*	-30.0	525.0	6.0	*
33. REC33	*	-30.0	675.0	6.0	*
34. REC34	*	-30.0	750.0	6.0	*
35. REC35	*	-30.0	825.0	6.0	*

PAGE 3

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:34:52

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
36. REC36	-30.0	900.0	6.0
37. REC37	-30.0	975.0	6.0
38. REC38	-30.0	1050.0	6.0
39. REC39	30.0	375.0	6.0
40. REC40	30.0	450.0	6.0
41. REC41	-30.0	375.0	6.0
42. REC42	-30.0	450.0	6.0
43. REC43	75.0	22.0	6.0
44. REC44	150.0	22.0	6.0
45. REC45	225.0	22.0	6.0
46. REC46	300.0	22.0	6.0
47. REC47	375.0	22.0	6.0

```
48. REC48                *       450.0       22.0        6.0   *

49. REC49                *       -75.0       22.0        6.0   *

50. REC50                *      -150.0       22.0        6.0   *

51. REC51                *      -225.0       22.0        6.0   *

52. REC52                *      -300.0       22.0        6.0   *

53. REC53                *      -375.0       22.0        6.0   *

54. REC54                *      -450.0       22.0        6.0   *

55. REC55                *        75.0      -22.0        6.0   *

56. REC56                *       150.0      -22.0        6.0   *

57. REC57                *       225.0      -22.0        6.0   *

58. REC58                *       300.0      -22.0        6.0   *

59. REC59                *       375.0      -22.0        6.0   *

60. REC60                *       450.0      -22.0        6.0   *

61. REC61                *       -75.0      -22.0        6.0   *

62. REC62                *      -150.0      -22.0        6.0   *

63. REC63                *      -225.0      -22.0        6.0   *

64. REC64                *      -300.0      -22.0        6.0   *

65. REC65                *      -375.0      -22.0        6.0   *

66. REC66                *      -450.0      -22.0        6.0   *

67. REC67                *        30.0       75.0        6.0   *

68. REC68                *        30.0      150.0        6.0   *

69. REC69                *        30.0      225.0        6.0   *
```

70. REC70	*	30.0	300.0	6.0	*
71. REC71	*	30.0	-75.0	6.0	*
72. REC72	*	30.0	-150.0	6.0	*
73. REC73	*	30.0	-225.0	6.0	*
74. REC74	*	30.0	-300.0	6.0	*
75. REC75	*	30.0	-375.0	6.0	*
76. REC76	*	30.0	-450.0	6.0	*
77. REC77	*	-30.0	75.0	6.0	*
78. REC78	*	-30.0	150.0	6.0	*
79. REC79	*	-30.0	225.0	6.0	*
80. REC80	*	-30.0	300.0	6.0	*
81. REC81	*	-30.0	-75.0	6.0	*
82. REC82	*	-30.0	-150.0	6.0	*
83. REC83	*	-30.0	-225.0	6.0	*
84. REC84	*	-30.0	-300.0	6.0	*
85. REC85	*	-30.0	-375.0	6.0	*

PAGE 4

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:34:52

```
  RECEPTOR LOCATIONS

  ------------------

                        *          COORDINATES (FT)         *

    RECEPTOR            *      X          Y          Z       *

-------------------------*-------------------------------------*

86. REC86               *       -30.0     -450.0        6.0   *
```

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	3.3
10.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.4	3.2
20.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	3.2
30.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.6	3.2
40.	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.6	3.3

50.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	3.6
60.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	3.9
70.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.9
80.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.8
90.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.6	3.6	3.5	3.5	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.8
100.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.8	3.8	3.8	3.7	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7
110.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.2	3.9	3.7	3.7	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.6
120.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.2	4.4	3.7	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.4
130.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.5	4.0	3.5	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.4
140.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.7	3.7	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.2
150.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.9	3.5	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2
160.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.7	3.5	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2
170.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.5	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0
180.	*	3.1	3.0	3.0	3.0	3.0	3.0	4.4	3.3	3.3	3.3	3.3	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.1	3.0
190.	*	3.4	3.0	3.0	3.0	3.0	3.0	4.3	3.3	3.3	3.3	3.3	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
200.	*	3.6	3.2	3.0	3.0	3.0	3.0	4.1	3.3	3.3	3.3	3.3	3.3	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.0
210.	*	3.8	3.3	3.0	3.0	3.0	3.0	4.0	3.3	3.3	3.3	3.3	3.3	3.7	3.2	3.0	3.0	3.0	3.0	3.0	3.0
220.	*	3.9	3.4	3.1	3.0	3.0	3.0	3.8	3.3	3.3	3.3	3.3	3.3	3.9	3.3	3.1	3.0	3.0	3.0	3.0	3.0
230.	*	3.7	3.6	3.3	3.0	3.0	3.0	3.6	3.4	3.4	3.4	3.4	3.4	3.9	3.4	3.1	3.0	3.0	3.0	3.0	3.0
240.	*	3.8	3.4	3.2	3.2	3.0	3.0	3.6	3.5	3.5	3.5	3.5	3.5	3.8	3.6	3.2	3.0	3.0	3.0	3.0	3.0
250.	*	3.8	3.3	3.2	3.2	3.2	3.0	3.5	3.5	3.5	3.5	3.5	3.5	3.6	3.5	3.2	3.2	3.0	3.0	3.1	3.1
260.	*	3.8	3.3	3.5	3.2	3.1	3.0	3.6	3.6	3.6	3.6	3.6	3.6	3.8	3.6	3.2	3.2	3.2	3.0	3.2	3.2

270.	*	3.7	3.4	3.4	3.2	3.1	3.0	3.4	3.4	3.4	3.4	3.4	3.4	3.7	3.5	3.5	3.3	3.1	3.0	3.3	3.3
280.	*	3.5	3.2	3.1	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.4	3.4	3.1	3.0	3.0	3.6	3.5
290.	*	3.2	3.1	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.1	3.1	3.0	3.0	3.0	3.6	3.5
300.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.1	3.0	3.0	3.0	3.0	3.8	3.4
310.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0	4.0	3.4
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	4.1	3.3
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	4.2	3.2
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	3.2
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.4	3.2
MAX	*	3.9	3.6	3.5	3.2	3.2	3.0	4.9	4.4	3.9	3.8	3.7	3.6	3.9	3.6	3.5	3.3	3.2	3.0	4.6	3.9
DEGR.	*	220	230	260	240	250	0	150	120	110	100	100	100	220	240	270	270	260	0	30	60

PAGE 6

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum

concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	* REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	* 3.3	3.3	3.3	3.3	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.1	3.1	3.1	3.1	3.1	3.0	3.8	4.0
10.	* 3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.3	3.4
20.	* 3.2	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
30.	* 3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
40.	* 3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
50.	* 3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
60.	* 3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
70.	* 3.6	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
80.	* 3.5	3.5	3.6	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
90.	* 3.7	3.6	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
100.	* 3.4	3.3	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0
110.	* 3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0
120.	* 3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0
130.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	3.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0

140.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	3.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0
150.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0
160.	*	3.0	3.0	3.0	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.8	4.2	3.5	3.3	3.1	3.1	3.1	3.1	3.1
170.	*	3.0	3.0	3.0	3.0	3.3	3.4	3.3	3.0	3.0	3.0	3.0	3.5	4.2	3.6	3.6	3.5	3.1	3.1	3.2	3.2
180.	*	3.0	3.0	3.0	3.0	3.8	3.8	3.5	3.5	3.3	3.0	3.0	3.4	3.9	3.7	3.6	3.5	3.0	3.0	3.6	3.4
190.	*	3.0	3.0	3.0	3.0	4.3	3.7	3.5	3.5	3.2	3.0	3.0	3.1	3.6	3.5	3.1	3.1	3.0	3.0	3.4	3.5
200.	*	3.0	3.0	3.0	3.0	4.7	3.6	3.6	3.2	3.1	3.0	3.0	3.1	3.6	3.3	3.1	3.0	3.0	3.0	3.5	3.5
210.	*	3.0	3.0	3.0	3.0	4.9	3.7	3.5	3.1	3.0	3.0	3.0	3.0	3.6	3.2	3.0	3.0	3.0	3.0	3.5	3.5
220.	*	3.0	3.0	3.0	3.0	5.0	3.7	3.3	3.0	3.0	3.0	3.0	3.0	3.5	3.1	3.0	3.0	3.0	3.0	3.4	3.4
230.	*	3.0	3.0	3.0	3.0	4.9	4.0	3.2	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.3	3.3
240.	*	3.0	3.0	3.0	3.0	4.7	4.0	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.0	3.0	3.0	3.3	3.3
250.	*	3.1	3.1	3.1	3.1	4.7	3.7	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.0	3.0	3.0	3.3	3.3
260.	*	3.1	3.1	3.1	3.1	4.7	3.5	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.3	3.3
270.	*	3.3	3.3	3.3	3.3	4.9	3.3	3.0	3.0	3.0	3.0	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.3	3.3
280.	*	3.5	3.5	3.5	3.5	4.9	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3
290.	*	3.5	3.4	3.4	3.4	5.1	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.7
300.	*	3.4	3.4	3.4	3.4	5.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	4.0
310.	*	3.4	3.4	3.4	3.4	5.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.3	4.4
320.	*	3.3	3.3	3.3	3.3	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.4	4.9
330.	*	3.2	3.2	3.2	3.2	4.6	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.8	5.1
340.	*	3.2	3.2	3.2	3.2	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.0	3.0	3.0	3.0	3.0	3.0	4.0	5.1
350.	*	3.2	3.2	3.2	3.2	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.7

```
------*-------------------------------------------------------------------------------------------------------------------------------
MAX   *   3.7   3.6   3.6   3.5   5.2   4.0   3.6   3.5   3.3   3.0   3.0   4.3   4.2   3.7   3.6   3.5   3.1   3.1   4.0   5.1
DEGR. *   90    90    80    80   300   230   200   180   180     0     0   130   160   180   170   170     0    10   340   330
```


JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

```
WIND  * CONCENTRATION
ANGLE *      (PPM)
(DEGR)* REC41 REC42 REC43 REC44 REC45 REC46 REC47 REC48 REC49 REC50 REC51 REC52 REC53 REC54 REC55 REC56 REC57 REC58 REC59 REC60
------*-------------------------------------------------------------------------------------------------------------------------------
  0.  *   3.6   3.5   3.1   3.0   3.0   3.0   3.0   3.0   3.1   3.0   3.0   3.0   3.0   3.0   3.6   3.0   3.0   3.0   3.0   3.0
```

10.	*	3.8	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0
20.	*	4.0	4.1	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0
30.	*	3.7	4.3	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0
40.	*	3.6	4.4	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
50.	*	3.4	4.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
60.	*	3.3	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
70.	*	3.3	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1
80.	*	3.3	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.0
90.	*	3.3	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
100.	*	3.3	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
110.	*	3.3	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
120.	*	3.3	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
130.	*	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
140.	*	3.4	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
150.	*	3.5	3.5	3.2	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
160.	*	3.5	3.5	3.4	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
170.	*	3.5	3.5	3.6	3.0	3.0	3.0	3.0	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
180.	*	3.6	3.4	4.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0
190.	*	3.1	3.1	4.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.1	3.0	3.0	3.0	3.0
200.	*	3.1	3.1	4.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.0	3.0	3.0
210.	*	3.0	3.0	4.3	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.0	3.0	3.0
220.	*	3.0	3.0	4.4	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.1	3.0	3.0	3.0

230.	*	3.0	3.0	4.5	3.4	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	4.2	3.5	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.9	3.4	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.5	3.4	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.4	3.4	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.1	3.1	3.0	3.0
280.	*	3.0	3.0	3.4	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.1	3.1	3.0	3.0
290.	*	3.0	3.2	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.1	3.0	3.0	3.1
300.	*	3.0	3.2	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.5	3.0	3.0	3.0	3.0
310.	*	3.0	3.2	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3	3.1	3.0	3.0	3.0
320.	*	3.0	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.2	3.1	3.0	3.0	3.0
330.	*	3.0	3.4	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.2	3.0	3.0	3.0	3.0
340.	*	3.2	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.2	3.0	3.0	3.0	3.0
350.	*	3.2	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.0	3.0	3.0	3.0	3.0
MAX	*	4.0	4.4	4.5	3.5	3.2	3.2	3.1	3.1	3.5	3.3	3.2	3.0	3.0	3.0	3.9	3.5	3.2	3.1	3.1	3.1
DEGR.	*	20	40	230	240	210	260	90	90	80	70	140	0	0	0	320	300	210	70	70	70

PAGE 8

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC61	REC62	REC63	REC64	REC65	REC66	REC67	REC68	REC69	REC70	REC71	REC72	REC73	REC74	REC75	REC76	REC77	REC78	REC79	REC80
0.	3.1	3.0	3.0	3.0	3.0	3.0	3.4	3.6	3.6	3.6	3.6	3.6	3.7	3.5	3.4	3.4	3.4	3.6	3.6	3.5
10.	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.3	3.3	3.4	3.4	3.2	3.1	3.1	3.2	3.5	3.7	3.7	3.6
20.	3.2	3.2	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.2	3.2	3.1	3.1	3.1	3.1	3.5	3.5	3.7	3.7
30.	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.6
40.	3.5	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4
50.	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4
60.	3.6	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
70.	3.5	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3

80.	*	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
90.	*	3.5	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
100.	*	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.3	3.3
110.	*	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.3	3.3	3.3
120.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.3	3.3	3.3
130.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	3.4	3.4	3.4
140.	*	3.2	3.2	3.1	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.5	3.4	3.4
150.	*	3.2	3.2	3.2	3.0	3.0	3.0	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	3.6	3.5	3.5
160.	*	3.2	3.2	3.0	3.0	3.0	3.0	3.3	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.0	3.7	3.6	3.5
170.	*	3.2	3.1	3.0	3.0	3.0	3.0	3.5	3.3	3.2	3.1	3.3	3.2	3.2	3.2	3.2	3.2	4.0	3.7	3.7	3.6
180.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	3.4	3.4	3.4	3.4	3.4	3.4	3.5	3.5	3.6	3.5
190.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.8	3.7	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.4	3.3	3.1	3.1
200.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.6	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.1	3.1
210.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0
220.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
230.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.3	3.3	3.4	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.3	3.3	3.4	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
280.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.5	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
290.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.6	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0

300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.8	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.9	3.3	3.3	3.4	3.4	3.4	3.0	3.0	3.0	3.0
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.9	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	4.1	3.6	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.8	4.0	3.6	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.7	3.6	3.6	3.9	3.9	3.7	3.4	3.5	3.5	3.1	3.1	3.1	3.2
MAX	*	3.6	3.3	3.2	3.0	3.0	3.0	3.7	3.8	3.7	3.8	4.1	3.9	3.7	3.6	3.6	3.6	4.2	3.7	3.7	3.7
DEGR.	*	60	60	150	0	0	0	190	190	190	340	330	350	0	190	190	190	150	10	10	20

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC81	REC82	REC83	REC84	REC85	REC86
0.	3.5	3.5	3.5	3.6	3.4	3.4
10.	3.7	3.8	3.7	3.5	3.5	3.5
20.	3.7	3.7	3.7	3.5	3.5	3.5
30.	3.6	3.7	3.5	3.5	3.5	3.5
40.	3.7	3.6	3.4	3.4	3.4	3.4

50.	*	3.9	3.4	3.4	3.4	3.4	3.4
60.	*	3.8	3.3	3.3	3.3	3.3	3.3
70.	*	3.6	3.3	3.3	3.3	3.3	3.3
80.	*	3.5	3.3	3.3	3.3	3.3	3.3
90.	*	3.4	3.3	3.3	3.3	3.3	3.3
100.	*	3.3	3.3	3.3	3.3	3.3	3.3
110.	*	3.3	3.3	3.3	3.3	3.3	3.3
120.	*	3.3	3.3	3.3	3.3	3.3	3.3
130.	*	3.4	3.4	3.4	3.4	3.4	3.4
140.	*	3.4	3.4	3.4	3.4	3.4	3.4
150.	*	3.5	3.5	3.5	3.5	3.5	3.5
160.	*	3.5	3.5	3.5	3.5	3.5	3.5
170.	*	3.6	3.6	3.6	3.6	3.6	3.5
180.	*	3.4	3.4	3.4	3.4	3.4	3.4
190.	*	3.3	3.2	3.2	3.2	3.2	3.2
200.	*	3.1	3.1	3.1	3.1	3.1	3.1
210.	*	3.0	3.0	3.0	3.0	3.0	3.0
220.	*	3.0	3.0	3.0	3.0	3.0	3.0
230.	*	3.0	3.0	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.0	3.0	3.0	3.0

```
270.  *   3.0   3.0   3.0   3.0   3.0   3.0

280.  *   3.0   3.0   3.0   3.0   3.0   3.0

290.  *   3.0   3.0   3.0   3.0   3.0   3.0

300.  *   3.0   3.0   3.0   3.0   3.0   3.0

310.  *   3.0   3.0   3.0   3.0   3.0   3.0

320.  *   3.0   3.0   3.0   3.0   3.0   3.0

330.  *   3.0   3.0   3.0   3.0   3.0   3.0

340.  *   3.1   3.1   3.1   3.1   3.1   3.1

350.  *   3.3   3.2   3.1   3.1   3.1   3.2

------*-----------------------------------

MAX   *   3.9   3.8   3.7   3.6   3.6   3.5

DEGR. *   50    10    10     0   170    10


THE HIGHEST CONCENTRATION OF    5.20 PPM OCCURRED AT RECEPTOR REC25.
```



```
     JOB: SOUTHPARK BRIDGE PROJECT                          RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON


     DATE :  9/13/ 2

     TIME : 17:34:52
```

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	220	230	260	240	250	0	150	120	110	100	100	100	220	240	270	270	260	0	30	60
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.1	.1	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0
4	.3	.2	.1	.1	.1	.0	.2	.1	.1	.1	.0	.0	.3	.2	.1	.0	.1	.0	.0	.0
5	.3	.2	.1	.1	.1	.0	.2	.1	.1	.1	.0	.0	.4	.2	.1	.1	.1	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1
9	.1	.1	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.0	.0	.1	.0	.0	.0	.1	.2	.2	.2	.2	.2	.0	.0	.1	.1	.0	.0	.1	.2
19	*	.0	.0	.1	.0	.0	.0	.7	.3	.1	.1	.1	.0	.0	.0	.1	.0	.0	.0	.7	.3
20	*	.0	.0	.0	.0	.0	.0	.3	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.5	.1
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.0	.0	.1	.0	.0	.0	.2	.3	.3	.3	.4	.4	.0	.0	.1	.1	.0	.0	.1	.2

PAGE 11

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:34:52

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

LINK #	ANGLE (DEGREES)																			
	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	90	90	80	80	300	230	200	180	180	0	0	130	160	180	170	170	0	10	340	330
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.2	.0	.0	.1	.1	.0	.0	.2	.1	.1	.1	.1	.0	.0	.3	.3
4	.1	.1	.0	.0	.6	.0	.1	.1	.1	.0	.0	.5	.2	.1	.1	.1	.0	.0	.2	.7
5	.1	.1	.0	.0	.8	.0	.1	.1	.1	.0	.0	.4	.2	.1	.1	.1	.0	.0	.2	.8
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0
8	.0	.0	.0	.0	.0	.5	.2	.1	.0	.0	.0	.0	.5	.2	.1	.1	.0	.0	.0	.0
9	.0	.0	.0	.0	.1	.0	.1	.1	.0	.0	.0	.2	.1	.1	.1	.0	.0	.0	.2	.1
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	.2	.2	.3	.3	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

19	*	.1	.1	.1	.0	.2	.2	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.1	.1
20	*	.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.1	.1	.2	.2	.1	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:34:52

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
	20	40	230	240	210	260	90	90	80	70	140	0	0	0	320	300	210	70	70	70
1	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0
2	.0	.0	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.2	.2	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0
4	.2	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5	.3	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

8	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.3	.2	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0
11	*	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.1	.1	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1
16	*	.0	.0	1.0	.1	.0	.1	.0	.0	.1	.0	.0	.0	.0	.0	.6	.2	.0	.0	.0	.0
17	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:34:52

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC61	REC62	REC63	REC64	REC65	REC66	REC67	REC68	REC69	REC70	REC71	REC72	REC73	REC74	REC75	REC76	REC77	REC78	REC79	REC80
	60	60	150	0	0	0	190	190	190	340	330	350	0	190	190	190	150	10	10	20
1	.0	.0	.1	.0	.0	.0	.2	.1	.1	.0	.2	.3	.2	.4	.4	.4	.1	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.6	.2	.1	.0	.0	.0	.1	.0	.0	.0
3	.1	.1	.0	.0	.0	.0	.2	.3	.3	.3	.0	.1	.1	.0	.0	.0	.1	.2	.2	.2
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1
5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

8	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.1	.1	.0	.0	.0	.0	.0	.1	.1	.2	.1	.1	.1	.0	.0	.0	.2	.3	.3	.3
10	*	.1	.1	.0	.0	.0	.0	.0	.1	.1	.0	.1	.1	.0	.0	.0	.0	.6	.0	.0	.0
11	*	.0	.0	.1	.0	.0	.0	.2	.1	.1	.0	.1	.1	.1	.2	.2	.2	.0	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.1	.0	.0	.0
17	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:34:52

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

LINK #	* CO/LINK (PPM) / * ANGLE (DEGREES)	REC81	REC82	REC83	REC84	REC85	REC86
	*	50	10	10	0	170	10
1	*	.1	.1	.1	.1	.2	.2
2	*	.4	.1	.1	.0	.0	.0
3	*	.0	.1	.1	.1	.0	.0
4	*	.0	.0	.0	.0	.0	.0
5	*	.0	.0	.0	.0	.0	.0
6	*	.0	.0	.0	.0	.0	.0
7	*	.0	.0	.0	.0	.0	.0

```
 8  *    .0    .0    .0    .0    .0    .0

 9  *    .0    .1    .1    .1    .0    .0

10  *    .0    .1    .0    .0    .0    .0

11  *    .2    .3    .3    .3    .4    .3

12  *    .0    .0    .0    .0    .0    .0

13  *    .0    .0    .0    .0    .0    .0

14  *    .0    .0    .0    .0    .0    .0

15  *    .0    .0    .0    .0    .0    .0

16  *    .2    .0    .0    .0    .0    .0

17  *    .0    .0    .0    .0    .0    .0

18  *    .0    .0    .0    .0    .0    .0

19  *    .0    .0    .0    .0    .0    .0

20  *    .0    .0    .0    .0    .0    .0

21  *    .0    .0    .0    .0    .0    .0

22  *    .0    .0    .0    .0    .0    .0

23  *    .0    .0    .0    .0    .0    .0

24  *    .0    .0    .0    .0    .0    .0
```

2007 REHAB, BASCULE, MID-LEVEL BRIDGES – 16TH AVENUE SOUTH / EAST MARGINAL WAY

```
                CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1


(C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.
```

JOB: SOUTHPARK PROJECT RUN: 2007 BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17:11:49

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM

U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)			(G/MI)	(FT)	(FT)		(VEH)
1. 16TH NB	*	625.0	-750.0	.0	.0	*	976.	320.	AG	583.	10.6	.0	60.0		
2. 16TH QUE LT	*	66.7	-88.6	120.9	-153.6	*	85.	140.	AG	1142.	100.0	.0	30.0	.51	4.3
3. 16TH QUE RT	*	82.6	-76.0	103.4	-100.9	*	32.	140.	AG	381.	100.0	.0	10.0	.20	1.7
4. 16TH SB	*	-18.0	-42.6	607.0	-792.6	*	976.	140.	AG	971.	10.6	.0	40.0		
5. MARGINAL SE 1	*	-1000.0	-16.0	.0	-16.0	*	1000.	90.	AG	1416.	7.8	.0	52.0		

6. MAR SE QUE TH RT	*	-60.0	-10.0	-208.6	-10.0	*	149.	270.	AG	465.	100.0	.0	20.0	.67	7.5
7. MAR SE QUE E RT	*	-60.0	-26.0	-118.5	-26.0	*	59.	270.	AG	106.	100.0	.0	10.0	.43	3.0
8. MARGINAL SE 2	*	.0	-12.0	1000.0	-12.0	*	1000.	90.	AG	627.	7.8	.0	24.0		
9. MARGINAL NW 1	*	1000.0	22.0	.0	22.0	*	1000.	270.	AG	690.	7.8	.0	64.0		
10. MAR NW QUE LT	*	60.0	6.0	120.3	6.0	*	60.	90.	AG	402.	100.0	.0	12.0	.45	3.1
11. MAR NW QUE TH	*	60.0	28.0	91.3	28.0	*	31.	90.	AG	381.	100.0	.0	32.0	.19	1.6
12. MAR NW 2	*	.0	16.0	-1000.0	16.0	*	1000.	270.	AG	1091.	7.8	.0	52.0		

PAGE 2

JOB: SOUTHPARK PROJECT RUN: 2007 BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17:11:49

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 16TH QUE LT	*	120	90	2.0	517	1562	189.20	1	3
3. 16TH QUE RT	*	120	90	2.0	66	1487	189.20	1	3

6. MAR SE QUE TH RT	*	120	55	2.0	988	1447	189.20	1	3
7. MAR SE QUE E RT	*	120	25	2.0	428	1315	189.20	1	3
10. MAR NW QUE LT	*	120	95	2.0	116	1466	189.20	1	3
11. MAR NW QUE TH	*	120	30	2.0	574	1405	189.20	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. RECEPTOR 1	75.7	-43.5	.0
2. RECEPTOR 2	123.6	-101.1	.0
3. RECEPTOR 3	171.6	-158.8	.0
4. RECEPTOR 4	219.6	-216.4	.0
5. RECEPTOR 5	267.6	-274.1	.0
6. RECEPTOR 6	315.6	-331.7	.0
7. RECEPTOR 7	363.5	-389.3	.0
8. RECEPTOR 10	-7.5	-87.5	.0
9. RECEPTOR 11	40.4	-145.1	.0
10. RECEPTOR 12	88.4	-202.8	.0
11. RECEPTOR 13	136.4	-260.4	.0
12. RECEPTOR 14	184.3	-318.1	.0

13. RECEPTOR 15	*	232.3	-375.7	.0	*
14. RECEPTOR 16	*	280.3	-433.4	.0	*
15. RECEPTOR 20	*	-424.8	41.6	.0	*
16. RECEPTOR 21	*	-349.8	41.6	.0	*
17. RECEPTOR 22	*	-274.8	41.6	.0	*
18. RECEPTOR 23	*	-199.8	41.6	.0	*
19. RECEPTOR 24	*	-124.8	41.6	.0	*
20. RECEPTOR 25	*	-49.8	41.6	.0	*
21. RECEPTOR 26	*	.8	54.4	.0	*
22. RECEPTOR 27	*	75.8	54.4	.0	*
23. RECEPTOR 28	*	150.8	54.4	.0	*
24. RECEPTOR 29	*	225.8	54.4	.0	*
25. RECEPTOR 30	*	300.8	54.4	.0	*
26. RECEPTOR 31	*	375.8	54.4	.0	*
27. RECEPTOR 32	*	450.8	54.4	.0	*
28. RECEPTOR 34	*	-424.8	-41.5	.0	*
29. RECEPTOR 35	*	-349.8	-41.5	.0	*
30. RECEPTOR 36	*	-274.8	-41.5	.0	*
31. RECEPTOR 37	*	-199.8	-41.5	.0	*
32. RECEPTOR 38	*	-124.8	-41.5	.0	*
33. RECEPTOR 39	*	-49.8	-41.5	.0	*
34. RECEPTOR 40	*	.1	-24.2	.0	*

```
35. RECEPTOR 41          *        75.1      -24.2         .0   *

36. RECEPTOR 42          *       150.1      -24.2         .0   *

37. RECEPTOR 43          *       225.1      -24.2         .0   *

38. RECEPTOR 44          *       300.1      -24.2         .0   *

39. RECEPTOR 45          *       375.1      -24.2         .0   *
```


JOB: SOUTHPARK PROJECT RUN: 2007 BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17:11:49

RECEPTOR LOCATIONS

```
                         *           COORDINATES (FT)          *

   RECEPTOR              *      X          Y          Z        *

-------------------------*-------------------------------------*

40. RECEPTOR 46          *       450.1      -24.2         .0   *
```


JOB: SOUTHPARK PROJECT RUN: 2007 BRIDGE MARGINAL WAY

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	* REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	* 4.1	3.5	3.1	3.0	3.0	3.0	3.0	3.7	4.0	5.9	4.4	3.8	3.7	3.7	3.1	3.1	3.1	3.1	3.1	3.1
10.	* 4.0	3.3	3.1	3.0	3.0	3.0	3.0	3.7	4.2	5.7	3.8	3.6	3.6	3.6	3.0	3.0	3.0	3.0	3.0	3.0
20.	* 3.9	3.2	3.1	3.0	3.0	3.0	3.0	3.8	4.9	5.2	3.6	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0
30.	* 3.8	3.2	3.1	3.0	3.0	3.0	3.0	3.9	5.3	4.8	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0
40.	* 3.5	3.2	3.1	3.0	3.0	3.0	3.0	4.0	5.8	4.3	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0
50.	* 3.4	3.2	3.2	3.1	3.0	3.0	3.0	4.0	5.9	3.9	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0
60.	* 3.4	3.2	3.2	3.1	3.0	3.0	3.0	3.8	5.9	3.7	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1	3.0	3.0

70.	*	3.4	3.2	3.2	3.0	3.0	3.0	3.0	4.0	5.9	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1	3.1	3.2
80.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.0	4.3	5.4	3.5	3.5	3.5	3.5	3.5	3.3	3.3	3.2	3.3	3.2	3.3
90.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.0	4.7	5.0	3.5	3.5	3.5	3.5	3.5	3.8	3.8	3.8	4.0	3.7	3.8
100.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.3	4.7	3.7	3.7	3.7	3.7	3.7	4.1	4.2	4.6	4.2	3.9	3.9
110.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.3	4.2	3.7	3.7	3.7	3.7	3.7	4.2	4.5	4.9	4.6	4.2	3.9
120.	*	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.9	4.0	3.8	3.8	3.8	3.8	3.8	4.0	4.2	4.7	5.1	4.5	4.0
130.	*	3.4	3.2	3.2	3.1	3.1	3.1	3.1	4.4	3.9	3.9	3.9	3.8	3.8	3.8	3.8	3.9	4.4	5.1	4.8	4.5
140.	*	4.2	3.4	3.4	3.4	3.4	3.4	3.4	3.8	3.7	3.7	3.7	3.7	3.6	3.6	3.6	3.6	3.9	4.6	4.9	4.7
150.	*	5.4	3.7	3.6	3.6	3.6	3.6	3.5	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.6	3.6	3.7	4.4	4.6	4.4
160.	*	6.2	3.9	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.6	3.6	4.2	4.4	4.0
170.	*	6.4	4.4	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.5	3.5	4.2	4.4	3.7
180.	*	5.9	5.1	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	4.1	4.3	3.7
190.	*	5.0	5.7	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.9	4.3	4.0
200.	*	4.2	6.1	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.8	4.4	4.3
210.	*	3.8	6.2	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.7	4.4	4.4
220.	*	3.5	6.2	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	4.4	4.5
230.	*	3.4	6.3	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	4.4	4.6
240.	*	3.4	6.3	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	4.1	4.5
250.	*	3.4	6.4	3.6	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.8	3.8	4.0	4.4
260.	*	3.6	6.6	3.9	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.9	3.9	3.9	4.0	4.2
270.	*	4.0	6.8	4.5	3.4	3.4	3.4	3.4	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.5	3.6	3.6	3.7	3.7	3.8
280.	*	4.3	6.7	5.5	3.9	3.6	3.5	3.5	3.6	3.2	3.2	3.1	3.0	3.0	3.0	3.2	3.3	3.3	3.3	3.3	3.4

290.	*	4.0	6.1	6.1	4.3	3.9	3.8	3.6	3.9	3.5	3.4	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1
300.	*	3.6	5.1	6.0	4.7	4.2	4.0	3.9	4.3	3.7	3.5	3.4	3.4	3.3	3.2	3.1	3.1	3.1	3.1	3.1	3.1
310.	*	3.6	4.3	5.3	4.8	4.3	4.1	4.0	4.1	3.8	3.6	3.6	3.7	3.7	3.6	3.0	3.0	3.0	3.0	3.0	3.0
320.	*	3.3	3.8	4.0	4.0	3.9	3.7	3.6	4.0	3.8	3.8	4.1	4.1	4.1	3.9	3.0	3.0	3.0	3.0	3.0	3.0
330.	*	3.5	3.7	3.7	3.5	3.4	3.2	3.2	3.8	3.8	4.3	4.5	4.4	4.1	4.1	3.0	3.0	3.0	3.0	3.0	3.0
340.	*	3.7	3.6	3.4	3.2	3.1	3.1	3.1	3.7	3.8	4.4	4.9	4.5	4.1	4.0	3.0	3.0	3.0	3.0	3.0	3.0
350.	*	3.9	3.5	3.2	3.0	3.0	3.0	3.0	3.7	3.6	5.3	4.9	4.1	3.8	3.8	3.0	3.0	3.0	3.0	3.0	3.0
MAX	*	6.4	6.8	6.1	4.8	4.3	4.1	4.0	5.3	5.9	5.9	4.9	4.5	4.1	4.1	4.2	4.5	4.9	5.1	4.9	4.7
DEGR.	*	170	270	290	310	310	310	310	100	50	0	340	340	320	330	110	110	110	120	140	140

JOB: SOUTHPARK PROJECT RUN: 2007 BRIDGE MARGINAL WAY

MODEL RESULTS

REMARKS : In search of the angle corresponding to

the maximum concentration, only the first

angle, of the angles with same maximum

concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	4.5	4.7	3.7	3.7	4.7	3.4	3.4	3.4	3.4	3.4
10.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	4.6	4.8	3.6	3.6	4.6	3.3	3.3	3.3	3.3	3.3
20.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	4.7	4.8	3.6	3.6	4.4	3.3	3.3	3.3	3.3	3.3
30.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	4.7	4.9	3.6	3.7	4.4	3.4	3.4	3.4	3.4	3.4
40.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.7	4.8	4.9	3.6	4.0	4.2	3.4	3.4	3.4	3.4	3.4
50.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.9	4.9	5.1	3.9	4.2	4.1	3.5	3.5	3.5	3.5	3.5
60.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.9	4.3	4.9	5.0	3.9	4.5	3.9	3.5	3.5	3.5	3.5	3.5
70.	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.9	4.1	4.5	5.2	4.8	4.0	4.5	3.8	3.6	3.6	3.6	3.6	3.6
80.	3.2	3.1	3.1	3.1	3.1	3.1	3.1	4.1	4.4	4.6	4.8	4.4	4.1	4.5	3.7	3.6	3.6	3.6	3.6	3.6
90.	3.6	3.4	3.4	3.2	3.2	3.2	3.2	3.9	4.1	4.5	4.5	4.3	3.9	3.9	3.4	3.4	3.4	3.4	3.4	3.4
100.	3.8	3.4	3.4	3.4	3.4	3.4	3.4	3.7	3.7	4.0	3.8	3.9	4.2	3.6	3.3	3.3	3.2	3.2	3.2	3.2
110.	4.0	3.5	3.4	3.4	3.4	3.4	3.4	3.3	3.4	3.5	3.6	3.9	4.5	4.0	3.1	3.1	3.1	3.1	3.1	3.1
120.	3.9	3.6	3.3	3.3	3.3	3.3	3.3	3.2	3.2	3.4	3.5	3.8	4.7	4.6	3.0	3.0	3.0	3.0	3.0	3.0

130.	*	4.1	3.8	3.3	3.3	3.3	3.3	3.3	3.1	3.1	3.2	3.3	3.6	4.4	5.2	3.1	3.0	3.0	3.0	3.0	3.0
140.	*	4.4	4.3	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.1	3.1	3.8	5.4	3.7	3.0	3.0	3.0	3.0	3.0
150.	*	4.5	4.8	3.5	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.2	4.9	4.5	3.2	3.0	3.0	3.0	3.0
160.	*	4.3	5.5	3.5	3.5	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.1	4.2	5.3	3.2	3.2	3.1	3.0	3.0
170.	*	4.1	6.0	3.6	3.5	3.5	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.9	5.5	3.3	3.2	3.2	3.1	3.0
180.	*	3.6	6.0	3.8	3.5	3.5	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.7	5.2	3.5	3.2	3.2	3.2	3.1
190.	*	3.7	5.5	4.2	3.6	3.5	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.5	4.6	3.9	3.2	3.2	3.2	3.1
200.	*	3.4	4.9	4.4	3.8	3.5	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.9	4.3	3.3	3.2	3.1	3.1
210.	*	3.5	4.3	4.4	4.0	3.5	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	4.6	3.5	3.2	3.1	3.1
220.	*	3.9	4.1	4.2	4.1	3.7	3.5	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.4	4.5	3.7	3.3	3.1	3.1
230.	*	4.1	3.9	4.3	4.1	3.8	3.6	3.5	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.4	4.2	4.1	3.5	3.2	3.1
240.	*	4.2	4.0	4.3	3.8	3.7	3.7	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.3	3.7	4.0	3.7	3.3	3.2
250.	*	4.2	4.2	4.2	4.0	3.8	3.9	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.7	3.6	3.5	3.9	3.9	3.6	3.4
260.	*	4.0	4.0	4.2	4.0	3.8	3.9	3.9	3.3	3.3	3.3	3.3	3.3	3.4	4.4	4.0	3.8	4.0	3.9	3.8	3.6
270.	*	3.5	3.6	3.8	3.7	3.7	3.6	3.5	3.7	3.7	3.7	3.7	3.8	4.2	5.2	4.4	4.3	4.1	3.9	3.9	3.9
280.	*	3.1	3.2	3.3	3.2	3.2	3.1	3.1	3.9	3.9	3.9	3.9	4.3	4.9	5.3	4.5	4.5	4.2	4.1	4.0	4.0
290.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.9	3.9	3.9	4.6	5.4	4.9	4.1	4.4	4.0	3.7	3.5	3.5
300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.8	3.8	4.8	5.4	4.2	3.8	4.4	3.7	3.5	3.5	3.5
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	4.8	5.2	4.0	3.7	4.3	3.5	3.5	3.5	3.5
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.7	4.7	4.8	3.8	3.6	3.9	3.4	3.4	3.4	3.4
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.8	4.7	4.5	3.7	3.8	3.7	3.4	3.4	3.4	3.4
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	4.0	4.7	4.3	3.7	4.1	3.3	3.3	3.3	3.3	3.3

```
350.  *   3.0   3.0   3.0   3.0   3.0   3.0   3.0   3.6   3.6   3.6   4.3   4.7   4.0   3.7   4.5   3.3   3.3   3.3   3.3   3.3
------*-------------------------------------------------------------------------------------------------------------------------
MAX   *   4.5   6.0   4.4   4.1   3.8   3.9   3.9   4.1   4.4   4.6   5.2   5.1   5.4   5.4   5.5   4.6   4.2   4.1   4.0   4.0
DEGR. *  150   170   200   220   230   250   260    80    80    80    70    50   290   140   170   210   280   280   280   280

THE HIGHEST CONCENTRATION OF    6.80 PPM OCCURRED AT RECEPTOR REC2 .
```

JOB: SOUTHPARK PROJECT RUN: 2007 BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17:11:49

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	170	270	290	310	310	310	310	100	50	0	340	340	320	330	110	110	110	120	140	140
1	.3	.2	.3	.3	.3	.4	.4	.2	.1	.2	.1	.2	.1	.1	.0	.1	.1	.1	.1	.2
2	2.5	2.6	2.2	1.0	.6	.3	.2	1.5	2.0	1.9	1.0	.6	.3	.3	.1	.2	.2	.3	.2	.6
3	.4	.5	.0	.1	.0	.0	.0	.1	.2	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1
4	.2	.2	.2	.1	.1	.2	.2	.5	.4	.5	.6	.6	.5	.7	.1	.1	.1	.1	.2	.3
5	.0	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.1	.0	.3	.3	.3	.3	.3	.2
6	.0	.1	.2	.1	.1	.1	.1	.0	.0	.0	.0	.0	.1	.0	.2	.3	.7	.8	.7	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0

8	*	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.5	.5	.5	.4	.3	.3

JOB: SOUTHPARK PROJECT RUN: 2007 BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17:11:49

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	150	170	200	220	230	250	260	80	80	80	70	50	290	140	170	210	280	280	280	280
1	.2	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.5	.2	.1	.0	.0	.0	.0
2	.7	.7	.7	.5	.4	.2	.1	.0	.0	.0	.0	.0	.0	1.2	1.8	1.2	.0	.0	.0	.0
3	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.3	.2	.0	.0	.0	.0
4	.2	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.4	.2	.1	.0	.0	.0	.0
5	.0	.0	.0	.0	.0	.1	.1	.7	.7	.6	.6	.5	.7	.2	.0	.0	.1	.1	.1	.1
6	.0	.0	.0	.0	.0	.1	.1	.2	.4	.7	1.1	1.1	1.2	.0	.0	.0	.2	.1	.1	.1
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.3	.3	.0	.0	.0	.0	.0	.0	.0

8	*	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4	.4	.4	.4
9	*	.2	.2	.2	.2	.2	.3	.3	.0	.1	.1	.1	.0	.0	.0	.0	.0	.1	.2	.2	.2
10	*	.0	.6	.1	.0	.0	.1	.1	.0	.0	.1	.1	.0	.0	.0	.0	.0	.2	.1	.1	.1
11	*	.0	1.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.1	.2	.2	.1	.2	.2	.2	.0	.0	.0	.1	.1	.1	.1

2007 REHAB, BASCULE, MID-LEVEL BRIDGES – 14TH AVENUE SOUTH / SOUTH CLOVERDALE AND SOUTH TRENTON STREETS

```
     CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1


(C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.

     JOB: SOUTHPARK BRIDGE PROJECT                           RUN: 2007 BRIDGE CLOVERDALE & TRENTON


     DATE :  9/13/ 2

     TIME : 17:59:14


        The MODE flag has been set to C for calculating CO averages.


      SITE & METEOROLOGICAL VARIABLES

      ------------------------------

      VS =    .0 CM/S       VD =    .0 CM/S       Z0 = 108. CM

       U =  1.0 M/S         CLAS =   4  (D)     ATIM =  60. MINUTES     MIXH =  1000. M   AMB =  3.0 PPM
```

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)			(G/MI)	(FT)	(FT)		(VEH)
1. 14TH NB 1	*	10.0	-1000.0	10.0	.0	*	1000.	360.	AG	567.	10.6	.0	40.0		
2. 14TH NB QUE ALL	*	10.0	-30.0	10.0	-68.7	*	39.	180.	AG	254.	100.0	.0	20.0	.24	2.0
3. 14TH NB 2	*	10.0	.0	10.0	600.0	*	600.	360.	AG	570.	10.6	.0	40.0		
4. 14TH NB QUE ALL	*	10.0	560.0	10.0	483.5	*	76.	180.	AG	528.	100.0	.0	20.0	.38	3.9
5. 14TH NB 3	*	10.0	600.0	10.0	1600.0	*	1000.	360.	AG	568.	10.6	.0	40.0		
6. 14TH SB 1	*	-10.0	1600.0	-10.0	600.0	*	1000.	180.	AG	1009.	10.6	.0	40.0		
7. 14TH SB QUE ALL	*	-10.0	630.0	-10.0	751.3	*	121.	360.	AG	447.	100.0	.0	20.0	.62	6.2
8. 14TH SB 2	*	-10.0	600.0	-10.0	.0	*	600.	180.	AG	775.	10.6	.0	40.0		
9. 14TH SB QUE ALL	*	-10.0	30.0	-10.0	82.2	*	52.	360.	AG	254.	100.0	.0	20.0	.32	2.7
10. 14TH SB 3	*	-10.0	.0	-10.0	-1000.0	*	1000.	180.	AG	790.	10.6	.0	40.0		
11. TRENTON EB 1	*	-1000.0	-6.0	.0	-6.0	*	1000.	90.	AG	21.	12.9	.0	32.0		
12. TRENTON EB QUE ALL	*	-40.0	-6.0	-48.2	-6.0	*	8.	270.	AG	381.	100.0	.0	12.0	.06	.4
13. TRENTON EB 2	*	.0	-6.0	1000.0	-6.0	*	1000.	90.	AG	44.	12.9	.0	32.0		
14. TRENTON WB 1	*	1000.0	6.0	.0	6.0	*	1000.	270.	AG	116.	12.9	.0	32.0		
15. TRENTON WB QUE ALL	*	40.0	6.0	87.2	6.0	*	47.	90.	AG	381.	100.0	.0	12.0	.33	2.4
16. TRENTON WB 2	*	.0	6.0	-1000.0	6.0	*	1000.	270.	AG	39.	12.9	.0	32.0		

```
17. CLOVERDALE EB 1     *  -1000.0     590.0        .0     590.0 *    1000.    90. AG    354.  10.6    .0 40.0
18. CLOVERDALE EB QUE LT*    -40.0     595.0     -99.5     595.0 *      59.   270. AG    345. 100.0    .0 10.0  .36   3.0
19. CLOVERDALE EB QUE AL*    -40.0     585.0    -112.1     585.0 *      72.   270. AG    345. 100.0    .0 10.0  .48   3.7
20. CLOVERDALE EB 2     *       .0     595.0    1000.0     595.0 *    1000.    90. AG     13.  10.6    .0 30.0
21. CLOVERDALE WB 1     *   1000.0     605.0        .0     605.0 *    1000.   270. AG     21.  10.6    .0 30.0
22. CLOVERDALE WB QUE AL*     40.0     605.0      48.7     605.0 *       9.    90. AG    406. 100.0    .0 10.0  .08    .4
23. CLOVERDALE WB 2     *       .0     605.0   -1000.0     605.0 *    1000.   270. AG    553.  10.6    .0 30.0
```

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:59:14

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 14TH NB QUE ALL	*	100	25	2.0	567	1640	189.20	1	3
4. 14TH NB QUE ALL	*	100	52	2.0	538	1622	189.20	1	3
7. 14TH SB QUE ALL	*	100	44	2.0	1009	1564	189.20	1	3
9. 14TH SB QUE ALL	*	100	25	2.0	765	1689	189.20	1	3
12. TRENTON EB QUE ALL	*	100	75	2.0	20	1658	189.20	1	3
15. TRENTON WB QUE ALL	*	100	75	2.0	115	1641	189.20	1	3
18. CLOVERDALE EB QUE LT	*	100	68	2.0	160	1594	189.20	1	3
19. CLOVERDALE EB QUE AL	*	100	68	2.0	194	1445	189.20	1	3
22. CLOVERDALE WB QUE AL	*	100	80	2.0	20	1524	189.20	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC1	75.0	620.0	6.0
2. REC2	150.0	620.0	6.0
3. REC3	225.0	620.0	6.0
4. REC4	300.0	620.0	6.0
5. REC5	375.0	620.0	6.0
6. REC6	450.0	620.0	6.0
7. REC7	-75.0	620.0	6.0
8. REC8	-150.0	620.0	6.0
9. REC9	-225.0	620.0	6.0
10. REC10	-300.0	620.0	6.0
11. REC11	-375.0	620.0	6.0
12. REC12	-450.0	620.0	6.0
13. REC13	75.0	580.0	6.0
14. REC14	150.0	580.0	6.0
15. REC15	225.0	580.0	6.0
16. REC16	300.0	580.0	6.0
17. REC17	375.0	580.0	6.0

18. REC18	*	450.0	580.0	6.0	*
19. REC19	*	-75.0	570.0	6.0	*
20. REC20	*	-150.0	570.0	6.0	*
21. REC21	*	-225.0	570.0	6.0	*
22. REC22	*	-300.0	570.0	6.0	*
23. REC23	*	-375.0	570.0	6.0	*
24. REC24	*	-450.0	570.0	6.0	*
25. REC25	*	30.0	525.0	6.0	*
26. REC26	*	30.0	675.0	6.0	*
27. REC27	*	30.0	750.0	6.0	*
28. REC28	*	30.0	825.0	6.0	*
29. REC29	*	30.0	900.0	6.0	*
30. REC30	*	30.0	975.0	6.0	*
31. REC31	*	30.0	1050.0	6.0	*
32. REC32	*	-30.0	525.0	6.0	*
33. REC33	*	-30.0	675.0	6.0	*
34. REC34	*	-30.0	750.0	6.0	*
35. REC35	*	-30.0	825.0	6.0	*
36. REC36	*	-30.0	900.0	6.0	*

PAGE 3

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:59:14

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
37. REC37	-30.0	975.0	6.0
38. REC38	-30.0	1050.0	6.0
39. REC39	30.0	375.0	6.0
40. REC40	30.0	450.0	6.0
41. REC41	-30.0	375.0	6.0
42. REC42	-30.0	450.0	6.0
43. REC43	75.0	22.0	6.0
44. REC44	150.0	22.0	6.0
45. REC45	225.0	22.0	6.0
46. REC46	300.0	22.0	6.0
47. REC47	375.0	22.0	6.0
48. REC48	450.0	22.0	6.0

```
49. REC49                 *       -75.0       22.0        6.0   *

50. REC50                 *      -150.0       22.0        6.0   *

51. REC51                 *      -225.0       22.0        6.0   *

52. REC52                 *      -300.0       22.0        6.0   *

53. REC53                 *      -375.0       22.0        6.0   *

54. REC54                 *      -450.0       22.0        6.0   *

55. REC55                 *        75.0      -22.0        6.0   *

56. REC56                 *       150.0      -22.0        6.0   *

57. REC57                 *       225.0      -22.0        6.0   *

58. REC58                 *       300.0      -22.0        6.0   *

59. REC59                 *       375.0      -22.0        6.0   *

60. REC60                 *       450.0      -22.0        6.0   *

61. REC61                 *       -75.0      -22.0        6.0   *

62. REC62                 *      -150.0      -22.0        6.0   *

63. REC63                 *      -225.0      -22.0        6.0   *

64. REC64                 *      -300.0      -22.0        6.0   *

65. REC65                 *      -375.0      -22.0        6.0   *

66. REC66                 *      -450.0      -22.0        6.0   *

67. REC67                 *        30.0       75.0        6.0   *

68. REC68                 *        30.0      150.0        6.0   *

69. REC69                 *        30.0      225.0        6.0   *

70. REC70                 *        30.0      300.0        6.0   *
```

71. REC71	*	30.0	-75.0	6.0	*
72. REC72	*	30.0	-150.0	6.0	*
73. REC73	*	30.0	-225.0	6.0	*
74. REC74	*	30.0	-300.0	6.0	*
75. REC75	*	30.0	-375.0	6.0	*
76. REC76	*	30.0	-450.0	6.0	*
77. REC77	*	-30.0	75.0	6.0	*
78. REC78	*	-30.0	150.0	6.0	*
79. REC79	*	-30.0	225.0	6.0	*
80. REC80	*	-30.0	300.0	6.0	*
81. REC81	*	-30.0	-75.0	6.0	*
82. REC82	*	-30.0	-150.0	6.0	*
83. REC83	*	-30.0	-225.0	6.0	*
84. REC84	*	-30.0	-300.0	6.0	*
85. REC85	*	-30.0	-375.0	6.0	*
86. REC86	*	-30.0	-450.0	6.0	*

PAGE 4

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

100.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	4.2	3.9	3.8	3.8	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.9
110.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.9	4.5	4.0	3.8	3.6	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.5
120.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.2	4.6	3.7	3.6	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.4
130.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.7	4.2	3.6	3.5	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3
140.	*	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.8	3.5	3.4	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.2
150.	*	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.6	3.4	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2
160.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.8	3.5	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2
170.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.8	3.5	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.1
180.	*	3.2	3.0	3.0	3.0	3.0	3.0	4.6	3.3	3.3	3.3	3.3	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.0
190.	*	3.3	3.1	3.0	3.0	3.0	3.0	4.5	3.3	3.3	3.3	3.3	3.3	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0
200.	*	3.6	3.2	3.0	3.0	3.0	3.0	4.4	3.3	3.3	3.3	3.3	3.3	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0
210.	*	3.8	3.3	3.2	3.0	3.0	3.0	4.4	3.3	3.3	3.3	3.3	3.3	3.7	3.2	3.1	3.0	3.0	3.0	3.0	3.0
220.	*	3.8	3.4	3.2	3.1	3.0	3.0	4.1	3.3	3.3	3.3	3.3	3.3	3.8	3.3	3.2	3.1	3.0	3.0	3.0	3.0
230.	*	3.7	3.5	3.3	3.1	3.0	3.0	4.0	3.4	3.4	3.4	3.4	3.4	3.9	3.4	3.2	3.1	3.0	3.0	3.0	3.0
240.	*	3.7	3.5	3.3	3.2	3.0	3.0	3.6	3.4	3.4	3.4	3.4	3.4	3.8	3.5	3.3	3.1	3.0	3.0	3.0	3.0
250.	*	4.0	3.6	3.3	3.1	3.1	3.1	3.6	3.6	3.6	3.6	3.6	3.6	3.7	3.5	3.3	3.2	3.1	3.0	3.0	3.0
260.	*	4.2	3.6	3.5	3.2	3.1	3.1	3.6	3.6	3.6	3.6	3.6	3.6	3.8	3.8	3.3	3.1	3.1	3.1	3.2	3.2
270.	*	4.0	3.6	3.6	3.2	3.2	3.1	3.5	3.5	3.5	3.4	3.4	3.4	4.0	3.6	3.5	3.4	3.3	3.1	3.4	3.3
280.	*	3.8	3.5	3.4	3.2	3.2	3.1	3.3	3.3	3.2	3.2	3.2	3.2	4.0	3.6	3.5	3.2	3.1	3.1	3.7	3.4
290.	*	3.7	3.5	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.8	3.5	3.3	3.2	3.2	3.1	4.0	3.4
300.	*	3.8	3.5	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.5	3.3	3.2	3.2	3.1	4.3	3.4
310.	*	3.8	3.4	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.5	3.3	3.1	3.1	3.1	4.6	3.4

320.	*	3.7	3.3	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.4	3.2	3.1	3.1	3.1	4.6	3.3
330.	*	3.6	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3	3.2	3.1	3.1	3.0	4.7	3.2
340.	*	3.4	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.2	3.2	3.1	3.0	3.0	4.7	3.2
350.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.0	3.0	3.0	3.0	4.8	3.2
MAX	*	4.2	3.6	3.6	3.2	3.2	3.2	5.0	4.6	4.0	3.8	3.8	3.7	4.0	3.8	3.5	3.4	3.3	3.1	5.6	4.6
DEGR.	*	260	250	270	240	270	290	140	120	110	100	100	100	270	260	270	270	270	260	20	80

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	3.2	3.2	3.2	3.2	4.1	3.5	3.5	3.5	3.5	3.5	3.5	4.4	4.1	3.7	3.7	3.7	3.7	3.6	4.1	4.4
10.	3.3	3.2	3.2	3.2	3.5	3.3	3.3	3.3	3.3	3.3	3.3	4.5	4.7	3.9	3.9	3.9	3.9	3.9	3.6	3.6
20.	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.0	5.1	3.8	3.8	3.8	3.8	3.8	3.1	3.2
30.	3.4	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	5.2	3.7	3.7	3.7	3.7	3.7	3.0	3.0
40.	3.6	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	5.1	3.6	3.6	3.6	3.6	3.6	3.0	3.0

50.	*	3.7	3.6	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	5.0	3.6	3.6	3.6	3.6	3.6	3.0	3.0
60.	*	3.7	3.6	3.6	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	4.9	3.7	3.6	3.6	3.6	3.6	3.0	3.0
70.	*	3.9	3.7	3.6	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	4.7	3.6	3.4	3.4	3.4	3.4	3.0	3.0
80.	*	3.8	3.7	3.7	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.4	4.6	3.9	3.4	3.4	3.4	3.4	3.0	3.0
90.	*	3.7	3.6	3.6	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.4	4.7	4.2	3.5	3.5	3.5	3.5	3.0	3.0
100.	*	3.6	3.3	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.4	4.6	4.4	3.4	3.4	3.4	3.4	3.0	3.0
110.	*	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.4	4.6	4.6	3.4	3.4	3.4	3.4	3.0	3.0
120.	*	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.4	4.9	4.9	3.6	3.6	3.6	3.6	3.0	3.0
130.	*	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	5.0	5.0	3.6	3.6	3.6	3.6	3.0	3.0
140.	*	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.9	5.1	3.7	3.6	3.6	3.6	3.0	3.0
150.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	5.0	5.4	3.9	3.8	3.7	3.7	3.0	3.0
160.	*	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.8	4.9	5.4	4.4	4.0	3.9	3.9	3.1	3.1
170.	*	3.0	3.0	3.0	3.0	3.3	3.6	3.4	3.3	3.3	3.4	3.4	3.7	4.6	5.2	4.7	4.3	4.2	4.0	3.2	3.3
180.	*	3.0	3.0	3.0	3.0	3.8	4.0	3.8	4.0	3.9	3.9	3.8	3.6	4.4	4.7	4.5	4.2	4.0	3.9	3.6	3.6
190.	*	3.0	3.0	3.0	3.0	4.1	4.1	4.3	4.3	4.1	4.1	3.8	3.2	3.9	4.0	3.8	3.7	3.4	3.4	3.7	3.7
200.	*	3.0	3.0	3.0	3.0	4.5	4.0	4.7	4.6	4.0	3.7	3.8	3.1	3.9	3.5	3.4	3.1	3.1	3.1	3.6	3.6
210.	*	3.0	3.0	3.0	3.0	4.9	4.3	4.8	4.2	3.7	3.6	3.6	3.0	3.8	3.4	3.1	3.1	3.1	3.1	3.6	3.6
220.	*	3.0	3.0	3.0	3.0	5.0	4.6	4.7	3.8	3.6	3.6	3.6	3.0	3.6	3.1	3.0	3.0	3.0	3.0	3.5	3.5
230.	*	3.0	3.0	3.0	3.0	5.0	4.8	4.6	3.6	3.5	3.5	3.5	3.0	3.4	3.1	3.0	3.0	3.0	3.0	3.4	3.4
240.	*	3.0	3.0	3.0	3.0	4.9	4.9	4.5	3.6	3.5	3.5	3.5	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.4	3.4
250.	*	3.0	3.0	3.0	3.0	4.9	4.7	4.4	3.5	3.5	3.5	3.5	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.4	3.4
260.	*	3.2	3.1	3.1	3.1	4.9	4.6	4.3	3.5	3.5	3.5	3.5	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.4	3.4

270.	*	3.3	3.3	3.3	3.3	5.1	4.5	4.0	3.5	3.5	3.5	3.5	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.4	3.4
280.	*	3.4	3.4	3.4	3.4	5.2	4.4	3.8	3.5	3.5	3.5	3.5	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4
290.	*	3.4	3.4	3.4	3.4	5.4	4.4	3.6	3.5	3.5	3.5	3.5	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.6
300.	*	3.4	3.4	3.4	3.4	5.5	4.4	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.6
310.	*	3.4	3.4	3.4	3.4	5.5	4.4	3.5	3.5	3.5	3.5	3.5	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.9
320.	*	3.3	3.3	3.3	3.3	5.4	4.4	3.6	3.6	3.6	3.6	3.6	3.9	3.0	3.0	3.0	3.0	3.0	3.0	3.6	4.3
330.	*	3.2	3.2	3.2	3.2	5.1	4.2	3.6	3.6	3.6	3.6	3.6	3.9	3.1	3.1	3.1	3.1	3.1	3.1	3.8	4.8
340.	*	3.2	3.2	3.2	3.2	4.7	4.1	3.7	3.7	3.7	3.7	3.7	4.1	3.1	3.1	3.1	3.1	3.1	3.1	4.2	5.2
350.	*	3.2	3.2	3.2	3.2	4.4	3.9	3.8	3.8	3.7	3.7	3.7	4.2	3.5	3.4	3.4	3.3	3.3	3.3	4.4	5.0
MAX	*	3.9	3.7	3.7	3.5	5.5	4.9	4.8	4.6	4.1	4.1	3.8	4.5	5.2	5.4	4.7	4.3	4.2	4.0	4.4	5.2
DEGR.	*	70	70	80	50	300	240	210	200	190	190	180	10	30	150	170	170	170	170	350	340

PAGE 6

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum

concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
0.	4.3	4.1	3.4	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0
10.	4.3	4.4	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.1	3.0	3.0	3.0	3.6	3.0	3.0	3.0	3.0	3.0
20.	4.2	4.5	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.2	3.1	3.1	3.0	3.4	3.0	3.0	3.0	3.0	3.0
30.	3.8	4.4	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0
40.	3.6	4.3	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.2	3.1	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0
50.	3.5	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.2	3.1	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1
60.	3.5	3.8	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.1	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1
70.	3.4	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.2	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1
80.	3.4	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.2	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1
90.	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.4	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
100.	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
110.	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
120.	3.5	3.5	3.3	3.1	3.1	3.1	3.1	3.1	3.4	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
130.	3.5	3.5	3.4	3.1	3.1	3.1	3.1	3.1	3.5	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

140.	*	3.5	3.5	3.6	3.1	3.1	3.1	3.1	3.1	3.5	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
150.	*	3.6	3.6	3.8	3.1	3.1	3.1	3.1	3.1	3.5	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
160.	*	3.6	3.7	3.8	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
170.	*	3.9	3.8	3.9	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
180.	*	3.7	3.6	4.3	3.1	3.1	3.1	3.1	3.1	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0
190.	*	3.2	3.2	4.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.0	3.0	3.0
200.	*	3.1	3.1	4.4	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.0	3.0	3.0
210.	*	3.0	3.0	4.5	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.1	3.0	3.0
220.	*	3.0	3.0	4.5	3.3	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.1	3.1	3.0
230.	*	3.0	3.0	4.5	3.4	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.1	3.0	3.0
240.	*	3.0	3.0	4.2	3.5	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.2	3.1	3.0	3.0
250.	*	3.0	3.0	4.0	3.6	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.1	3.1	3.0	3.0
260.	*	3.0	3.0	3.6	3.4	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.2	3.0	3.0	3.0
270.	*	3.0	3.0	3.4	3.6	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.1	3.1	3.0	3.0
280.	*	3.0	3.0	3.4	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.3	3.1	3.2	3.1	3.1
290.	*	3.0	3.1	3.4	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.4	3.1	3.1	3.1
300.	*	3.0	3.1	3.4	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.2	3.2	3.1	3.1
310.	*	3.0	3.1	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.4	3.3	3.2	3.1	3.1
320.	*	3.0	3.2	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.2	3.2	3.1	3.0	3.0
330.	*	3.0	3.3	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	3.2	3.2	3.0	3.0	3.0
340.	*	3.3	3.5	3.2	3.3	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.2	3.1	3.1	3.1	3.0
350.	*	3.7	3.8	3.5	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	3.2	3.1	3.0	3.0	3.0

MAX *	4.3	4.5	4.5	3.6	3.3	3.2	3.2	3.1	3.6	3.3	3.2	3.1	3.1	3.0	4.1	3.6	3.4	3.2	3.1	3.1
DEGR. *	0	20	210	250	210	210	220	90	10	10	20	20	20	0	330	300	290	280	50	50

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR) *	CONCENTRATION (PPM) REC61	REC62	REC63	REC64	REC65	REC66	REC67	REC68	REC69	REC70	REC71	REC72	REC73	REC74	REC75	REC76	REC77	REC78	REC79	REC80
0. *	3.2	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.8	3.9	4.0	3.9	3.8	3.6	3.5	3.5	3.8	3.8	3.9	4.1

10.	*	3.5	3.2	3.1	3.0	3.0	3.0	3.3	3.4	3.3	3.3	3.5	3.5	3.2	3.1	3.2	3.3	3.9	4.0	4.1	4.1
20.	*	3.4	3.3	3.0	3.1	3.1	3.0	3.1	3.1	3.1	3.1	3.3	3.2	3.2	3.1	3.1	3.1	3.7	3.7	3.7	3.8
30.	*	3.5	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.7
40.	*	3.6	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.6	3.5	3.5	3.5
50.	*	3.6	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.6	3.5	3.5	3.5
60.	*	3.6	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.5	3.5	3.5
70.	*	3.6	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.4	3.4	3.4
80.	*	3.5	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.4	3.4	3.4
90.	*	3.5	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.4	3.4	3.4
100.	*	3.5	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	3.4	3.4	3.4
110.	*	3.5	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	3.4	3.4	3.4
120.	*	3.4	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	3.5	3.5	3.5
130.	*	3.4	3.2	3.1	3.1	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	3.6	3.5	3.5
140.	*	3.3	3.2	3.2	3.1	3.1	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	3.6	3.5	3.5
150.	*	3.3	3.2	3.2	3.1	3.0	3.0	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.4	3.8	3.7	3.6
160.	*	3.3	3.2	3.1	3.0	3.0	3.0	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.3	4.0	3.8	3.6
170.	*	3.3	3.1	3.0	3.0	3.0	3.0	3.5	3.4	3.4	3.2	3.3	3.3	3.3	3.3	3.3	3.3	4.1	4.1	3.8	3.9
180.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.8	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.8	3.8	3.7	3.8
190.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.9	3.8	3.8	3.7	3.7	3.7	3.7	3.7	3.7	3.4	3.4	3.3	3.3
200.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.9	3.7	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.1	3.1	3.1	3.1
210.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.5	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.0	3.0	3.0	3.0
220.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0

230.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.4	3.4	3.4	3.5	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
280.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.4	3.4	3.4	3.6	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
290.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.4	3.4	3.4	3.8	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.4	3.4	3.4	3.9	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	4.0	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	4.2	3.4	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	4.3	3.6	3.6	3.6	3.6	3.6	3.0	3.0	3.0	3.0
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.7	4.0	4.1	3.8	3.6	3.6	3.6	3.6	3.1	3.1	3.1	3.1
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.9	3.9	4.0	4.0	3.9	3.8	3.6	3.7	3.6	3.2	3.3	3.5	3.7
MAX	*	3.6	3.3	3.2	3.1	3.1	3.0	3.9	3.9	3.9	4.0	4.3	3.9	3.8	3.7	3.7	3.7	4.5	4.1	4.1	4.1
DEGR.	*	40	20	40	20	20	0	240	190	350	340	330	0	0	190	190	190	120	170	10	0

PAGE 8

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

```
      MODEL RESULTS
      -------------

      REMARKS : In search of the angle corresponding to
                the maximum concentration, only the first
                angle, of the angles with same maximum
                concentrations, is indicated as maximum.

WIND ANGLE RANGE:   0.-350.

WIND  * CONCENTRATION
ANGLE *      (PPM)
(DEGR)* REC81 REC82 REC83 REC84 REC85 REC86
------*-----------------------------------
  0.  *   3.8   3.7   3.6   3.7   3.6   3.6
 10.  *   3.9   3.9   3.8   3.8   3.8   3.7
 20.  *   3.8   3.9   3.8   3.6   3.7   3.7
 30.  *   3.8   3.8   3.7   3.6   3.6   3.6
 40.  *   3.9   3.7   3.6   3.6   3.6   3.6
 50.  *   4.1   3.5   3.5   3.5   3.5   3.5
 60.  *   4.0   3.5   3.5   3.5   3.5   3.5
 70.  *   3.9   3.4   3.4   3.4   3.4   3.4
```

80.	*	3.7	3.4	3.4	3.4	3.4	3.4
90.	*	3.5	3.4	3.4	3.4	3.4	3.4
100.	*	3.5	3.4	3.4	3.4	3.4	3.4
110.	*	3.4	3.4	3.4	3.4	3.4	3.4
120.	*	3.5	3.5	3.5	3.5	3.5	3.5
130.	*	3.5	3.5	3.5	3.5	3.5	3.5
140.	*	3.6	3.6	3.6	3.6	3.6	3.6
150.	*	3.6	3.6	3.6	3.6	3.6	3.6
160.	*	3.7	3.7	3.7	3.7	3.7	3.7
170.	*	3.7	3.7	3.7	3.7	3.7	3.7
180.	*	3.6	3.6	3.6	3.5	3.5	3.5
190.	*	3.4	3.3	3.3	3.2	3.2	3.2
200.	*	3.1	3.1	3.1	3.1	3.1	3.1
210.	*	3.0	3.0	3.0	3.0	3.0	3.0
220.	*	3.0	3.0	3.0	3.0	3.0	3.0
230.	*	3.0	3.0	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.0	3.0	3.0	3.0
280.	*	3.0	3.0	3.0	3.0	3.0	3.0
290.	*	3.0	3.0	3.0	3.0	3.0	3.0

```
300.  *   3.0   3.0   3.0   3.0   3.0   3.0

310.  *   3.0   3.0   3.0   3.0   3.0   3.0

320.  *   3.0   3.0   3.0   3.0   3.0   3.0

330.  *   3.0   3.0   3.0   3.0   3.0   3.0

340.  *   3.2   3.1   3.1   3.1   3.1   3.1

350.  *   3.4   3.3   3.3   3.2   3.2   3.2

------*-----------------------------------

MAX   *   4.1   3.9   3.8   3.8   3.8   3.7

DEGR. *   50    10    10    10    10    10


THE HIGHEST CONCENTRATION OF    5.60 PPM OCCURRED AT RECEPTOR REC19.
```

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:59:14

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	260	250	270	240	270	290	140	120	110	100	100	100	270	260	270	270	270	260	20	80
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.1	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0
4	.0	.2	.0	.1	.0	.0	.4	.3	.2	.1	.1	.1	.1	.2	.1	.1	.1	.1	.0	.1
5	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0
6	.1	.0	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.1
7	.1	.0	.1	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.4	.1

8	*	.1	.1	.0	.1	.0	.0	.2	.1	.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.1
9	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	*	.1	.0	.1	.0	.0	.0	.1	.1	.1	.1	.1	.2	.1	.1	.1	.0	.0	.0	.1	.2
18	*	.2	.1	.1	.0	.0	.0	.6	.3	.1	.1	.1	.0	.2	.1	.1	.0	.0	.0	.7	.3
19	*	.2	.1	.1	.0	.0	.0	.4	.4	.2	.1	.1	.0	.2	.1	.1	.1	.0	.0	.9	.6
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.2	.0	.1	.0	.1	.0	.2	.3	.3	.4	.4	.4	.2	.1	.1	.1	.1	.0	.1	.1

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:59:14

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	70	70	80	50	300	240	210	200	190	190	180	10	30	150	170	170	170	170	350	340
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.3	.3
4	.0	.0	.0	.0	1.5	.0	.0	.1	.1	.1	.1	.0	.0	.1	.1	.1	.1	.1	.4	1.1
5	.0	.0	.0	.0	.0	.2	.3	.3	.3	.4	.3	.2	.2	.2	.1	.1	.2	.2	.1	.1
6	.1	.1	.0	.1	.0	.3	.3	.3	.3	.3	.2	.3	.5	.5	.6	.6	.6	.6	.2	.1
7	.2	.2	.1	.0	.0	.8	.9	.6	.3	.2	.1	.5	1.5	1.6	.7	.3	.2	.1	.2	.2

8	*	.0	.0	.0	.0	.2	.0	.0	.1	.1	.1	.1	.3	.0	.0	.1	.1	.1	.0	.2	.2
9	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	*	.2	.2	.2	.2	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.1	.0	.1	.0	.2	.2	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
19	*	.1	.0	.1	.0	.2	.2	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.2	.2	.2	.2	.1	.1	.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:59:14

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
	0	20	210	250	210	210	220	90	10	10	20	20	20	0	330	300	290	280	50	50
1	.0	.0	.1	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.1	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0
4	.2	.7	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6	.2	.1	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0
7	.2	.1	.0	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0

8	*	.3	.4	.0	.0	.0	.0	.0	.0	.2	.1	.0	.0	.0	.0	.2	.1	.1	.0	.0	.0
9	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0
10	*	.0	.0	.2	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1
15	*	.0	.0	1.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.7	.2	.1	.1	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:59:14

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC61	REC62	REC63	REC64	REC65	REC66	REC67	REC68	REC69	REC70	REC71	REC72	REC73	REC74	REC75	REC76	REC77	REC78	REC79	REC80
	40	20	40	20	20	0	240	190	350	340	330	0	0	190	190	190	120	170	10	0
1	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.2	.2	.3	.4	.4	.4	.0	.1	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.6	.1	.1	.0	.0	.0	.0	.1	.0	.0
3	.1	.1	.1	.0	.0	.0	.2	.3	.4	.3	.1	.1	.1	.0	.0	.0	.2	.1	.2	.1
4	.0	.1	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1	.2
5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1
6	.0	.0	.0	.1	.1	.0	.0	.0	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.1	.1
7	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1

8	*	.2	.1	.1	.0	.0	.0	.2	.1	.2	.3	.1	.1	.1	.0	.0	.0	.3	.4	.5	.4
9	*	.2	.0	.0	.0	.0	.0	.5	.1	.0	.0	.1	.1	.0	.0	.0	.0	.8	.2	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.2	.1	.1	.3	.3	.3	.0	.2	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.2	.0	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:59:14

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

LINK #	* CO/LINK (PPM) / * ANGLE (DEGREES)	REC81	REC82	REC83	REC84	REC85	REC86
	*	50	10	10	10	10	10
1	*	.2	.1	.1	.1	.2	.2
2	*	.4	.1	.1	.0	.0	.0
3	*	.0	.1	.1	.1	.0	.0
4	*	.0	.0	.0	.0	.0	.0
5	*	.0	.0	.0	.0	.0	.0
6	*	.0	.0	.0	.0	.0	.0
7	*	.0	.0	.0	.0	.0	.0

```
 8  *    .0    .1    .1    .1    .1    .0

 9  *    .0    .1    .0    .0    .0    .0

10  *    .3    .4    .4    .5    .5    .5

11  *    .0    .0    .0    .0    .0    .0

12  *    .0    .0    .0    .0    .0    .0

13  *    .0    .0    .0    .0    .0    .0

14  *    .0    .0    .0    .0    .0    .0

15  *    .2    .0    .0    .0    .0    .0

16  *    .0    .0    .0    .0    .0    .0

17  *    .0    .0    .0    .0    .0    .0

18  *    .0    .0    .0    .0    .0    .0

19  *    .0    .0    .0    .0    .0    .0

20  *    .0    .0    .0    .0    .0    .0

21  *    .0    .0    .0    .0    .0    .0

22  *    .0    .0    .0    .0    .0    .0

23  *    .0    .0    .0    .0    .0    .0
```

2007 HIGH-LEVEL BRIDGE – 16TH AVENUE SOUTH / EAST MARGINAL WAY

```
                CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1


 (C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.

      JOB: SOUTHPARK PROJECT                                  RUN: 2007 HIGH LEVEL MARGINAL WAY
```

DATE : 9/13/ 2

TIME : 17: 9: 1

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM

U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. 16TH NB	625.0	-750.0	.0	.0	976.	320.	AG	765.	10.6	.0	60.0		
2. 16TH QUE LT	66.7	-88.6	137.9	-174.1	111.	140.	AG	1142.	100.0	.0	30.0	.67	5.7
3. 16TH QUE RT	82.6	-76.0	109.3	-108.1	42.	140.	AG	381.	100.0	.0	10.0	.26	2.1
4. 16TH SB	-18.0	-42.6	607.0	-792.6	976.	140.	AG	1010.	10.6	.0	40.0		
5. MARGINAL SE 1	-1000.0	-16.0	.0	-16.0	1000.	90.	AG	1600.	7.8	.0	52.0		
6. MAR SE QUE TH RT	-60.0	-10.0	-161.4	-10.0	101.	270.	AG	465.	100.0	.0	20.0	.46	5.1

7. MAR SE QUE E RT	*	-60.0	-26.0	-240.4	-26.0	*	180.	270.	AG	106.	100.0	.0	10.0	.93	9.2
8. MARGINAL SE 2	*	.0	-12.0	1000.0	-12.0	*	1000.	90.	AG	760.	7.8	.0	24.0		
9. MARGINAL NW 1	*	1000.0	22.0	.0	22.0	*	1000.	270.	AG	645.	7.8	.0	64.0		
10. MAR NW QUE LT	*	60.0	6.0	104.2	6.0	*	44.	90.	AG	402.	100.0	.0	12.0	.33	2.2
11. MAR NW QUE TH	*	60.0	28.0	90.5	28.0	*	31.	90.	AG	381.	100.0	.0	32.0	.18	1.6
12. MAR NW 2	*	.0	16.0	-1000.0	16.0	*	1000.	270.	AG	1240.	7.8	.0	52.0		

PAGE 2

JOB: SOUTHPARK PROJECT RUN: 2007 HIGH LEVEL MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 9: 1

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 16TH QUE LT	*	120	90	2.0	680	1562	189.20	1	3
3. 16TH QUE RT	*	120	90	2.0	85	1487	189.20	1	3
6. MAR SE QUE TH RT	*	120	55	2.0	675	1447	189.20	1	3

7. MAR SE QUE E RT	*	120	25	2.0	925	1315	189.20	1	3
10. MAR NW QUE LT	*	120	95	2.0	85	1466	189.20	1	3
11. MAR NW QUE TH	*	120	30	2.0	560	1405	189.20	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. RECEPTOR 1	75.7	-43.5	.0
2. RECEPTOR 2	123.6	-101.1	.0
3. RECEPTOR 3	171.6	-158.8	.0
4. RECEPTOR 4	219.6	-216.4	.0
5. RECEPTOR 5	267.6	-274.1	.0
6. RECEPTOR 6	315.6	-331.7	.0
7. RECEPTOR 7	363.5	-389.3	.0
8. RECEPTOR 10	-7.5	-87.5	.0
9. RECEPTOR 11	40.4	-145.1	.0
10. RECEPTOR 12	88.4	-202.8	.0
11. RECEPTOR 13	136.4	-260.4	.0
12. RECEPTOR 14	184.3	-318.1	.0
13. RECEPTOR 15	232.3	-375.7	.0

14. RECEPTOR 16	*	280.3	-433.4	.0	*
15. RECEPTOR 20	*	-424.8	41.6	.0	*
16. RECEPTOR 21	*	-349.8	41.6	.0	*
17. RECEPTOR 22	*	-274.8	41.6	.0	*
18. RECEPTOR 23	*	-199.8	41.6	.0	*
19. RECEPTOR 24	*	-124.8	41.6	.0	*
20. RECEPTOR 25	*	-49.8	41.6	.0	*
21. RECEPTOR 26	*	.8	54.4	.0	*
22. RECEPTOR 27	*	75.8	54.4	.0	*
23. RECEPTOR 28	*	150.8	54.4	.0	*
24. RECEPTOR 29	*	225.8	54.4	.0	*
25. RECEPTOR 30	*	300.8	54.4	.0	*
26. RECEPTOR 31	*	375.8	54.4	.0	*
27. RECEPTOR 32	*	450.8	54.4	.0	*
28. RECEPTOR 34	*	-424.8	-41.5	.0	*
29. RECEPTOR 35	*	-349.8	-41.5	.0	*
30. RECEPTOR 36	*	-274.8	-41.5	.0	*
31. RECEPTOR 37	*	-199.8	-41.5	.0	*
32. RECEPTOR 38	*	-124.8	-41.5	.0	*
33. RECEPTOR 39	*	-49.8	-41.5	.0	*
34. RECEPTOR 40	*	.1	-24.2	.0	*
35. RECEPTOR 41	*	75.1	-24.2	.0	*

```
36. RECEPTOR 42          *       150.1      -24.2         .0   *

37. RECEPTOR 43          *       225.1      -24.2         .0   *

38. RECEPTOR 44          *       300.1      -24.2         .0   *

39. RECEPTOR 45          *       375.1      -24.2         .0   *
```


JOB: SOUTHPARK PROJECT RUN: 2007 HIGH LEVEL MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 9: 1

RECEPTOR LOCATIONS

```
                         *           COORDINATES (FT)          *

   RECEPTOR              *      X          Y          Z        *

-------------------------*-----------------------------------*

40. RECEPTOR 46          *       450.1      -24.2         .0   *
```


JOB: SOUTHPARK PROJECT RUN: 2007 HIGH LEVEL MARGINAL WAY

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	* REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	* 4.1	3.3	3.2	3.0	3.0	3.0	3.0	3.8	4.1	6.0	4.9	3.9	3.7	3.7	3.1	3.1	3.1	3.1	3.1	3.1
10.	* 4.1	3.2	3.2	3.0	3.0	3.0	3.0	3.8	4.5	6.2	4.3	3.7	3.7	3.7	3.0	3.0	3.0	3.0	3.0	3.0
20.	* 3.9	3.2	3.2	3.0	3.0	3.0	3.0	3.9	5.0	5.8	3.8	3.6	3.6	3.6	3.0	3.0	3.0	3.0	3.0	3.0
30.	* 3.7	3.2	3.2	3.0	3.0	3.0	3.0	4.0	5.5	5.7	3.6	3.6	3.6	3.6	3.0	3.0	3.0	3.0	3.0	3.0
40.	* 3.5	3.2	3.2	3.0	3.0	3.0	3.0	4.1	5.9	5.5	3.6	3.6	3.6	3.6	3.0	3.0	3.0	3.0	3.0	3.0
50.	* 3.4	3.2	3.2	3.0	3.0	3.0	3.0	4.1	6.1	5.4	3.6	3.6	3.6	3.6	3.0	3.0	3.0	3.0	3.0	3.0
60.	* 3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.9	6.1	4.9	3.6	3.6	3.6	3.6	3.1	3.1	3.1	3.1	3.1	3.0
70.	* 3.3	3.2	3.2	3.0	3.0	3.0	3.0	4.1	6.0	4.2	3.6	3.6	3.6	3.6	3.1	3.1	3.1	3.1	3.1	3.1

80.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.0	4.4	5.8	3.8	3.6	3.6	3.6	3.6	3.2	3.2	3.2	3.3	3.3	3.3
90.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.0	5.1	5.7	3.8	3.7	3.7	3.6	3.6	3.8	3.9	3.9	3.9	3.7	3.8
100.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	5.5	5.4	3.7	3.7	3.7	3.7	3.7	4.2	4.4	4.4	4.4	4.0	4.0
110.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.7	4.9	3.8	3.8	3.8	3.8	3.8	4.5	4.5	4.8	4.8	4.4	4.0
120.	*	3.1	3.1	3.1	3.1	3.1	3.1	3.1	5.4	4.4	3.9	3.9	3.9	3.8	3.8	4.1	4.4	4.7	5.2	4.7	4.3
130.	*	3.5	3.2	3.2	3.2	3.2	3.2	3.2	4.7	4.0	3.9	3.9	3.9	3.9	3.9	3.8	3.9	4.2	5.1	5.1	4.6
140.	*	4.6	3.7	3.5	3.5	3.5	3.5	3.4	3.9	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.9	4.6	5.1	4.9
150.	*	5.9	4.2	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.6	3.6	3.7	4.0	4.6	4.5
160.	*	6.8	4.9	3.7	3.7	3.7	3.7	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.6	3.6	3.8	4.5	4.1
170.	*	6.7	5.6	3.6	3.6	3.6	3.6	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.6	3.6	3.7	4.5	3.8
180.	*	6.0	6.1	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.8	4.6	3.9
190.	*	5.1	6.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.7	4.5	4.1
200.	*	4.3	6.5	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.7	4.4	4.3
210.	*	3.9	6.4	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.7	4.2	4.4
220.	*	3.6	6.5	3.6	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	4.1	4.6
230.	*	3.5	6.6	4.0	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.9	4.6
240.	*	3.5	6.8	4.6	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.8	3.8	3.9	4.5
250.	*	3.6	7.0	5.3	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	4.0	4.0	4.0	4.0	4.5
260.	*	3.9	7.2	5.8	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.9	3.9	3.9	3.9	4.1
270.	*	4.3	7.3	6.2	3.6	3.5	3.5	3.5	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.7
280.	*	4.5	7.1	6.7	4.1	3.6	3.5	3.5	3.6	3.3	3.2	3.1	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.4	3.4
290.	*	4.2	6.5	7.1	4.8	4.0	3.9	3.7	3.9	3.5	3.3	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1

300.	*	3.8	5.4	6.5	5.4	4.5	4.2	4.0	4.1	3.7	3.4	3.4	3.3	3.3	3.3	3.1	3.1	3.1	3.1	3.1	3.1
310.	*	3.7	4.4	5.5	5.3	4.7	4.5	4.2	4.2	3.9	3.6	3.6	3.7	3.7	3.6	3.0	3.0	3.0	3.0	3.0	3.0
320.	*	3.5	3.7	4.2	4.4	4.1	3.9	3.8	4.2	3.9	3.8	4.2	4.3	4.1	4.0	3.0	3.0	3.0	3.0	3.0	3.0
330.	*	3.6	3.7	3.8	3.7	3.5	3.4	3.4	3.8	3.8	4.3	4.7	4.6	4.4	4.3	3.0	3.0	3.0	3.0	3.0	3.0
340.	*	3.9	3.6	3.5	3.1	3.1	3.1	3.1	3.7	3.9	4.5	5.3	4.9	4.4	4.2	3.0	3.0	3.0	3.0	3.0	3.0
350.	*	3.9	3.5	3.2	3.0	3.0	3.0	3.0	3.8	3.7	5.5	5.5	4.3	4.0	3.9	3.0	3.0	3.0	3.0	3.0	3.0
MAX	*	6.8	7.3	7.1	5.4	4.7	4.5	4.2	5.7	6.1	6.2	5.5	4.9	4.4	4.3	4.5	4.5	4.8	5.2	5.1	4.9
DEGR.	*	160	270	290	300	310	310	310	110	50	10	350	340	330	330	110	110	110	120	130	140

JOB: SOUTHPARK PROJECT RUN: 2007 HIGH LEVEL MARGINAL WAY

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	4.0	5.1	3.8	3.7	4.7	3.4	3.4	3.4	3.4	3.4
10.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.9	5.0	3.6	3.9	4.7	3.4	3.4	3.4	3.4	3.4
20.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.9	5.0	3.6	3.7	4.3	3.3	3.3	3.3	3.3	3.3
30.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	4.1	5.0	3.6	3.8	4.3	3.4	3.4	3.4	3.4	3.4
40.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	4.3	5.1	3.6	4.0	4.1	3.5	3.5	3.5	3.5	3.5
50.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.9	4.7	5.1	4.0	4.3	3.8	3.5	3.5	3.5	3.5	3.5
60.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.9	4.2	5.0	5.1	3.9	4.5	3.8	3.6	3.6	3.6	3.6	3.6
70.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	4.1	4.4	5.3	4.9	4.3	4.6	3.6	3.6	3.6	3.6	3.6	3.6
80.	3.2	3.1	3.1	3.1	3.1	3.1	3.1	4.2	4.3	4.8	5.1	4.6	4.2	4.6	3.7	3.7	3.7	3.7	3.7	3.7
90.	3.5	3.3	3.3	3.3	3.3	3.3	3.2	4.0	4.4	4.6	4.6	4.3	4.2	4.0	3.5	3.5	3.5	3.5	3.5	3.5
100.	3.8	3.4	3.4	3.4	3.4	3.4	3.4	3.8	3.9	4.0	4.1	4.1	4.2	3.9	3.2	3.2	3.2	3.2	3.2	3.2
110.	3.9	3.5	3.4	3.4	3.4	3.4	3.4	3.4	3.5	3.6	3.7	4.1	4.6	4.2	3.1	3.1	3.1	3.1	3.1	3.1
120.	3.9	3.5	3.3	3.3	3.3	3.3	3.3	3.2	3.4	3.4	3.5	3.9	5.0	4.9	3.0	3.0	3.0	3.0	3.0	3.0
130.	4.0	3.7	3.3	3.3	3.3	3.3	3.3	3.1	3.2	3.2	3.4	3.6	4.6	5.7	3.2	3.0	3.0	3.0	3.0	3.0
140.	4.6	4.0	3.3	3.3	3.3	3.3	3.3	3.1	3.1	3.1	3.2	3.3	4.0	5.7	3.8	3.1	3.0	3.0	3.0	3.0
150.	4.6	4.6	3.5	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.3	5.1	4.8	3.2	3.2	3.0	3.0	3.0
160.	4.5	5.7	3.5	3.5	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.1	4.4	5.8	3.3	3.2	3.2	3.0	3.0

170.	*	4.1	6.2	3.7	3.5	3.5	3.5	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.9	5.8	3.5	3.2	3.2	3.2	3.0
180.	*	3.7	6.2	4.0	3.5	3.5	3.5	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.7	5.4	3.8	3.2	3.2	3.2	3.2
190.	*	3.7	5.6	4.4	3.7	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.6	4.7	4.2	3.3	3.2	3.2	3.2
200.	*	3.5	4.9	4.4	3.9	3.6	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.9	4.6	3.4	3.2	3.2	3.2
210.	*	3.6	4.3	4.2	4.2	3.7	3.6	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.6	4.7	3.7	3.3	3.2	3.2
220.	*	4.0	4.1	4.0	4.2	3.9	3.7	3.5	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.4	4.5	4.0	3.4	3.2	3.2
230.	*	4.2	4.1	4.0	4.0	4.1	3.8	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.4	4.2	4.2	3.7	3.4	3.3
240.	*	4.3	4.0	4.2	3.7	3.9	3.9	3.7	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.4	3.7	4.1	3.8	3.6	3.4
250.	*	4.2	4.2	4.2	3.9	3.8	3.7	3.6	3.1	3.2	3.2	3.2	3.2	3.2	3.9	3.6	3.5	3.9	3.9	3.8	3.6
260.	*	3.9	4.0	4.2	3.8	3.9	3.9	3.8	3.3	3.4	3.4	3.5	3.6	3.7	4.7	4.1	3.8	4.0	4.1	3.8	3.7
270.	*	3.5	3.6	3.8	3.7	3.7	3.5	3.5	3.8	3.8	3.8	3.9	4.1	4.3	5.4	4.4	4.3	4.0	4.2	3.9	3.9
280.	*	3.2	3.3	3.4	3.3	3.2	3.1	3.1	4.0	4.0	4.0	4.2	4.4	5.0	5.6	4.6	4.6	4.2	4.0	4.1	3.9
290.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.2	4.4	5.4	5.2	4.2	4.4	4.0	3.8	3.6	3.6
300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.9	3.9	4.2	4.7	5.4	4.5	3.8	4.2	3.8	3.6	3.6	3.6
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.8	4.1	4.7	5.2	4.0	3.7	4.1	3.5	3.5	3.5	3.5
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	4.0	4.9	4.9	3.8	3.7	3.8	3.5	3.5	3.5	3.5
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	4.0	5.0	4.6	3.9	3.9	3.5	3.4	3.4	3.4	3.4
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.9	5.0	4.3	3.8	4.1	3.3	3.3	3.3	3.3	3.3
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.9	5.0	4.0	3.8	4.6	3.4	3.4	3.4	3.4	3.4
MAX	*	4.6	6.2	4.4	4.2	4.1	3.9	3.8	4.2	4.4	4.8	5.3	5.1	5.4	5.7	5.8	4.7	4.2	4.2	4.1	3.9
DEGR.	*	140	170	190	210	230	240	260	80	90	80	70	0	290	130	160	210	230	270	280	270

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	5.1	3.2
10.	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.3	3.4
20.	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.6	3.4
30.	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.5	3.5
40.	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.3	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	5.5	3.8
50.	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.5	3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	5.3	4.1
60.	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.5	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	4.8	4.5
70.	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.6	3.4	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.5
80.	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.6	3.5	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.6
90.	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.8	3.8	3.7	3.7	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.6	4.0

```
THE HIGHEST CONCENTRATION OF    7.30 PPM OCCURRED AT RECEPTOR REC2 .
```

JOB: SOUTHPARK PROJECT RUN: 2007 HIGH LEVEL MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 9: 1

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	160	270	290	300	310	310	310	110	50	10	350	340	330	330	110	110	110	120	130	140
1	.5	.3	.4	.4	.4	.5	.5	.2	.2	.2	.2	.2	.2	.2	.1	.1	.1	.1	.2	.3
2	2.5	2.6	3.0	1.4	.8	.5	.3	1.8	2.0	2.2	1.5	.9	.5	.4	.2	.2	.3	.4	.5	.7
3	.6	1.0	.1	.1	.1	.0	.0	.1	.3	.2	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1
4	.2	.2	.2	.2	.1	.2	.2	.6	.4	.5	.6	.7	.7	.7	.1	.1	.1	.1	.2	.3
5	.0	.1	.2	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.3	.3	.3	.3	.3	.2
6	.0	.0	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.2	.4	.7	.5	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0

8	*	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.6	.5	.5	.5	.4	.3

JOB: SOUTHPARK PROJECT RUN: 2007 HIGH LEVEL MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 9: 1

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	140	170	190	210	230	240	260	80	90	80	70	0	290	130	160	210	230	270	280	270
1	.3	.2	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.7	.4	.1	.1	.1	.0	.0
2	.6	.9	.8	.6	.5	.4	.1	.0	.2	.0	.0	.0	.0	1.4	1.8	1.3	.9	.1	.0	.1
3	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.2	.4	.2	.1	.0	.0	.0
4	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.2	.1	.1	.0	.0	.0

5	*	.0	.0	.0	.0	.0	.0	.1	.8	.6	.7	.7	.5	.7	.2	.0	.0	.0	.2	.1	.1
6	*	.0	.0	.0	.0	.0	.0	.1	.1	.2	.4	.9	1.1	1.0	.0	.0	.0	.0	.1	.1	.1
7	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.3	.4	.3	.4	.0	.0	.0	.0	.0	.0	.0
8	*	.1	.1	.1	.1	.1	.1	.1	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.4	.5	.4
9	*	.2	.2	.2	.2	.2	.2	.3	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.1	.2	.1
10	*	.1	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0
11	*	.1	1.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.1	.2	.1	.2	.2	.2	.3	.0	.0	.0	.0	.1	.1	.1

2007 HIGH-LEVEL BRIDGE – 14TH AVENUE SOUTH / SOUTH TRENTON STREET

```
        CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1


(C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.

     JOB: SOUTHPARK BRIDGE PROJECT                          RUN: 2007 BRIDGE HIGH LEVEL - TRENTON


     DATE :  9/13/ 2

     TIME : 18: 4:57


        The MODE flag has been set to C for calculating CO averages.


      SITE & METEOROLOGICAL VARIABLES

      -------------------------------
```

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM

U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)			(G/MI)	(FT)	(FT)		(VEH)
1. 14TH NB 2	*	10.0	-400.0	10.0	600.0	*	1000.	360.	AG	652.	10.6	.0	40.0		
2. 14TH NB QUE ALL	*	10.0	560.0	10.0	467.3	*	93.	180.	AG	528.	100.0	.0	20.0	.46	4.7
3. 14TH NB 3	*	10.0	600.0	10.0	1600.0	*	1000.	360.	AG	720.	10.6	.0	40.0		
4. 14TH SB 1	*	-10.0	1600.0	-10.0	600.0	*	1000.	180.	AG	930.	10.6	.0	40.0		
5. 14TH SB QUE ALL	*	-10.0	630.0	-10.0	745.2	*	115.	360.	AG	528.	100.0	.0	20.0	.59	5.9
6. 14TH SB 2	*	-10.0	600.0	-10.0	-400.0	*	1000.	180.	AG	810.	10.6	.0	40.0		
7. TRENTON EB 1	*	-1000.0	590.0	.0	590.0	*	1000.	90.	FL	436.	12.9	.0	40.0		
8. TRENTON EB QUE LT	*	-40.0	595.0	-118.1	595.0	*	78.	270.	AG	345.	100.0	.0	10.0	.47	4.0
9. TRENTON EB QUE AL	*	-40.0	585.0	-124.0	585.0	*	84.	270.	AG	345.	100.0	.0	10.0	.56	4.3
10. TRENTON EB 2	*	.0	595.0	1000.0	595.0	*	1000.	90.	AG	65.	12.9	.0	30.0		
11. TRENTON WB 1	*	1000.0	605.0	.0	605.0	*	1000.	270.	AG	115.	12.9	.0	30.0		
12. TRENTON WB QUE AL	*	40.0	605.0	90.3	605.0	*	50.	90.	AG	406.	100.0	.0	10.0	.47	2.6
13. TRENTON WB 2	*	.0	605.0	-1000.0	605.0	*	1000.	270.	AG	538.	12.9	.0	30.0		

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE HIGH LEVEL - TRENTON

DATE : 9/13/ 2

TIME : 18: 4:57

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 14TH NB QUE ALL	100	52	2.0	652	1622	189.20	1	3
5. 14TH SB QUE ALL	100	52	2.0	810	1564	189.20	1	3
8. TRENTON EB QUE LT	100	68	2.0	210	1594	189.20	1	3
9. TRENTON EB QUE AL	100	68	2.0	226	1445	189.20	1	3
12. TRENTON WB QUE AL	100	80	2.0	115	1524	189.20	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z

```
-------------------------*-------------------------------------*
 1. REC1                 *        75.0      620.0        6.0   *
 2. REC2                 *       150.0      620.0        6.0   *
 3. REC3                 *       225.0      620.0        6.0   *
 4. REC4                 *       300.0      620.0        6.0   *
 5. REC5                 *       375.0      620.0        6.0   *
 6. REC6                 *       450.0      620.0        6.0   *
 7. REC7                 *       -75.0      620.0        6.0   *
 8. REC8                 *      -150.0      620.0        6.0   *
 9. REC9                 *      -225.0      620.0        6.0   *
10. REC10                *      -300.0      620.0        6.0   *
11. REC11                *      -375.0      620.0        6.0   *
12. REC12                *      -450.0      620.0        6.0   *
13. REC13                *        75.0      580.0        6.0   *
14. REC14                *       150.0      580.0        6.0   *
15. REC15                *       225.0      580.0        6.0   *
16. REC16                *       300.0      580.0        6.0   *
17. REC17                *       375.0      580.0        6.0   *
18. REC18                *       450.0      580.0        6.0   *
19. REC19                *       -75.0      570.0        6.0   *
20. REC20                *      -150.0      570.0        6.0   *
21. REC21                *      -225.0      570.0        6.0   *
```

22. REC22	*	-300.0	570.0	6.0	*
23. REC23	*	-375.0	570.0	6.0	*
24. REC24	*	-450.0	570.0	6.0	*
25. REC25	*	30.0	525.0	6.0	*
26. REC26	*	30.0	675.0	6.0	*
27. REC27	*	30.0	750.0	6.0	*
28. REC28	*	30.0	825.0	6.0	*
29. REC29	*	30.0	900.0	6.0	*
30. REC30	*	30.0	975.0	6.0	*
31. REC31	*	30.0	1050.0	6.0	*
32. REC32	*	-30.0	525.0	6.0	*
33. REC33	*	-30.0	675.0	6.0	*
34. REC34	*	-30.0	750.0	6.0	*
35. REC35	*	-30.0	825.0	6.0	*
36. REC36	*	-30.0	900.0	6.0	*
37. REC37	*	-30.0	975.0	6.0	*
38. REC38	*	-30.0	1050.0	6.0	*
39. REC39	*	30.0	375.0	6.0	*
40. REC40	*	30.0	450.0	6.0	*

PAGE 3

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE HIGH LEVEL - TRENTON

DATE : 9/13/ 2

TIME : 18: 4:57

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
41. REC41	-30.0	375.0	6.0
42. REC42	-30.0	450.0	6.0
43. REC68	30.0	150.0	6.0
44. REC69	30.0	225.0	6.0
45. REC70	30.0	300.0	6.0
46. REC78	-30.0	150.0	6.0
47. REC79	-30.0	225.0	6.0
48. REC80	-30.0	300.0	6.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE HIGH LEVEL - TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0	5.3	3.4
10.	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.0	3.0	3.0	3.0	3.7	3.0	3.0	3.0	3.0	3.0	5.5	3.6
20.	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.2	3.2	3.1	3.0	3.0	3.6	3.0	3.0	3.0	3.0	3.0	5.8	3.6
30.	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.2	3.2	3.2	3.1	3.0	3.4	3.0	3.0	3.0	3.0	3.0	5.8	3.8
40.	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.3	3.2	3.2	3.1	3.1	3.3	3.0	3.0	3.0	3.0	3.0	5.7	4.2
50.	3.0	3.0	3.0	3.0	3.0	3.0	4.1	3.5	3.3	3.2	3.1	3.1	3.2	3.1	3.1	3.1	3.1	3.1	5.3	4.7
60.	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.6	3.4	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.9	5.0

70.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.7	3.6	3.4	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	4.5	5.4
80.	*	3.1	3.1	3.1	3.0	3.0	3.0	3.9	3.9	3.7	3.6	3.4	3.4	3.2	3.2	3.2	3.2	3.2	3.2	4.0	4.9
90.	*	3.1	3.1	3.1	3.1	3.1	3.1	3.9	4.2	4.0	3.8	3.8	3.8	3.1	3.1	3.1	3.0	3.0	3.0	3.7	4.5
100.	*	3.1	3.1	3.1	3.1	3.1	3.1	4.0	4.6	4.3	3.9	3.9	3.9	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.9
110.	*	3.2	3.1	3.1	3.1	3.1	3.1	4.0	5.0	4.3	4.0	3.7	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.7
120.	*	3.4	3.1	3.1	3.1	3.1	3.1	4.3	5.0	4.1	3.8	3.8	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.5
130.	*	3.6	3.1	3.1	3.1	3.1	3.1	4.8	4.9	3.8	3.6	3.6	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3
140.	*	3.8	3.1	3.1	3.1	3.1	3.1	5.3	4.3	3.7	3.6	3.6	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.2
150.	*	4.0	3.1	3.1	3.1	3.1	3.1	5.2	3.9	3.6	3.5	3.5	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.2
160.	*	4.0	3.0	3.0	3.0	3.0	3.0	5.0	3.7	3.6	3.5	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2
170.	*	4.0	3.0	3.0	3.0	3.0	3.0	5.0	3.6	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2
180.	*	4.3	3.1	3.1	3.1	3.1	3.1	4.8	3.4	3.4	3.4	3.4	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.0
190.	*	4.6	3.2	3.0	3.0	3.0	3.0	4.6	3.4	3.4	3.4	3.4	3.4	3.5	3.2	3.0	3.0	3.0	3.0	3.0	3.0
200.	*	4.8	3.2	3.2	3.0	3.0	3.0	4.5	3.4	3.4	3.4	3.4	3.4	3.6	3.2	3.2	3.0	3.0	3.0	3.0	3.0
210.	*	5.1	3.4	3.3	3.3	3.1	3.1	4.6	3.4	3.4	3.4	3.4	3.4	3.9	3.2	3.2	3.2	3.0	3.0	3.0	3.0
220.	*	4.9	3.5	3.3	3.3	3.2	3.1	4.7	3.5	3.5	3.5	3.5	3.5	4.0	3.3	3.2	3.2	3.1	3.0	3.0	3.0
230.	*	4.7	3.6	3.4	3.2	3.1	3.1	4.5	3.5	3.5	3.5	3.5	3.5	3.9	3.4	3.3	3.1	3.0	3.0	3.0	3.0
240.	*	4.6	3.8	3.5	3.3	3.2	3.1	4.2	3.6	3.6	3.6	3.6	3.6	3.8	3.5	3.3	3.2	3.0	3.0	3.0	3.0
250.	*	4.5	4.1	3.5	3.3	3.2	3.2	3.9	3.6	3.6	3.6	3.6	3.6	3.7	3.5	3.4	3.2	3.1	3.1	3.1	3.1
260.	*	4.6	4.1	3.8	3.6	3.2	3.2	3.9	3.8	3.7	3.7	3.7	3.7	3.8	3.9	3.7	3.2	3.1	3.1	3.4	3.3
270.	*	4.2	4.2	3.7	3.7	3.5	3.3	3.6	3.6	3.6	3.6	3.6	3.6	4.1	3.9	3.7	3.7	3.5	3.3	3.7	3.5
280.	*	3.9	3.8	3.6	3.3	3.1	3.1	3.3	3.3	3.3	3.3	3.3	3.3	4.2	3.9	3.7	3.6	3.4	3.3	4.2	3.6

290.	*	3.7	3.6	3.4	3.3	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.0	3.9	3.6	3.4	3.3	3.2	4.4	3.5
300.	*	3.9	3.5	3.3	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.8	3.5	3.4	3.3	3.1	4.8	3.5
310.	*	3.9	3.4	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	4.4	3.7	3.4	3.3	3.2	3.2	5.0	3.4
320.	*	3.9	3.3	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	4.7	3.4	3.2	3.2	3.1	3.1	5.0	3.4
330.	*	3.7	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.7	3.3	3.2	3.2	3.1	3.0	5.0	3.4
340.	*	3.5	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.4	3.2	3.2	3.1	3.0	3.0	4.9	3.4
350.	*	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	3.2	3.0	3.0	3.0	3.0	5.0	3.4
MAX	*	5.1	4.2	3.8	3.7	3.5	3.3	5.3	5.0	4.3	4.0	3.9	3.9	4.7	3.9	3.7	3.7	3.5	3.3	5.8	5.4
DEGR.	*	210	270	260	270	270	270	140	110	100	110	100	100	320	260	260	270	270	270	20	70

PAGE 5

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE HIGH LEVEL - TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	3.4	3.4	3.4	3.4	4.1	3.6	3.6	3.6	3.6	3.6	3.6	4.6	4.1	3.7	3.7	3.7	3.7	3.6	4.3	4.7
10.	3.5	3.4	3.4	3.4	3.6	3.3	3.3	3.3	3.3	3.3	3.3	4.5	4.8	3.9	3.9	3.8	3.8	3.8	3.8	3.8
20.	3.6	3.5	3.4	3.4	3.3	3.1	3.1	3.1	3.1	3.1	3.1	4.4	5.3	3.9	3.9	3.9	3.9	3.8	3.3	3.3
30.	3.6	3.6	3.5	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	4.0	5.4	3.7	3.7	3.7	3.7	3.7	3.0	3.1
40.	3.7	3.6	3.5	3.5	3.2	3.0	3.0	3.0	3.0	3.0	3.0	4.1	5.3	3.6	3.6	3.6	3.6	3.6	3.0	3.0
50.	3.8	3.7	3.5	3.5	3.1	3.0	3.0	3.0	3.0	3.0	3.0	4.3	5.2	3.6	3.6	3.6	3.6	3.6	3.0	3.0
60.	4.1	3.7	3.7	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	5.1	3.5	3.5	3.5	3.5	3.5	3.0	3.0
70.	4.3	4.0	3.7	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	5.0	3.5	3.5	3.5	3.5	3.5	3.0	3.0
80.	4.2	3.8	3.8	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	5.0	3.6	3.5	3.5	3.5	3.5	3.0	3.0
90.	4.0	3.7	3.7	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	5.0	3.8	3.5	3.5	3.5	3.5	3.0	3.0
100.	3.6	3.5	3.2	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	5.0	4.1	3.5	3.5	3.5	3.5	3.0	3.0
110.	3.5	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	5.1	4.5	3.5	3.5	3.5	3.5	3.0	3.0
120.	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	5.2	4.7	3.5	3.5	3.5	3.5	3.0	3.0
130.	3.2	3.1	3.1	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	4.4	5.4	5.1	3.6	3.6	3.6	3.6	3.0	3.0
140.	3.2	3.1	3.1	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	4.4	5.3	5.4	3.7	3.6	3.6	3.6	3.0	3.0

150.	*	3.2	3.1	3.0	3.0	3.0	3.3	3.1	3.0	3.0	3.0	3.0	4.1	5.3	5.7	4.0	3.8	3.7	3.7	3.0	3.0
160.	*	3.2	3.0	3.0	3.0	3.1	3.4	3.2	3.2	3.1	3.1	3.1	3.9	5.4	6.0	4.4	4.1	3.8	3.9	3.1	3.1
170.	*	3.0	3.0	3.0	3.0	3.4	3.7	3.5	3.7	3.5	3.4	3.4	3.9	4.9	5.5	4.8	4.4	4.3	4.1	3.3	3.3
180.	*	3.0	3.0	3.0	3.0	3.9	4.1	4.1	4.2	3.9	4.1	4.0	3.7	4.6	5.1	4.6	4.3	4.1	4.1	3.6	3.6
190.	*	3.0	3.0	3.0	3.0	4.4	4.3	4.4	4.5	4.2	4.2	4.2	3.4	4.1	4.2	3.9	3.7	3.6	3.4	3.7	3.7
200.	*	3.0	3.0	3.0	3.0	4.9	4.1	4.9	4.7	4.2	3.8	3.8	3.1	3.9	3.8	3.5	3.1	3.1	3.1	3.7	3.7
210.	*	3.0	3.0	3.0	3.0	5.1	4.5	5.0	4.5	3.8	3.7	3.7	3.0	3.8	3.4	3.1	3.1	3.1	3.1	3.6	3.6
220.	*	3.0	3.0	3.0	3.0	5.3	4.6	5.1	3.9	3.6	3.6	3.6	3.0	3.7	3.2	3.1	3.0	3.0	3.0	3.6	3.6
230.	*	3.0	3.0	3.0	3.0	5.1	5.0	5.1	3.8	3.6	3.6	3.6	3.0	3.5	3.2	3.1	3.0	3.0	3.0	3.5	3.5
240.	*	3.0	3.0	3.0	3.0	5.0	5.0	4.7	3.8	3.6	3.6	3.6	3.0	3.4	3.2	3.2	3.0	3.0	3.0	3.4	3.4
250.	*	3.1	3.1	3.1	3.1	4.9	4.8	4.4	3.5	3.4	3.4	3.4	3.0	3.2	3.2	3.1	3.0	3.0	3.0	3.4	3.4
260.	*	3.3	3.3	3.3	3.3	4.9	4.6	4.1	3.4	3.4	3.4	3.4	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.4	3.4
270.	*	3.5	3.5	3.4	3.4	5.1	4.7	3.8	3.5	3.5	3.5	3.5	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.4	3.4
280.	*	3.6	3.6	3.6	3.5	5.3	4.4	3.5	3.4	3.4	3.4	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.7
290.	*	3.5	3.5	3.5	3.5	5.5	4.4	3.4	3.4	3.4	3.4	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.8
300.	*	3.5	3.5	3.5	3.5	5.6	4.6	3.6	3.6	3.6	3.6	3.6	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.6	4.1
310.	*	3.4	3.4	3.4	3.4	5.6	4.6	3.6	3.6	3.6	3.6	3.6	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.6
320.	*	3.4	3.4	3.4	3.4	5.5	4.5	3.6	3.6	3.6	3.6	3.6	3.9	3.0	3.0	3.0	3.0	3.0	3.0	3.8	5.1
330.	*	3.4	3.4	3.4	3.4	5.4	4.4	3.7	3.7	3.7	3.7	3.7	3.9	3.1	3.1	3.1	3.1	3.1	3.1	4.1	5.4
340.	*	3.4	3.4	3.4	3.4	4.9	4.1	3.7	3.7	3.7	3.7	3.7	4.0	3.1	3.1	3.1	3.1	3.1	3.1	4.4	5.7
350.	*	3.4	3.4	3.4	3.4	4.5	3.9	3.8	3.8	3.8	3.8	3.8	4.2	3.5	3.4	3.4	3.4	3.4	3.4	4.5	5.3

------*----------

MAX	*	4.3	4.0	3.8	3.7	5.6	5.0	5.1	4.7	4.2	4.2	4.2	4.6	5.4	6.0	4.8	4.4	4.3	4.1	4.5	5.7
DEGR.	*	70	70	80	90	300	230	220	200	190	190	190	0	30	160	170	170	170	170	350	340

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE HIGH LEVEL - TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48
0.	*	4.4	4.4	3.9	3.9	4.0	3.9	3.9	4.2

10.	*	4.4	4.6	3.4	3.3	3.7	4.1	4.2	4.3
20.	*	4.4	4.7	3.1	3.1	3.1	3.8	3.8	4.0
30.	*	4.0	4.7	3.0	3.0	3.0	3.6	3.6	3.7
40.	*	3.7	4.7	3.0	3.0	3.0	3.6	3.6	3.6
50.	*	3.5	4.4	3.0	3.0	3.0	3.5	3.5	3.5
60.	*	3.5	4.2	3.0	3.0	3.0	3.5	3.5	3.5
70.	*	3.5	3.9	3.0	3.0	3.0	3.5	3.5	3.5
80.	*	3.5	3.7	3.0	3.0	3.0	3.5	3.5	3.5
90.	*	3.5	3.6	3.0	3.0	3.0	3.5	3.5	3.5
100.	*	3.5	3.5	3.0	3.0	3.0	3.5	3.5	3.5
110.	*	3.5	3.5	3.0	3.0	3.0	3.5	3.5	3.5
120.	*	3.5	3.5	3.0	3.0	3.0	3.5	3.5	3.5
130.	*	3.5	3.5	3.0	3.0	3.0	3.5	3.5	3.5
140.	*	3.6	3.6	3.0	3.0	3.0	3.6	3.6	3.6
150.	*	3.6	3.6	3.0	3.0	3.0	3.6	3.6	3.6
160.	*	3.7	3.7	3.1	3.1	3.1	3.7	3.7	3.7
170.	*	3.7	3.8	3.3	3.3	3.3	3.7	3.7	3.7
180.	*	3.7	3.7	3.6	3.6	3.6	3.5	3.5	3.6
190.	*	3.4	3.4	3.7	3.7	3.7	3.2	3.3	3.3
200.	*	3.1	3.1	3.7	3.7	3.7	3.1	3.1	3.1
210.	*	3.0	3.0	3.6	3.6	3.6	3.0	3.0	3.0
220.	*	3.0	3.0	3.6	3.6	3.6	3.0	3.0	3.0

230.	*	3.0	3.0	3.5	3.5	3.5	3.0	3.0	3.0
240.	*	3.0	3.0	3.4	3.4	3.4	3.0	3.0	3.0
250.	*	3.0	3.0	3.4	3.4	3.4	3.0	3.0	3.0
260.	*	3.0	3.0	3.4	3.4	3.4	3.0	3.0	3.0
270.	*	3.0	3.0	3.4	3.4	3.4	3.0	3.0	3.0
280.	*	3.0	3.2	3.4	3.4	3.4	3.0	3.0	3.0
290.	*	3.1	3.2	3.4	3.4	3.4	3.0	3.0	3.0
300.	*	3.2	3.2	3.4	3.4	3.4	3.0	3.0	3.0
310.	*	3.2	3.2	3.5	3.5	3.5	3.0	3.0	3.0
320.	*	3.1	3.4	3.6	3.5	3.5	3.0	3.0	3.0
330.	*	3.2	3.5	3.6	3.6	3.8	3.0	3.0	3.0
340.	*	3.4	3.7	3.7	3.9	4.1	3.1	3.1	3.3
350.	*	3.7	4.2	3.9	4.1	4.3	3.2	3.7	3.7
------	*	----------	----------	----------	----------	----------	----------	----------	----------
MAX	*	4.4	4.7	3.9	4.1	4.3	4.1	4.2	4.3
DEGR.	*	0	20	0	350	350	10	10	10

THE HIGHEST CONCENTRATION OF 6.00 PPM OCCURRED AT RECEPTOR REC34.

PAGE 7

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE HIGH LEVEL - TRENTON

DATE : 9/13/ 2

TIME : 18: 4:57

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	210	270	260	270	270	270	140	110	100	110	100	100	320	260	260	270	270	270	20	70
1	.2	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0
2	.6	.0	.1	.0	.0	.0	.5	.2	.1	.1	.1	.1	.0	.2	.2	.1	.1	.1	.0	.0
3	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0	.0	.2	.1
4	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0	.0	.2	.1
5	.0	.2	.1	.1	.1	.1	.0	.0	.1	.0	.0	.0	.6	.0	.0	.1	.1	.1	.5	.2
6	.2	.0	.0	.0	.0	.0	.2	.1	.0	.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0
7	.0	.1	.1	.1	.1	.0	.2	.2	.2	.2	.2	.2	.0	.1	.1	.1	.1	.0	.2	.3
8	.0	.1	.1	.1	.0	.0	.6	.6	.2	.1	.1	.0	.0	.1	.0	.1	.0	.0	.6	.6
9	.0	.1	.1	.1	.0	.0	.4	.4	.2	.1	.1	.1	.0	.1	.1	.1	.0	.0	.9	.8

10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	1.0	.3	.1	.1	.1	.0	.0	.0	.1	.0	.0	.0	.7	.1	.1	.1	.1	.0	.0	.1
13	*	.0	.1	.1	.1	.1	.1	.3	.4	.4	.4	.4	.5	.0	.1	.1	.1	.1	.1	.2	.2

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE HIGH LEVEL - TRENTON

DATE : 9/13/ 2

TIME : 18: 4:57

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	70	70	80	90	300	230	220	200	190	190	190	0	30	160	170	170	170	170	350	340
1	.0	.0	.0	.0	.2	.0	.0	.0	.1	.1	.0	.0	.0	.1	.1	.1	.1	.0	.4	.3
2	.0	.0	.0	.1	1.5	.0	.0	.1	.1	.1	.1	.0	.0	.2	.2	.1	.1	.1	.5	1.6
3	.1	.0	.0	.0	.0	.3	.3	.4	.4	.4	.5	.2	.2	.2	.2	.2	.2	.2	.1	.1
4	.1	.1	.0	.0	.0	.3	.3	.3	.2	.3	.3	.3	.5	.5	.5	.6	.6	.6	.1	.1
5	.2	.2	.1	.0	.0	.8	1.1	.6	.3	.2	.2	.5	1.7	1.8	.7	.3	.2	.1	.2	.2
6	.0	.0	.0	.0	.2	.0	.0	.1	.1	.1	.1	.2	.0	.1	.1	.1	.1	.1	.2	.2
7	.3	.3	.3	.3	.1	.1	.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0

8	*	.2	.1	.1	.1	.2	.2	.1	.1	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1
9	*	.2	.1	.1	.1	.3	.2	.1	.1	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0
13	*	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2007 BRIDGE HIGH LEVEL - TRENTON

DATE : 9/13/ 2

TIME : 18: 4:57

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	*	CO/LINK (PPM)							
	*	ANGLE (DEGREES)							
	*	REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48
LINK #	*	0	20	0	350	350	10	10	10
1	*	.1	.2	.3	.4	.4	.2	.2	.2
2	*	.2	.7	.1	.2	.3	.1	.2	.3
3	*	.1	.1	.1	.1	.1	.1	.1	.1
4	*	.2	.1	.1	.1	.1	.1	.1	.1

5	*	.2	.1	.1	.1	.1	.1	.1	.1
6	*	.4	.4	.2	.2	.2	.5	.5	.5
7	*	.0	.0	.0	.0	.0	.0	.0	.0
8	*	.1	.0	.0	.0	.0	.0	.0	.0
9	*	.1	.0	.0	.0	.1	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.1	.0	.0	.0	.0	.0	.0
13	*	.0	.0	.0	.0	.0	.0	.0	.0

2027 NO ACTION – 16TH AVENUE SOUTH / EAST MARGINAL WAY

```
                    CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1

(C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.

     JOB: SOUTHPARK PROJECT                                  RUN: 2027 NO BRIDGE MARGINAL WAY

     DATE :  9/13/ 2

     TIME : 16:51:47

        The MODE flag has been set to C for calculating CO averages.

      SITE & METEOROLOGICAL VARIABLES
```

```
-------------------------------

VS =    .0 CM/S       VD =    .0 CM/S       Z0 = 108. CM

 U =  1.0 M/S         CLAS =   4  (D)     ATIM =  60. MINUTES     MIXH =  1000. M   AMB =  3.0 PPM


LINK VARIABLES

--------------

  LINK DESCRIPTION     *         LINK COORDINATES (FT)          *    LENGTH  BRG TYPE   VPH    EF      H   W    V/C QUEUE

                       *   X1        Y1        X2        Y2     *     (FT)  (DEG)           (G/MI)  (FT) (FT)       (VEH)

------------------------*----------------------------------------*-------------------------------------------------------

 1. 16TH NB            *    633.9    -745.4       8.9       4.6 *     976.   320. AG     70.   5.6    .0 40.0

 2. 16TH QUE LT        *     74.4     -81.9      90.1    -100.8 *      25.   140. AG    187. 100.0    .0 10.0  .14   1.3

 3. 16TH QUE RT        *     82.6     -76.0      88.9     -83.6 *      10.   140. AG    187. 100.0    .0 10.0  .06    .5

 4. 16TH SB            *    -18.0     -42.6     607.0    -792.6 *     976.   140. AG     60.   5.6    .0 40.0

 5. MARGINAL SE 1      *  -1000.0     -16.0        .0     -16.0 *    1000.    90. AG   1696.   3.9    .0 52.0

 6. MAR SE QUE TH      *    -60.0     -10.0    -217.9     -10.0 *     158.   270. AG    145. 100.0    .0 20.0  .76   8.0

 7. MAR SE QUE E RT    *    -60.0     -26.0     -82.6     -26.0 *      23.   270. AG    187. 100.0    .0 10.0  .15   1.2

 8. MARGINAL SE 2      *       .0     -12.0    1000.0     -12.0 *    1000.    90. AG   1670.   3.9    .0 24.0

 9. MARGINAL NW 1      *   1000.0      22.0        .0      22.0 *    1000.   270. AG    919.   3.9    .0 64.0

10. MAR NW QUE LT      *     60.0       6.0      67.3       6.0 *       7.    90. AG    197. 100.0    .0 12.0  .05    .4

11. MAR NW QUE TH      *     60.0      28.0     109.4      28.0 *      49.    90. AG    187. 100.0    .0 32.0  .30   2.5

12. MAR NW 2           *       .0      16.0   -1000.0      16.0 *    1000.   270. AG    955.   3.9    .0 52.0
```

JOB: SOUTHPARK PROJECT RUN: 2027 NO BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 16:51:47

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 16TH QUE LT	120	90	2.0	50	1662	92.90	1	3
3. 16TH QUE RT	120	90	2.0	20	1487	92.90	1	3
6. MAR SE QUE TH	120	35	2.0	1650	1616	92.90	1	3
7. MAR SE QUE E RT	120	90	2.0	46	1446	92.90	1	3
10. MAR NW QUE LT	120	95	2.0	14	1466	92.90	1	3
11. MAR NW QUE TH	120	30	2.0	905	1405	92.90	1	3

RECEPTOR LOCATIONS

COORDINATES (FT)

	RECEPTOR	X	Y	Z
1.	RECEPTOR 1	75.7	-43.5	.0
2.	RECEPTOR 2	123.6	-101.1	.0
3.	RECEPTOR 3	171.6	-158.8	.0
4.	RECEPTOR 4	219.6	-216.4	.0
5.	RECEPTOR 5	267.6	-274.1	.0
6.	RECEPTOR 6	315.6	-331.7	.0
7.	RECEPTOR 7	363.5	-389.3	.0
8.	RECEPTOR 10	-7.5	-87.5	.0
9.	RECEPTOR 11	40.4	-145.1	.0
10.	RECEPTOR 12	88.4	-202.8	.0
11.	RECEPTOR 13	136.4	-260.4	.0
12.	RECEPTOR 14	184.3	-318.1	.0
13.	RECEPTOR 15	232.3	-375.7	.0
14.	RECEPTOR 16	280.3	-433.4	.0
15.	RECEPTOR 20	-424.8	41.6	.0
16.	RECEPTOR 21	-349.8	41.6	.0
17.	RECEPTOR 22	-274.8	41.6	.0
18.	RECEPTOR 23	-199.8	41.6	.0
19.	RECEPTOR 24	-124.8	41.6	.0
20.	RECEPTOR 25	-49.8	41.6	.0

21. RECEPTOR 26	*	.8	54.4	.0	*
22. RECEPTOR 27	*	75.8	54.4	.0	*
23. RECEPTOR 28	*	150.8	54.4	.0	*
24. RECEPTOR 29	*	225.8	54.4	.0	*
25. RECEPTOR 30	*	300.8	54.4	.0	*
26. RECEPTOR 31	*	375.8	54.4	.0	*
27. RECEPTOR 32	*	450.8	54.4	.0	*
28. RECEPTOR 34	*	-424.8	-41.5	.0	*
29. RECEPTOR 35	*	-349.8	-41.5	.0	*
30. RECEPTOR 36	*	-274.8	-41.5	.0	*
31. RECEPTOR 37	*	-199.8	-41.5	.0	*
32. RECEPTOR 38	*	-124.8	-41.5	.0	*
33. RECEPTOR 39	*	-49.8	-41.5	.0	*
34. RECEPTOR 40	*	.1	-24.2	.0	*
35. RECEPTOR 41	*	75.1	-24.2	.0	*
36. RECEPTOR 42	*	150.1	-24.2	.0	*
37. RECEPTOR 43	*	225.1	-24.2	.0	*
38. RECEPTOR 44	*	300.1	-24.2	.0	*
39. RECEPTOR 45	*	375.1	-24.2	.0	*

PAGE 3

JOB: SOUTHPARK PROJECT RUN: 2027 NO BRIDGE MARGINAL WAY

```
 DATE :  9/13/ 2

 TIME : 16:51:47



  RECEPTOR LOCATIONS

  ------------------

                        *           COORDINATES (FT)          *

    RECEPTOR            *      X          Y          Z        *

-------------------------*-------------------------------------*

40. RECEPTOR 46         *       450.1      -24.2         .0   *
```



```
 JOB: SOUTHPARK PROJECT                                  RUN: 2027 NO BRIDGE MARGINAL WAY


  MODEL RESULTS

  -------------


  REMARKS : In search of the angle corresponding to

            the maximum concentration, only the first

            angle, of the angles with same maximum

            concentrations, is indicated as maximum.
```

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	3.5	3.2	3.1	3.0	3.0	3.0	3.0	3.1	3.1	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
10.	3.5	3.2	3.1	3.0	3.0	3.0	3.0	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
20.	3.5	3.1	3.1	3.0	3.0	3.0	3.0	3.1	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
30.	3.4	3.2	3.1	3.0	3.0	3.0	3.0	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
40.	3.4	3.2	3.1	3.1	3.0	3.0	3.0	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
50.	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
60.	3.3	3.2	3.1	3.1	3.0	3.0	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
70.	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
80.	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.2	3.2
90.	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.5	3.5	3.4	3.4	3.4
100.	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.5	3.5	3.6	3.5	3.5
110.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.6	3.6	3.4	3.5
120.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.5	3.6	3.6	3.4	3.3
130.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.6	3.7	3.6	3.3
140.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.4	3.6	3.6	3.3

150.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.6	3.6	3.2
160.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.4	3.4	3.2
170.	*	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.4	3.4	3.2
180.	*	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.4	3.4	3.4
190.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.4	3.4	3.4
200.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.3	3.4	3.6
210.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.4	3.5	3.6
220.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.5	3.6
230.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.6	3.7
240.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.6	3.7
250.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.5	3.6
260.	*	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.4	3.5
270.	*	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.3	3.3
280.	*	3.5	3.5	3.1	3.0	3.0	3.0	3.0	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1
290.	*	3.4	3.6	3.2	3.1	3.1	3.0	3.0	3.4	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
300.	*	3.3	3.5	3.2	3.1	3.1	3.0	3.0	3.5	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
310.	*	3.3	3.3	3.1	3.0	3.0	3.0	3.0	3.5	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
320.	*	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.4	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
330.	*	3.3	3.2	3.2	3.0	3.0	3.0	3.0	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
340.	*	3.5	3.2	3.2	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
350.	*	3.6	3.2	3.1	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

------*----------

MAX	*	3.6	3.6	3.2	3.1	3.1	3.0	3.0	3.5	3.3	3.2	3.2	3.1	3.0	3.0	3.5	3.5	3.6	3.7	3.6	3.7
DEGR.	*	350	290	290	40	290	0	0	300	20	0	310	300	0	0	110	90	110	130	130	230

JOB: SOUTHPARK PROJECT RUN: 2027 NO BRIDGE MARGINAL WAY

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.7	3.7	3.4	3.5	3.8	3.4	3.4	3.4	3.4	3.4
10.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.6	3.6	3.3	3.4	3.7	3.4	3.4	3.4	3.4	3.4

20.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.6	3.6	3.3	3.4	3.7	3.4	3.4	3.4	3.4	3.4
30.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.6	3.6	3.3	3.4	3.6	3.4	3.4	3.4	3.4	3.4
40.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.8	3.8	3.3	3.6	3.6	3.4	3.4	3.4	3.4	3.4
50.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.5	3.8	3.7	3.5	3.7	3.6	3.5	3.5	3.5	3.5	3.5
60.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.6	3.8	3.8	3.5	3.8	3.5	3.5	3.5	3.5	3.5	3.5
70.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.6	3.8	3.8	3.9	3.6	3.8	3.6	3.6	3.6	3.6	3.6	3.6
80.	*	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.7	3.9	3.7	3.7	3.5	3.8	3.6	3.6	3.6	3.6	3.6	3.6
90.	*	3.4	3.3	3.3	3.3	3.3	3.3	3.3	3.5	3.5	3.6	3.5	3.5	3.4	3.6	3.6	3.6	3.6	3.5	3.5	3.5
100.	*	3.5	3.4	3.3	3.3	3.3	3.3	3.3	3.2	3.2	3.3	3.1	3.2	3.2	3.3	3.3	3.3	3.3	3.3	3.3	3.3
110.	*	3.5	3.5	3.3	3.3	3.3	3.3	3.3	3.1	3.1	3.1	3.1	3.1	3.0	3.2	3.1	3.1	3.1	3.1	3.1	3.1
120.	*	3.5	3.6	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.1	3.1	3.1	3.1	3.1	3.1
130.	*	3.3	3.6	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0
140.	*	3.2	3.7	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0
150.	*	3.2	3.8	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0
160.	*	3.2	3.8	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0
170.	*	3.2	3.8	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.2	3.0	3.0	3.0	3.0	3.0
180.	*	3.4	3.8	3.2	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0
190.	*	3.2	3.8	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0
200.	*	3.2	3.7	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0
210.	*	3.2	3.5	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0
220.	*	3.4	3.4	3.3	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.1	3.0	3.0	3.0	3.0
230.	*	3.4	3.5	3.4	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.1	3.0	3.0	3.0	3.0

240.	*	3.5	3.5	3.7	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.1	3.1	3.1	3.1
250.	*	3.6	3.5	3.8	3.5	3.3	3.3	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.3	3.2	3.1	3.1	3.1	3.1	3.1
260.	*	3.5	3.5	3.6	3.6	3.5	3.4	3.4	3.2	3.2	3.2	3.2	3.2	3.2	3.6	3.5	3.4	3.3	3.3	3.2	3.2
270.	*	3.2	3.3	3.4	3.4	3.3	3.2	3.2	3.5	3.5	3.5	3.5	3.6	3.6	4.0	3.7	3.7	3.7	3.6	3.6	3.6
280.	*	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.5	3.5	3.5	3.5	3.6	3.9	4.1	3.8	3.8	3.9	3.8	3.6	3.6
290.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	3.8	4.2	3.8	3.8	3.6	3.6	3.7	3.6	3.6
300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.7	4.1	3.5	3.6	3.7	3.6	3.5	3.5	3.5
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.5	3.8	4.2	3.3	3.4	3.7	3.5	3.5	3.5	3.5
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.5	3.8	4.0	3.3	3.5	3.6	3.4	3.4	3.4	3.4
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.5	3.6	3.8	3.3	3.6	3.5	3.4	3.4	3.4	3.4
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.6	3.6	3.6	3.4	3.7	3.4	3.4	3.4	3.4	3.4
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.6	3.6	3.4	3.3	3.7	3.4	3.4	3.4	3.4	3.4
MAX	*	3.6	3.8	3.8	3.6	3.5	3.4	3.4	3.6	3.7	3.9	3.8	3.9	4.2	4.1	3.8	3.8	3.9	3.8	3.6	3.6
DEGR.	*	250	150	250	260	260	260	260	80	80	80	40	70	290	280	0	280	280	280	70	70

THE HIGHEST CONCENTRATION OF 4.20 PPM OCCURRED AT RECEPTOR REC33.

JOB: SOUTHPARK PROJECT RUN: 2027 NO BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 16:51:47

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	350	290	290	40	290	0	0	300	20	0	310	300	0	0	110	90	110	130	130	230
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.2	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5	.0	.1	.1	.0	.1	.0	.0	.2	.0	.0	.1	.1	.0	.0	.2	.1	.2	.2	.1	.2

6	*	.0	.1	.1	.0	.0	.0	.0	.2	.0	.0	.1	.0	.0	.0	.1	.1	.2	.3	.2	.3
7	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0
8	*	.2	.0	.0	.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0
9	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.2	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.2	.2	.2	.2	.2	.2

JOB: SOUTHPARK PROJECT RUN: 2027 NO BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 16:51:47

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	250	150	250	260	260	260	260	80	80	80	40	70	290	280	0	280	280	280	70	70
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

3	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5	*	.2	.0	.1	.1	.1	.1	.1	.4	.4	.4	.3	.3	.4	.5	.0	.1	.1	.1	.0	.0
6	*	.2	.0	.1	.1	.0	.0	.0	.1	.1	.3	.4	.2	.4	.3	.0	.1	.0	.0	.0	.0
7	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.3	.1	.0	.0	.0	.0	.0	.0
8	*	.0	.1	.1	.0	.1	.1	.1	.0	.1	.1	.0	.1	.0	.0	.3	.4	.5	.5	.5	.5
9	*	.0	.1	.2	.2	.2	.2	.2	.0	.0	.0	.0	.1	.0	.0	.1	.1	.1	.1	.1	.1
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
11	*	.0	.6	.3	.1	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.3	.0	.1	.1	.0	.0
12	*	.2	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.0	.1	.2	.0	.1	.1	.0	.0	.0

2027 NO ACTION – 14TH AVENUE SOUTH / SOUTH CLOVERDALE AND SOUTH TRENTON STREETS

```
                CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1


(C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.

     JOB: SOUTHPARK BRIDGE PROJECT                              RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON


     DATE :  9/13/ 2

     TIME : 17:15:17


        The MODE flag has been set to C for calculating CO averages.
```

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM

U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)			(G/MI)	(FT)	(FT)		(VEH)
1. 14TH NB 1	*	10.0	-1000.0	10.0	.0	*	1000.	360.	AG	587.	5.6	.0	40.0		
2. 14TH NB QUE ALL	*	10.0	-30.0	10.0	-70.1	*	40.	180.	AG	125.	100.0	.0	20.0	.25	2.0
3. 14TH NB 2	*	10.0	.0	10.0	600.0	*	600.	360.	AG	600.	5.6	.0	40.0		
4. 14TH NB QUE LT	*	5.0	560.0	5.0	464.5	*	96.	180.	AG	159.	100.0	.0	10.0	.55	4.9
5. 14TH NB QUE ALL	*	15.0	560.0	15.0	461.3	*	99.	180.	AG	159.	100.0	.0	10.0	.56	5.0
6. 14TH NB 3	*	10.0	600.0	10.0	1600.0	*	1000.	360.	AG	70.	5.6	.0	40.0		
7. 14TH SB 1	*	-10.0	1600.0	-10.0	600.0	*	1000.	180.	AG	91.	5.6	.0	40.0		
8. 14TH SB QUE ALL	*	-10.0	630.0	-10.0	669.3	*	39.	360.	AG	197.	100.0	.0	10.0	.33	2.0
9. 14TH SB 2	*	-10.0	600.0	-10.0	.0	*	600.	180.	AG	410.	5.6	.0	40.0		
10. 14TH SB QUE ALL	*	-10.0	30.0	-10.0	58.4	*	28.	360.	AG	125.	100.0	.0	20.0	.17	1.4
11. 14TH SB 3	*	-10.0	.0	-10.0	-1000.0	*	1000.	180.	AG	432.	5.6	.0	40.0		
12. TRENTON EB 1	*	-1000.0	-6.0	.0	-6.0	*	1000.	90.	AG	17.	6.9	.0	32.0		

```
13. TRENTON EB QUE ALL  *    -40.0      -6.0     -47.0      -6.0 *       7.   270. AG    187. 100.0    .0 12.0  .05    .4
14. TRENTON EB 2        *       .0      -6.0    1000.0      -6.0 *    1000.    90. AG     29.   6.9    .0 32.0
15. TRENTON WB 1        *   1000.0       6.0        .0       6.0 *    1000.   270. AG     98.   6.9    .0 32.0
16. TRENTON WB QUE ALL  *     40.0       6.0      80.2       6.0 *      40.    90. AG    187. 100.0    .0 12.0  .29   2.0
17. TRENTON WB 2        *       .0       6.0   -1000.0       6.0 *    1000.   270. AG     37.   6.9    .0 32.0
18. CLOVERDALE EB 1     *  -1000.0     590.0        .0     590.0 *    1000.    90. AG    370.   5.6    .0 40.0
19. CLOVERDALE EB QUE AL*    -40.0     595.0     -87.9     595.0 *      48.   270. AG    182. 100.0    .0 10.0  .36   2.4
20. CLOVERDALE EB QUE RT*    -40.0     585.0     -90.6     585.0 *      51.   270. AG     92. 100.0    .0 10.0  .30   2.6
21. CLOVERDALE EB 2     *       .0     595.0    1000.0     595.0 *    1000.    90. AG     16.   5.6    .0 30.0
22. CLOVERDALE WB 1     *   1000.0     605.0        .0     605.0 *    1000.   270. AG     20.   5.6    .0 30.0
23. CLOVERDALE WB QUE AL*     40.0     605.0      49.2     605.0 *       9.    90. AG    209. 100.0    .0 10.0  .11    .5
24. CLOVERDALE WB 2     *       .0     605.0   -1000.0     605.0 *    1000.   270. AG    545.   5.6    .0 30.0
```

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:15:17

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 14TH NB QUE ALL	100	25	2.0	587	1640	92.90	1	3
4. 14TH NB QUE LT	100	64	2.0	273	1564	92.90	1	3
5. 14TH NB QUE ALL	100	64	2.0	282	1576	92.90	1	3
8. 14TH SB QUE ALL	100	79	2.0	91	1644	92.90	1	3
10. 14TH SB QUE ALL	100	25	2.0	417	1689	92.90	1	3
13. TRENTON EB QUE ALL	100	75	2.0	17	1685	92.90	1	3
16. TRENTON WB QUE ALL	100	75	2.0	98	1619	92.90	1	3
19. CLOVERDALE EB QUE AL	100	73	2.0	120	1459	92.90	1	3
20. CLOVERDALE EB QUE RT	100	37	2.0	250	1426	92.90	1	3
23. CLOVERDALE WB QUE AL	100	84	2.0	20	1524	92.90	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC1	75.0	620.0	6.0
2. REC2	150.0	620.0	6.0
3. REC3	225.0	620.0	6.0
4. REC4	300.0	620.0	6.0
5. REC5	375.0	620.0	6.0
6. REC6	450.0	620.0	6.0
7. REC7	-75.0	620.0	6.0
8. REC8	-150.0	620.0	6.0
9. REC9	-225.0	620.0	6.0
10. REC10	-300.0	620.0	6.0
11. REC11	-375.0	620.0	6.0
12. REC12	-450.0	620.0	6.0
13. REC13	75.0	580.0	6.0
14. REC14	150.0	580.0	6.0
15. REC15	225.0	580.0	6.0
16. REC16	300.0	580.0	6.0

17. REC17	*	375.0	580.0	6.0	*
18. REC18	*	450.0	580.0	6.0	*
19. REC19	*	-75.0	570.0	6.0	*
20. REC20	*	-150.0	570.0	6.0	*
21. REC21	*	-225.0	570.0	6.0	*
22. REC22	*	-300.0	570.0	6.0	*
23. REC23	*	-375.0	570.0	6.0	*
24. REC24	*	-450.0	570.0	6.0	*
25. REC25	*	30.0	525.0	6.0	*
26. REC26	*	30.0	675.0	6.0	*
27. REC27	*	30.0	750.0	6.0	*
28. REC28	*	30.0	825.0	6.0	*
29. REC29	*	30.0	900.0	6.0	*
30. REC30	*	30.0	975.0	6.0	*
31. REC31	*	30.0	1050.0	6.0	*
32. REC32	*	-30.0	525.0	6.0	*
33. REC33	*	-30.0	675.0	6.0	*
34. REC34	*	-30.0	750.0	6.0	*
35. REC35	*	-30.0	825.0	6.0	*

PAGE 3

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:15:17

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
36. REC36	-30.0	900.0	6.0
37. REC37	-30.0	975.0	6.0
38. REC38	-30.0	1050.0	6.0
39. REC39	30.0	375.0	6.0
40. REC40	30.0	450.0	6.0
41. REC41	-30.0	375.0	6.0
42. REC42	-30.0	450.0	6.0
43. REC43	75.0	22.0	6.0
44. REC44	150.0	22.0	6.0
45. REC45	225.0	22.0	6.0
46. REC46	300.0	22.0	6.0
47. REC47	375.0	22.0	6.0

```
48. REC48                *       450.0       22.0        6.0   *

49. REC49                *       -75.0       22.0        6.0   *

50. REC50                *      -150.0       22.0        6.0   *

51. REC51                *      -225.0       22.0        6.0   *

52. REC52                *      -300.0       22.0        6.0   *

53. REC53                *      -375.0       22.0        6.0   *

54. REC54                *      -450.0       22.0        6.0   *

55. REC55                *        75.0      -22.0        6.0   *

56. REC56                *       150.0      -22.0        6.0   *

57. REC57                *       225.0      -22.0        6.0   *

58. REC58                *       300.0      -22.0        6.0   *

59. REC59                *       375.0      -22.0        6.0   *

60. REC60                *       450.0      -22.0        6.0   *

61. REC61                *       -75.0      -22.0        6.0   *

62. REC62                *      -150.0      -22.0        6.0   *

63. REC63                *      -225.0      -22.0        6.0   *

64. REC64                *      -300.0      -22.0        6.0   *

65. REC65                *      -375.0      -22.0        6.0   *

66. REC66                *      -450.0      -22.0        6.0   *

67. REC67                *        30.0       75.0        6.0   *

68. REC68                *        30.0      150.0        6.0   *

69. REC69                *        30.0      225.0        6.0   *
```

70. REC70	*	30.0	300.0	6.0	*
71. REC71	*	30.0	-75.0	6.0	*
72. REC72	*	30.0	-150.0	6.0	*
73. REC73	*	30.0	-225.0	6.0	*
74. REC74	*	30.0	-300.0	6.0	*
75. REC75	*	30.0	-375.0	6.0	*
76. REC76	*	30.0	-450.0	6.0	*
77. REC77	*	-30.0	75.0	6.0	*
78. REC78	*	-30.0	150.0	6.0	*
79. REC79	*	-30.0	225.0	6.0	*
80. REC80	*	-30.0	300.0	6.0	*
81. REC81	*	-30.0	-75.0	6.0	*
82. REC82	*	-30.0	-150.0	6.0	*
83. REC83	*	-30.0	-225.0	6.0	*
84. REC84	*	-30.0	-300.0	6.0	*
85. REC85	*	-30.0	-375.0	6.0	*

PAGE 4

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:15:17

```
  RECEPTOR LOCATIONS

  ------------------

                        *          COORDINATES (FT)         *

    RECEPTOR            *      X          Y          Z       *

-------------------------*-------------------------------------*

86. REC86               *       -30.0     -450.0        6.0   *
```

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.2
10.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.2
20.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.2
30.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.2
40.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.2

50.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.2
60.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.4
70.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.4
80.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.1	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.4
90.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.1	3.2	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.3
100.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.4	3.4	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2
110.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.5	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2
120.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.7	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2
130.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.4	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0
140.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0
150.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0
160.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0
170.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
180.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
190.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.6	3.2	3.2	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
200.	*	3.3	3.0	3.0	3.0	3.0	3.0	3.5	3.2	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
210.	*	3.3	3.0	3.0	3.0	3.0	3.0	3.5	3.2	3.2	3.2	3.2	3.2	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0
220.	*	3.3	3.1	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.2	3.2	3.2	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0
230.	*	3.4	3.2	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2	3.2	3.2	3.5	3.2	3.0	3.0	3.0	3.0	3.0	3.0
240.	*	3.1	3.2	3.2	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0
250.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.2	3.2	3.0	3.0	3.0	3.0	3.0
260.	*	3.4	3.1	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.2	3.1	3.0	3.0	3.0	3.1	3.1

270.	*	3.4	3.1	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.3	3.3	3.4	3.1	3.0	3.0	3.0	3.0	3.2	3.2
280.	*	3.2	3.1	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.3	3.1	3.0	3.0	3.0	3.0	3.2	3.2
290.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.2
300.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.3	3.2
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.3	3.2
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.5	3.2
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.2
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.2
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.2
MAX	*	3.4	3.2	3.2	3.0	3.0	3.0	4.0	3.7	3.4	3.3	3.3	3.3	3.5	3.2	3.2	3.0	3.0	3.0	3.8	3.4
DEGR.	*	230	230	240	0	0	0	150	120	100	100	90	90	230	230	250	0	0	0	30	60

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum

concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	* REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	* 3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.4
10.	* 3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2
20.	* 3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
30.	* 3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
40.	* 3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
50.	* 3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
60.	* 3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
70.	* 3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
80.	* 3.3	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
90.	* 3.1	3.1	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
100.	* 3.2	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
110.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
120.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0
130.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0

140.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0
150.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0
160.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.5	3.1	3.0	3.0	3.0	3.0	3.0	3.0
170.	*	3.0	3.0	3.0	3.0	3.1	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.5	3.4	3.0	3.0	3.0	3.0	3.1	3.1
180.	*	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.2	3.5	3.2	3.0	3.0	3.0	3.0	3.2	3.2
190.	*	3.0	3.0	3.0	3.0	3.7	3.4	3.4	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.3	3.3
200.	*	3.0	3.0	3.0	3.0	3.9	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.3	3.3
210.	*	3.0	3.0	3.0	3.0	4.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.3	3.3
220.	*	3.0	3.0	3.0	3.0	4.0	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.2
230.	*	3.0	3.0	3.0	3.0	3.9	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.2
240.	*	3.0	3.0	3.0	3.0	3.9	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.2
250.	*	3.0	3.0	3.0	3.0	3.9	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.2
260.	*	3.1	3.1	3.1	3.1	3.9	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.2
270.	*	3.2	3.2	3.2	3.2	3.9	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2
280.	*	3.2	3.2	3.2	3.2	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2
290.	*	3.2	3.2	3.2	3.2	4.1	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.4
300.	*	3.2	3.2	3.2	3.2	4.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.5
310.	*	3.2	3.2	3.2	3.2	4.1	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.6
320.	*	3.2	3.2	3.2	3.2	3.9	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.9
330.	*	3.2	3.2	3.2	3.2	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	4.2
340.	*	3.2	3.2	3.2	3.2	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.5	4.1
350.	*	3.2	3.2	3.2	3.2	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.8

MAX *	3.3	3.2	3.2	3.2	4.2	3.4	3.4	3.0	3.0	3.0	3.0	3.7	3.5	3.4	3.0	3.0	3.0	3.0	3.5	4.2
DEGR. *	80	0	0	0	300	190	190	0	0	0	0	90	150	170	0	0	0	0	340	330

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR) *	CONCENTRATION (PPM)																			
	REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
0. *	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0

10.	*	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0
20.	*	3.4	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0
30.	*	3.4	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
40.	*	3.2	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
50.	*	3.2	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
60.	*	3.2	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
70.	*	3.2	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
80.	*	3.2	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
90.	*	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
100.	*	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
110.	*	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
120.	*	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
130.	*	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
140.	*	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
150.	*	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
160.	*	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
170.	*	3.2	3.2	3.3	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
180.	*	3.2	3.2	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
190.	*	3.1	3.1	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0
200.	*	3.0	3.0	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0
210.	*	3.0	3.0	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0
220.	*	3.0	3.0	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0

230.	*	3.0	3.0	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.1	3.0	3.0	3.0	3.0
280.	*	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.0	3.0	3.0
290.	*	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.0	3.0	3.0	3.0
300.	*	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.0	3.0	3.0	3.0
310.	*	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0
320.	*	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0
330.	*	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0
340.	*	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0
350.	*	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0
MAX	*	3.4	3.7	3.7	3.1	3.1	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.4	3.1	3.1	3.0	3.0	3.0
DEGR.	*	10	30	210	240	260	0	0	0	130	0	0	0	0	0	310	270	280	0	0	0

PAGE 8

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC61	REC62	REC63	REC64	REC65	REC66	REC67	REC68	REC69	REC70	REC71	REC72	REC73	REC74	REC75	REC76	REC77	REC78	REC79	REC80
0.	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.4	3.4	3.3	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.2
10.	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.2	3.2	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.4
20.	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.4
30.	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2
40.	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2
50.	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2
60.	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2
70.	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2

80.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2
90.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2
100.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2
110.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.2
120.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.2	3.2
130.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.2	3.2	3.2
140.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.2	3.2	3.2
150.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.2	3.2
160.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.2	3.2	3.2
170.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.4	3.4	3.2	3.2
180.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.2	3.2	3.2	3.3	3.3	3.3	3.3	3.2	3.2	3.4	3.3	3.1	3.1
190.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.2	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.1	3.1
200.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.4	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
210.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
220.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
230.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2	3.3	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
280.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2	3.3	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
290.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2	3.4	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0

300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2	3.5	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2	3.5	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2	3.5	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.4	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.5	3.4	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.5	3.4	3.4	3.3	3.3	3.3	3.3	3.1	3.1	3.1	3.1
MAX	*	3.3	3.0	3.0	3.0	3.0	3.0	3.5	3.4	3.3	3.5	3.5	3.4	3.3	3.3	3.3	3.3	3.5	3.4	3.2	3.4
DEGR.	*	50	0	0	0	0	0	180	200	200	350	300	340	180	180	190	190	130	170	0	10

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC81	REC82	REC83	REC84	REC85	REC86
0.	3.3	3.2	3.1	3.1	3.2	3.2
10.	3.3	3.3	3.2	3.2	3.2	3.2
20.	3.2	3.3	3.2	3.2	3.2	3.2
30.	3.3	3.3	3.2	3.2	3.2	3.2
40.	3.4	3.2	3.2	3.2	3.2	3.2

50.	*	3.5	3.2	3.2	3.2	3.2	3.2
60.	*	3.5	3.2	3.2	3.2	3.2	3.2
70.	*	3.4	3.2	3.2	3.2	3.2	3.2
80.	*	3.3	3.2	3.2	3.2	3.2	3.2
90.	*	3.3	3.2	3.2	3.2	3.2	3.2
100.	*	3.2	3.2	3.2	3.2	3.2	3.2
110.	*	3.2	3.2	3.2	3.2	3.2	3.2
120.	*	3.2	3.2	3.2	3.2	3.2	3.2
130.	*	3.2	3.2	3.2	3.2	3.2	3.2
140.	*	3.2	3.2	3.2	3.2	3.2	3.2
150.	*	3.2	3.2	3.2	3.2	3.2	3.2
160.	*	3.2	3.2	3.2	3.2	3.2	3.2
170.	*	3.3	3.3	3.3	3.3	3.3	3.2
180.	*	3.2	3.2	3.2	3.2	3.2	3.2
190.	*	3.1	3.1	3.1	3.1	3.1	3.1
200.	*	3.0	3.0	3.0	3.0	3.0	3.0
210.	*	3.0	3.0	3.0	3.0	3.0	3.0
220.	*	3.0	3.0	3.0	3.0	3.0	3.0
230.	*	3.0	3.0	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.0	3.0	3.0	3.0

```
270.  *   3.0   3.0   3.0   3.0   3.0   3.0

280.  *   3.0   3.0   3.0   3.0   3.0   3.0

290.  *   3.0   3.0   3.0   3.0   3.0   3.0

300.  *   3.0   3.0   3.0   3.0   3.0   3.0

310.  *   3.0   3.0   3.0   3.0   3.0   3.0

320.  *   3.0   3.0   3.0   3.0   3.0   3.0

330.  *   3.0   3.0   3.0   3.0   3.0   3.0

340.  *   3.0   3.0   3.0   3.0   3.0   3.0

350.  *   3.0   3.0   3.1   3.1   3.1   3.1

------*-----------------------------------

MAX   *   3.5   3.3   3.3   3.3   3.3   3.2

DEGR. *   50    10   170   170   170     0


THE HIGHEST CONCENTRATION OF    4.20 PPM OCCURRED AT RECEPTOR REC25.
```



```
     JOB: SOUTHPARK BRIDGE PROJECT                          RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON


     DATE :  9/13/ 2

     TIME : 17:15:17
```

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	230	230	240	0	0	0	150	120	100	100	90	90	230	230	250	0	0	0	30	60
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0
4	.1	.1	.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.2	.1	.1	.0	.0	.0	.0	.0
5	.1	.1	.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.2	.1	.1	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1
9	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.1	.1
19	*	.0	.0	.0	.0	.0	.0	.3	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.1
20	*	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.0	.0	.0	.0	.0	.0	.1	.2	.2	.2	.2	.2	.0	.0	.0	.0	.0	.0	.1	.1

PAGE 11

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:15:17

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

LINK #	ANGLE (DEGREES)																			
	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	80	0	0	0	300	190	190	0	0	0	0	90	150	170	0	0	0	0	340	330
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.1	.0	.1	.0	.0	.0	.0	.2	.2
4	.0	.0	.0	.0	.3	.1	.1	.0	.0	.0	.0	.3	.0	.1	.0	.0	.0	.0	.1	.3
5	.0	.0	.0	.0	.4	.1	.1	.0	.0	.0	.0	.2	.1	.1	.0	.0	.0	.0	.1	.5
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.4	.1	.0	.0	.0	.0	.0	.0
9	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.1	.1
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

19	*	.1	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
20	*	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:15:17

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
	10	30	210	240	260	0	0	0	130	0	0	0	0	0	310	270	280	0	0	0
1	.0	.0	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
4	.1	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5	.1	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

8	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.5	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1	.1	.0	.0	.0
17	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:15:17

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC61	REC62	REC63	REC64	REC65	REC66	REC67	REC68	REC69	REC70	REC71	REC72	REC73	REC74	REC75	REC76	REC77	REC78	REC79	REC80
	50	0	0	0	0	0	180	200	200	350	300	340	180	180	190	190	130	170	0	10
1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.1	.2	.2	.2	.2	.2	.0	.1	.0	.0
2	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.3	.1	.0	.0	.0	.0	.0	.0	.0	.0
3	.1	.0	.0	.0	.0	.0	.1	.2	.2	.2	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

8	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1
10	*	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
17	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 NO BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:15:17

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM)					
		ANGLE (DEGREES)					
		REC81	REC82	REC83	REC84	REC85	REC86
LINK #		50	10	170	170	170	0
1		.1	.0	.1	.1	.1	.1
2		.2	.1	.0	.0	.0	.0
3		.0	.1	.0	.0	.0	.0
4		.0	.0	.0	.0	.0	.0
5		.0	.0	.0	.0	.0	.0
6		.0	.0	.0	.0	.0	.0
7		.0	.0	.0	.0	.0	.0

```
 8  *    .0    .0    .0    .0    .0    .0

 9  *    .0    .0    .0    .0    .0    .0

10  *    .0    .0    .0    .0    .0    .0

11  *    .1    .1    .2    .2    .2    .1

12  *    .0    .0    .0    .0    .0    .0

13  *    .0    .0    .0    .0    .0    .0

14  *    .0    .0    .0    .0    .0    .0

15  *    .0    .0    .0    .0    .0    .0

16  *    .1    .0    .0    .0    .0    .0

17  *    .0    .0    .0    .0    .0    .0

18  *    .0    .0    .0    .0    .0    .0

19  *    .0    .0    .0    .0    .0    .0

20  *    .0    .0    .0    .0    .0    .0

21  *    .0    .0    .0    .0    .0    .0

22  *    .0    .0    .0    .0    .0    .0

23  *    .0    .0    .0    .0    .0    .0

24  *    .0    .0    .0    .0    .0    .0
```

2027 REHAB, BASCULE, MID-LEVEL BRIDGES – 16TH AVENUE SOUTH / EAST MARGINAL WAY

```
                    CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1


 (C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.
```

JOB: SOUTHPARK PROJECT RUN: 2027 BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 2:37

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM

U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)			(G/MI)	(FT)	(FT)		(VEH)
1. 16TH NB	*	625.0	-750.0	.0	.0	*	976.	320.	AG	991.	5.6	.0	60.0		
2. 16TH QUE LT	*	66.7	-88.6	175.5	-219.1	*	170.	140.	AG	561.	100.0	.0	30.0	.87	8.6
3. 16TH QUE RT	*	82.6	-76.0	117.9	-118.3	*	55.	140.	AG	187.	100.0	.0	10.0	.35	2.8
4. 16TH SB	*	-18.0	-42.6	607.0	-792.6	*	976.	140.	AG	1325.	5.6	.0	40.0		
5. MARGINAL SE 1	*	-1000.0	-16.0	.0	-16.0	*	1000.	90.	AG	1980.	3.9	.0	52.0		

6. MAR SE QUE TH RT	*	-60.0	-10.0	-286.7	-10.0	*	227.	270.	AG	228.	100.0	.0	20.0	.89	11.5
7. MAR SE QUE E RT	*	-60.0	-26.0	-151.2	-26.0	*	91.	270.	AG	52.	100.0	.0	10.0	.67	4.6
8. MARGINAL SE 2	*	.0	-12.0	1000.0	-12.0	*	1000.	90.	AG	897.	3.9	.0	24.0		
9. MARGINAL NW 1	*	1000.0	22.0	.0	22.0	*	1000.	270.	AG	774.	3.9	.0	64.0		
10. MAR NW QUE LT	*	60.0	6.0	127.5	6.0	*	68.	90.	AG	197.	100.0	.0	12.0	.51	3.4
11. MAR NW QUE TH	*	60.0	28.0	95.1	28.0	*	35.	90.	AG	187.	100.0	.0	32.0	.21	1.8
12. MAR NW 2	*	.0	16.0	-1000.0	16.0	*	1000.	270.	AG	1523.	3.9	.0	52.0		

PAGE 2

JOB: SOUTHPARK PROJECT RUN: 2027 BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 2:37

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 16TH QUE LT	*	120	90	2.0	879	1562	92.90	1	3
3. 16TH QUE RT	*	120	90	2.0	112	1487	92.90	1	3

6. MAR SE QUE TH RT	*	120	55	2.0	1313	1455	92.90	1	3
7. MAR SE QUE E RT	*	120	25	2.0	667	1315	92.90	1	3
10. MAR NW QUE LT	*	120	95	2.0	130	1466	92.90	1	3
11. MAR NW QUE TH	*	120	30	2.0	644	1405	92.90	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. RECEPTOR 1	75.7	-43.5	.0
2. RECEPTOR 2	123.6	-101.1	.0
3. RECEPTOR 3	171.6	-158.8	.0
4. RECEPTOR 4	219.6	-216.4	.0
5. RECEPTOR 5	267.6	-274.1	.0
6. RECEPTOR 6	315.6	-331.7	.0
7. RECEPTOR 7	363.5	-389.3	.0
8. RECEPTOR 10	-7.5	-87.5	.0
9. RECEPTOR 11	40.4	-145.1	.0
10. RECEPTOR 12	88.4	-202.8	.0
11. RECEPTOR 13	136.4	-260.4	.0
12. RECEPTOR 14	184.3	-318.1	.0

13. RECEPTOR 15	*	232.3	-375.7	.0	*
14. RECEPTOR 16	*	280.3	-433.4	.0	*
15. RECEPTOR 20	*	-424.8	41.6	.0	*
16. RECEPTOR 21	*	-349.8	41.6	.0	*
17. RECEPTOR 22	*	-274.8	41.6	.0	*
18. RECEPTOR 23	*	-199.8	41.6	.0	*
19. RECEPTOR 24	*	-124.8	41.6	.0	*
20. RECEPTOR 25	*	-49.8	41.6	.0	*
21. RECEPTOR 26	*	.8	54.4	.0	*
22. RECEPTOR 27	*	75.8	54.4	.0	*
23. RECEPTOR 28	*	150.8	54.4	.0	*
24. RECEPTOR 29	*	225.8	54.4	.0	*
25. RECEPTOR 30	*	300.8	54.4	.0	*
26. RECEPTOR 31	*	375.8	54.4	.0	*
27. RECEPTOR 32	*	450.8	54.4	.0	*
28. RECEPTOR 34	*	-424.8	-41.5	.0	*
29. RECEPTOR 35	*	-349.8	-41.5	.0	*
30. RECEPTOR 36	*	-274.8	-41.5	.0	*
31. RECEPTOR 37	*	-199.8	-41.5	.0	*
32. RECEPTOR 38	*	-124.8	-41.5	.0	*
33. RECEPTOR 39	*	-49.8	-41.5	.0	*
34. RECEPTOR 40	*	.1	-24.2	.0	*

```
35. RECEPTOR 41          *        75.1      -24.2         .0   *

36. RECEPTOR 42          *       150.1      -24.2         .0   *

37. RECEPTOR 43          *       225.1      -24.2         .0   *

38. RECEPTOR 44          *       300.1      -24.2         .0   *

39. RECEPTOR 45          *       375.1      -24.2         .0   *
```

PAGE 3

JOB: SOUTHPARK PROJECT RUN: 2027 BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 2:37

RECEPTOR LOCATIONS

```
                         *           COORDINATES (FT)          *

   RECEPTOR              *      X          Y          Z        *

-------------------------*-----------------------------------*

40. RECEPTOR 46          *       450.1      -24.2         .0   *
```

PAGE 4

JOB: SOUTHPARK PROJECT RUN: 2027 BRIDGE MARGINAL WAY

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	3.6	3.1	3.0	3.0	3.0	3.0	3.0	3.6	3.5	4.6	4.5	3.8	3.5	3.4	3.1	3.1	3.1	3.1	3.1	3.1
10.	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.8	4.7	4.5	3.6	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0
20.	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.9	4.5	4.4	3.5	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0
30.	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.6	4.3	4.5	4.2	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0
40.	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.4	4.5	4.0	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0
50.	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.7	4.6	4.4	3.7	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0
60.	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.7	4.6	4.4	3.5	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0

70.	*	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.7	4.5	4.4	3.4	3.4	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.0
80.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.9	4.6	4.4	3.4	3.4	3.4	3.4	3.2	3.1	3.1	3.1	3.1	3.2
90.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.5	4.3	3.4	3.4	3.4	3.4	3.5	3.5	3.5	3.3	3.3	3.5
100.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	4.5	4.0	3.4	3.4	3.4	3.4	3.9	3.9	3.7	3.7	3.6	3.6
110.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.7	4.6	4.0	3.6	3.6	3.6	3.5	3.8	4.2	4.3	4.1	3.6	3.7
120.	*	3.1	3.1	3.1	3.1	3.1	3.1	3.1	4.6	4.4	3.8	3.7	3.7	3.6	3.5	3.8	4.1	4.3	4.4	4.0	3.8
130.	*	3.4	3.2	3.1	3.1	3.1	3.1	3.1	4.2	3.9	3.6	3.6	3.6	3.6	3.6	3.5	3.8	4.1	4.3	4.3	4.1
140.	*	4.2	3.7	3.4	3.4	3.4	3.3	3.3	3.7	3.6	3.5	3.5	3.5	3.5	3.5	3.4	3.5	3.8	4.0	4.2	4.2
150.	*	4.9	4.1	3.5	3.4	3.4	3.4	3.4	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.4	3.4	3.8	3.8	4.0	3.9
160.	*	5.3	4.7	3.8	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.4	3.4	3.8	3.8	3.9	3.7
170.	*	5.1	5.0	4.2	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.8	3.8	3.9	3.5
180.	*	4.5	5.0	4.4	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.7	3.8	3.9	3.5
190.	*	4.1	5.0	4.6	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.6	3.8	3.8	3.6
200.	*	3.7	5.1	4.7	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.5	3.8	3.8	3.7
210.	*	3.5	5.1	4.7	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.5	3.8	3.8	3.9
220.	*	3.4	5.1	4.7	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.8	3.8	3.9
230.	*	3.3	5.2	4.7	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.8	3.9	3.9
240.	*	3.3	5.2	4.7	3.4	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.7	3.9	4.0
250.	*	3.3	5.2	4.7	3.6	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.7	3.9	4.0
260.	*	3.5	5.2	4.8	3.8	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	3.8	3.9
270.	*	3.8	5.3	4.8	4.1	3.3	3.3	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.5	3.5
280.	*	4.0	5.1	5.2	4.6	3.4	3.3	3.3	3.4	3.2	3.1	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2	3.2	3.2

290.	*	3.8	4.8	5.3	5.2	4.0	3.7	3.5	3.6	3.3	3.3	3.1	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1
300.	*	3.6	4.4	5.0	5.2	4.3	4.0	3.7	3.6	3.5	3.4	3.4	3.3	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0
310.	*	3.4	3.6	4.4	4.8	4.3	4.0	3.7	3.7	3.5	3.5	3.4	3.5	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0
320.	*	3.3	3.3	3.6	3.9	3.7	3.7	3.7	3.6	3.6	3.5	3.6	3.8	3.9	3.7	3.0	3.0	3.0	3.0	3.0	3.0
330.	*	3.4	3.3	3.4	3.3	3.3	3.3	3.2	3.6	3.6	3.6	3.9	4.2	4.1	3.9	3.0	3.0	3.0	3.0	3.0	3.0
340.	*	3.4	3.2	3.1	3.0	3.1	3.1	3.1	3.5	3.6	3.9	4.4	4.4	4.1	4.0	3.0	3.0	3.0	3.0	3.0	3.0
350.	*	3.6	3.2	3.0	3.0	3.0	3.0	3.0	3.5	3.5	4.3	4.7	4.2	3.7	3.7	3.0	3.0	3.0	3.0	3.0	3.0
MAX	*	5.3	5.3	5.3	5.2	4.3	4.0	3.7	4.7	4.6	4.7	4.7	4.4	4.1	4.0	3.9	4.2	4.3	4.4	4.3	4.2
DEGR.	*	160	270	290	290	300	300	300	110	50	10	350	340	330	340	100	110	110	120	130	140

PAGE 5

JOB: SOUTHPARK PROJECT RUN: 2027 BRIDGE MARGINAL WAY

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.9	3.9	4.0	3.5	3.5	4.0	3.3	3.3	3.3	3.3	3.3
10.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.9	3.9	4.0	3.4	3.5	4.0	3.3	3.3	3.3	3.3	3.3
20.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.9	3.9	4.0	3.4	3.5	3.8	3.2	3.2	3.2	3.2	3.2
30.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.9	3.9	4.0	3.4	3.5	3.8	3.3	3.3	3.3	3.3	3.3
40.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	4.0	4.0	4.1	3.4	3.7	3.8	3.3	3.3	3.3	3.3	3.3
50.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.6	4.1	4.0	4.1	3.7	3.8	3.6	3.3	3.3	3.3	3.3	3.3
60.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.9	4.2	4.1	4.1	3.8	3.9	3.5	3.3	3.3	3.3	3.3	3.3
70.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.0	4.1	4.1	4.1	3.7	3.9	3.5	3.4	3.4	3.4	3.4	3.4
80.	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.9	4.0	4.0	4.1	3.9	3.7	3.9	3.4	3.4	3.4	3.4	3.4	3.4
90.	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.8	3.9	3.7	3.8	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
100.	3.6	3.3	3.3	3.3	3.3	3.3	3.3	3.4	3.5	3.6	3.6	3.6	3.7	3.4	3.1	3.1	3.1	3.1	3.1	3.1
110.	3.7	3.4	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.5	3.6	3.7	4.0	3.9	3.1	3.1	3.1	3.1	3.1	3.1
120.	3.5	3.4	3.2	3.2	3.2	3.2	3.2	3.0	3.2	3.3	3.4	3.7	4.3	4.1	3.0	3.0	3.0	3.0	3.0	3.0
130.	3.6	3.5	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.1	3.2	3.4	4.1	4.6	3.2	3.0	3.0	3.0	3.0	3.0
140.	4.1	3.8	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.1	3.7	4.8	3.7	3.0	3.0	3.0	3.0	3.0
150.	4.1	4.3	3.3	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.3	4.4	4.3	3.2	3.0	3.0	3.0	3.0

160.	*	3.9	4.8	3.5	3.3	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.9	4.7	3.3	3.2	3.0	3.0	3.0
170.	*	3.5	5.0	3.6	3.4	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.5	4.6	3.6	3.2	3.2	3.0	3.0
180.	*	3.5	4.9	3.8	3.5	3.3	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.5	4.3	3.8	3.3	3.2	3.1	3.0
190.	*	3.4	4.3	4.0	3.6	3.3	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.8	3.9	3.4	3.2	3.1	3.0
200.	*	3.2	4.0	4.0	3.7	3.3	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.6	4.0	3.6	3.3	3.0	3.0
210.	*	3.5	3.8	4.0	3.8	3.4	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	4.0	3.7	3.4	3.0	3.0
220.	*	3.6	3.5	3.7	3.8	3.5	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.9	3.7	3.5	3.1	3.0
230.	*	3.7	3.6	3.7	3.6	3.5	3.5	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.7	3.8	3.6	3.2	3.1
240.	*	3.7	3.5	3.8	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.5	3.7	3.6	3.3	3.2
250.	*	3.8	3.6	3.7	3.5	3.6	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.3	3.4	3.6	3.4	3.4	3.3
260.	*	3.7	3.7	3.8	3.6	3.5	3.5	3.5	3.2	3.2	3.2	3.2	3.3	3.3	4.1	3.9	3.6	3.5	3.4	3.4	3.3
270.	*	3.4	3.4	3.5	3.5	3.4	3.4	3.4	3.5	3.5	3.5	3.6	3.7	3.9	4.6	4.0	3.9	3.6	3.6	3.7	3.7
280.	*	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.6	3.7	3.9	4.1	4.3	4.6	3.9	3.8	3.9	3.8	3.7	3.4
290.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	4.1	4.4	4.5	4.2	3.6	4.0	3.5	3.3	3.3	3.3
300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	4.1	4.3	4.4	3.9	3.5	3.7	3.5	3.3	3.3	3.3
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	4.1	4.2	4.2	3.6	3.4	3.7	3.3	3.3	3.3	3.3
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.5	4.0	4.1	4.0	3.5	3.4	3.6	3.3	3.3	3.3	3.3
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.6	3.9	4.0	3.9	3.6	3.6	3.4	3.3	3.3	3.3	3.3
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.7	3.9	4.0	3.7	3.5	3.7	3.3	3.2	3.2	3.2	3.2
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.8	3.9	4.0	3.6	3.5	3.8	3.3	3.3	3.3	3.3	3.3
------	*	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------
MAX	*	4.1	5.0	4.0	3.8	3.6	3.5	3.5	3.9	4.0	4.2	4.1	4.4	4.5	4.8	4.7	4.0	3.9	3.8	3.7	3.7

```
DEGR. *  140   170   190   210   250   230   260    80    70    60    60   290   290   140   160   200   280   280   270   270


THE HIGHEST CONCENTRATION OF    5.30 PPM OCCURRED AT RECEPTOR REC1 .
```

JOB: SOUTHPARK PROJECT RUN: 2027 BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 2:37

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	160	270	290	290	300	300	300	110	50	10	350	340	330	340	100	110	110	120	130	140
1	.3	.2	.3	.3	.3	.3	.3	.2	.1	.1	.1	.1	.1	.2	.0	.0	.1	.1	.1	.2
2	1.5	1.3	1.5	1.5	.7	.3	.2	1.0	1.0	1.1	1.1	.8	.5	.3	.1	.2	.2	.3	.3	.5
3	.3	.5	.1	.0	.0	.0	.0	.1	.2	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
4	.2	.1	.1	.1	.1	.2	.2	.4	.3	.3	.4	.5	.5	.5	.0	.1	.1	.1	.2	.2
5	.0	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.2	.2	.2	.2	.2	.1
6	.0	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.2	.4	.4	.4	.2	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

8	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4	.3	.3	.3	.3	.2

JOB: SOUTHPARK PROJECT RUN: 2027 BRIDGE MARGINAL WAY

DATE : 9/13/ 2

TIME : 17: 2:37

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	140	170	190	210	250	230	260	80	70	60	60	290	290	140	160	200	280	280	270	270
1	.2	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4	.2	.1	.0	.0	.0	.0
2	.4	.6	.5	.4	.1	.3	.1	.0	.0	.0	.0	.0	.0	.9	1.1	.7	.0	.0	.1	.1
3	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.2	.1	.0	.0	.0	.0
4	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.1	.0	.0	.0	.0

5	*	.0	.0	.0	.0	.1	.0	.1	.5	.4	.4	.4	.5	.5	.1	.0	.0	.1	.1	.1	.1
6	*	.0	.0	.0	.0	.1	.0	.1	.3	.4	.6	.6	.6	.6	.0	.0	.0	.1	.1	.1	.1
7	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.2	.0	.0	.0	.0	.0	.0	.0
8	*	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.3	.2	.2
9	*	.1	.1	.1	.1	.1	.1	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1
10	*	.1	.3	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0
11	*	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.1	.2	.2	.1	.2	.2	.0	.0	.0	.1	.1	.1	.1

2027 REHAB, BASCULE, MID-LEVEL BRIDGES – 14TH AVENUE SOUTH / SOUTH CLOVERDALE AND SOUTH TRENTON STREETS

```
                CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1


(C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.

     JOB: SOUTHPARK BRIDGE PROJECT                            RUN: 2027 BRIDGE CLOVERDALE & TRENTON


     DATE :  9/13/ 2

     TIME : 17:20:53


        The MODE flag has been set to C for calculating CO averages.


      SITE & METEOROLOGICAL VARIABLES
```

```
-------------------------------

VS =    .0 CM/S       VD =    .0 CM/S       Z0 = 108. CM

 U =  1.0 M/S         CLAS =   4  (D)     ATIM =  60. MINUTES     MIXH =  1000. M   AMB =  3.0 PPM


LINK VARIABLES

--------------

  LINK DESCRIPTION     *         LINK COORDINATES (FT)          *    LENGTH  BRG TYPE   VPH    EF      H   W    V/C QUEUE

                       *   X1        Y1        X2        Y2     *     (FT)  (DEG)           (G/MI)  (FT) (FT)       (VEH)

------------------------*----------------------------------------*-------------------------------------------------------

 1. 14TH NB 1          *     10.0   -1000.0      10.0        .0 *    1000.   360. AG    954.   5.6    .0 40.0

 2. 14TH NB QUE ALL    *     10.0     -30.0      10.0     -95.2 *      65.   180. AG    125. 100.0    .0 20.0  .41   3.3

 3. 14TH NB 2          *     10.0        .0      10.0     600.0 *     600.   360. AG    900.   5.6    .0 40.0

 4. 14TH NB QUE ALL    *     10.0     560.0      10.0     439.2 *     121.   180. AG    259. 100.0    .0 20.0  .59   6.1

 5. 14TH NB 3          *     10.0     600.0      10.0    1600.0 *    1000.   360. AG    930.   5.6    .0 40.0

 6. 14TH SB 1          *    -10.0    1600.0     -10.0     600.0 *    1000.   180. AG   1176.   5.6    .0 40.0

 7. 14TH SB QUE ALL    *    -10.0     630.0     -10.0     816.6 *     187.   360. AG    259. 100.0    .0 20.0  .85   9.5

 8. 14TH SB 2          *    -10.0     600.0     -10.0        .0 *     600.   180. AG    900.   5.6    .0 40.0

 9. 14TH SB QUE ALL    *    -10.0      30.0     -10.0      88.8 *      59.   360. AG    125. 100.0    .0 20.0  .36   3.0

10. 14TH SB 3          *    -10.0        .0     -10.0   -1000.0 *    1000.   180. AG    882.   5.6    .0 40.0

11. TRENTON EB 1       *  -1000.0      -6.0        .0      -6.0 *    1000.    90. AG     21.   6.9    .0 32.0

12. TRENTON EB QUE ALL *    -40.0      -6.0     -48.6      -6.0 *       9.   270. AG    187. 100.0    .0 12.0  .06    .4

13. TRENTON EB 2       *       .0      -6.0    1000.0      -6.0 *    1000.    90. AG     51.   6.9    .0 32.0
```

14.	TRENTON WB 1	*	1000.0	6.0	.0	6.0	*	1000.	270.	AG	116.	6.9	.0	32.0		
15.	TRENTON WB QUE ALL	*	40.0	6.0	87.2	6.0	*	47.	90.	AG	187.	100.0	.0	12.0	.33	2.4
16.	TRENTON WB 2	*	.0	6.0	-1000.0	6.0	*	1000.	270.	AG	58.	6.9	.0	32.0		
17.	CLOVERDALE EB 1	*	-1000.0	590.0	.0	590.0	*	1000.	90.	AG	549.	5.6	.0	40.0		
18.	CLOVERDALE EB QUE LT	*	-40.0	595.0	-125.9	595.0	*	86.	270.	AG	169.	100.0	.0	10.0	.52	4.4
19.	CLOVERDALE EB QUE AL	*	-40.0	585.0	-166.8	585.0	*	127.	270.	AG	169.	100.0	.0	10.0	.78	6.4
20.	CLOVERDALE EB 2	*	.0	595.0	1000.0	595.0	*	1000.	90.	AG	19.	5.6	.0	30.0		
21.	CLOVERDALE WB 1	*	1000.0	605.0	.0	605.0	*	1000.	270.	AG	21.	5.6	.0	30.0		
22.	CLOVERDALE WB QUE AL	*	40.0	605.0	48.7	605.0	*	9.	90.	AG	199.	100.0	.0	10.0	.08	.4
23.	CLOVERDALE WB 2	*	.0	605.0	-1000.0	605.0	*	1000.	270.	AG	662.	5.6	.0	30.0		

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:20:53

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 14TH NB QUE ALL	*	100	25	2.0	954	1641	92.90	1	3
4. 14TH NB QUE ALL	*	100	52	2.0	850	1625	92.90	1	3
7. 14TH SB QUE ALL	*	100	52	2.0	1176	1564	92.90	1	3
9. 14TH SB QUE ALL	*	100	25	2.0	861	1689	92.90	1	3
12. TRENTON EB QUE ALL	*	100	75	2.0	21	1658	92.90	1	3
15. TRENTON WB QUE ALL	*	100	75	2.0	115	1641	92.90	1	3
18. CLOVERDALE EB QUE LT	*	100	68	2.0	231	1594	92.90	1	3
19. CLOVERDALE EB QUE AL	*	100	68	2.0	318	1456	92.90	1	3
22. CLOVERDALE WB QUE AL	*	100	80	2.0	20	1524	92.90	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC1	75.0	620.0	6.0
2. REC2	150.0	620.0	6.0
3. REC3	225.0	620.0	6.0
4. REC4	300.0	620.0	6.0
5. REC5	375.0	620.0	6.0
6. REC6	450.0	620.0	6.0
7. REC7	-75.0	620.0	6.0
8. REC8	-150.0	620.0	6.0
9. REC9	-225.0	620.0	6.0
10. REC10	-300.0	620.0	6.0
11. REC11	-375.0	620.0	6.0
12. REC12	-450.0	620.0	6.0
13. REC13	75.0	580.0	6.0
14. REC14	150.0	580.0	6.0
15. REC15	225.0	580.0	6.0
16. REC16	300.0	580.0	6.0
17. REC17	375.0	580.0	6.0

18. REC18	*	450.0	580.0	6.0	*
19. REC19	*	-75.0	570.0	6.0	*
20. REC20	*	-150.0	570.0	6.0	*
21. REC21	*	-225.0	570.0	6.0	*
22. REC22	*	-300.0	570.0	6.0	*
23. REC23	*	-375.0	570.0	6.0	*
24. REC24	*	-450.0	570.0	6.0	*
25. REC25	*	30.0	525.0	6.0	*
26. REC26	*	30.0	675.0	6.0	*
27. REC27	*	30.0	750.0	6.0	*
28. REC28	*	30.0	825.0	6.0	*
29. REC29	*	30.0	900.0	6.0	*
30. REC30	*	30.0	975.0	6.0	*
31. REC31	*	30.0	1050.0	6.0	*
32. REC32	*	-30.0	525.0	6.0	*
33. REC33	*	-30.0	675.0	6.0	*
34. REC34	*	-30.0	750.0	6.0	*
35. REC35	*	-30.0	825.0	6.0	*
36. REC36	*	-30.0	900.0	6.0	*

PAGE 3

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:20:53

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
37. REC37	-30.0	975.0	6.0
38. REC38	-30.0	1050.0	6.0
39. REC39	30.0	375.0	6.0
40. REC40	30.0	450.0	6.0
41. REC41	-30.0	375.0	6.0
42. REC42	-30.0	450.0	6.0
43. REC43	75.0	22.0	6.0
44. REC44	150.0	22.0	6.0
45. REC45	225.0	22.0	6.0
46. REC46	300.0	22.0	6.0
47. REC47	375.0	22.0	6.0
48. REC48	450.0	22.0	6.0

```
49. REC49                 *       -75.0       22.0        6.0   *

50. REC50                 *      -150.0       22.0        6.0   *

51. REC51                 *      -225.0       22.0        6.0   *

52. REC52                 *      -300.0       22.0        6.0   *

53. REC53                 *      -375.0       22.0        6.0   *

54. REC54                 *      -450.0       22.0        6.0   *

55. REC55                 *        75.0      -22.0        6.0   *

56. REC56                 *       150.0      -22.0        6.0   *

57. REC57                 *       225.0      -22.0        6.0   *

58. REC58                 *       300.0      -22.0        6.0   *

59. REC59                 *       375.0      -22.0        6.0   *

60. REC60                 *       450.0      -22.0        6.0   *

61. REC61                 *       -75.0      -22.0        6.0   *

62. REC62                 *      -150.0      -22.0        6.0   *

63. REC63                 *      -225.0      -22.0        6.0   *

64. REC64                 *      -300.0      -22.0        6.0   *

65. REC65                 *      -375.0      -22.0        6.0   *

66. REC66                 *      -450.0      -22.0        6.0   *

67. REC67                 *        30.0       75.0        6.0   *

68. REC68                 *        30.0      150.0        6.0   *

69. REC69                 *        30.0      225.0        6.0   *

70. REC70                 *        30.0      300.0        6.0   *
```

71. REC71	*	30.0	-75.0	6.0	*
72. REC72	*	30.0	-150.0	6.0	*
73. REC73	*	30.0	-225.0	6.0	*
74. REC74	*	30.0	-300.0	6.0	*
75. REC75	*	30.0	-375.0	6.0	*
76. REC76	*	30.0	-450.0	6.0	*
77. REC77	*	-30.0	75.0	6.0	*
78. REC78	*	-30.0	150.0	6.0	*
79. REC79	*	-30.0	225.0	6.0	*
80. REC80	*	-30.0	300.0	6.0	*
81. REC81	*	-30.0	-75.0	6.0	*
82. REC82	*	-30.0	-150.0	6.0	*
83. REC83	*	-30.0	-225.0	6.0	*
84. REC84	*	-30.0	-300.0	6.0	*
85. REC85	*	-30.0	-375.0	6.0	*
86. REC86	*	-30.0	-450.0	6.0	*

PAGE 4

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	4.2	3.6
10.	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.4	3.7
20.	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	3.9
30.	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	4.0
40.	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	4.2
50.	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.2	4.3
60.	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.4	3.3	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.1	4.4
70.	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.3	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.1
80.	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.4	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.8
90.	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.5	3.6	3.6	3.5	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.6

100.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.6	3.7	3.6	3.5	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4
110.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.9	3.7	3.5	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3
120.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.9	4.3	3.6	3.4	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.4
130.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.2	3.5	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3
140.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.2	3.9	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.2
150.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.1	3.8	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2
160.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.1	3.6	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.1
170.	*	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.5	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0
180.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.9	3.5	3.2	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
190.	*	3.3	3.0	3.0	3.0	3.0	3.0	3.8	3.4	3.2	3.2	3.2	3.2	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0
200.	*	3.4	3.1	3.0	3.0	3.0	3.0	3.8	3.4	3.2	3.2	3.2	3.2	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.0
210.	*	3.5	3.3	3.0	3.0	3.0	3.0	3.8	3.3	3.2	3.2	3.2	3.2	3.5	3.2	3.0	3.0	3.0	3.0	3.0	3.0
220.	*	3.5	3.3	3.0	3.0	3.0	3.0	3.8	3.3	3.2	3.2	3.2	3.2	3.6	3.3	3.0	3.0	3.0	3.0	3.0	3.0
230.	*	3.5	3.4	3.1	3.0	3.0	3.0	3.9	3.3	3.3	3.3	3.3	3.3	3.6	3.4	3.1	3.0	3.0	3.0	3.0	3.0
240.	*	3.5	3.4	3.1	3.1	3.0	3.0	3.9	3.3	3.3	3.3	3.3	3.3	3.5	3.4	3.1	3.1	3.0	3.0	3.0	3.0
250.	*	3.6	3.2	3.1	3.1	3.1	3.0	3.7	3.3	3.3	3.3	3.3	3.3	3.4	3.3	3.1	3.1	3.1	3.0	3.0	3.0
260.	*	3.7	3.4	3.2	3.1	3.1	3.0	3.6	3.4	3.4	3.4	3.4	3.3	3.6	3.3	3.1	3.1	3.1	3.1	3.2	3.1
270.	*	3.7	3.5	3.2	3.1	3.1	3.0	3.3	3.3	3.3	3.3	3.3	3.3	3.6	3.5	3.3	3.1	3.0	3.0	3.5	3.3
280.	*	3.5	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.5	3.1	3.1	3.1	3.1	3.8	3.3
290.	*	3.4	3.4	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.0	3.6	3.2	3.1	3.1	3.1	3.1	4.0	3.4
300.	*	3.5	3.4	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.4	3.2	3.1	3.1	3.0	4.0	3.3
310.	*	3.5	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.4	3.2	3.1	3.0	3.0	4.0	3.4

320.	*	3.5	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.4	3.2	3.0	3.0	3.0	4.0	3.5
330.	*	3.5	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.2	3.0	3.0	3.0	3.9	3.6
340.	*	3.4	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.1	3.0	3.0	3.0	3.9	3.6
350.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.9	3.6
MAX	*	3.7	3.5	3.2	3.1	3.1	3.1	4.2	4.3	3.7	3.6	3.5	3.3	3.6	3.5	3.3	3.1	3.1	3.1	4.5	4.4
DEGR.	*	260	270	260	240	250	280	140	120	100	90	90	90	220	270	270	240	250	260	20	60

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	3.2	3.2	3.2	3.2	3.7	3.6	3.4	3.4	3.4	3.4	3.4	4.0	3.9	3.7	3.5	3.5	3.4	3.4	3.9	4.0
10.	3.2	3.2	3.2	3.2	3.4	3.3	3.3	3.3	3.3	3.1	3.1	3.9	4.3	4.0	3.6	3.6	3.6	3.6	3.3	3.5
20.	3.3	3.2	3.2	3.2	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.7	4.5	4.3	3.6	3.6	3.6	3.6	3.1	3.0
30.	3.3	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.4	4.3	3.5	3.5	3.5	3.5	3.0	3.0
40.	3.4	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	4.4	4.3	3.5	3.5	3.5	3.5	3.0	3.0

50.	*	3.4	3.3	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	4.1	4.1	3.3	3.3	3.3	3.3	3.0	3.0
60.	*	3.6	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.1	4.1	3.3	3.3	3.3	3.3	3.0	3.0
70.	*	3.7	3.5	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.0	4.0	3.3	3.3	3.3	3.3	3.0	3.0
80.	*	3.8	3.6	3.5	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.0	4.0	3.3	3.3	3.3	3.3	3.0	3.0
90.	*	3.5	3.5	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.0	4.0	3.4	3.3	3.3	3.3	3.0	3.0
100.	*	3.3	3.3	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.0	4.0	3.5	3.3	3.3	3.3	3.0	3.0
110.	*	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.0	4.0	3.7	3.3	3.3	3.3	3.0	3.0
120.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.1	4.1	3.8	3.3	3.3	3.3	3.0	3.0
130.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.1	4.1	3.9	3.3	3.3	3.3	3.0	3.0
140.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.2	4.3	4.3	3.5	3.5	3.5	3.0	3.0
150.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.3	4.3	4.4	3.6	3.5	3.5	3.0	3.0
160.	*	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.1	3.1	3.1	3.1	3.8	4.3	4.5	4.5	3.9	3.7	3.7	3.1	3.1
170.	*	3.0	3.0	3.0	3.0	3.2	3.3	3.3	3.2	3.2	3.2	3.2	3.6	3.9	4.4	4.6	4.0	3.7	3.7	3.1	3.1
180.	*	3.0	3.0	3.0	3.0	3.7	3.5	3.6	3.8	3.7	3.6	3.5	3.4	3.9	3.9	4.2	4.0	3.6	3.5	3.4	3.3
190.	*	3.0	3.0	3.0	3.0	4.0	3.6	3.8	4.1	4.0	3.7	3.6	3.1	3.5	3.5	3.5	3.4	3.3	3.3	3.4	3.4
200.	*	3.0	3.0	3.0	3.0	4.3	3.8	4.1	4.1	3.9	3.7	3.6	3.1	3.3	3.3	3.3	3.1	3.1	3.1	3.5	3.5
210.	*	3.0	3.0	3.0	3.0	4.3	3.6	4.1	4.1	3.6	3.5	3.4	3.0	3.5	3.2	3.0	3.0	3.0	3.0	3.4	3.5
220.	*	3.0	3.0	3.0	3.0	4.2	4.0	4.1	4.0	3.5	3.4	3.4	3.0	3.4	3.1	3.0	3.0	3.0	3.0	3.3	3.4
230.	*	3.0	3.0	3.0	3.0	4.1	4.2	4.0	3.9	3.4	3.4	3.4	3.0	3.4	3.0	3.0	3.0	3.0	3.0	3.3	3.5
240.	*	3.0	3.0	3.0	3.0	4.1	4.3	3.9	3.8	3.4	3.4	3.4	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.3	3.7
250.	*	3.0	3.0	3.0	3.0	4.0	4.3	3.9	3.7	3.4	3.4	3.4	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.3	3.8
260.	*	3.1	3.1	3.1	3.1	4.0	4.1	3.9	3.6	3.4	3.4	3.4	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.3	3.9

270.	*	3.3	3.3	3.3	3.3	4.0	3.9	3.9	3.5	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	4.0
280.	*	3.3	3.3	3.3	3.3	4.3	3.9	3.9	3.4	3.4	3.4	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	4.0
290.	*	3.3	3.3	3.3	3.3	4.5	3.9	3.9	3.4	3.4	3.4	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	4.0
300.	*	3.2	3.2	3.2	3.2	4.5	3.9	3.9	3.4	3.4	3.4	3.4	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.3	4.2
310.	*	3.2	3.2	3.2	3.2	4.4	3.9	3.9	3.4	3.4	3.4	3.4	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.3	4.3
320.	*	3.2	3.2	3.2	3.2	4.4	4.0	3.8	3.4	3.4	3.4	3.4	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.5	4.4
330.	*	3.2	3.2	3.2	3.2	4.1	3.9	3.7	3.4	3.4	3.4	3.4	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.4
340.	*	3.2	3.2	3.2	3.2	4.2	3.9	3.7	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1	3.1	3.1	3.8	4.4
350.	*	3.2	3.2	3.2	3.2	4.1	3.8	3.6	3.5	3.5	3.5	3.5	3.8	3.4	3.3	3.2	3.2	3.2	3.2	4.1	4.3
MAX	*	3.8	3.6	3.5	3.4	4.5	4.3	4.1	4.1	4.0	3.7	3.6	4.0	4.5	4.5	4.6	4.0	3.7	3.7	4.1	4.4
DEGR.	*	80	80	80	70	290	240	200	190	190	190	190	0	20	160	170	170	160	160	350	320

PAGE 6

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum

concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
0.	3.7	3.7	3.1	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0
10.	4.0	3.9	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0
20.	3.9	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0
30.	3.7	3.8	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0
40.	3.5	3.8	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0
50.	3.4	3.8	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
60.	3.3	3.8	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
70.	3.3	3.8	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
80.	3.3	3.8	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
90.	3.3	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
100.	3.3	3.6	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
110.	3.3	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
120.	3.3	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
130.	3.3	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

140.	*	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
150.	*	3.4	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
160.	*	3.5	3.5	3.4	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
170.	*	3.4	3.4	3.5	3.0	3.0	3.0	3.0	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
180.	*	3.5	3.3	3.6	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0
190.	*	3.1	3.1	3.7	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.1	3.0	3.0	3.0	3.0
200.	*	3.1	3.1	3.8	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.0	3.0	3.0
210.	*	3.0	3.0	3.8	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2	3.1	3.0	3.0	3.0
220.	*	3.0	3.0	3.8	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0
230.	*	3.0	3.0	3.8	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.7	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.2	3.2	3.1	3.0	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.4	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.1	3.0	3.0	3.0	3.0
280.	*	3.0	3.0	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.0	3.0	3.0
290.	*	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.0	3.0	3.0	3.0
300.	*	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.0	3.0	3.0	3.0
310.	*	3.0	3.0	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.0	3.0	3.0	3.0
320.	*	3.0	3.1	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.2	3.0	3.0	3.0	3.0
330.	*	3.1	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.2	3.0	3.0	3.0	3.0
340.	*	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.1	3.0	3.0	3.0	3.0
350.	*	3.5	3.5	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.0	3.0	3.0	3.0	3.0

MAX	4.0	4.0	3.8	3.3	3.1	3.1	3.1	3.1	3.4	3.3	3.0	3.0	3.0	3.0	3.6	3.3	3.1	3.0	3.0	3.0
DEGR.	10	20	200	230	100	100	100	100	90	120	0	0	0	0	320	310	210	0	0	0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC61	REC62	REC63	REC64	REC65	REC66	REC67	REC68	REC69	REC70	REC71	REC72	REC73	REC74	REC75	REC76	REC77	REC78	REC79	REC80
0.	3.1	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.7	3.8	3.4	3.5	3.6	3.4	3.4	3.4	3.6	3.6	3.7	3.7

10.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.2	3.2	3.3	3.3	3.1	3.1	3.1	3.1	3.6	3.5	3.7	3.9
20.	*	3.3	3.1	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.5	3.6	3.7
30.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.5	3.4	3.4	3.5
40.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.3	3.3
50.	*	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.3	3.3
60.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.3	3.3
70.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.3	3.3
80.	*	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.3	3.3
90.	*	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.3	3.3
100.	*	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.3	3.3
110.	*	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3	3.3	3.3
120.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3	3.3	3.3
130.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3	3.3	3.3
140.	*	3.2	3.2	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3	3.3	3.3
150.	*	3.2	3.2	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.5	3.4	3.4
160.	*	3.2	3.2	3.0	3.0	3.0	3.0	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.8	3.5	3.4	3.5
170.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.1	3.8	3.6	3.7	3.5
180.	*	3.2	3.0	3.0	3.0	3.0	3.0	3.6	3.4	3.5	3.5	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.5	3.6	3.5
190.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.7	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.2	3.2	3.1	3.1
200.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.5	3.5	3.5	3.6	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.1	3.1
210.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.4	3.4	3.4	3.6	3.5	3.5	3.5	3.5	3.5	3.0	3.0	3.0	3.0
220.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.3	3.3	3.5	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0

230.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.3	3.3	3.6	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.3	3.3	3.6	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.3	3.3	3.6	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.3	3.3	3.6	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.3	3.3	3.6	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
280.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.3	3.3	3.6	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
290.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.3	3.3	3.6	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	3.3	3.3	3.7	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.7	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3	3.7	3.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.7	3.4	3.4	3.5	3.5	3.5	3.0	3.0	3.0	3.0
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.6	3.6	3.8	3.7	3.4	3.5	3.5	3.5	3.1	3.1	3.1	3.1
350.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.7	3.9	3.6	3.8	3.7	3.4	3.4	3.4	3.1	3.1	3.1	3.3
MAX	*	3.4	3.3	3.0	3.0	3.0	3.0	3.6	3.6	3.7	3.9	3.8	3.8	3.7	3.5	3.5	3.5	3.8	3.6	3.7	3.9
DEGR.	*	50	110	0	0	0	0	0	0	0	350	340	350	350	190	190	190	110	0	0	10

PAGE 8

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

MODEL RESULTS

```
      REMARKS : In search of the angle corresponding to
                the maximum concentration, only the first
                angle, of the angles with same maximum
                concentrations, is indicated as maximum.


WIND ANGLE RANGE:   0.-350.


WIND  * CONCENTRATION
ANGLE *      (PPM)
(DEGR)* REC81 REC82 REC83 REC84 REC85 REC86
------*-----------------------------------
  0.  *   3.4   3.4   3.5   3.4   3.3   3.3
 10.  *   3.5   3.6   3.7   3.4   3.4   3.5
 20.  *   3.6   3.5   3.6   3.5   3.5   3.5
 30.  *   3.5   3.6   3.4   3.4   3.4   3.4
 40.  *   3.5   3.5   3.4   3.4   3.4   3.4
 50.  *   3.6   3.3   3.3   3.3   3.3   3.3
 60.  *   3.6   3.3   3.3   3.3   3.3   3.3
 70.  *   3.5   3.3   3.3   3.3   3.3   3.3
 80.  *   3.5   3.3   3.3   3.3   3.3   3.3
 90.  *   3.5   3.3   3.3   3.3   3.3   3.3
```

100.	*	3.5	3.3	3.3	3.3	3.3	3.3
110.	*	3.5	3.3	3.3	3.3	3.3	3.3
120.	*	3.4	3.3	3.3	3.3	3.3	3.3
130.	*	3.4	3.3	3.3	3.3	3.3	3.3
140.	*	3.4	3.4	3.4	3.4	3.4	3.4
150.	*	3.4	3.4	3.4	3.4	3.4	3.4
160.	*	3.5	3.5	3.5	3.5	3.5	3.5
170.	*	3.5	3.5	3.5	3.5	3.5	3.5
180.	*	3.4	3.4	3.4	3.4	3.4	3.4
190.	*	3.1	3.1	3.1	3.1	3.1	3.1
200.	*	3.1	3.1	3.1	3.1	3.1	3.1
210.	*	3.0	3.0	3.0	3.0	3.0	3.0
220.	*	3.0	3.0	3.0	3.0	3.0	3.0
230.	*	3.0	3.0	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.0	3.0	3.0	3.0
280.	*	3.0	3.0	3.0	3.0	3.0	3.0
290.	*	3.0	3.0	3.0	3.0	3.0	3.0
300.	*	3.0	3.0	3.0	3.0	3.0	3.0
310.	*	3.0	3.0	3.0	3.0	3.0	3.0

```
320.  *   3.0   3.0   3.0   3.0   3.0   3.0

330.  *   3.0   3.0   3.0   3.0   3.0   3.0

340.  *   3.0   3.0   3.0   3.1   3.1   3.1

350.  *   3.2   3.2   3.1   3.1   3.1   3.1

------*-----------------------------------

MAX   *   3.6   3.6   3.7   3.5   3.5   3.5

DEGR. *   20    10    10    20    20    10


THE HIGHEST CONCENTRATION OF    4.60 PPM OCCURRED AT RECEPTOR REC35.
```

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:20:53

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	260	270	260	240	250	280	140	120	100	90	90	90	220	270	270	240	250	260	20	60
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.1	.1	.1	.0	.3	.2	.1	.0	.0	.0	.4	.1	.1	.1	.1	.1	.0	.0
5	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1
6	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1
7	.0	.1	.0	.0	.0	.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.3	.2

8	*	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	*	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.0	.0	.0	.0	.1	.1
18	*	.1	.1	.0	.0	.0	.0	.3	.3	.1	.1	.0	.0	.0	.1	.0	.0	.0	.0	.3	.3
19	*	.1	.1	.1	.0	.0	.0	.2	.3	.2	.1	.1	.0	.0	.1	.1	.0	.0	.0	.4	.5
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.1	.1	.0	.0	.0	.0	.1	.2	.2	.2	.2	.2	.0	.1	.1	.0	.0	.0	.1	.1

PAGE 10

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:20:53

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	80	80	80	70	290	240	200	190	190	190	190	0	20	160	170	170	160	160	350	320
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.2	.0	.0	.1	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.3	.2
4	.0	.0	.0	.0	.7	.0	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.0	.0	.4	.9
5	.0	.0	.0	.0	.0	.2	.3	.3	.3	.3	.3	.1	.2	.1	.1	.1	.2	.2	.1	.0
6	.0	.0	.0	.0	.0	.2	.2	.1	.2	.2	.2	.2	.4	.3	.3	.4	.4	.4	.1	.0
7	.1	.1	.1	.1	.0	.5	.4	.4	.4	.2	.1	.3	.9	.9	.9	.4	.1	.1	.1	.0
8	.0	.0	.0	.0	.1	.0	.1	.1	.0	.0	.0	.1	.0	.0	.1	.0	.0	.0	.1	.1
9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

13	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	*	.2	.2	.2	.2	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.1	.1	.0	.0	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1
19	*	.3	.1	.1	.0	.2	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

PAGE 11

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:20:53

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

```
       *    CO/LINK  (PPM)

       *    ANGLE (DEGREES)

       *  REC41 REC42 REC43 REC44 REC45 REC46 REC47 REC48 REC49 REC50 REC51 REC52 REC53 REC54 REC55 REC56 REC57 REC58 REC59 REC60

LINK # *    10    20   200   230   100   100   100   100    90   120     0     0     0     0   320   310   210     0     0     0

-------*-------------------------------------------------------------------------------------------------------------------------

    1  *    .0    .0    .1    .1    .0    .0    .0    .0    .0    .1    .0    .0    .0    .0    .0    .0    .1    .0    .0    .0

    2  *    .0    .0    .1    .1    .0    .0    .0    .0    .0    .1    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0

    3  *    .1    .1    .0    .0    .0    .0    .0    .0    .1    .0    .0    .0    .0    .0    .1    .1    .0    .0    .0    .0

    4  *    .3    .4    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0

    5  *    .1    .1    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0

    6  *    .1    .1    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0

    7  *    .1    .1    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0

    8  *    .3    .2    .0    .0    .0    .0    .0    .0    .1    .0    .0    .0    .0    .0    .1    .1    .0    .0    .0    .0

    9  *    .0    .0    .0    .0    .0    .0    .0    .0    .1    .0    .0    .0    .0    .0    .1    .0    .0    .0    .0    .0

   10  *    .0    .0    .1    .1    .0    .0    .0    .0    .0    .1    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0

   11  *    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0

   12  *    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0

   13  *    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0

   14  *    .0    .0    .0    .0    .1    .1    .1    .1    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0

   15  *    .0    .0    .5    .0    .0    .0    .0    .0    .1    .0    .0    .0    .0    .0    .3    .1    .0    .0    .0    .0

   16  *    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0

   17  *    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0
```

18	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:20:53

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	*	CO/LINK (PPM)																			
	*	ANGLE (DEGREES)																			
	*	REC61	REC62	REC63	REC64	REC65	REC66	REC67	REC68	REC69	REC70	REC71	REC72	REC73	REC74	REC75	REC76	REC77	REC78	REC79	REC80
LINK #	*	50	110	0	0	0	0	0	0	0	350	340	350	350	190	190	190	110	0	0	10

-------*----------

1	*	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.2	.3	.3	.3	.3	.3	.0	.0	.0	.0
2	*	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.2	.2	.1	.0	.0	.0	.0	.0	.0	.0
3	*	.1	.0	.0	.0	.0	.0	.3	.2	.2	.3	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1
4	*	.0	.0	.0	.0	.0	.0	.1	.1	.1	.2	.0	.0	.0	.0	.0	.0	.0	.1	.1	.2
5	*	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1
6	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1
7	*	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1
8	*	.1	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.2	.2	.2	.3
9	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.4	.0	.0	.0
10	*	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.2	.2	.2	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

```
23  *    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0
```

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE CLOVERDALE & TRENTON

DATE : 9/13/ 2

TIME : 17:20:53

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

```
        *    CO/LINK  (PPM)

        *    ANGLE (DEGREES)

        *  REC81 REC82 REC83 REC84 REC85 REC86

LINK # *    20    10    10    20    20    10

-------*-----------------------------------

     1  *    .1    .1    .1    .2    .2    .2

     2  *    .0    .1    .1    .0    .0    .0

     3  *    .1    .1    .1    .0    .0    .0

     4  *    .0    .0    .0    .0    .0    .0

     5  *    .0    .0    .0    .0    .0    .0

     6  *    .0    .0    .0    .0    .0    .0

     7  *    .0    .0    .0    .0    .0    .0

     8  *    .1    .1    .1    .0    .0    .0

     9  *    .1    .0    .0    .0    .0    .0

    10  *    .2    .2    .3    .3    .3    .3

    11  *    .0    .0    .0    .0    .0    .0

    12  *    .0    .0    .0    .0    .0    .0

    13  *    .0    .0    .0    .0    .0    .0

    14  *    .0    .0    .0    .0    .0    .0

    15  *    .0    .0    .0    .0    .0    .0

    16  *    .0    .0    .0    .0    .0    .0

    17  *    .0    .0    .0    .0    .0    .0
```

```
18  *    .0    .0    .0    .0    .0    .0

19  *    .0    .0    .0    .0    .0    .0

20  *    .0    .0    .0    .0    .0    .0

21  *    .0    .0    .0    .0    .0    .0

22  *    .0    .0    .0    .0    .0    .0

23  *    .0    .0    .0    .0    .0    .0
```

2027 HIGH-LEVEL BRIDGE – 16TH AVENUE SOUTH / EAST MARGINAL WAY

```
                    CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1


(C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.

     JOB: SOUTHPARK PROJECT                                    RUN: 2027 HIGH LEVEL MARGINAL WAY


     DATE :  9/13/ 2

     TIME : 16:58:15


        The MODE flag has been set to C for calculating CO averages.


      SITE & METEOROLOGICAL VARIABLES

      -------------------------------
```

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM

U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)			(G/MI)	(FT)	(FT)		(VEH)
1. 16TH NB	*	625.0	-750.0	.0	.0	*	976.	320.	AG	890.	5.6	.0	60.0		
2. 16TH QUE LT	*	66.7	-88.6	155.2	-194.8	*	138.	140.	AG	561.	100.0	.0	30.0	.78	7.0
3. 16TH QUE RT	*	82.6	-76.0	114.1	-113.8	*	49.	140.	AG	187.	100.0	.0	10.0	.31	2.5
4. 16TH SB	*	-18.0	-42.6	607.0	-792.6	*	976.	140.	AG	1175.	5.6	.0	40.0		
5. MARGINAL SE 1	*	-1000.0	-16.0	.0	-16.0	*	1000.	90.	AG	1860.	3.9	.0	52.0		
6. MAR SE QUE TH RT	*	-60.0	-10.0	-177.9	-10.0	*	118.	270.	AG	228.	100.0	.0	20.0	.53	6.0
7. MAR SE QUE E RT	*	-60.0	-26.0	-1141.3	-26.0	*	1081.	270.	AG	52.	100.0	.0	10.0	1.08	54.9
8. MARGINAL SE 2	*	.0	-12.0	1000.0	-12.0	*	1000.	90.	AG	885.	3.9	.0	24.0		
9. MARGINAL NW 1	*	1000.0	22.0	.0	22.0	*	1000.	270.	AG	750.	3.9	.0	64.0		
10. MAR NW QUE LT	*	60.0	6.0	111.9	6.0	*	52.	90.	AG	197.	100.0	.0	12.0	.39	2.6
11. MAR NW QUE TH	*	60.0	28.0	95.4	28.0	*	35.	90.	AG	187.	100.0	.0	32.0	.21	1.8
12. MAR NW 2	*	.0	16.0	-1000.0	16.0	*	1000.	270.	AG	1440.	3.9	.0	52.0		

PAGE 2

JOB: SOUTHPARK PROJECT RUN: 2027 HIGH LEVEL MARGINAL WAY

DATE : 9/13/ 2

TIME : 16:58:15

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 16TH QUE LT	*	120	90	2.0	790	1562	92.90	1	3
3. 16TH QUE RT	*	120	90	2.0	100	1487	92.90	1	3
6. MAR SE QUE TH RT	*	120	55	2.0	785	1455	92.90	1	3
7. MAR SE QUE E RT	*	120	25	2.0	1075	1315	92.90	1	3
10. MAR NW QUE LT	*	120	95	2.0	100	1466	92.90	1	3
11. MAR NW QUE TH	*	120	30	2.0	650	1405	92.90	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. RECEPTOR 1	75.7	-43.5	.0
2. RECEPTOR 2	123.6	-101.1	.0
3. RECEPTOR 3	171.6	-158.8	.0
4. RECEPTOR 4	219.6	-216.4	.0
5. RECEPTOR 5	267.6	-274.1	.0
6. RECEPTOR 6	315.6	-331.7	.0
7. RECEPTOR 7	363.5	-389.3	.0
8. RECEPTOR 10	-7.5	-87.5	.0
9. RECEPTOR 11	40.4	-145.1	.0
10. RECEPTOR 12	88.4	-202.8	.0
11. RECEPTOR 13	136.4	-260.4	.0
12. RECEPTOR 14	184.3	-318.1	.0
13. RECEPTOR 15	232.3	-375.7	.0
14. RECEPTOR 16	280.3	-433.4	.0

15. RECEPTOR 20	*	-424.8	41.6	.0	*
16. RECEPTOR 21	*	-349.8	41.6	.0	*
17. RECEPTOR 22	*	-274.8	41.6	.0	*
18. RECEPTOR 23	*	-199.8	41.6	.0	*
19. RECEPTOR 24	*	-124.8	41.6	.0	*
20. RECEPTOR 25	*	-49.8	41.6	.0	*
21. RECEPTOR 26	*	.8	54.4	.0	*
22. RECEPTOR 27	*	75.8	54.4	.0	*
23. RECEPTOR 28	*	150.8	54.4	.0	*
24. RECEPTOR 29	*	225.8	54.4	.0	*
25. RECEPTOR 30	*	300.8	54.4	.0	*
26. RECEPTOR 31	*	375.8	54.4	.0	*
27. RECEPTOR 32	*	450.8	54.4	.0	*
28. RECEPTOR 34	*	-424.8	-41.5	.0	*
29. RECEPTOR 35	*	-349.8	-41.5	.0	*
30. RECEPTOR 36	*	-274.8	-41.5	.0	*
31. RECEPTOR 37	*	-199.8	-41.5	.0	*
32. RECEPTOR 38	*	-124.8	-41.5	.0	*
33. RECEPTOR 39	*	-49.8	-41.5	.0	*
34. RECEPTOR 40	*	.1	-24.2	.0	*
35. RECEPTOR 41	*	75.1	-24.2	.0	*
36. RECEPTOR 42	*	150.1	-24.2	.0	*

37. RECEPTOR 43	*	225.1	-24.2	.0	*
38. RECEPTOR 44	*	300.1	-24.2	.0	*
39. RECEPTOR 45	*	375.1	-24.2	.0	*

PAGE 3

JOB: SOUTHPARK PROJECT RUN: 2027 HIGH LEVEL MARGINAL WAY

DATE : 9/13/ 2

```
 TIME : 16:58:15


  RECEPTOR LOCATIONS

  ------------------

                        *           COORDINATES (FT)          *

    RECEPTOR            *      X          Y          Z        *

-------------------------*-------------------------------------*

40. RECEPTOR 46         *       450.1      -24.2         .0   *
```



```
 JOB: SOUTHPARK PROJECT                                  RUN: 2027 HIGH LEVEL MARGINAL WAY


  MODEL RESULTS

  -------------


  REMARKS : In search of the angle corresponding to

            the maximum concentration, only the first

            angle, of the angles with same maximum

            concentrations, is indicated as maximum.


WIND ANGLE RANGE:   0.-350.
```

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	3.6	3.1	3.0	3.0	3.0	3.0	3.0	3.5	3.5	4.5	4.3	3.6	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.1
10.	3.7	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.8	4.6	4.1	3.5	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0
20.	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.9	4.5	3.8	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0
30.	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.5	4.1	4.4	3.5	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0
40.	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.6	4.3	4.4	3.4	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0
50.	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.6	4.6	4.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0
60.	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.6	4.5	4.3	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0
70.	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.6	4.4	4.2	3.3	3.3	3.3	3.3	3.1	3.1	3.1	3.1	3.1	3.0
80.	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.9	4.4	4.1	3.4	3.4	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.2
90.	3.1	3.0	3.0	3.0	3.0	3.0	3.0	4.0	4.4	3.8	3.4	3.4	3.4	3.4	3.5	3.5	3.5	3.3	3.3	3.5
100.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.3	4.4	3.6	3.4	3.4	3.4	3.4	3.7	3.6	3.7	3.6	3.5	3.6
110.	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.5	4.3	3.4	3.4	3.4	3.4	3.4	3.8	3.8	3.9	4.0	3.6	3.6
120.	3.1	3.1	3.1	3.0	3.0	3.0	3.0	4.3	4.0	3.5	3.5	3.5	3.5	3.5	3.8	3.9	4.2	4.3	3.9	3.6
130.	3.3	3.1	3.1	3.1	3.1	3.1	3.1	4.1	3.8	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.8	4.3	4.1	3.9
140.	4.0	3.5	3.3	3.3	3.3	3.3	3.2	3.7	3.5	3.5	3.5	3.5	3.4	3.4	3.5	3.5	3.5	4.1	4.1	4.1
150.	4.7	3.9	3.4	3.4	3.4	3.4	3.4	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.5	3.5	3.5	3.8	4.0	3.9
160.	5.2	4.4	3.4	3.4	3.4	3.4	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.5	3.5	3.6	3.9	3.6

170.	*	4.9	4.6	3.4	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.6	3.9	3.5
180.	*	4.5	4.8	3.5	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	3.9	3.5
190.	*	4.1	4.8	3.7	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	3.9	3.6
200.	*	3.7	4.9	3.9	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	3.9	3.7
210.	*	3.5	4.9	4.2	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	3.8	3.8
220.	*	3.4	5.0	4.5	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	3.8	3.9
230.	*	3.3	5.1	4.7	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	3.7	3.9
240.	*	3.3	5.2	4.7	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	3.7	4.0
250.	*	3.3	5.2	4.8	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	3.6	3.8
260.	*	3.5	5.2	4.8	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.7	3.7	3.7	3.7	3.8
270.	*	3.8	5.2	4.8	3.5	3.3	3.3	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4	3.4	3.4
280.	*	3.8	5.2	5.0	3.9	3.4	3.3	3.3	3.5	3.2	3.1	3.0	3.0	3.0	3.0	3.2	3.2	3.2	3.2	3.2	3.2
290.	*	3.7	4.7	5.1	4.3	3.6	3.4	3.3	3.5	3.3	3.2	3.1	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	3.1
300.	*	3.6	4.2	4.9	4.7	3.9	3.7	3.5	3.6	3.4	3.4	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0
310.	*	3.4	3.5	4.0	4.4	4.0	3.7	3.6	3.8	3.4	3.4	3.4	3.4	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0

320.	*	3.3	3.3	3.6	3.8	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.6	3.6	3.0	3.0	3.0	3.0	3.0	3.0
330.	*	3.4	3.3	3.4	3.3	3.3	3.2	3.2	3.5	3.6	3.6	3.9	4.0	3.9	3.8	3.0	3.0	3.0	3.0	3.0	3.0
340.	*	3.4	3.2	3.1	3.0	3.0	3.0	3.0	3.4	3.4	3.9	4.4	4.1	3.8	3.7	3.0	3.0	3.0	3.0	3.0	3.0
350.	*	3.6	3.2	3.0	3.0	3.0	3.0	3.0	3.4	3.4	4.2	4.5	3.8	3.6	3.5	3.0	3.0	3.0	3.0	3.0	3.0
MAX	*	5.2	5.2	5.1	4.7	4.0	3.7	3.6	4.5	4.6	4.6	4.5	4.1	3.9	3.8	3.8	3.9	4.2	4.3	4.1	4.1
DEGR.	*	160	240	290	300	310	300	310	110	50	10	350	340	330	330	110	120	120	120	130	140

PAGE 5

JOB: SOUTHPARK PROJECT RUN: 2027 HIGH LEVEL MARGINAL WAY

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND * CONCENTRATION

ANGLE (DEGR)	*	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
		(PPM)																			
0.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	4.0	3.5	3.5	4.0	3.3	3.3	3.3	3.3	3.3
10.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	4.0	3.4	3.5	3.9	3.2	3.2	3.2	3.2	3.2
20.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	3.9	3.3	3.5	3.8	3.2	3.2	3.2	3.2	3.2
30.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.7	4.0	3.4	3.5	3.8	3.3	3.3	3.3	3.3	3.3
40.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.9	4.0	3.4	3.6	3.7	3.3	3.3	3.3	3.3	3.3
50.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	4.1	4.1	3.6	3.8	3.5	3.3	3.3	3.3	3.3	3.3
60.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.8	4.3	4.0	3.7	3.8	3.4	3.3	3.3	3.3	3.3	3.3
70.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.8	3.9	4.2	3.9	3.7	3.9	3.4	3.3	3.3	3.3	3.3	3.3
80.	*	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.8	3.8	3.9	4.1	3.7	3.7	3.8	3.4	3.4	3.4	3.4	3.4	3.4
90.	*	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.7	3.7	3.7	3.7	3.6	3.6	3.6	3.3	3.3	3.3	3.3	3.3	3.3
100.	*	3.6	3.3	3.3	3.3	3.3	3.3	3.3	3.4	3.5	3.7	3.6	3.5	3.7	3.4	3.1	3.1	3.1	3.1	3.1	3.1
110.	*	3.6	3.4	3.3	3.3	3.3	3.3	3.3	3.2	3.3	3.4	3.5	3.7	3.8	3.7	3.1	3.1	3.1	3.1	3.1	3.1
120.	*	3.5	3.3	3.2	3.2	3.2	3.2	3.2	3.0	3.1	3.2	3.4	3.5	4.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0
130.	*	3.6	3.5	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.1	3.3	3.9	4.5	3.2	3.0	3.0	3.0	3.0	3.0
140.	*	3.9	3.6	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.1	3.6	4.7	3.6	3.0	3.0	3.0	3.0	3.0

150.	*	4.1	4.2	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.1	4.3	4.0	3.2	3.0	3.0	3.0	3.0
160.	*	3.8	4.5	3.4	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.9	4.5	3.3	3.2	3.0	3.0	3.0
170.	*	3.5	4.9	3.5	3.4	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.5	4.6	3.4	3.2	3.2	3.0	3.0
180.	*	3.5	4.8	3.7	3.4	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.5	4.2	3.6	3.2	3.2	3.0	3.0
190.	*	3.4	4.3	3.8	3.5	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.8	3.8	3.3	3.1	3.0	3.0
200.	*	3.2	4.0	3.9	3.6	3.3	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.5	4.0	3.4	3.0	3.0	3.0
210.	*	3.4	3.7	3.8	3.6	3.4	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3	4.0	3.6	3.1	3.0	3.0
220.	*	3.4	3.4	3.6	3.5	3.5	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.9	3.7	3.2	3.1	3.0
230.	*	3.7	3.5	3.6	3.4	3.5	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.7	3.8	3.3	3.2	3.1
240.	*	3.8	3.5	3.6	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2	3.5	3.7	3.3	3.2	3.1
250.	*	3.7	3.7	3.7	3.5	3.3	3.3	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.3	3.3	3.6	3.4	3.4	3.3
260.	*	3.6	3.7	3.7	3.6	3.4	3.4	3.4	3.3	3.3	3.3	3.3	3.3	3.3	4.0	3.8	3.4	3.4	3.3	3.3	3.3
270.	*	3.3	3.4	3.5	3.4	3.3	3.3	3.2	3.7	3.7	3.7	3.7	3.7	3.8	4.5	3.9	3.9	3.7	3.5	3.6	3.5
280.	*	3.1	3.1	3.0	3.0	3.1	3.1	3.1	3.8	3.8	3.8	3.8	4.0	4.2	4.5	4.0	3.7	3.8	3.6	3.6	3.4
290.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.8	3.8	4.0	4.3	4.1	3.6	3.8	3.5	3.3	3.3	3.3
300.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.8	3.8	3.8	4.1	4.4	3.7	3.5	3.6	3.4	3.3	3.3	3.3
310.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	4.1	4.1	3.5	3.4	3.6	3.3	3.3	3.3	3.3
320.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6	4.1	4.0	3.5	3.4	3.5	3.3	3.3	3.3	3.3
330.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	4.0	3.9	3.6	3.6	3.3	3.3	3.3	3.3	3.3
340.	*	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	4.0	3.7	3.5	3.7	3.2	3.2	3.2	3.2	3.2

350. *	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	3.5	3.5	4.0	3.6	3.5	3.7	3.2	3.2	3.2	3.2	3.2
MAX *	4.1	4.9	3.9	3.6	3.5	3.4	3.4	3.8	3.8	3.9	4.3	4.1	4.4	4.7	4.6	4.0	3.8	3.6	3.6	3.5
DEGR. *	150	170	200	200	220	230	240	60	60	70	60	50	300	140	170	200	230	280	270	270

THE HIGHEST CONCENTRATION OF 5.20 PPM OCCURRED AT RECEPTOR REC1 .

PAGE 6

JOB: SOUTHPARK PROJECT RUN: 2027 HIGH LEVEL MARGINAL WAY

DATE : 9/13/ 2

TIME : 16:58:15

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

* CO/LINK (PPM)

* ANGLE (DEGREES)

	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
LINK # *	160	240	290	300	310	300	310	110	50	10	350	340	330	330	110	120	120	120	130	140

1	*	.3	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.1	.0	.0	.1	.1	.1	.2
2	*	1.4	1.4	1.5	1.0	.6	.2	.2	.9	1.0	1.1	1.0	.6	.4	.3	.1	.1	.2	.2	.3	.4
3	*	.3	.5	.0	.0	.0	.0	.0	.1	.2	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
4	*	.2	.1	.1	.1	.1	.1	.1	.4	.3	.3	.3	.4	.4	.4	.0	.1	.1	.1	.1	.2
5	*	.0	.0	.1	.1	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.2	.2	.2	.2	.2	.1
6	*	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.2	.4	.2	.0
7	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0
8	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.3	.3	.3	.2	.2

PAGE 7

JOB: SOUTHPARK PROJECT RUN: 2027 HIGH LEVEL MARGINAL WAY

DATE : 9/13/ 2

TIME : 16:58:15

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

LINK #	CO/LINK (PPM) / ANGLE (DEGREES)	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
		150	170	200	200	220	230	240	60	60	70	60	50	300	140	170	200	230	280	270	270
1		.2	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4	.2	.1	.1	.0	.0	.0
2		.5	.5	.4	.3	.3	.2	.2	.0	.0	.0	.0	.0	.0	.8	1.1	.7	.5	.0	.1	.1
3		.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.2	.1	.1	.0	.0	.0
4		.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.1	.1	.1	.0	.0	.0
5		.0	.0	.0	.0	.0	.0	.0	.4	.4	.4	.4	.3	.4	.1	.0	.0	.0	.1	.1	.1
6		.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.6	.5	.6	.0	.0	.0	.0	.0	.0	.0
7		.0	.0	.0	.0	.0	.0	.0	.2	.2	.2	.2	.2	.2	.0	.0	.0	.0	.0	.0	.0
8		.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.2
9		.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1
10		.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11		.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12		.0	.0	.0	.0	.0	.0	.0	.2	.2	.1	.1	.1	.2	.0	.0	.0	.0	.1	.1	.0

2027 HIGH-LEVEL BRIDGE – 14TH AVENUE SOUTH / SOUTH TRENTON STREET

```
                CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1


(C) Copyright 1993-1997  TRINITY CONSULTANTS, INC.

     JOB: SOUTHPARK BRIDGE PROJECT                            RUN: 2027 BRIDGE HIGH LEVEL - TRENTON


     DATE :  9/13/ 2

     TIME : 18: 2: 7


        The MODE flag has been set to C for calculating CO averages.


      SITE & METEOROLOGICAL VARIABLES

      -------------------------------

      VS =    .0 CM/S       VD =    .0 CM/S       Z0 = 108. CM

       U =  1.0 M/S         CLAS =   4  (D)     ATIM =  60. MINUTES     MIXH =  1000. M   AMB =  3.0 PPM


      LINK VARIABLES

      --------------

        LINK DESCRIPTION     *         LINK COORDINATES (FT)          *    LENGTH  BRG TYPE   VPH    EF      H   W    V/C QUEUE

                             *   X1        Y1        X2        Y2     *     (FT)  (DEG)           (G/MI)  (FT) (FT)       (VEH)

     ------------------------*----------------------------------------*-------------------------------------------------------
```

1. 14TH NB 1	*	10.0	-400.0	10.0	600.0	*	1000.	360.	AG	760.	5.6	.0	40.0	
2. 14TH NB QUE ALL	*	10.0	560.0	10.0	452.0	*	108.	180.	AG	259.	100.0	.0	20.0	.53 5.5
3. 14TH NB 2	*	10.0	600.0	10.0	1600.0	*	1000.	360.	AG	830.	5.6	.0	40.0	
4. 14TH SB 1	*	-10.0	1600.0	-10.0	600.0	*	1000.	180.	AG	1080.	5.6	.0	40.0	
5. 14TH SB QUE ALL	*	-10.0	630.0	-10.0	786.0	*	156.	360.	AG	259.	100.0	.0	20.0	.78 7.9
6. 14TH SB 2	*	-10.0	600.0	-10.0	-400.0	*	1000.	180.	AG	940.	5.6	.0	40.0	
7. TRENTON EB 1	*	-1000.0	590.0	.0	590.0	*	1000.	90.	AG	500.	6.9	.0	40.0	
8. TRENTON EB QUE LT	*	-40.0	595.0	-129.2	595.0	*	89.	270.	AG	169.	100.0	.0	10.0	.54 4.5
9. TRENTON EB QUE AL	*	-40.0	585.0	-136.7	585.0	*	97.	270.	AG	169.	100.0	.0	10.0	.64 4.9
10. TRENTON EB 2	*	.0	595.0	1000.0	595.0	*	1000.	90.	AG	75.	6.9	.0	30.0	
11. TRENTON WB 1	*	1000.0	605.0	.0	605.0	*	1000.	270.	AG	130.	6.9	.0	30.0	
12. TRENTON WB QUE AL	*	40.0	605.0	96.9	605.0	*	57.	90.	AG	199.	100.0	.0	10.0	.53 2.9
13. TRENTON WB 2	*	.0	605.0	-1000.0	605.0	*	1000.	270.	AG	625.	6.9	.0	30.0	

PAGE 2

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE HIGH LEVEL - TRENTON

DATE : 9/13/ 2

TIME : 18: 2: 7

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 14TH NB QUE ALL	100	52	2.0	760	1625	92.90	1	3
5. 14TH SB QUE ALL	100	52	2.0	1080	1564	92.90	1	3
8. TRENTON EB QUE LT	100	68	2.0	240	1594	92.90	1	3
9. TRENTON EB QUE AL	100	68	2.0	260	1456	92.90	1	3
12. TRENTON WB QUE AL	100	80	2.0	130	1524	92.90	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC1	75.0	620.0	6.0
2. REC2	150.0	620.0	6.0
3. REC3	225.0	620.0	6.0
4. REC4	300.0	620.0	6.0
5. REC5	375.0	620.0	6.0
6. REC6	450.0	620.0	6.0
7. REC7	-75.0	620.0	6.0

```
 8. REC8                 *      -150.0      620.0        6.0   *

 9. REC9                 *      -225.0      620.0        6.0   *

10. REC10                *      -300.0      620.0        6.0   *

11. REC11                *      -375.0      620.0        6.0   *

12. REC12                *      -450.0      620.0        6.0   *

13. REC13                *        75.0      580.0        6.0   *

14. REC14                *       150.0      580.0        6.0   *

15. REC15                *       225.0      580.0        6.0   *

16. REC16                *       300.0      580.0        6.0   *

17. REC17                *       375.0      580.0        6.0   *

18. REC18                *       450.0      580.0        6.0   *

19. REC19                *       -75.0      570.0        6.0   *

20. REC20                *      -150.0      570.0        6.0   *

21. REC21                *      -225.0      570.0        6.0   *

22. REC22                *      -300.0      570.0        6.0   *

23. REC23                *      -375.0      570.0        6.0   *

24. REC24                *      -450.0      570.0        6.0   *

25. REC25                *        30.0      525.0        6.0   *

26. REC26                *        30.0      675.0        6.0   *

27. REC27                *        30.0      750.0        6.0   *

28. REC28                *        30.0      825.0        6.0   *

29. REC29                *        30.0      900.0        6.0   *
```

30. REC30	*	30.0	975.0	6.0	*
31. REC31	*	30.0	1050.0	6.0	*
32. REC32	*	-30.0	525.0	6.0	*
33. REC33	*	-30.0	675.0	6.0	*
34. REC34	*	-30.0	750.0	6.0	*
35. REC35	*	-30.0	825.0	6.0	*
36. REC36	*	-30.0	900.0	6.0	*
37. REC37	*	-30.0	975.0	6.0	*
38. REC38	*	-30.0	1050.0	6.0	*
39. REC39	*	30.0	375.0	6.0	*
40. REC40	*	30.0	450.0	6.0	*

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE HIGH LEVEL - TRENTON

DATE : 9/13/ 2

TIME : 18: 2: 7

RECEPTOR LOCATIONS

---

	*	COORDINATES (FT)	*

RECEPTOR	X	Y	Z
41. REC41	-30.0	375.0	6.0
42. REC42	-30.0	450.0	6.0
43. REC67	30.0	75.0	6.0
44. REC68	30.0	150.0	6.0
45. REC69	30.0	225.0	6.0
46. REC70	30.0	300.0	6.0
47. REC77	-30.0	75.0	6.0
48. REC78	-30.0	150.0	6.0
49. REC79	-30.0	225.0	6.0
50. REC80	-30.0	300.0	6.0

PAGE 4

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE HIGH LEVEL - TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum

concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)																			
	* REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	* 3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.6	3.0	3.0	3.0	3.0	3.0	4.1	3.2
10.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.1	3.0	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0	4.3	3.3
20.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.2	3.1	3.0	3.0	3.0	3.4	3.0	3.0	3.0	3.0	3.0	4.4	3.5
30.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.1	3.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	4.4	3.7
40.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.1	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	4.4	4.0
50.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.2	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	4.2	4.1
60.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.3	3.2	3.1	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	4.1	4.4
70.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.3	3.3	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.2
80.	* 3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.4	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.4	4.0
90.	* 3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.4	3.6	3.6	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.6
100.	* 3.2	3.1	3.1	3.1	3.1	3.1	3.5	3.6	3.7	3.7	3.5	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.4
110.	* 3.2	3.1	3.1	3.1	3.1	3.1	3.6	3.9	3.6	3.6	3.5	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.3
120.	* 3.3	3.0	3.0	3.0	3.0	3.0	3.9	4.1	3.5	3.4	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.2
130.	* 3.4	3.0	3.0	3.0	3.0	3.0	4.0	4.1	3.4	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.2

140.	*	3.5	3.0	3.0	3.0	3.0	3.0	4.3	4.0	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.4	3.1
150.	*	3.5	3.0	3.0	3.0	3.0	3.0	4.2	3.8	3.4	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.3	3.2
160.	*	3.5	3.0	3.0	3.0	3.0	3.0	4.1	3.5	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.2
170.	*	3.5	3.0	3.0	3.0	3.0	3.0	4.0	3.4	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.1
180.	*	3.7	3.0	3.0	3.0	3.0	3.0	4.0	3.3	3.3	3.3	3.3	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.1	3.0
190.	*	3.8	3.0	3.0	3.0	3.0	3.0	3.8	3.2	3.2	3.2	3.2	3.2	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0
200.	*	3.9	3.2	3.0	3.0	3.0	3.0	3.8	3.2	3.2	3.2	3.2	3.2	3.4	3.2	3.0	3.0	3.0	3.0	3.0	3.0
210.	*	4.0	3.3	3.0	3.0	3.0	3.0	3.9	3.3	3.3	3.3	3.3	3.3	3.5	3.2	3.0	3.0	3.0	3.0	3.0	3.0
220.	*	4.0	3.3	3.0	3.0	3.0	3.0	3.9	3.3	3.3	3.3	3.3	3.3	3.6	3.3	3.0	3.0	3.0	3.0	3.0	3.0
230.	*	3.9	3.3	3.1	3.0	3.0	3.0	3.8	3.3	3.3	3.3	3.3	3.3	3.6	3.2	3.0	3.0	3.0	3.0	3.0	3.0
240.	*	3.7	3.4	3.1	3.1	3.0	3.0	3.8	3.3	3.3	3.3	3.3	3.3	3.5	3.3	3.1	3.0	3.0	3.0	3.0	3.0
250.	*	3.8	3.3	3.2	3.2	3.2	3.1	3.8	3.5	3.5	3.5	3.5	3.4	3.4	3.2	3.1	3.1	3.1	3.0	3.0	3.0
260.	*	3.8	3.6	3.4	3.2	3.2	3.1	3.6	3.5	3.5	3.5	3.4	3.4	3.7	3.1	3.1	3.1	3.1	3.1	3.1	3.1
270.	*	3.8	3.7	3.4	3.2	3.1	3.0	3.4	3.4	3.4	3.4	3.4	3.3	3.6	3.6	3.4	3.1	3.0	3.0	3.4	3.3
280.	*	3.5	3.4	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.5	3.7	3.3	3.1	3.1	3.1	3.7	3.3
290.	*	3.4	3.3	3.1	3.1	3.1	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.6	3.3	3.2	3.1	3.1	3.1	3.9	3.3
300.	*	3.5	3.4	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.6	3.5	3.1	3.1	3.1	3.0	4.1	3.3
310.	*	3.5	3.4	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.5	3.1	3.0	3.0	3.0	4.0	3.2
320.	*	3.5	3.3	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.3	3.1	3.0	3.0	3.0	4.0	3.2
330.	*	3.4	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.9	3.3	3.1	3.0	3.0	3.0	3.9	3.2
340.	*	3.3	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	3.2	3.0	3.0	3.0	3.0	3.9	3.2
350.	*	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.7	3.1	3.0	3.0	3.0	3.0	3.9	3.2

```
------*-----------------------------------------------------------------------------------------------------------------------------------------------------------
MAX   *   4.0   3.7   3.4   3.2   3.2   3.1   4.3   4.1   3.7   3.7   3.5   3.4   3.9   3.7   3.4   3.1   3.1   3.1   4.4   4.4
DEGR. *  210   270   260   250   250    90   140   120   100   100   100   100   330   280   270   250   250   260    20    60
```

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE HIGH LEVEL - TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	3.2	3.2	3.2	3.2	3.7	3.5	3.4	3.4	3.3	3.3	3.3	4.1	3.8	3.5	3.4	3.4	3.4	3.4	3.9	3.9
10.	3.2	3.2	3.2	3.2	3.5	3.2	3.2	3.2	3.1	3.1	3.1	3.9	4.3	3.8	3.6	3.6	3.5	3.5	3.2	3.5
20.	3.3	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.7	4.4	3.9	3.5	3.5	3.5	3.5	3.0	3.1
30.	3.3	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.3	3.9	3.4	3.4	3.4	3.4	3.0	3.0
40.	3.4	3.2	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.6	4.3	4.1	3.4	3.4	3.4	3.4	3.0	3.0

50.	*	3.4	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.1	4.1	3.3	3.3	3.3	3.3	3.0	3.0
60.	*	3.4	3.4	3.4	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.1	4.1	3.3	3.3	3.3	3.3	3.0	3.0
70.	*	3.6	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.0	4.0	3.3	3.3	3.3	3.3	3.0	3.0
80.	*	3.6	3.6	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.0	4.0	3.3	3.3	3.3	3.3	3.0	3.0
90.	*	3.5	3.6	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.0	4.0	3.3	3.3	3.3	3.3	3.0	3.0
100.	*	3.3	3.2	3.2	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.0	4.0	3.3	3.3	3.3	3.3	3.0	3.0
110.	*	3.1	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.1	4.0	3.3	3.3	3.3	3.3	3.0	3.0
120.	*	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.8	4.2	4.1	3.3	3.3	3.3	3.3	3.0	3.0
130.	*	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.8	4.2	4.1	3.4	3.3	3.3	3.3	3.0	3.0
140.	*	3.0	3.0	3.0	3.0	3.0	3.1	3.0	3.0	3.0	3.0	3.0	3.8	4.2	4.4	3.6	3.4	3.4	3.4	3.0	3.0
150.	*	3.1	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.7	4.2	4.4	3.8	3.5	3.4	3.4	3.0	3.0
160.	*	3.0	3.0	3.0	3.0	3.1	3.2	3.1	3.0	3.0	3.1	3.1	3.6	4.2	4.4	4.0	3.6	3.5	3.5	3.1	3.1
170.	*	3.0	3.0	3.0	3.0	3.2	3.4	3.3	3.1	3.2	3.2	3.1	3.5	4.1	4.4	4.4	3.9	3.7	3.6	3.1	3.1
180.	*	3.0	3.0	3.0	3.0	3.5	3.6	3.6	3.8	3.8	3.5	3.4	3.4	4.0	3.9	4.2	3.9	3.7	3.5	3.3	3.3
190.	*	3.0	3.0	3.0	3.0	4.0	3.7	3.8	4.0	3.9	3.7	3.6	3.2	3.6	3.5	3.5	3.2	3.3	3.3	3.5	3.5
200.	*	3.0	3.0	3.0	3.0	4.1	3.7	3.9	3.9	3.6	3.6	3.6	3.1	3.4	3.3	3.2	3.1	3.1	3.1	3.4	3.4
210.	*	3.0	3.0	3.0	3.0	4.2	3.6	4.1	3.9	3.5	3.4	3.4	3.0	3.5	3.2	3.0	3.0	3.0	3.0	3.4	3.4
220.	*	3.0	3.0	3.0	3.0	4.3	4.0	4.1	3.8	3.4	3.4	3.4	3.0	3.4	3.0	3.0	3.0	3.0	3.0	3.4	3.4
230.	*	3.0	3.0	3.0	3.0	4.1	4.2	3.9	3.6	3.4	3.4	3.4	3.0	3.4	3.0	3.0	3.0	3.0	3.0	3.3	3.3
240.	*	3.0	3.0	3.0	3.0	4.0	4.3	4.0	3.5	3.4	3.4	3.4	3.0	3.3	3.1	3.0	3.0	3.0	3.0	3.2	3.2
250.	*	3.0	3.0	3.0	3.0	3.9	4.1	3.8	3.2	3.2	3.2	3.2	3.0	3.2	3.1	3.0	3.0	3.0	3.0	3.2	3.2
260.	*	3.1	3.1	3.1	3.1	3.9	3.9	3.7	3.2	3.2	3.2	3.2	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.2	3.3

270.	*	3.3	3.3	3.3	3.3	3.9	3.9	3.8	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.5
280.	*	3.3	3.3	3.3	3.3	4.2	3.7	3.7	3.2	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.6
290.	*	3.3	3.3	3.3	3.3	4.3	3.7	3.7	3.2	3.2	3.2	3.2	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.8
300.	*	3.3	3.3	3.3	3.3	4.3	3.9	3.8	3.4	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.9
310.	*	3.2	3.2	3.2	3.2	4.4	3.9	3.7	3.4	3.4	3.4	3.4	3.5	3.0	3.0	3.0	3.0	3.0	3.0	3.3	4.3
320.	*	3.2	3.2	3.2	3.2	4.5	3.9	3.6	3.4	3.4	3.4	3.4	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.4	4.4
330.	*	3.2	3.2	3.2	3.2	4.0	3.9	3.5	3.4	3.4	3.4	3.4	3.6	3.0	3.0	3.0	3.0	3.0	3.0	3.7	4.4
340.	*	3.2	3.2	3.2	3.2	4.1	3.9	3.5	3.5	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.1	3.1	3.1	3.8	4.4
350.	*	3.2	3.2	3.2	3.2	3.9	3.7	3.5	3.5	3.5	3.5	3.5	3.7	3.3	3.2	3.2	3.2	3.2	3.2	3.9	4.4
MAX	*	3.6	3.6	3.4	3.4	4.5	4.3	4.1	4.0	3.9	3.7	3.6	4.1	4.4	4.4	4.4	3.9	3.7	3.6	3.9	4.4
DEGR.	*	70	80	60	70	320	240	210	190	190	190	190	0	20	140	170	170	170	170	0	320

PAGE 6

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE HIGH LEVEL - TRENTON

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum

concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-350.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM)									
	REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50
0.	3.6	3.7	3.4	3.6	3.6	3.8	3.5	3.7	3.7	3.7
10.	4.0	3.9	3.1	3.1	3.2	3.2	3.5	3.5	3.6	3.9
20.	3.7	4.1	3.0	3.0	3.0	3.0	3.4	3.4	3.5	3.5
30.	3.5	3.9	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4
40.	3.4	3.9	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
50.	3.3	3.8	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
60.	3.3	3.8	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
70.	3.3	3.7	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
80.	3.3	3.6	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
90.	3.3	3.5	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
100.	3.3	3.4	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
110.	3.3	3.3	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
120.	3.3	3.3	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
130.	3.3	3.3	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3

140.	*	3.3	3.3	3.0	3.0	3.0	3.0	3.3	3.3	3.3	3.3
150.	*	3.4	3.4	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4
160.	*	3.4	3.4	3.0	3.0	3.0	3.0	3.4	3.4	3.4	3.4
170.	*	3.4	3.4	3.1	3.1	3.1	3.1	3.4	3.4	3.4	3.4
180.	*	3.4	3.4	3.3	3.3	3.3	3.3	3.4	3.4	3.4	3.4
190.	*	3.2	3.2	3.5	3.5	3.5	3.5	3.1	3.1	3.1	3.2
200.	*	3.1	3.1	3.4	3.4	3.4	3.4	3.1	3.1	3.1	3.1
210.	*	3.0	3.0	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
220.	*	3.0	3.0	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
230.	*	3.0	3.0	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
240.	*	3.0	3.0	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
250.	*	3.0	3.0	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
260.	*	3.0	3.0	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
270.	*	3.0	3.0	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
280.	*	3.0	3.0	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
290.	*	3.0	3.0	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
300.	*	3.0	3.0	3.2	3.2	3.2	3.2	3.0	3.0	3.0	3.0
310.	*	3.0	3.0	3.3	3.3	3.3	3.3	3.0	3.0	3.0	3.0
320.	*	3.0	3.1	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
330.	*	3.0	3.2	3.4	3.4	3.4	3.4	3.0	3.0	3.0	3.0
340.	*	3.3	3.2	3.4	3.4	3.4	3.5	3.1	3.1	3.1	3.1
350.	*	3.5	3.5	3.5	3.6	3.6	3.7	3.1	3.1	3.1	3.1

```
------*-------------------------------------------------------
MAX   *   4.0   4.1   3.5   3.6   3.6   3.8   3.5   3.7   3.7   3.9
DEGR. *   10    20   190     0     0     0     0     0     0    10

THE HIGHEST CONCENTRATION OF    4.50 PPM OCCURRED AT RECEPTOR REC25.
```



```
     JOB: SOUTHPARK BRIDGE PROJECT                          RUN: 2027 BRIDGE HIGH LEVEL - TRENTON

     DATE :  9/13/ 2
     TIME : 18: 2: 7

     RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
     THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

         *    CO/LINK  (PPM)
         *    ANGLE (DEGREES)
         *  REC1  REC2  REC3  REC4  REC5  REC6  REC7  REC8  REC9  REC10 REC11 REC12 REC13 REC14 REC15 REC16 REC17 REC18 REC19 REC20
  LINK # *   210   270   260   250   250    90   140   120   100   100   100   100   330   280   270   250   250   260    20    60
  -------*-------------------------------------------------------------------------------------------------------------------------
      1  *    .1    .0    .0    .0    .0    .0    .1    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0
```

2	*	.3	.0	.1	.1	.1	.0	.3	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.0	.0
3	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.1	.0
4	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.1	.1
5	*	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.1	.0	.0	.0	.0	.3	.2
6	*	.1	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	*	.0	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.1	.0	.0	.0	.1	.2
8	*	.0	.1	.0	.0	.0	.0	.3	.3	.1	.1	.0	.0	.0	.1	.0	.0	.0	.0	.3	.3
9	*	.0	.1	.0	.0	.0	.0	.2	.3	.1	.1	.0	.0	.0	.1	.0	.0	.0	.0	.4	.5
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.5	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4	.2	.1	.0	.0	.0	.0	.0
13	*	.0	.1	.1	.0	.0	.0	.2	.2	.3	.3	.3	.3	.0	.1	.1	.0	.0	.0	.1	.1

PAGE 8

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE HIGH LEVEL - TRENTON

DATE : 9/13/ 2

TIME : 18: 2: 7

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
	CO/LINK (PPM)																			
	ANGLE (DEGREES)																			
	70	80	60	70	320	240	210	190	190	190	190	0	20	140	170	170	170	170	0	320
1	.0	.0	.0	.0	.2	.0	.0	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.2	.2
2	.0	.0	.0	.0	.7	.0	.0	.1	.1	.0	.0	.0	.0	.0	.1	.1	.0	.0	.3	.9
3	.0	.0	.0	.0	.0	.2	.2	.2	.3	.3	.3	.1	.2	.1	.1	.1	.1	.1	.1	.0
4	.0	.0	.0	.0	.0	.2	.2	.1	.1	.2	.2	.2	.3	.3	.3	.3	.4	.4	.1	.0
5	.1	.1	.1	.1	.1	.5	.5	.4	.3	.2	.1	.3	.9	.9	.7	.3	.2	.1	.1	.0
6	.0	.0	.0	.0	.1	.0	.0	.1	.1	.0	.0	.1	.0	.0	.1	.1	.0	.0	.1	.1
7	.2	.2	.2	.2	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0
8	.1	.1	.0	.0	.1	.1	.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1
9	.1	.1	.0	.0	.1	.1	.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0
13	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0

JOB: SOUTHPARK BRIDGE PROJECT RUN: 2027 BRIDGE HIGH LEVEL - TRENTON

DATE : 9/13/ 2

TIME : 18: 2: 7

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING

THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50
	* CO/LINK (PPM)										
	* ANGLE (DEGREES)										
LINK #	*	10	20	190	0	0	0	0	0	0	10
1	*	.1	.1	.3	.2	.2	.2	.1	.1	.1	.1
2	*	.3	.4	.0	.1	.1	.2	.1	.1	.1	.2
3	*	.1	.1	.0	.0	.0	.1	.0	.0	.0	.1
4	*	.1	.1	.0	.1	.1	.1	.0	.1	.1	.1
5	*	.1	.1	.0	.1	.1	.1	.0	.1	.1	.1
6	*	.3	.3	.2	.1	.1	.1	.3	.3	.3	.3
7	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

8	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

This page intentionally blank

Appendix S. Noise Technical Report

This page intentionally blank

South Park Bridge Project

Noise Technical Report

Prepared for the

King County
Department of Transportation
201 South Jackson Street
Seattle, Washington 98104

Prepared by

Parsons Brinckerhoff, Inc.
999 Third Avenue, Suite 2200
Seattle, Washington 98104

February 2004

This page intentionally blank

Technical Report
South Park Bridge Project

Noise

February 2004

Prepared for:
King County Department of Transportation
201 South Jackson Street
Seattle, Washington 98104

Prepared by:
Parsons Brinckerhoff, Inc.
999 Third Avenue, Suite 2200
Seattle, Washington 98104

printed on recycled paper

This page intentionally blank

Table of Contents

CHAPTER 1 EXECUTIVE SUMMARY 1

1.1 Project Objectives 1

1.2 Existing Noise Environment and Impacts of Alternatives 1

1.3 Mitigation Measures 1

CHAPTER 2 INTRODUCTION 3

2.1 Description of Existing Conditions 3
2.1.1 The Project Area 3
2.1.2 The Existing South Park Bridge 5
2.1.3 Bridge Condition 5
2.1.4 Roadway Network 9
2.1.5 Freight, Transit, and Pedestrians 9

2.2 History of Project 10
2.2.1 Overview of Studies 10
2.2.2 Summary of Key Engineering Reports 10
2.2.2.1 Sverdrup Study 10
2.2.2.2 Entranco Study 11
2.2.3 Continuing Deterioration 11

2.3 Purpose and Need of Project 12
2.3.1 Function and Role of the South Park Bridge 12
2.3.2 Purpose of Proposed Project 12
2.3.3 Need for the Proposed Project 13
2.3.3.1 Seismic Vulnerability 13
2.3.3.2 Roadway Design Deficiencies 13
2.3.3.3 Transportation Issues 13
2.3.4 Key Issues 14
2.3.4.1 Community Impacts 14
2.3.4.2 Aquatic Habitat Protection 14
2.3.4.3 Duwamish Waterway Navigation 14

2.4 Description of Alternatives 15
2.4.1 Design Criteria 15
2.4.2 The Alternatives 18
2.4.2.1 No Action Alternative 18
2.4.2.2 Rehabilitation Alternative 19
2.4.2.3 Bascule Bridge Alternative 23
2.4.2.4 Mid-Level Fixed-Span Bridge Alternative 27
2.4.2.5 High-Level Fixed-Span Bridge Alternative 28
2.4.3 Construction Durations and Activities 35
2.4.4 Cost Estimates for the Alternatives 39

2.5 Project Coordination 40

CHAPTER 3 STUDIES AND COORDINATION 43

3.1 Characteristics of Noise 43

3.2 Noise Level Descriptors 46

3.3 Effects of Noise 46

3.4 Noise Regulations and Impact Criteria 47
3.4.1 Construction Noise 47
3.4.2 Traffic Noise 48

CHAPTER 4 METHODOLOGY 51

CHAPTER 5 AFFECTED ENVIRONMENT 57

5.1 Description of Study Area 57

5.2 Existing Noise Levels 57

CHAPTER 6 IMPACTS 61

6.1 Direct Impacts 61
6.1.1 No Action Alternative 61
6.1.1.1 Construction 61
6.1.1.2 Operation 61
6.1.2 Bridge Alternatives 61
6.1.2.1 Construction 61
6.1.2.2 Operation 64

CHAPTER 7 MITIGATION 67

7.1 Construction 67

7.2 Operation 68
7.2.1 Traffic Management Measures 69
7.2.2 Land Acquisition for Noise Buffers or Barriers 69
7.2.3 Realigning the Roadway 69
7.2.4 Noise Insulation of Buildings 69
7.2.5 Noise Barriers 69
7.2.5.1 Rehabilitation Alternative, West Wall (Not Feasible) 70
7.2.5.2 Bascule Bridge Alternative, West Wall (Not Feasible) 71
7.2.5.3 Mid-Level Fixed-Span Bridge Alternative, West Wall (Not Feasible) 71
7.2.5.4 Mid-Level Fixed-Span Bridge Alternative, East Wall (Not Feasible) 72
7.2.5.5 High-Level Fixed-Span Bridge Alternative, West Wall (Not Feasible) 73
7.2.5.6 High-Level Fixed-Span Bridge Alternative, East Wall (Not Feasible) 74
7.2.5.7 Summary of Noise Barriers 74

CHAPTER 8 REFERENCES 75

APPENDICES TRAFFIC NOISE MODEL OUTPUT

A Existing Conditions Traffic Noise Model

B 2027 No Action Alternative Traffic Noise Model

C 2027 Rehabilitation Alternative Traffic Noise Models

D 2027 Bascule Bridge Alternative Traffic Noise Models

E 2027 Mid-Level Fixed-Span Bridge Alternative Traffic Noise Models

F 2027 High-Level Fixed-Span Bridge Alternative Traffic Noise Models

List of Tables

Table 1. Summary of Noise Impacts and Mitigation 2
Table 2. Cost Estimates of the Project Alternatives....39
Table 3. Typical Noise Levels (Betsy, can you make sense of this table?) 44
Table 4. King County Maximum Permissible Sound Levels (dBA) 47
Table 5. FHWA Noise Abatement Criteria....49
Table 6. Modeled Traffic Volumes....54
Table 7. Noise Measurement Results....58
Table 8. Noise Modeling Results....58
Table 9. State of Washington Mitigation Allowance for Impacts Caused by Traffic Noise Level....68
Table 10. Summary of Walls Evaluated 70
Table 11. Rehabilitation Alternative, West Wall Area 71
Table 12. Bascule Bridge Alternative, West Wall Area 71
Table 13. Mid-Level Fixed-Span Bridge Alternative, West Wall Area 72
Table 14. Mid-Level Fixed-Span Bridge Alternative, East Wall Area....73
Table 15. High-Level Fixed-Span Bridge Alternative, West Wall Area 73
Table 16. High-Level Fixed-Span Bridge Alternative, East Wall Area 74

List of Figures

Figure 1 Project Area and Vicinity....4
Figure 2 Existing South Park Bridge....7
Figure 3 Existing and Proposed Bridge Cross-Section Designs 16
Figure 4 Existing Conditions Street Network 20
Figure 5 No Action Alternative Street Network 20
Figure 6 Rehabilitation Alternative....21
Figure 7 Rehabilitation Alternative Street Network....24
Figure 8 ascule Bridge Alternative Street Network 24
Figure 9 Bascule Bridge Alternative....25
Figure 10 Mid-Level Fixed-Span Bridge Alternative 29
Figure 11 Mid-Level Fixed-Span Bridge Alternative Street Network....31
Figure 12 High-Level Fixed-Span Bridge Alternative Street Network 31
Figure 13 High-Level Fixed-Span Bridge Alternative....33
Figure 14 Proposed Construction Staging Areas 37
Figure 15 Noise Barrier Effectiveness 45
Figure 16 Noise Measurement and Mode 53
Figure 17 24-Hour Noise Measurement....59
Figure 18 Construction Noise Levels....63

This page intentionally blank

Chapter 1 Executive Summary

1.1 Project Objectives

The purpose of the South Park Bridge Project is to find the most feasible long-term solution to address the deteriorated condition and increasing seismic vulnerability of the South Park Bridge, while maintaining a vital transportation linkage for cars, trucks, buses, bicyclists, and pedestrians across the Duwamish River.

This noise study evaluates the effects on the audible environment associated with the construction and long-term use of five alternatives proposed for the South Park Bridge. These alternatives are No Action, Rehabilitation, Bascule Bridge, Mid-Level Fixed-Span Bridge, and High-Level Fixed-Span Bridge. Each alternative is described in detail in Chapter 2.

1.2 Existing Noise Environment and Impacts of Alternatives

Eight measured sites and seven modeled-only sites, representing 45 residences, were chosen to represent similar residences in the project area. Traffic noise impacts occur at several of the modeled sites under each of the alternatives (see Table 1). Noise impacts occur when operational noise levels would approach or exceed the traffic noise impact criteria adopted from the Federal Highway Administration (FHWA). Noise levels at 5 of the 14 modeled sites currently approach or exceed the FHWA criteria.

1.3 Mitigation Measures

Noise barriers were found not feasible or reasonable along the eastern and western sides of all alternatives considered. Table 1 summarizes noise impacts and mitigation measures for the No Action, Rehabilitation, Bascule Bridge, Mid-Level Fixed-Span Bridge, and High-Level Fixed-Span Bridge alternatives. Noise insulation of the Sea Mar Community Health Center was found to be possibly feasible and requires further analysis prior to project completion. Predicted impacts for each alternative were modeled in greater detail, and the results of this modeling are outlined in the Mitigation section of this report (see Chapter 7).

Construction noise could temporarily affect nearby residents, and mitigation to reduce the effect is proposed.

Insulation of buildings could be feasible for public use or nonprofit institutional structures; however, it is not applicable to privately owned structures. Noise insulation could be used to reduce interior noise levels at Receptor 1, the Sea Mar Community Health Center. Because noise insulation is only effective at reducing interior levels, it is less preferable than other mitigation measures. However, if noise insulation proves feasible and reasonable, it is likely to be appropriate for this project because other measures are not feasible. Additional evaluation is required prior to determining the final need and applicability of the insulation. Prior to issuance of the Draft EIS, an evaluation of the Sea Mar Community Health Center buildings is needed to determine if interior traffic noise impacts are likely to occur based on the building acoustics and use of rooms adjacent to 14th Avenue S. This evaluation is also needed to determine whether the buildings can be retrofitted with acoustic windows and other measures, if needed, and within the reasonableness criteria.

Table 1. Summary of Noise Impacts and Mitigation

Alternative	Construction Impacts	Operation Impacts 2027	Mitigation Measures
Existing Conditions	None	Noise levels approach or exceed FHWA mitigation criteria at five modeled locations, representing 14 residences.	None
No Action	Nearby receptors would experience temporary noise impacts during bridge demolition. No vibration impacts are expected.	Noise levels would approach or exceed FHWA mitigation criteria at three modeled locations, representing 10 residences.	None
Rehabilitation	Receptors near the current bridge would experience temporary noise impacts during project construction. No vibration impacts are expected.	Mitigation at the seven modeled locations (representing 20 residences) was found to be infeasible and/or unreasonable based on FHWA mitigation criteria.	Construction of noise walls would not be feasible. Noise insulation could be applicable to Receptor 1, Sea Mar Community Health Center.
Bascule Bridge	Receptors near the current bridge area to at least S. Cloverdale Street would experience temporary noise impacts during project construction. No vibration impacts are expected.	Mitigation at the eight modeled locations (representing 21 residences) was found to be infeasible and/or unreasonable based on FHWA mitigation criteria.	Construction of noise walls would not be feasible. Noise insulation could be applicable to Receptor 1, Sea Mar Community Health Center.
Mid-Level Fixed-Span Bridge	Receptors from the current bridge area to at least S. Donovan Street would experience temporary noise impacts during project construction. No vibration impacts are expected.	Mitigation at the seven modeled locations (representing 21 residences) was found to be infeasible and/or unreasonable based on FHWA mitigation criteria.	Construction of noise walls would not be feasible. Noise insulation could be applicable to Receptor 1, Sea Mar Community Health Center.
High-Level Fixed-Span Bridge	Receptors from the current bridge area to S. Trenton Street, 12th Avenue S., and north to S. Cloverdale Street would experience temporary noise impacts during project construction. No vibration impacts are expected.	Mitigation at the five modeled locations (representing 16 residences) was found to be infeasible and/or unreasonable based on FHWA mitigation criteria.	Construction of noise walls would not be feasible. Noise insulation could be applicable to Receptor 1, Sea Mar Community Health Center for the one remaining building not acquired for right-of-way.

Chapter 2 Introduction

Chapter 2 is an introduction to the technical analysis contained in this discipline report. This chapter describes existing conditions, the history of the project, the purpose and need for the project, and the five project alternatives being considered for environmental review. In addition, this chapter summarizes project coordination conducted to date with agencies, local governments, the community advisory group, and members of the public.

2.1 Description of Existing Conditions

This first section describes existing conditions pertinent to the proposed South Park Bridge Project. The project area is defined. The existing bridge and its current condition are described. The local roadway network in the South Park community is described. Non-vehicular transportation in the community is also summarized.

2.1.1 The Project Area

The South Park community is about four miles south of downtown Seattle (see Figure 1). The community lies south of the Duwamish Waterway, the man-made channel portion of the Duwamish River as it enters Elliott Bay. Though originally incorporated as its own city in 1905, much of the area was annexed by the City of Seattle in 1907.[1] The project area lies south of the industrial Georgetown area of Seattle and the King County International Airport (known as Boeing Field). It encompasses the roadway corridor defined by 16th Avenue S. between East Marginal Way S. and the South Park Bridge and 14th Avenue S. between the bridge and S. Trenton Street. Residents and business owners in the project area generally identify with the City of Seattle.

The project area, however, is governed by three local government jurisdictions. The area north of the Duwamish Waterway (between East Marginal Way S. and the waterway) lies within the city limits of both the City of Seattle (northern portion) and the City of Tukwila (southern portion). The area south of the Duwamish Waterway (between the waterway and S. Trenton Street) lies within unincorporated King County and the City of Seattle. The two-block area between the riverbank and Dallas Avenue S. is in King County, and the city blocks to the south are in the City of Seattle.

Land uses in the project area are mixed residential, retail commercial, and industrial. The Boeing Company's Plant 2 dominates the north side of the Duwamish Waterway. On the south side, retail commercial and light industrial land uses front on 14th Avenue S. and along the south bank upstream of the South Park Bridge. Single-family residences, however, generally characterize the area off of this main transportation artery.

[1] City of Seattle, *South Park Residential Urban Village Plan*, 1998.

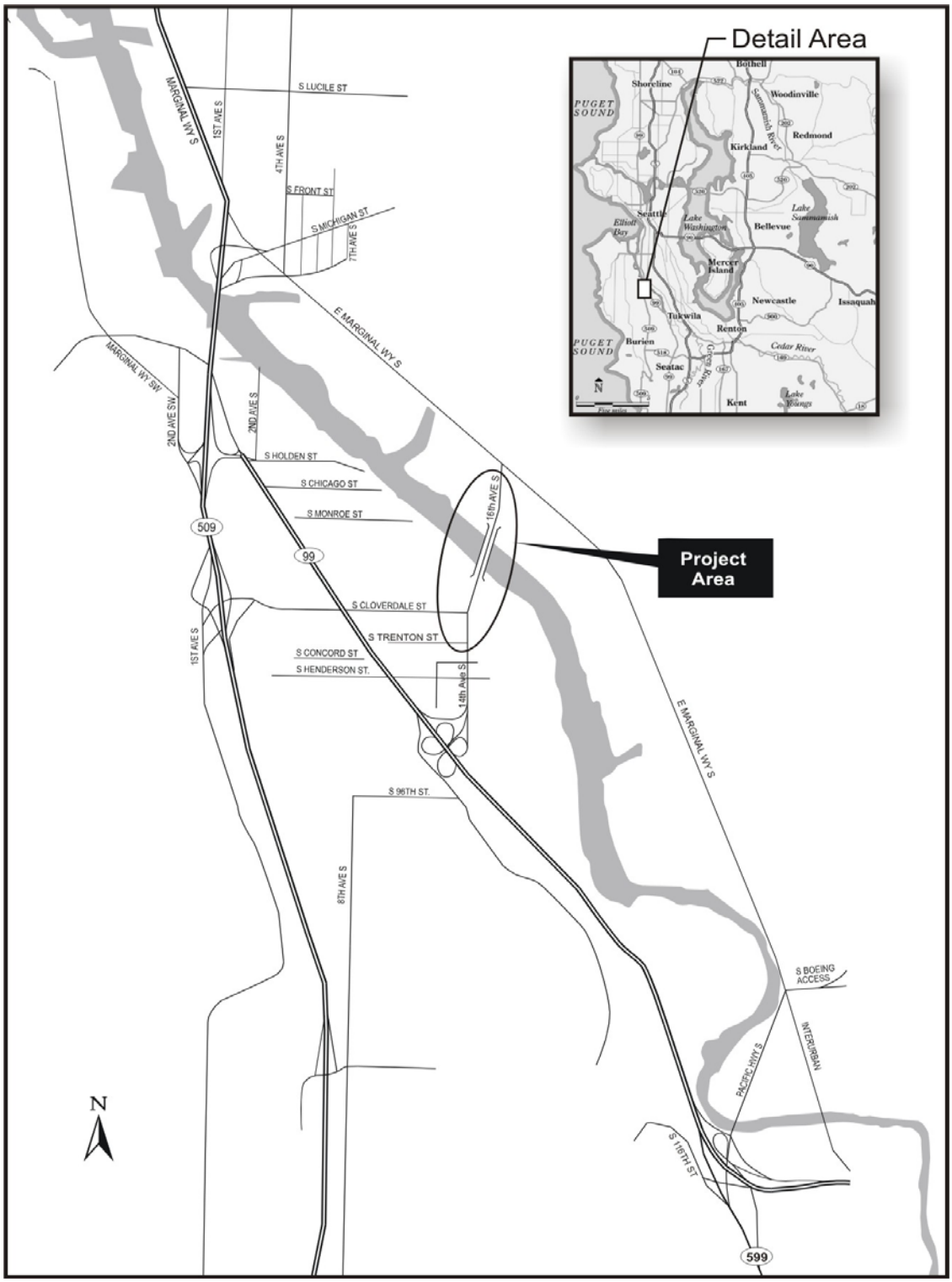


Figure 1
Project Area and Vicinity

2.1.2 The Existing South Park Bridge

The South Park Bridge was constructed in 1929-1931 (see Figure 2). The existing structure consists of a Scherzer rolling-lift double-leaf bascule movable span. Because it is the only operational example of a Scherzer rolling-lift bascule bridge in Washington, the bridge is listed on the National Historic Register.[2]

Each side is flanked by two truss approach spans and twelve concrete slab approach spans. The overall length of the bridge is approximately 1,045 feet abutment-to-abutment and approximately 1,340 feet in entirety to the grade match points. The double-leaf bascule movable span has a center-to-center distance between the front bearing points of approximately 190 feet. The roadway consists of four 9.5-foot lanes. The pavement is 38 feet with 6-foot sidewalks on both sides. Reinforced concrete piers founded on timber piling support the bascule span. Two large in-water piers support the counterweights, track supports, and racks for the rolling lift. The attached towers house the operating machinery, electrical equipment, and operator control room.

The South Park Bridge spans the Duwamish Waterway, which is used for industrial, commercial, and recreational purposes. The bridge is near the upstream limit of heavy industrial uses along the Duwamish Waterway, but it is within the section of the navigation channel maintained by the U.S. Army Corps of Engineers. The existing maximum vertical clearance of the bridge when closed is approximately 34 feet at Mean High Water (MHW). Bridge openings occur approximately three times per day on average to accommodate waterway traffic, although on some days the bridge does not open at all. The existing navigable horizontal clearances is approximately 118 feet at the water level (fender-to-fender), but narrows to 92 feet approximately 114 feet above the water between the open bascule leaves. The depth of the navigation channel is approximately 15 feet at Mean Lower Low-Water (MLLW).

2.1.3 Bridge Condition

In spite of substantial on-going maintenance and repairs, the South Park Bridge has suffered considerable deterioration over the past 70 years. In particular, the bascule piers are cracked and unstable resulting in the misalignment of the movable spans. Consequently, the center lock and glide tracks require on-going modifications and adjustments to allow the bridge to operate properly. Long-term, the stability of the entire bridge is at risk due to the original shallow placement of the supporting piles, which has resulted in movement of the bridge piers over the decades. The condition of the bridge worsened significantly following the Nisqually Earthquake in February 2001, and it remains vulnerable to future seismic events. A 2002 bridge inspection conducted by King County resulted in an existing condition rating of 6.0 out of a possible score of 100

[2] King County Landmarks and Heritage Commission. *Findings and Fact Decision – 14th Avenue South Bridge*, decision made December 19, 1996 and filed January 2, 1997.

This page intentionally blank

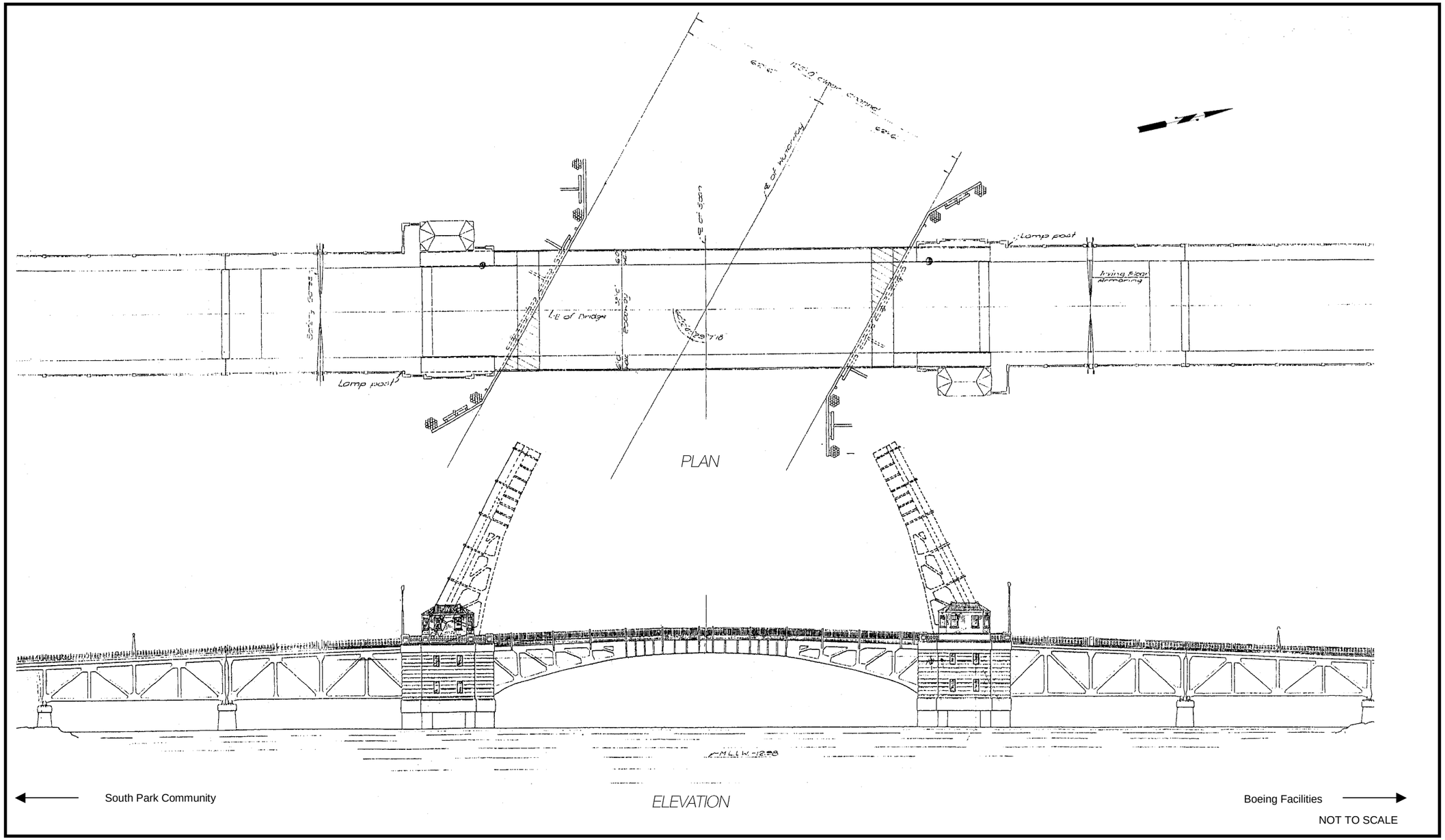


Figure 2
Existing South Park Bridge

This page intentionally blank

(based on Federal Highway Administration criteria).[3] This was among the lowest ratings given any bridge structure in the State of Washington in 2002.

2.1.4 Roadway Network

The bridge presently accommodates an average daily traffic volume of approximately 20,000 vehicles per day, based on 2001 City of Seattle traffic counts. Many of the vehicle trips originate in residential neighborhoods in the communities of West Seattle, White Center, and SeaTac. For South Park community residents, the bridge is the primary direct means of access to the north, downtown Seattle, and I-5.

The existing roadway network surrounding the South Park Bridge consists of a variety of roadway types. They range from local two-lane streets to major limited-access highways. Regional traffic movement in the South Park area is concentrated to three nearby north-south corridors including SR-99, SR-509, and East Marginal Way S. Local circulation is provided through a system of local and collector streets. Features such as the Duwamish Waterway and large-scale facilities such as Boeing Field and the Boeing Plant 2 create barriers within the road network and limit opportunities for access to and from the major regional routes.

2.1.5 Freight, Transit, and Pedestrians

Freight movement in peripheral areas of the South Park community is significant due to the high concentration of industrial and manufacturing uses in the general area. Major truck traffic is primarily directed along East Marginal Way S. and SR-99. The South Park Bridge and S. Cloverdale Street are also designated truck routes for oversized vehicles. Trucks use S. Cloverdale Street to access the City of Seattle South Recycling and Disposal Station located at 8105 Fifth Avenue S. as well as SR-509 and SR-99 located on the western edge of the South Park community. With respect to rail movements, the only train crossing in the study area exists immediately south of the intersection of East Marginal Way S. and 16th Avenue S.

Bus routes serving the South Park community are primarily located along major north-south corridors, including East Marginal Way S., 14th and 16th Avenues S., and S. Cloverdale Street. Six major King County Metro bus routes serve the area. Routes 60 and 130 cross the South Park Bridge and four of the six bus routes travel along S. Cloverdale Street.

Pedestrians and bicyclists are commonly seen in the South Park area, especially near the community's center near the intersection of 14th Avenue S. and S. Cloverdale Street. Mid-day pedestrian volumes are higher than the morning or evening commute periods due to shopping, transit use, and lunch-related walking trips.

---

[3] King County, *Bridge Inspection Report,* August 1, 2002.

2.2 History of Project

Since 1931, the moveable bridge has crossed the Duwamish Waterway in the South Park community of the City of Seattle. The following sections contain an overview of the studies preceding the start of the current environmental review effort, a summary of two key documents that framed the initial development of project alternatives, and ongoing reports documenting the changing condition of the bridge.

2.2.1 Overview of Studies

In recent history, over 20 engineering studies have been prepared on the South Park Bridge. Starting in 1987, when the bridge was 56-years-old, King County contracted for the preparation of a general engineering investigation report to assess the condition of the bridge. In 1991 and 1993, additional studies were completed including a geotechnical study, foundation design report, and a life-cycle cost analysis. This information led King County to undertake a series of studies in 1994 addressing liquefaction risks as well as the condition of the concrete, substructures, approach span joints and loading rating. In addition, a study was conducted to evaluate potential replacement alternatives for the bridge and another study investigated community issues related to the bridge. Since 1994, King County has recognized that the bridge required either rehabilitation or replacement and has continued to investigate the condition and vulnerabilities of the bridge in an effort to evaluate these options.

2.2.2 Summary of Key Engineering Reports

Two key engineering studies were conducted that helped to frame the current pursuit to evaluate potential alternatives to rehabilitate or replace the South Park Bridge. A 1994 Sverdrup study evaluated potential design options and a 1999 Entranco study researched and presented the likely steps required to conduct the necessary environmental review of the project alternatives and to complete necessary permitting. These studies are summarized below.

2.2.2.1 Sverdrup Study

In November 1994, Sverdrup Civil, Inc. completed a report titled *14th/16th Avenue South Park Bridge Rehabilitation/Replacement – Design Report* for the King County Department of Public Works. The objective of that report was to evaluate alternative alignments and bridge types, impacts of the alternatives studied and to present to King County results, findings, conclusions, and recommendations of a preferred replacement bridge for the existing South Park Bridge.

The 1994 design report studied five alternatives: rehabilitation of the existing bridge; two fixed-span bridge replacements (a 100-foot vertical clearance bridge and a 60-foot vertical clearance bridge); a new moveable bridge (double-leaf bascule bridge); and bridge closure (permanent closure and demolition of the existing bridge). Other alternatives that had been evaluated but were not carried forward, according to this report were: locating the replacement bridge immediately east (upstream) of the existing

alignment; matching the existing alignment; and locating the northbound and southbound lanes on separate structures. These three alternatives were not considered feasible and thus were not studied further.

The 1994 design report concluded that the 60-foot vertical clearance fixed-span bridge design could be used to replace the existing South Park Bridge, with consideration of mitigation of impacts to some users.

2.2.2.2 Entranco Study

In July 1999, Entranco completed the *16th Avenue S. Bridge Replacement Project: Environmental Review Report* for the King County Department of Transportation. The objective of this report was to present to King County a summary of environmental review and permitting activities that would likely be required for replacing the bridge.

The report identified the proposed project as a replacement of the existing bridge, including improvements to the approach road – 14th Avenue S. to the south and 16th Avenue S. to the north of the Duwamish Waterway. The project limits were identified as East Marginal Way S. on the north and S. Cloverdale Street on the south. The report asserted three build alternatives should be selected for evaluation in the EIS, including alternatives with differing alignments and bridge types. It was further noted that three alternatives would be the least number needed to provide a reasonable range of alternatives under National Environmental Policy Act (NEPA) and Washington State Environmental Policy Act (SEPA) regulations.

Entranco outlined the various tasks that would be required under the WSDOT Environmental Procedures Manual and FHWA guidelines. The report identified these tasks to include the following: the development of bridge alternatives, screening, and selection of alternatives for analysis in the EIS; preliminary engineering design, including an update to the1994 rehabilitation/replacement report; survey and mapping work; hydraulic and geotechnical studies, and conceptual-level design documentation. The report concluded that the alternatives proposed, including rehabilitation of the existing bridge, had not been designed in enough detail to make a decision regarding a preferred alternative. Related to the environmental review process, the report recommended the public involvement program include coordination with an Interdisciplinary Team (IDT) of agency representatives and a community advisory committee. The report also listed 17 specific environmental discipline reports that would likely be required for the preparation of the EIS.

The findings and recommendations presented in the Entranco report formed the basis from which King County staff developed the current contracted scope of work for environmental review. The scope includes engineering, environmental review, agency coordination, and public involvement tasks.

2.2.3 Continuing Deterioration

Since 1999, King County has continued to move forward to develop alternatives for rehabilitating or replacing the existing South Park Bridge. Bridge conditions have worsened since the engineering studies were conducted in the mid-1990s. In February

2001, the Puget Sound Nisqually Earthquake caused significant and widespread damage to the bridge. Over $740,000 was required to repair the bridge in order to keep it operational.[4] The King County 2001 bridge inspection report recorded a rating of 8.0 out of a total possible score of 100 (based on FHWA criteria).[5] The following year, this rating decreased to 6.0.[6]

2.3 Purpose and Need of Project

As a required element of the EIS, a Purpose and Need Statement was developed for the South Park Bridge Project to clarify the underlying basis for the proposed action. The development of the initial draft Purpose and Need Statement involved review and comment by a number of parties including King County staff and the Project Advisory Committee (PAC) that includes agencies with jurisdiction over the proposed project. The draft Purpose and Need Statement was also revised based on comments received at several public involvement events. In April 2002, King County forwarded the draft Purpose and Need Statement to the FHWA for review and approval. The text of the FHWA-approved version of the Propose and Need Statement is presented in the following sub-sections, although minor revisions and footnotes have been included for clarification.

2.3.1 Function and Role of the South Park Bridge

The King County Department of Transportation (KCDOT) is proposing the rehabilitation or replacement of the South Park Bridge located in King County, Washington. Since 1931 the moveable span bridge has carried traffic along the 14th Avenue South and 16th Avenue South corridor across the Duwamish Waterway. On a typical workday, a mix of approximately 20,000 cars, trucks and buses use the bridge to access employment centers in downtown Seattle and the Duwamish industrial area. Many of the vehicle trips originate in residential neighborhoods in the communities of West Seattle, White Center, and SeaTac. For residents of the community of South Park, the bridge is the only immediate means of access to and from destinations east of the community. The moveable structure spans the navigation channel of the Duwamish Waterway. When open, large-size industrial and recreational vessels have access to upriver destinations. The South Park Bridge is also a major route for heavy truck traffic traveling to and from large industrial manufacturers including the Boeing Company.

2.3.2 Purpose of Proposed Project

The purpose of the proposed action is to find the most feasible long-term solution to address the deteriorated condition and increasing seismic vulnerability of the South Park

---

[4] Tim Lane, King County Department of Transportation, Telephone Conversation, September 23, 2002.

[5] King County, *Bridge Inspection Report,* August 21, 2001.

[6] King County, *Bridge Inspection Report,* August 1, 2002.

Bridge. The proposed action must also maintain the vital transportation linkage for cars, trucks, buses, bicyclists and pedestrians across the Duwamish Waterway.

2.3.3 Need for the Proposed Project

In spite of substantial ongoing maintenance and repairs, the South Park Bridge has suffered substantial deterioration over the past 70 years. Existing problems with the bridge worsened significantly following the Nisqually Earthquake in February 2001 and the bridge remains vulnerable to future seismic events. A recent 2002 bridge inspection conducted by King County resulted in an existing condition rating of 6.0 out of a possible score of 100 (based on FHWA criteria).[7] This is among the lowest ratings given any bridge structure in the State of Washington.

The bridge could be closed as a consequence of excessive structural deterioration or failure of the moveable span operations (particularly in the event of another seismic event). Closure of the bridge would have a significant impact on the transportation system and traffic conditions throughout the lower Duwamish industrial area-- including SR-99, SR-509, First Avenue S. and East Marginal Way S. Improvements are required in the near future to protect public safety and to maintain a transportation corridor that is critical to the local and regional economy.

2.3.3.1 Seismic Vulnerability

The February 28, 2001 Nisqually earthquake (magnitude 6.8, located 35 miles from Seattle and deep below the surface) caused significant damage to the South Park Bridge. Since the earthquake, operation of the moveable span has been less reliable, requiring the bridge to be closed for repairs intermittently for several days. The continuing periodic closure of the bridge for repairs has heightened the awareness of the need for rehabilitation or replacement of the existing bridge.

2.3.3.2 Roadway Design Deficiencies

The South Park Bridge does not meet current roadway design standards and has many design deficiencies. For example, the overall bridge width including lane widths, shoulders and sidewalks should be 64 feet according to current design standards. The existing bridge width is currently only 52 feet (measured outside-to-outside).

2.3.3.3 Transportation Issues

An average of 20,000 daily vehicle trips cross the Duwamish Waterway on the South Park Bridge. It is a significant link between the east and west side of the Duwamish, both locally and regionally. The South Park Bridge is also a route for heavy and oversize truck traffic. According to previous studies, closure of the bridge would have a significant noticeable impact on the transportation system and traffic conditions throughout the lower Duwamish industrial area – including the Highway 99 and East Marginal Way S. corridors.

---

[7] The original text of the FHWA-approved Purpose and Need Statement cited the condition rating of 8.0 from the 2001 King County Bridge Inspection Report. The current cited condition rating of 6.0 is from the King County *Bridge Inspection Report* dated August 1, 2002.

2.3.4 Key Issues

2.3.4.1 Community Impacts

The existing South Park Bridge is a highly valued feature of the South Park community. There is widespread concern in the community that changes to the bridge could have a significant adverse impact on the community and the emerging economic vitality of the South Park business district centered along 14th Avenue South. The *South Park Residential Urban Village Plan of 1998* (the neighborhood plan) identified one of its primary objectives as "finding a solution for the South Park Bridge that is sensitive to the needs of the community."

The South Park community is also ethnically diverse. Approximately 30 percent of the populations' primary language is not English. These factors require greater emphasis on the consideration of environmental justice[8] in order to ensure that the potential adverse effects from the proposed project do not have a disproportionate impact on lower-income or minority populations.

2.3.4.2 Aquatic Habitat Protection

The Duwamish Waterway is an important route for juvenile and adult salmon migrating between the upper Green River, Elliott Bay and the Pacific Ocean. However, much of the waterway in the vicinity of the South Park Bridge currently provides poor habitat for chinook salmon (listed as threatened under the Endangered Species Act) and other marine organisms. The armored shoreline along the waterway in the project area provides minimal habitat for young chinook salmon during their critical rearing period. Recovery plans now underway for threatened and endangered salmon will address potential means of enhancing habitat favorable to the survival and growth of young salmon from the Duwamish/Green River system. Restoration of the shoreline in the vicinity of the project would address immediate and long-term needs for habitat improvement along the Duwamish Waterway.[9]

2.3.4.3 Duwamish Waterway Navigation

The Duwamish Waterway is used for industrial, commercial and recreational purposes. The South Park Bridge is near the upstream limit of heavy industrial uses along the waterway, but it is within the section of the waterway maintained by the U.S. Army Corps of Engineers as a navigation channel. A number of local businesses, as well as the U.S. Coast Guard, have emphasized to King County that any engineering solutions for the South Park Bridge must maintain navigational access upstream of the existing bridge.

---

[8] Environmental justice concerns the need to avoid disproportionate, significant adverse impact on minority and/or low-income communities.

[9] This section highlights the importance of addressing aquatic habitat values in the project area, as well as the implications for species currently listed under the ESA; however, it is not intended as a complete characterization of the factors that need to be considered in this regard.

2.4 Description of Alternatives

This section describes the No Action Alternative, the Rehabilitation Alternative, and the three replacement bridge alternatives (Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridge alternatives). The first section explains the transportation engineering criteria and standards used to design the Rehabilitation Alternative and the three replacement bridge alternatives. The second section describes the horizontal and vertical profile of the bridge alternatives, navigation channel clearances, and impacts to the local road network. The last section describes construction activities associated with each of the five alternatives for the South Park Bridge Project.

2.4.1 Design Criteria

Except for the No Action Alternative, construction of any of the project alternatives would incorporate current transportation engineering design criteria for the cross-section, alignment, design speed, maximum grade, and transition segment. The road cross-section design is a key design element that would change for any of the build alternatives (see Figure 3). The existing bridge cross-section incorporates four 9.5-foot travel lanes, raised curbs on both sides of the pavement, and a 6-foot sidewalk on either side of the roadway. The outside-to-outside dimension of the existing bridge is 52 feet. These lane widths are non-standard and would be changed for the Rehabilitation Alternative and for the three replacement bridge alternatives. For the Rehabilitation Alternative, the pavement would remain approximately the same width as it is currently, but would be reconfigured for three standard lanes. There would be two 12-foot lanes on the outside and one 11-foot lane in the middle of the roadway. Traffic would use one 12-foot lane for northbound travel and the other two lanes for southbound travel. The 6-foot sidewalk on either side of the roadway would be enlarged to approximately 7.5 feet. In contrast, each of the replacement bridge alternatives would be designed with four standard 11-foot lanes, traffic barriers or a painted median down the center, a traffic barrier on each side of the pavement, and a single combined 13-foot pedestrian/bike path on the west (downstream) side of the bridge. The width of the cross-section for the new replacement bridge alternatives including the exterior barriers would total approximately 68 feet (outside-to-outside of the bridge structure).

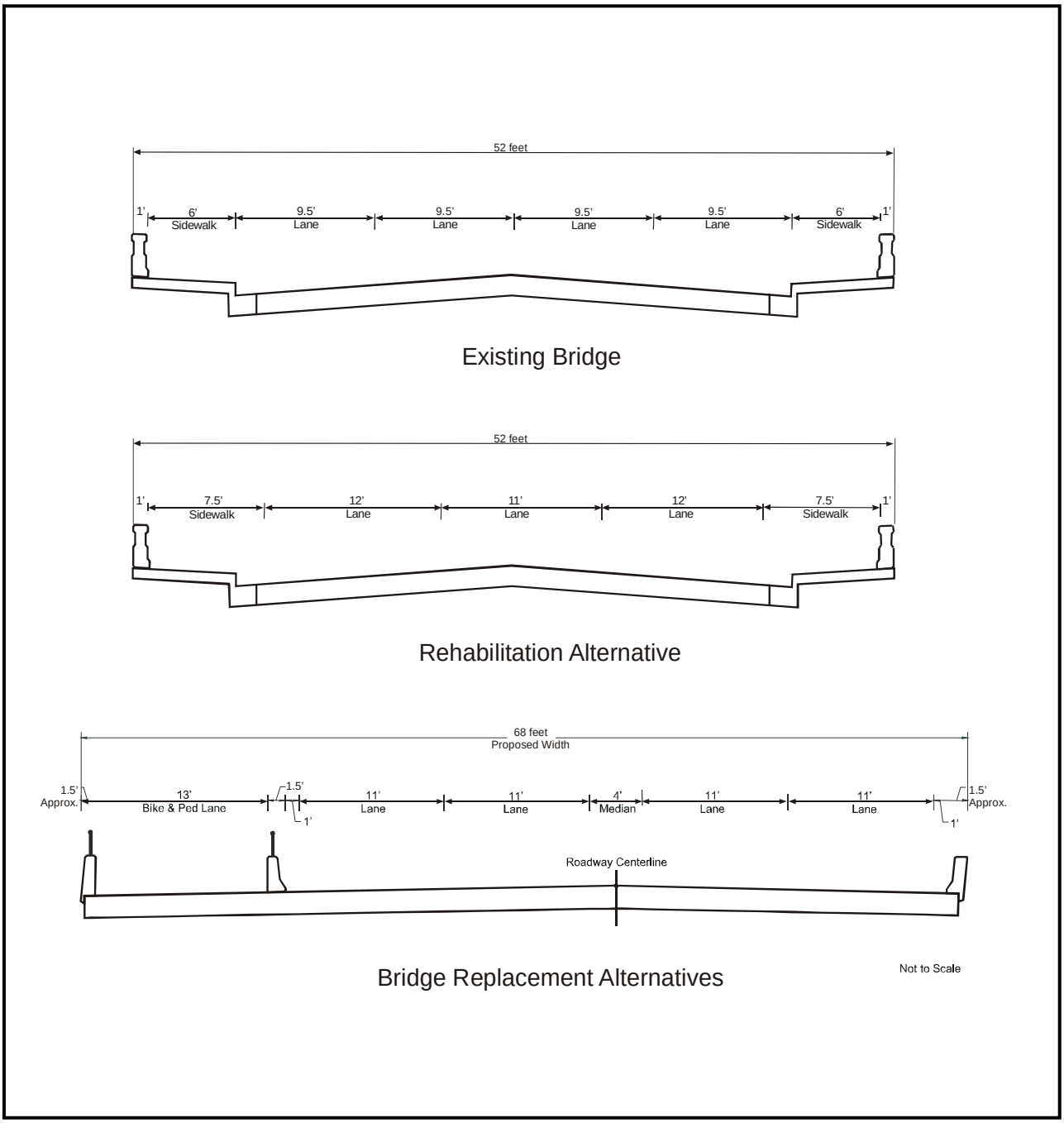


Figure 3
Existing and Proposed
Bridge Cross-Section Designs

An initial range of potential bridge alternatives and alignments was considered based on earlier studies,[10] current input from stakeholders, and the project team. During the course of this initial alternatives development process, it was determined that there were no practical alternative alignments for a replacement bridge other than to parallel the existing bridge. It was determined that replacement bridge alternatives should be aligned to the west (downstream) of the existing bridge in order to minimize impacts to existing land uses. Conceptual engineering for the replacement bridge alternatives set the alignment for these bridges at approximately 80 feet to the west of the centerline of the existing bridge (i.e., as close to the existing structure as practicable without compromising constructability). The initial alignment of the new roadway was the same as the existing road alignment on the south side of the waterway. The existing roadway is quite narrow. Matching the centerline of the new bridge alternatives to the existing would require acquisition of both land and buildings on both sides of 14th Avenue S. To minimize these impacts, the alignment of the new transition segment was shifted slightly to the east of the existing road alignment because there are fewer parcels and buildings located on the east side of the road compared to the west. In addition, more of the buildings located on the east side are set back from the existing sidewalk than on the west side. In this way, the proposed alignment for the replacement alternatives has been developed to avoid or minimize potential land use and relocation impacts.

Other design factors affecting impacts to adjacent properties include the new bridge's design speed and maximum grade. King County road standards call for a 35 mph design speed and a maximum of 8 percent grade. Initially, these standards were incorporated into each of the alternatives. Implementation of an 8 percent maximum grade for the High-Level Fixed-Span Bridge Alternative, however, would have resulted in a very long bridge (project terminus to terminus). For example, the north terminus would have extended across East Marginal Way S. and into Boeing Field. To reduce impacts to land use, the maximum grade for the High-Level Fixed-Span Bridge Alternative would need to slightly exceed 8 percent. In this manner, the north side of the bridge would terminate south of East Marginal Way S. This grade change reduced the overall length of the bridge on both south and north ends of the bridge by several hundred feet for the High-Level Fixed-Span Alternative.

Community impacts would also be affected depending on the design of the transition segment. This is the segment of the roadway that merges the differing widths of the new roadway and the existing narrow roadway. Typically, transition segments begin at the point the grade of the bridge matches the grade of the existing roadway and extends beyond some distance. The actual rate at which the width of the roadway is reduced is defined by transportation engineering design standards. To minimize impacts to land uses along 14th Avenue S., King County proposes to start the transition segment from the abutment for all alternatives. This means that by the time the bridge matches the grade of the existing roadway, the width of the new bridge is nearly the same width as the existing road. As a result, the total length of the roadway is reduced potentially several hundred

[10] Entranco, Inc., *Environmental Review Report: 16th Avenue S. Bridge Replacement*, July 1999.

feet in length. In addition, the width of the transition segment for the Mid-Level Fixed-Span Alternative is further reduced by having the single combined 13-foot pedestrian/bike path split off from the main bridge structure at approximately S. Orr Street and descended to ground level in a zigzag fashion. This design modification further reduced the overall impact of the Mid-Level Fixed-Span Alternative.

Together, the design criteria discussed in this section would allow for the construction of a replacement bridge that provides increased safety for vehicles, bicyclists, and pedestrians.

2.4.2 The Alternatives

A total of five alternatives were selected for evaluation in the environmental review process including: the No Action Alternative, the Rehabilitation Alternative, the Bascule Bridge Alternative, the Mid-Level Fixed-Span Bridge Alternative, and the High-Level Fixed-Span Bridge Alternative. These alternatives were selected from an initial group of nine preliminary project alternatives.[11] The alternatives proposed for evaluation in the environmental review process were selected because they had fewer potential impacts than the other preliminary alternatives. Based on comparison ratings for seven evaluation criteria (regional mobility, local access, navigation, community impacts, aquatic habitat, construction impacts, and estimated project costs), the following preliminary alternatives were dropped from further consideration: a low-level fixed-span bridge, a movable swing bridge, a vertical lift movable bridge, and a tunnel option. The following sections describe each of the proposed project alternatives to be considered in the environmental review process based on conceptual civil and structural engineering.[12] [13]

2.4.2.1 No Action Alternative

The No Action Alternative assumes that the existing bridge structure's poor condition would require it to be closed at some time in the future. Deterioration due to use could allow the bridge to continue to operate for the foreseeable future, but at some time in the future, the bridge would need to be closed. As such, for purposes of environmental review, it is assumed the existing bridge would be closed permanently sometime before 2027.

However, the bridge could be closed for other reasons than simply deteriorated condition. Another earthquake could cause an unexpected emergency closure of the bridge at any time. The on-going movement of the bridge foundations could eventually cause the moveable spans to become misaligned to the extent that repairs would be infeasible. Or, the cost of maintaining the bridge could become more than King County is willing to expend. Under any of these circumstances, the bridge would be closed.

---

[11] Parsons Brinckerhoff. *South Park Bridge Project: Summary Technical Memo - Alternatives Development and Screening*, September 6, 2002.

[12] Parsons Brinckerhoff. *South Park Bridge Project: Conceptual Plans*, June 2003.

[13] Parsons Brinckerhoff. *South Park Bridge Project: Structural Alternatives Study*, November 2003.

When closed, no vehicular, bicycle, or pedestrian traffic would be allowed to use the bridge. As a navigable waterway, the U.S. Coast Guard regulates bridges that span waterways such as the Duwamish Waterway. If the bridge were no longer operating, the U.S. Coast Guard regulations would require demolition and removal of the bridge. With no structures remaining, there would be no potential navigation obstructions in the Duwamish Waterway.

Under this alternative, there would be no change in the local street network except 14th and 16th Avenue S. would be dead-ended on both the south and north shores of the Duwamish Waterway. Figure **4** shows the existing local street network and Figure 5 shows the local street network following the removal of the existing bridge in the No Action Alternative. As the road does not currently provide direct access to the adjacent Boeing Company properties, the exact location of the road closure on the north side would need to be negotiated with Boeing as well as the owner of the railroad tracks immediately south of East Marginal Way S. In addition, the site of the removed bridge would be restored.

2.4.2.2 Rehabilitation Alternative

For the Rehabilitation Alternative, much of the existing bridge structure would need to be replaced. The existing steel trusses of the approach spans and the bascule leaves would be refurbished and reused. The mechanical and electrical operating systems would be refurbished and/or replaced. Studies have confirmed the existing bridge piers are gradually shifting because the foundation pilings were not originally driven to a sufficient depth. Although the initial goal was to rehabilitate the existing piers, the design team's structural analyses determined that the existing bascule piers and truss approach span piers must be replaced in order to ensure the long-term (approximately 75 years) integrity of the bridge. If the bascule piers were reconstructed, the longevity of the Rehabilitation Alternative would be similar to the expected minimum life of a new bridge structure.

For the Rehabilitation Alternative, the new bascule piers are proposed to be approximately the same size, location, and historic character as the existing piers (see Figure 6). To construct the new bascule piers, the bascule leaves and steel approach spans would need to be removed. The steel truss elements of the bridge structure would be taken to another site for repair, refurbishment, and/or painting before they are re-installed following the construction of the new piers. The concrete shafts or pilings supporting the foundations of the new piers would extend below the existing pilings to a depth beneath the riverbed where stable soils exist. The removal of the steel truss spans would also allow for replacement of the steel approach piers. The concrete approach spans and bridge abutments would be replaced and the bridge deck would be reconstructed. Like the existing bridge, there would be piers both on land and in the water. The first on-land piers would be only an estimated 20 feet from the top of the south embankment and the closest in-water piers would be approximately 20 feet from the top of the embankment. The piers on the north shoreline would extend through the

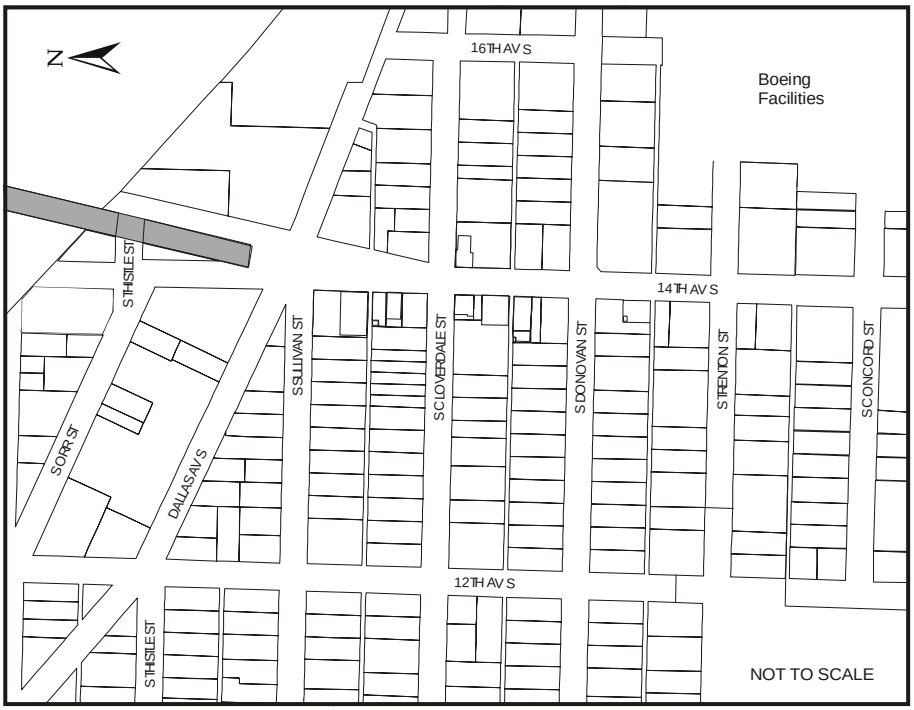


Figure 4
Existing Conditions Street Network

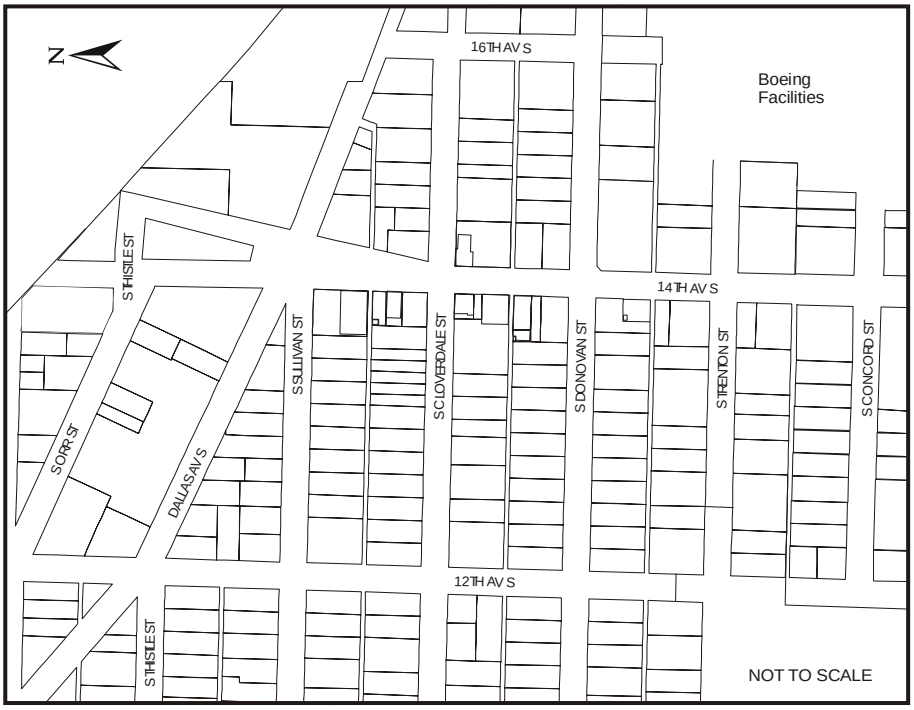


Figure 5
No Action Alternative Street Network

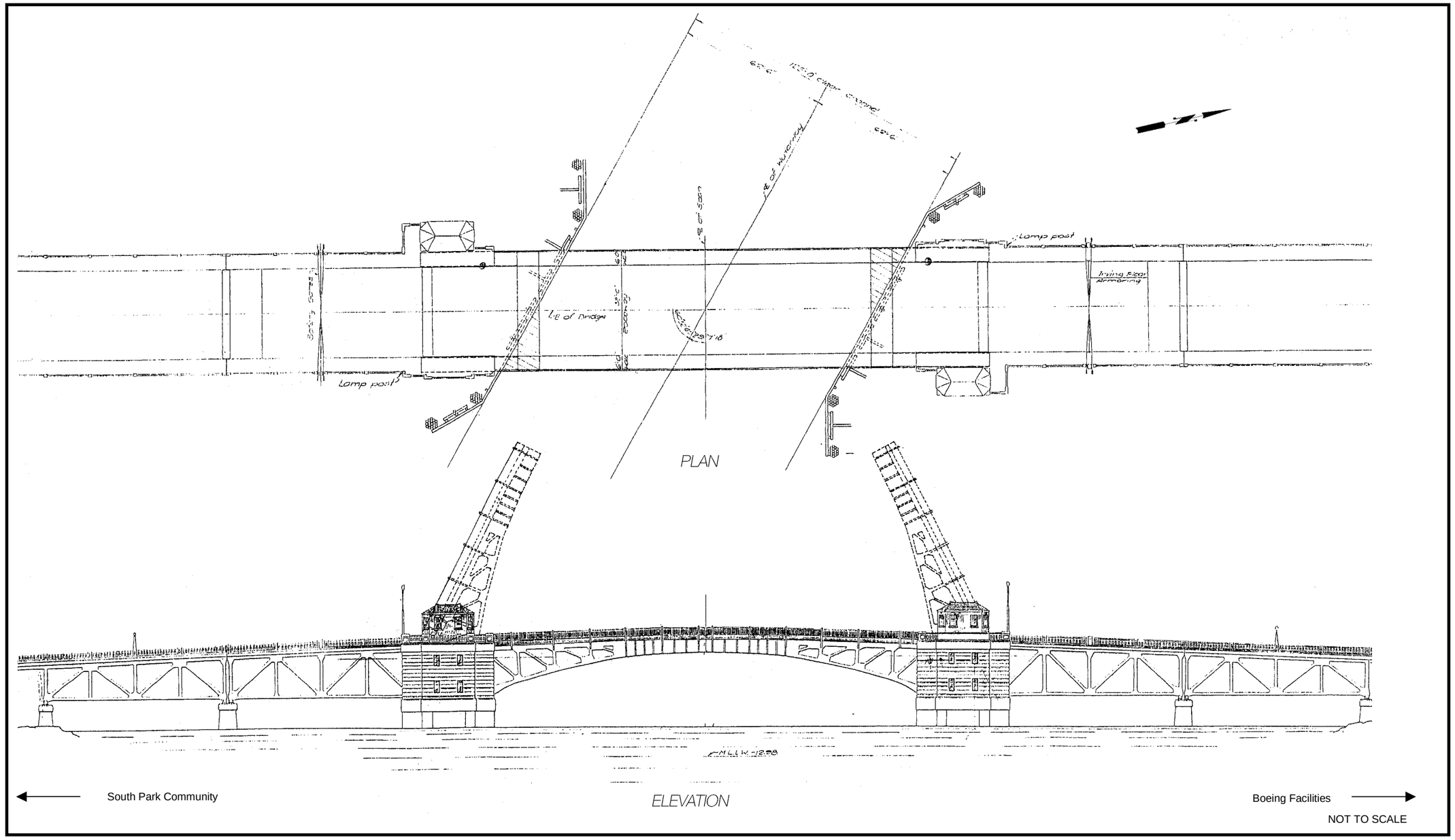


Figure 6
Rehabilitation Alternative

This page intentionally blank

existing Boeing dock. The conceptual engineering analysis also determined that the mechanical and electrical systems should be replaced. Any required construction activities, including replacement of the bridge railings, bridge tender towers, and lamp posts, would be done in a manner that preserves the historic character of the existing bridge to the greatest extent possible.

To meet current roadway design standards, the new bridge deck would remain approximately the same as the existing, but the pavement would be striped to accommodate three standard traffic lanes. Bicycle and pedestrian traffic would continue to be able to use the bridge via a 7.5-foot pedestrian path on each side of the bridge.

Following construction, the existing 118-foot navigable channel width would be preserved so existing waterway users would be able to continue to use the navigation channel to travel upriver of the South Park Bridge. The extended closure of the bridge during construction, however, would have a significant temporary impact on access to the South Park community.

Following construction, there would be only slight changes in the local street network. Figure 7 shows the local street network in the South Park community following construction activities for the rehabilitation of the existing bridge. The figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. (For comparison, Figure 8 shows the local street network following the construction of the Bascule Bridge Alternative.) To improve vehicular safety, S. Sullivan Street would intersect Dallas Avenue S., which would become the main cross street intersection with 14th Avenue S. The 16th Avenue S. (immediately east of the bridge) intersection with Dallas Avenue S. as well as 14th Avenue S. may also need to be reconfigured. Access to points north via the South Park Bridge would be maintained.

2.4.2.3 Bascule Bridge Alternative

The Bascule Bridge Alternative would result in the construction of a new movable bridge immediately downriver of the existing bridge (see Figure 9). The bridge mechanism could be a Scherzer rolling lift type (no longer a common design for new movable bridges) or another type. The bridge length would be approximately 935 feet from abutment-to-abutment, not including roadway approaches. Road improvements would extend from a point just north of S. Cloverdale Street on the south side of the waterway and north to a point opposite the northeast corner of Boeing Building 2-15. The interior walls of the bridge abutments would be approximately 200 feet from the top of the embankment, or approximately 50 feet closer to the shore than the existing bridge. With fewer piers than the existing bridge, the first on-land piers of this alternative would be approximately 55 feet from the top of the south embankment at the shortest distance and the closest in-water piers would be approximately 65 feet away. On the north shoreline, the closest in-water piers would be approximately 95 feet from the top of the embankment and the closest on-land piers would be approximately 30 feet away. Unlike

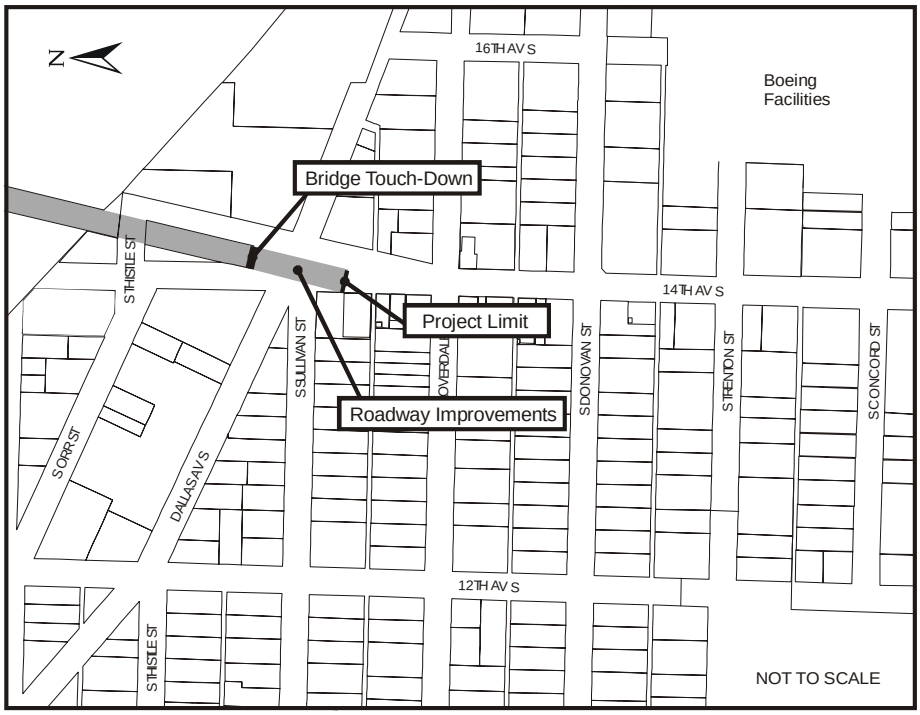


Figure 7
Rehabilitation Alternative Street Network

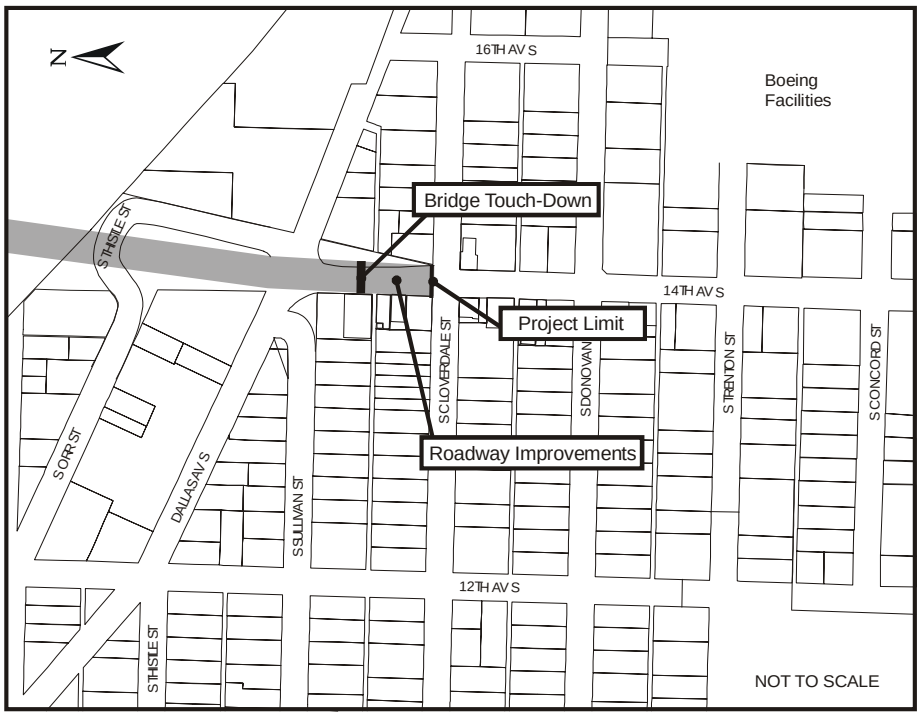


Figure 8
Bascule Bridge Alternative Street Network

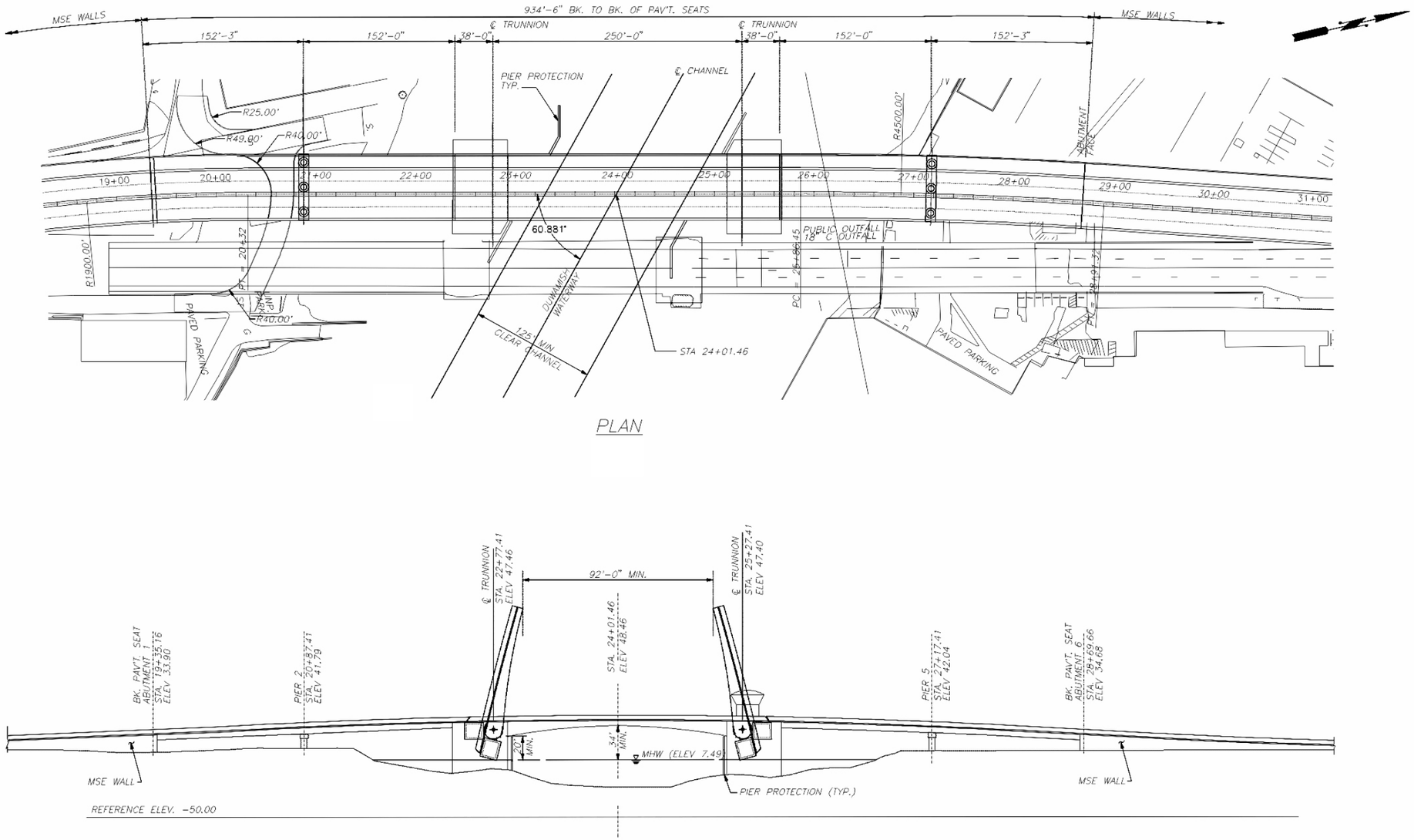


Figure 9
Bascule Bridge Alternative

This page intentionally blank

the existing bridge's grated bascule leaves, the bridge deck of the bascule leaves would be solid surface to improve vehicle traction and to control stormwater runoff.

Similar to the existing bascule bridge, this bridge profile would be approximately 34 feet above the Duwamish Waterway when in the closed position. The mid-section span would be comprised of two movable leaves that could be raised to open the bridge. The navigation channel would be approximately 125 feet in width (slightly greater than the existing 118-foot-wide channel). This two-leaf bascule bridge would not impose limitations to the height of waterway users passing the bridge, because the new bridge would be approximately 125 feet between the tips of the raised spans.

Following construction, there would be some change in the local street network (see Figure 8). S. Sullivan Street would be permanently closed or reconfigured to improve traffic safety and vehicular and truck turning movements from the new bascule bridge to Dallas Avenue S. S. Sullivan Street would no longer have direct access to 14th Avenue S. and the bridge. The intersection of 16th Avenue S. (immediately east of the bridge) and Dallas Avenue S. may also need to be reconfigured. To ensure adequate vertical clearance for vehicles, S. Thistle Street would need to be slightly realigned further to the north and closer to the Duwamish Waterway. This figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. Access to points north via the South Park Bridge would be maintained. Following construction and transfer of the traffic to the new bridge, the existing bridge would be demolished and removed as described for the No Action Alternative.

2.4.2.4 Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge Alternative would result in the construction of a non-movable bridge (see Figure 10). The bridge length would be approximately 1,660 feet abutment-to-abutment, not including roadway approaches. The interior walls of the abutments would be approximately 550 feet from the top of the Duwamish Waterway embankment, or 300 feet further setback than the existing bridge. The closest on-land piers would be approximately 85 feet from the south embankment and the closest in-water piers would be approximately 100 feet away. On the north side, the closest in-water piers would be approximately 130 feet from the top of the embankment and the closest on-land piers would be approximately 65 feet away. Road improvements would extend slightly north of S. Donovan Street and north to a point approximately 320 feet south of East Marginal Way S.

The mid-point of the bridge profile across the Duwamish Waterway would be approximately 65 feet above MHW of the Duwamish Waterway. The horizontal clearance would be approximately 125 feet, or slightly greater than the existing clearance. The vertical clearance, however, would restrict use of some waterway traffic, including some tugs and barges. Most vessels that currently pass the existing bridge would continue to be able to use the navigation channel. As described earlier in the discussion of the design considerations, the width of the new mid-level bridge is reduced when the bike-pedestrian path is separated from the elevated approach roadway near the south side abutment. This design feature reduces land use and relocation impacts.

Following construction, there would be changes in the local street network (see Figure 11). (For comparison, Figure 12 shows the local street network following the construction of the High-Level Fixed-Span Bridge Alternative.) The location of the south abutment and its vertical clearance would require modification of Dallas Avenue S. and S. Sullivan Street. S. Sullivan Street would likely be merged into Dallas Avenue S. just west of the new structure and a new roadway would be constructed under the new bridge. The alignment of this roadway would be slightly to the north to ensure it would have a minimum allowable vertical clearance. Neither street would have direct access to the new South Park Bridge. Figure 11 also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. A retaining wall supporting the elevated approach roadway would be constructed immediately adjacent to properties fronting on the both sides of 14th Avenue S. for the majority of the distance between S. Sullivan Street and S. Cloverdale Street. Traffic would be able to access the bridge at S. Cloverdale Street, which would be raised a maximum of approximately 5 feet at the intersection to meet the descending grade of the bridge. This change in the intersection would allow traffic on S. Cloverdale Street to continue to have direct access to 14th Avenue S. though a retaining wall would also need to be constructed around the four corners of the intersection of S. Cloverdale Street and 14th Avenue S. due to the grade change. S. Orr Street would be closed due to the location of the support structures for the proposed separated pedestrian/bike path, which would allow bicyclists and pedestrians to descend from the bridge level to the street level. In addition, S. Thistle Street would be closed as it would no longer be able to connect to S. Orr Street. Following construction and transfer of the traffic to the new bridge, the existing bridge would be demolished and removed as described for the No Action Alternative.

2.4.2.5 High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative is a non-movable bridge (see Figure 13). The bridge length would be approximately 2,332 feet abutment-to-abutment, not including roadway approaches. The interior walls of the abutments would be approximately 900 feet from the top of the Duwamish Waterway embankment, or 650 feet further set back than the existing bridge. The on-land and in-water piers of this alternative are approximately in the same location as proposed for the Mid-Level Fixed-Span Bridge Alternative. Road improvements would extend from S. Trenton Street and continue north to East Marginal Way S. This alternative would require minor modification of the 16th Avenue S. East Marginal Way S. intersection and of the existing railroad track crossing immediately south of this intersection.

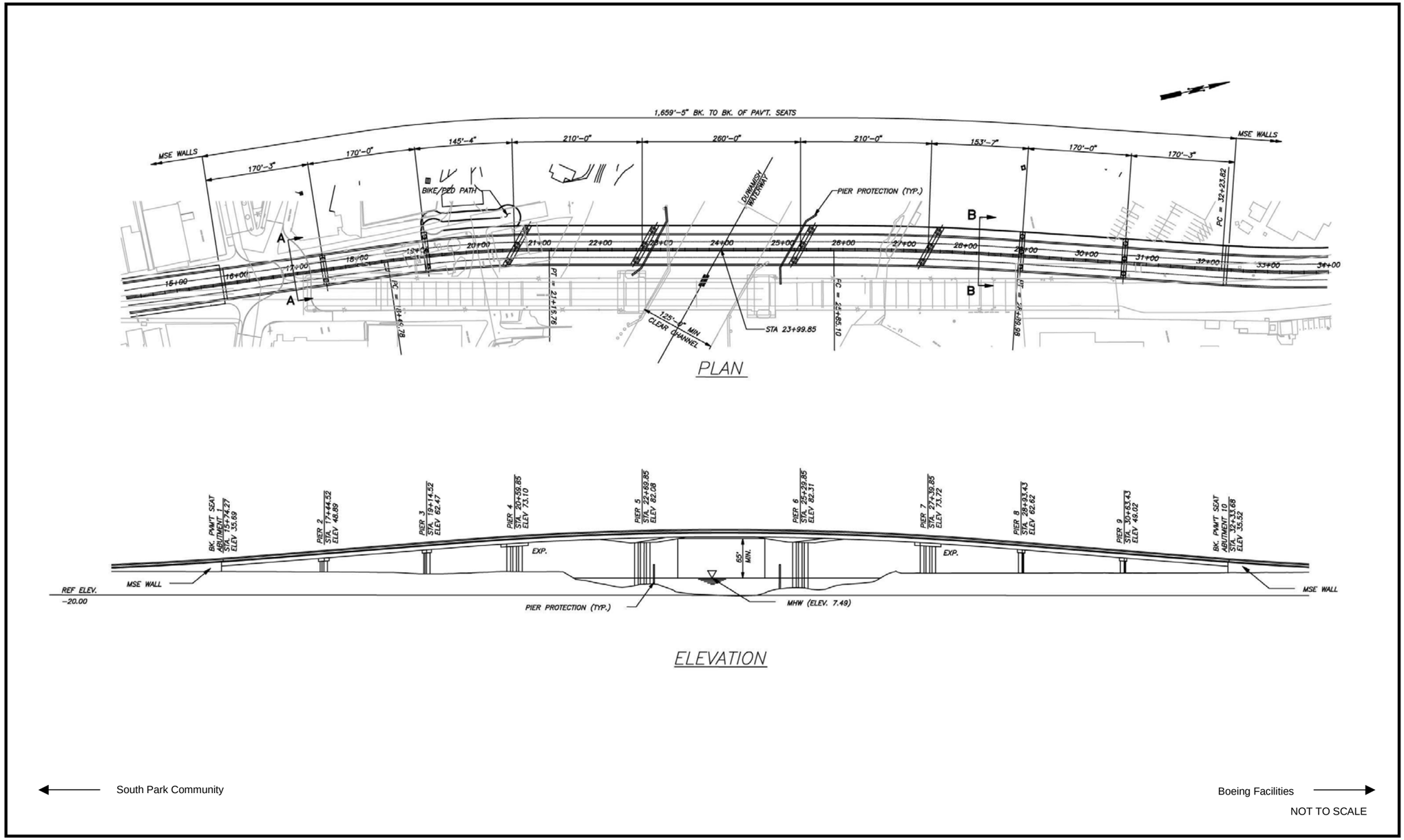


Figure 10
Mid-Level Fixed-Span
Bridge Alternative

This page intentionally blank

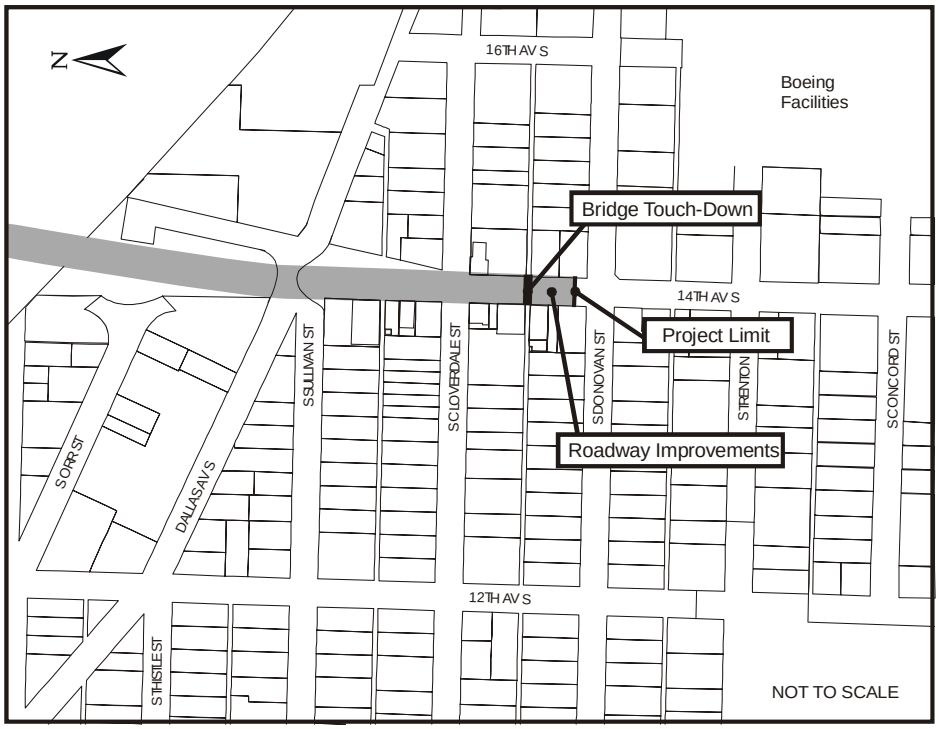


Figure 11
Mid-Level Fixed-Span Bridge Alternative Street Network

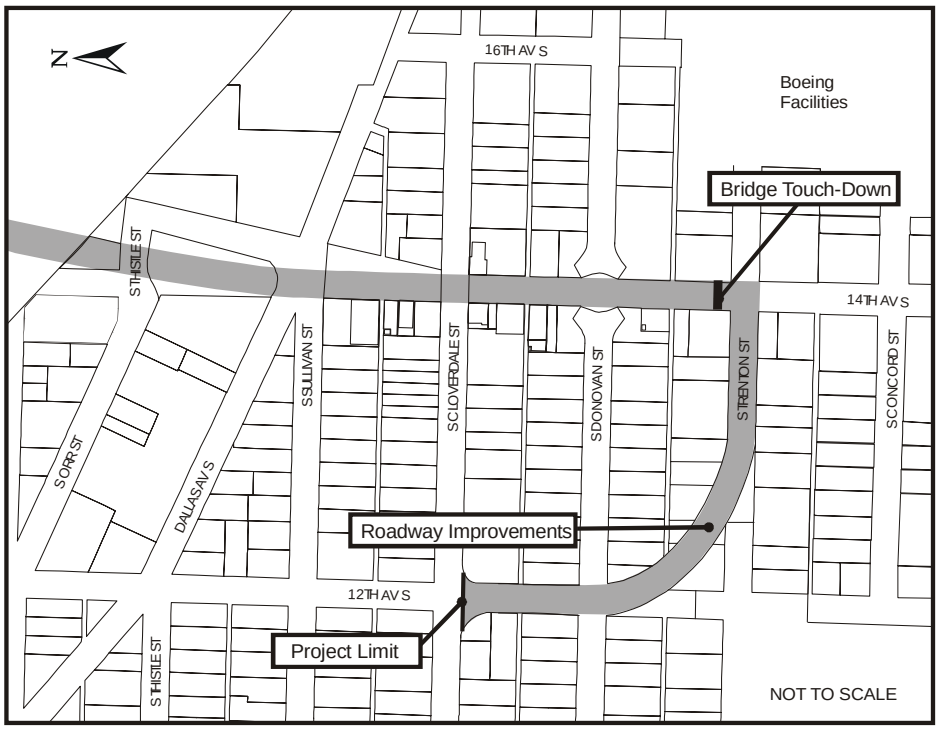
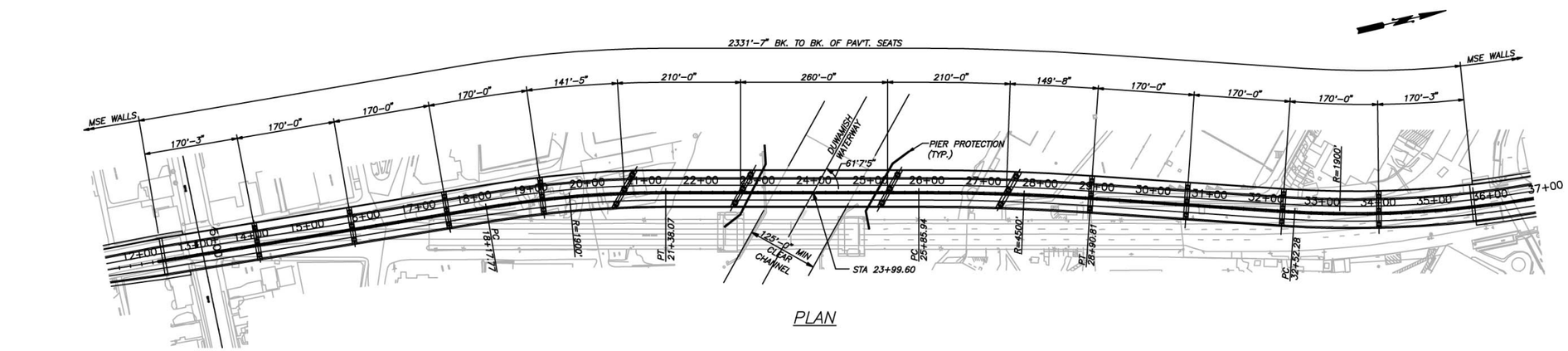
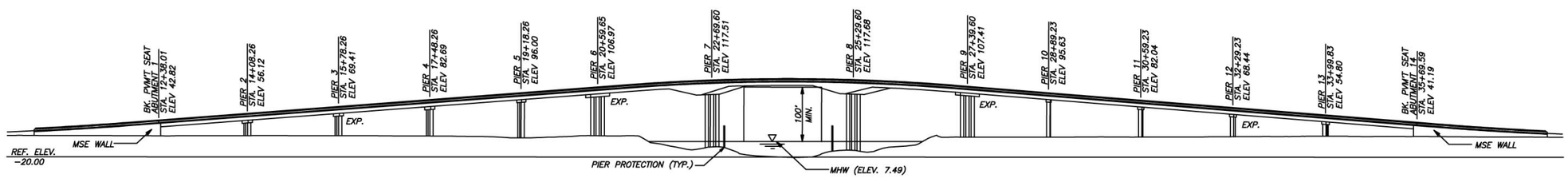


Figure 12
High-Level Fixed-Span Bridge Alternative Street Network

This page intentionally blank



PLAN



ELEVATION

South Park Community

Boeing Facilities

NOT TO SCALE

Figure 13
High-Level Fixed-Span Bridge Alternative

This page intentionally blank

The bridge design would allow for approximately 100 feet of vertical clearance above the MHW of the Duwamish Waterway as requested by the U.S. Coast Guard. The horizontal waterway clearance for the navigation channel would be approximately 125 feet, which is slightly greater than the existing 118-foot clearance (fender-to-fender). The bridge's vertical clearance would not be expected to limit the height of boats and barges currently passing the bridge. However, vessels larger than those currently using the navigation channel might not be able to pass the bridge in the future.

Following construction, there would be numerous changes in the local street network as shown in Figure 12. The figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. The bridge south abutment would require Dallas Avenue S., S. Sullivan Street, and S. Cloverdale Street to be converted to underpasses under the new South Park Bridge. A retaining wall supporting the elevated approach roadway would be constructed immediately adjacent to properties fronting on both sides of 14th Avenue S. for the majority of the two-block distance between S. Cloverdale Street and S. Trenton Street. S. Donovan Street would be closed at 14th Avenue S. due to obstruction from the bridge abutment and a vehicle turn-around would be constructed on either side of the abutment on S. Donovan Street. To allow traffic to access the new South Park Bridge, a new principle arterial roadway would need to be constructed between S. Trenton Street and 12th Avenue S. and road improvements would be required on 12th Avenue S. north to S. Cloverdale Street. This new route would allow traffic, trucks, and buses to continue to access the new South Park Bridge from S. Cloverdale Street via 12th Avenue S. and S. Trenton Street. Following construction and transfer of the traffic to the new bridge, the existing bridge would be demolished and removed as described for the No Action Alternative.

2.4.3 Construction Durations and Activities

Construction of a rehabilitation or replacement bridge for the existing South Park Bridge is planned to take approximately two to three years, including the demolition and removal of the existing bridge. Construction is anticipated to start within the next several years and opening of the rehabilitation or a replacement bridge is currently anticipated to occur by 2009. The actual time required for construction activities vary for each of the alternatives. Construction activities associated with the No Action Alternative involves only demolition of the existing bridge and restoration of the site. The construction period for this alternative would be the shortest of all alternatives, approximately 8 months. The other alternatives would additionally require rehabilitation or construction of a new replacement bridge. Anticipated construction durations (demolition of existing and construction of new) would be approximately 32 months for the Rehabilitation Alternative, 33 months for the Bascule Bridge Alternative, 20 months for the Mid-Level Fixed-Span Bridge Alternative, and 24 months for the High-Level Fixed-Span Bridge Alternative.[14]

[14] Parsons Brinckerhoff. *South Park Bridge Project: Structural Alternatives Study*, November 2003.

From a construction perspective, the five project alternatives include three different types of construction activities. The No Action Alternative assumes the existing bridge condition would eventually require closure and removal of the bridge structures. Construction activities would focus on demolishing the existing bridge and restoring the project area. The Rehabilitation Alternative would require bridge closure for approximately 30 months for rehabilitation or replacement of various elements of the existing bridge. The Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridge alternatives would all result in constructing a replacement bridge approximately 80 feet downstream of the existing bridge. For these three alternatives, the new bridge would be constructed while the existing bridge continues to be operational. When the new bridge is connected to the existing road, there would be short-term temporary bridge closures. These closures could be limited to weekends or could extend for approximately one month, depending on the alternative. Once the new bridge is completed, traffic would be rerouted to the new bridge and then the existing bridge structure would be demolished in a similar fashion as described for the No Action Alternative.

Rehabilitation of the existing bridge would require closure of the existing bridge for approximately 30 months, although efforts would be made to minimize the closure period as much as possible. Reconstruction activities would begin as soon as possible after completion of design engineering and acquisition of construction permits. Traffic would be given advance notice to take alternate routes prior to closure of the existing bridge. The construction of a temporary dock and a construction staging area would be required on both banks of the waterway (see Figure 14). Construction of the new bascule piers would likely be the first major construction activity. This would entail removing the existing pier protection fenders, installing temporary supports for the bridge superstructure, removing the bascule leaves as well as the steel truss spans, installing cofferdams around the existing steel truss approach piers and bascule piers, and demolishing the existing piers.

The bascule leaves and steel truss approach spans would be removed from the construction site for refurbishment. Construction of the new piers would involve drilling shafts through the existing timber piles, constructing the pile cap, dewatering the construction area inside the cofferdam, constructing the upper portions of the pier, removing the cofferdam, and finally reconstructing the upper portions of the bascule pier and bridge towers. Workers would reconstruct the concrete approach spans and replace the abutments. Workers would also reconstruct the bridge deck and replace the mechanical and electrical systems used to operate the bridge. Replacement of the piers, bridge tender towers, bridge railings, and lamp posts would be done in a manner that would preserve the historic character of these features of the existing bridge.

Major construction activities and sequencing would be similar for the Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridge alternatives. The construction duration and the impact area for each of these three alternatives, however, would clearly differ. Following completion of design engineering, acquisition of construction permits, purchase of needed property, and relocation of residents and businesses, construction

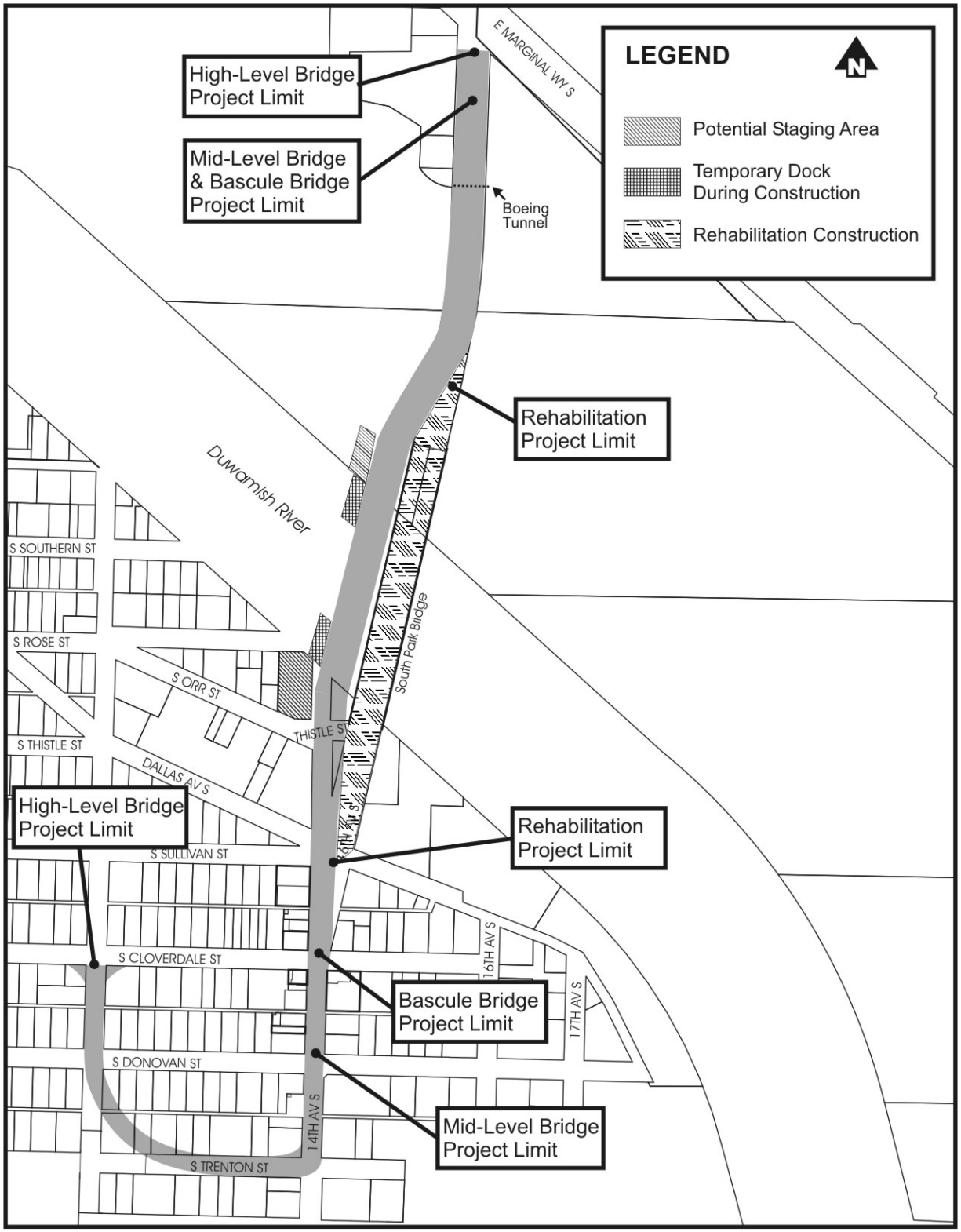


Figure 14
Proposed Construction Staging Areas

activities would begin. The first activities would include establishing the construction staging areas and constructing temporary docks with pilings on both sides of the waterway (see Figure 14).

Buildings affected by the construction activities would be demolished and utilities would be either temporarily or permanently relocated. To minimize traffic impacts, construction activities would begin with the construction of the in-water piers. Construction activities would progress landward from the central portion of each bridge alternative. Both in-water and on-land construction would begin with construction of the sub-structures (piers and abutment) and would be followed by placement of the superstructure (beams, deck, rails). On-land construction of the piers, abutment, retaining walls, and transition segments at either end of the bridge would likely require temporary closure of adjacent or nearby roads and rerouting of local traffic. If possible, these temporary closures would be limited to weekend and/or night times to minimize impacts to the community. Construction activities on the north and south portions of the new bridge structures could also occur either separately or concurrently. The last of the construction activities would be the construction of the new curb and gutter of the at-grade roadway, and paving the roadway to match the existing width of 14th Avenue S. Figure 14 shows the project limits, or start and end points, of construction activities for each of the project build alternatives.

For the rehabilitation and new bridge alternatives, new girders and other oversized materials would most likely be delivered to the project site by barge. Large cranes located on the barges or temporary docks would off-load the materials and place them in the nearby construction staging area. Removal of the existing bridge pier foundations and construction of the new bascule and steel truss piers would all require the use of cofferdams to isolate the construction activities. Construction of the new approach-span piers would use drilled shafts, which would likely incorporate the use of temporary casings to isolate the construction activities. This in-water work would be performed by equipment operated from the temporary docks or from barges.

Demolition of the existing bridge would involve disassembly and removal of the existing bascule leaves, superstructure, bridge piers, protection fenders, and abutment. Cranes would use the existing bridge structure and approaches as much as possible to remove the various elements of the bridge. Barges would likely be used to remove oversized materials. At this time, this demolition work is not planned to require construction of temporary docks or the acquisition or temporary use of property on the banks of the Duwamish Waterway for a staging area. Removal of the abutment foundations, however, would likely require temporary short-term closure of adjacent and/or nearby streets. During this time, local traffic would be temporarily rerouted from the immediate area.

Following the completion of the construction activities associated with any of the project alternatives, disturbed areas would be restored. Conceptual site restoration plans would be developed for each alternative based on additional consultation with resource agencies and other stakeholders.

2.4.4 Cost Estimates for the Alternatives

Cost estimates for each of the proposed project alternatives have been prepared by the project engineers (see Table 2).[15] The cost estimate for each project alternative, including the No Action alternative, is broken down into the following components: 1) plans, specifications, and estimates (PS&E), 2) right-of-way costs, and 3) construction and construction-related costs. The total cost estimates are provided in 2003 dollars as well as estimated costs escalated for 2008, the anticipated mid-point of the project construction period. These cost estimates were calculated based on the conceptual engineering plans that were prepared for each of the alternatives.[16]

Clearly, the No Action Alternative is the least expensive as the existing bridge would not be rehabilitated nor would a new replacement bridge be constructed. The cost to remove the existing bridge structure would be approximately $7,000,000 (2003 dollars). The estimated costs to either rehabilitate or replace the existing bridge structure range between approximately $62 million to $77 million in 2003 dollars. The least costly of the build alternatives is the proposed Mid-Level Fixed-Span Alternative, which is estimated to cost approximately $61,523,000 to design and construct. The Rehabilitation Alternative is estimated to cost approximately $63,930,000 and the High-Level Fixed-Span Alternative is estimated to cost approximately $70,460,000. The most costly of the build alternatives is the Bascule Bridge Alternative, which is estimated to cost $77,334,000. The escalated 2008 dollar estimates to design and construction the project alternatives are also shown in the table.

Table 2. Cost Estimates of the Project Alternatives

Alternative	PS&E	Right-of-Way	Construction	Total (2003 dollars)	Total (2008 dollars)
No Action	$ 250,000	$ 0	$ 6,750,000	$ 7,000,000	$ 9 M
Rehabilitation	$ 6,843,000	$ 754,000	$56,333,000	$63,930,000	$ 74 M
Bascule Bridge	$ 8,253,000	$ 3,655,000	$ 65,426,000	$ 77,334,000	$ 90 M
Mid-Level Fixed-Span Bridge	$ 4,235,000	$ 6,377,000	$ 50,911,000	$61,523,000	$ 71 M
High-Level Fixed-Span Bridge	$ 5,261,000	$ 15,310,000	$ 49,889,000	$ 70,460,000	$ 82 M

Source: Parsons Brinckerhoff, November 2003.

[15] Parsons Brinckerhoff. *South Park Bridge Project: Structural Alternatives Study*, November 2003.

[16] Parsons Brinckerhoff. *South Park Bridge Project: Conceptual Plans*, June 2003.

2.5 Project Coordination

Coordination to date for the South Park Bridge Project has involved members of the public, a special community advisory group, and representatives of government agencies. Formal scoping was initiated through publication of the NEPA Notice of Intent and the SEPA Determination of Significance and Scoping Notice on February 7, 2002, and February 14, 2002, respectively. Separate scoping meetings were conducted in the South Park community for relevant agencies and members of the public. Both meetings were held on February 28, 2002. Written and verbal comments received through the scoping process were reviewed by King County and used in the development of the project alternatives and topics for environmental impact assessment.

A public involvement plan for the proposed South Park Bridge Project was developed during the initial stages of project planning. The Project Advisory Committee (PAC) and the Community Advisory Group (CAG) reviewed this document and provided comments to King County. The first public involvement efforts began prior to the formal scoping period. A public workshop was held in the South Park community on January 17, 2002. At this meeting, the nine preliminary project alternatives were presented. A second public workshop was held on June 19, 2002. At this meeting, the five proposed project alternatives were presented. Members of the public were encouraged to provide comments at both of these meetings. To facilitate participation and input from Hispanic persons living in the community, a bilingual translator attended all meetings. In addition, handouts and newsletters for the project were published in English and Spanish, and public notices were published in “Siete Dias”, a local Spanish-speaking newspaper. Future opportunities for public involvement are also planned, including a public hearing and workshop following publication of the Draft Environmental Impact Statement in 2004.

Establishing a CAG was a significant component of the public involvement plan. A total of 17 individuals were chosen to participate in the CAG to represent community stakeholder interests and public concerns. The CAG meets periodically to be briefed on the progress of the project and to provide input to the South Park Bridge project team. Again, a bilingual English-Spanish translator attends the meeting to facilitate communication with Spanish-speaking individuals on the CAG. To date, CAG meetings have been held on April 10, May 21, June 4, June 11, and October 29 of 2002 and on January 7 and November 18, 2003. Additional CAG meetings are planned for the future.

As part of the environmental review process, King County periodically meets with the Project Advisory Committee (PAC) to give a status report of the project, answer questions, and to solicit comments. This committee is comprised of members of various agencies that have potential jurisdiction over the proposed South Park Bridge Project. The committee is the Interdisciplinary Team (IDT) required under NEPA implementation guidelines and provides technical support to King County staff. To date, the PAC has met on January 10, February 20, May 9, May 23, and October 10 of 2002. Coordination with the PAC is planned at critical future steps in the environmental review process.

A non-scientific survey was also conducted of South Park businesses located on 14th Avenue S. during the late spring of 2003.[17] The goal of the survey was to help assess potential impacts to businesses, especially minority-owned and –operated (employees) businesses. The survey respondents were also asked to identify their particular concerns about the proposed rehabilitation or replacement of the existing South Park Bridge. A total of 18 businesses were successfully surveyed. Spanish and Vietnamese translators were provided, as needed, to assist business representatives understand and respond to the questions. In addition, the data was used to assess the potential effects displaced businesses and jobs would have on the South Park community. The analysis of the survey findings are discussed in detail in the Economic, Social, and Relocation technical reports supporting the analysis in the EIS.

As key issues have arisen during development of the project alternatives and in assessing potential environmental impacts, special meetings have also been held with key stakeholders and organizations in the South Park community, as well as with other government agencies and jurisdictions with an interest in the project. For example, on December 3, 2002, King County met with owners of property along 14th Avenue S, and information booths were set up at the Sea Mar Community Health Center-sponsored annual Fiesta Patrias on September 14, 2002 and at a family night event held at the Concord Elementary School on September 27 and November 22 of 2002. Periodic coordination meetings have also been held with representatives of the City of Seattle and the City of Tukwila, and other government agencies. These coordination activities will continue to occur on an on-going basis as the EIS is prepared and finally adopted.

[17] Parsons Brinckerhoff. *South Park Bridge Project: Survey of 14th Avenue South Businesses*, August 22, 2003.

This page intentionally blank

Chapter 3 Studies and Coordination

This chapter describes the characteristics of noise, noise level descriptors, effects of noise, noise regulations, and noise impact criteria.

3.1 Characteristics of Noise

Sound is created when objects vibrate, resulting in a minute variation in surrounding atmospheric pressure called *sound pressure*. The human response to sound depends on the magnitude of a sound as a function of its frequency and time pattern (EPA, 1974). Magnitude measures the physical sound energy in the air. The range of magnitude, from the faintest to the loudest sound the ear can hear, is so large that sound pressure is expressed on a logarithmic scale in units called decibels (dB). Loudness, compared to physical sound measurement, refers to how people subjectively judge a sound, and this varies from person to person. Magnitudes of typical noise levels are presented in Table 3.

Humans respond to a sound's frequency or pitch. The human ear is very effective at perceiving sounds with a frequency between approximately 1,000 and 5,000 Hz, and the efficiency decreases outside this range. Environmental noise is composed of many frequencies, each occurring simultaneously at its own sound-pressure level. Frequency weighting, which is applied electronically by a sound-level meter, combines the overall sound frequency into one sound level that simulates how an average person hears sounds. The commonly used frequency weighting for environmental noise is A-weighting (dBA), which is most similar to how humans perceive sounds of low to moderate magnitude.

Because of the logarithmic decibel scale, a doubling of the number of noise sources (e.g., the number of cars operating on a roadway) increases noise levels by 3 dBA. A ten-fold increase in the number of noise sources will add 10 dBA. As a result, a noise source emitting a noise level of 60 dBA combined with another noise source of 60 dBA yields a combined noise level of 63 dBA (not 120 dBA). The human ear can barely perceive a 3-dBA increase, but a 5- or 6-dBA increase is readily noticeable and sounds as if the noise is about one and one-half times as loud. A 10-dBA increase appears to be a doubling in noise level to most listeners.

Noise levels from traffic sources depend on the volume, speed, and type of vehicle. Generally, an increase in volume, speed, or vehicle size increases traffic noise levels. Vehicular noise is a combination of noises from engines, exhaust, and tires. Other conditions affecting traffic noise include defective mufflers, steep grades, terrain, vegetation, distance from the roadway, shielding by barriers and buildings, roadway and bridge deck surfaces, and elevation of roadway in relation to noise receptors.

Noise levels decrease with distance from the noise source. For a line source such as a roadway, noise levels decrease 3 dBA over hard ground (concrete, pavement) or 4.5 dBA over soft ground (grass) for every doubling of distance between the source and

the receptor. For a point source such as construction sources, noise levels will decrease between 6 and 7.5 dBA for every doubling of distance from the source.

The propagation of noise can be greatly affected by terrain and the elevation of the receiver relative to the noise source (see Figure 15). Level ground is the simplest scenario, where noise travels in a straight line-of-sight path between the source and receiver. If the noise source is depressed or the receiver is elevated, noise generally travels directly to the receiver. Noise levels may be reduced when the terrain crests between the source and receiver and results in a partial noise barrier near the receiver. If the noise source is elevated or the receiver is depressed, noise is often reduced at the receiver. The edge of a roadway can also act as a partial noise barrier, blocking some sound transmission between the source and receiver. Even a short barrier (e.g., a solid concrete jersey-type safety barrier) can be effective at reducing noise levels. Breaking the line of sight between the receiver and the highest noise source results in a noise reduction of approximately 5 dBA.

Table 3. Typical Noise Levels

Transportation Sources	Noise Level (dBA)	Other Sources	Description
	130		Painfully loud
Jet takeoff (200 feet)	120		
Car horn (3 feet)			Maximum vocal
	110		Effort
	100	Shout (.5 feet)	
			Very annoying
Heavy truck (50 feet)	90	Jack hammer (50 feet)	Loss of hearing with
		Home shop tools (3 feet)	prolonged exposure
Train on a structure (50 feet)	85	Backhoe (50 feet)	
City bus (50 feet)	80	Bulldozer (50 feet)	Annoying
		Vacuum cleaner (3 feet)	
Train (50 feet)	75	Blender (3 feet)	
City bus at stop (50 feet)			
Freeway traffic (50 feet)	70	Lawn mower (50 feet)	
		Large office	
Train in station (50 feet)	65	Washing machine (3 feet)	Intrusive
	60	TV (10 feet)	
Light traffic (50 feet)		Talking (10 feet)	
Light traffic (100 feet)	50		Quiet
		Refrigerator (3 feet)	
	40	Library	
	30	Soft whisper (15 feet)	Very quiet

Sources: FTA, 1995; EPA, 1971; EPA, 1974

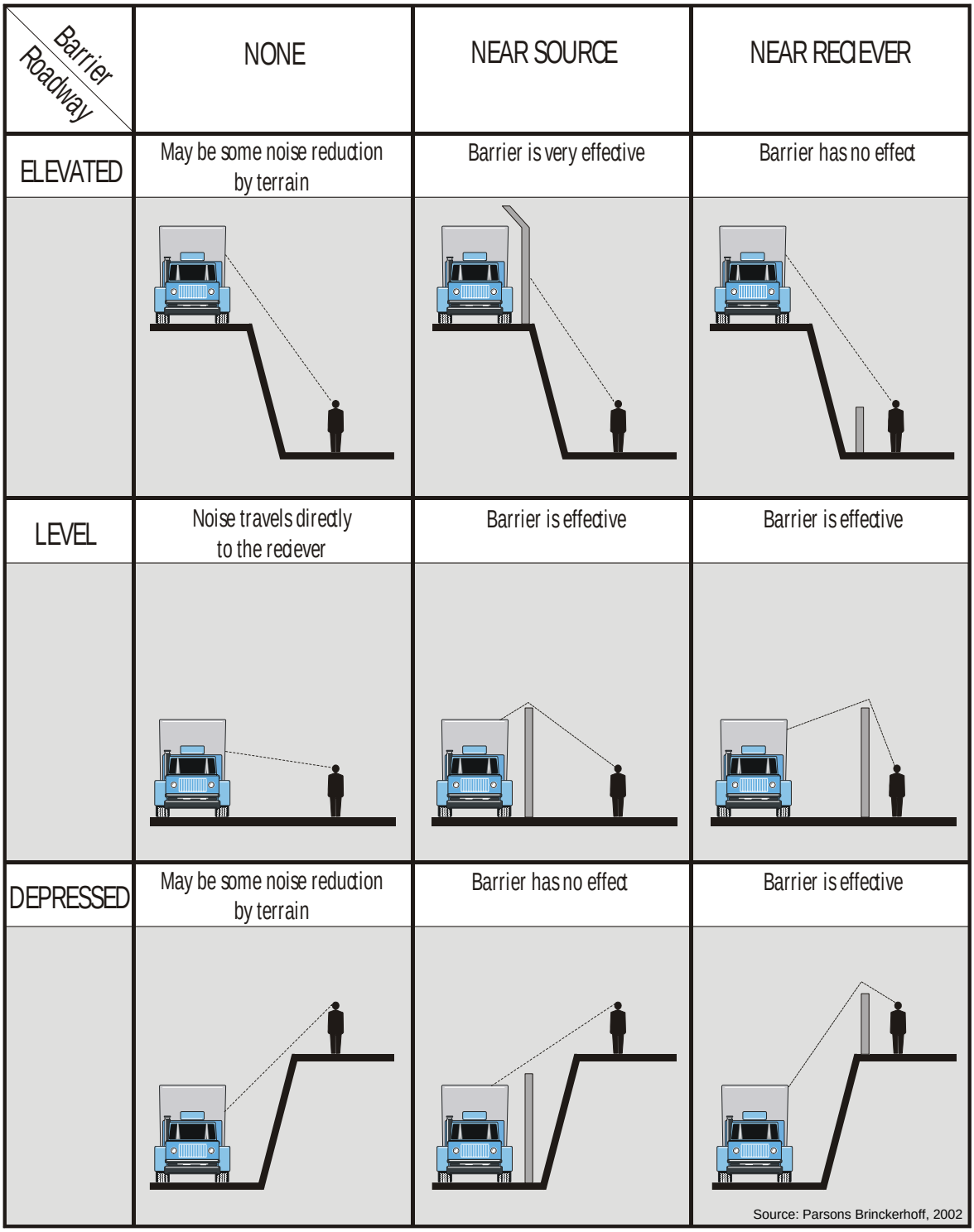


Figure 15
Noise Barrier Effectiveness

3.2 Noise Level Descriptors

A widely used descriptor for environmental noise is the equivalent sound level (L_{eq}). The L_{eq} can be considered a measure of the average noise level during a specified period of time. It is a measure of total noise or a summation of all sounds during a time period. It emphasizes the occasional high noise levels that accompany general background noise levels. L_{eq} is defined as the constant level that, over a given period of time, transmits to the receiver the same amount of acoustical energy as the actual time-varying sound. For example, two sounds, one of which contains twice as much energy but lasts only half as long, have the same L_{eq} noise levels. L_{eq} measured over a one-hour period is the hourly L_{eq} [L_{eq}(h)], which is used for highway noise impact and abatement analyses.

Short-term noise levels (e.g., from a single truck passing) can be described by either the total noise energy or the highest instantaneous noise level that occurs during the event. The sound exposure level (SEL) is a measure of total sound energy from an event and is useful in determining what the L_{eq} would be over a period in time when several noise events occur. The maximum sound level (L_{max}) is the greatest short-duration sound level that occurs during a single event. L_{max} is related to impacts on speech interference and sleep disruption. In comparison, L_{min} is the minimum sound level during a period of time.

People will generally find a moderately high, constant sound level more tolerable than a quiet background level interrupted by frequent high-level noise intrusions. An individual's response to sound depends greatly on the range that the sound varies in a given environment. For example, steady traffic noise from a highway is normally less bothersome than occasional aircraft flyovers in a relatively quiet area. In light of this subjective response, it is often useful to look at a statistical distribution of sound levels over a given time period in addition to the average sound level. Such distributions identify the sound level exceeded and the percentage of time exceeded. Therefore, it allows for a more thorough description of the range of sound levels during the given measurement period. These distributions are identified with an L_n where n is the percentage of time that the levels are exceeded. For example, the L_{10} level is the noise level that is exceeded 10 percent of the time.

3.3 Effects of Noise

Prolonged exposure to very high levels of environmental noise directly affects human health by causing the disease of hearing loss. The EPA has established a protective level of 70 dBA L_{eq} (24), below which hearing is conserved for exposure over a 40-year period (U.S. EPA, 1974). Although current scientific evidence is not conclusive, noise is suspected of causing or aggravating other diseases. Environmental noise indirectly affects human welfare by interfering with sleep, thought, and conversation. The FHWA noise abatement criteria are based on speech interference, which is a well-documented impact that is relatively reproducible in human response studies. Noise can also affect wildlife.

3.4 Noise Regulations and Impact Criteria

Applicable noise regulations and guidelines provide a basis for evaluating potential noise impacts. For federally funded highway projects, traffic noise impacts occur when predicted $L_{eq}(h)$ noise levels approach or exceed the FHWA's established noise abatement criteria (NAC) or substantially exceed existing noise levels (U.S. Department of Transportation, 1982). WSDOT has defined an increase of 10 dBA or more to be a substantial increase.

This project is located within three local governmental jurisdictions: King County, the City of Seattle, and the City of Tukwila. King County standards for noise were followed for the South Park Bridge Project. The City of Seattle standards for noise are similar to King County standards with identical "maximum permissible sound levels" (Seattle Municipal Code 25.08.410) and construction noise allowances (Seattle Municipal Code 25.08.425). The portion of the project located in the City of Tukwila does not include sensitive noise receptors.

King County limits noise levels at property lines of neighboring properties (King County Code 12.88.020). Property line noise regulations are presented in Table 4. The King County noise code is an adoption of the Washington State Department of Ecology standards (WAC Chapter 173-60). The maximum permissible sound levels depend on the land use district of both the source noise and receiving property. The standard does not include noise from traffic, aircraft, and railway operations in public right-of-way.

Table 4. King County Maximum Permissible Sound Levels (dBA)

	Receiving Property			
	Residential			
Noise Source	Day	Night[1]	Commercial	Industrial
Residential	55	45	57	60
Commercial	57	47	60	65
Industrial	60	50	65	70

Notes: The maximum permissible noise levels are reduced by 10 dBA for residential receiving properties between 10 PM and 7 AM

Source: King County Code 12.88.020.

3.4.1 Construction Noise

Noise levels in Table 4 apply to activities on individual parcels. The maximum permissible sound levels also apply to construction activities occurring between 10 PM and 7 AM on weekdays and 10 PM and 9 AM on weekends (King County Code 12.88.020). Performance of construction activities during nighttime hours would require a noise variance from King County or the City of Seattle depending on jurisdiction at the location of the construction. Construction activities carried out between 7 AM and 10 PM on weekdays and between 9 AM and 10 PM on weekends are allowed to exceed the property line standards per the following limits (King County Code 12.88.040):

- Earthmoving or other large construction equipment may exceed the applicable property line limit by 25 dBA.

- Portable powered equipment may exceed the limit by 20 dBA.

- Impact equipment, such as jackhammers, may not exceed an L_{eq}(h) of 90 dBA or shorter-duration noise levels of 93 dBA L_{eq}(30 min.), 96 dBA L_{eq}(15 min.), and 99 dBA L_{eq}(7.5 min.).

Short-term exceedances above the permissible sound level are allowed for any noise source. The maximum level may be exceeded by 5 dBA for a total of 15 minutes, by 10 dBA for a total of 5 minutes, or by 15 dBA for a total of 1.5 minutes during any one-hour period.

These allowed exceptions are referred to in terms of the percentage of time a certain level is exceeded; an L_{25} is the noise level that is exceeded 15 minutes during an hour. Therefore, the permissible L_{25} would be 5 dBA greater than the values in Table 4 provided that the noise level is below the permissible level in Table 4 for the rest of the hour and never exceeds the permissible level by more than 5 dBA. An hourly L_{eq} of approximately 2 dBA higher than the values in Table 4 is an equivalent sound level to the permissible levels, including the allowed short-term excursions. Using this rule, an L_{eq}(h) of 59 dBA corresponds approximately to a noise level of 57 dBA for 45 minutes and 62 dBA for 15 minutes, which is the maximum permissible noise level created by a source in a commercial zone and received by a property in a residential zone.

3.4.2 Traffic Noise

King County establishes maximum noise levels for individual vehicles (King County Code 12.90.010); however, collective traffic noise from vehicles operating on public streets is exempt from King County code (King County Code 12.90.060). Because traffic is exempt from the King County property line standards, the FHWA noise abatement criteria (NAC) are used to determine impacts from traffic noise. Under the FHWA guidelines, impacts occur when predicted L_{eq}(h) noise levels approach or exceed the NAC or substantially exceed existing noise levels (U.S. Department of Transportation, 1982). “Substantially exceed” is defined as an increase of 10 dBA or more in the State of Washington.

The FHWA noise abatement criteria specify exterior L_{eq}(h) noise levels for various land activity categories (Table 5). Thus, if a noise level L_{eq}(h) were 66 dBA or higher, it would approach or exceed the FHWA noise abatement criterion of 67 dBA for residences.

Table 5. FHWA Noise Abatement Criteria

Activity Category	L_{eq}(h) (dBA)	Description of Activity Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	-	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: U.S. Department of Transportation, 1982.

This page intentionally blank

Ambient noise levels were measured at eight locations near the project area to characterize the weekday noise levels and calibrate the traffic noise model (see Figure 16). Measured noise locations were representative of all sensitive use in the study area and consistent with the FHWA *Manual for Highway Noise and Land Use*. Daytime measurements were taken at seven of the locations, and a 24-hour noise measurement was taken at the eighth. Typical receptor distances range between 25 and 200 feet from modeled roadways. Existing and future noise levels for each of the alternatives were modeled at each of the monitoring locations to describe the alternative's effects on the audible environment.

FHWA's Traffic Noise Model (TNM) Version 1.1 computer model (FHWA, 2000) was used to predict L_{eq}(h) traffic noise levels. TNM is the industry standard model to estimate traffic noise levels at discrete points by considering interactions between different noise sources and the effects of topographical features on the noise level. Noise emissions from free-flowing traffic depend on the number of automobiles, medium trucks, and heavy trucks per hour; vehicular speed; and reference noise emission levels of an individual vehicle. Noise from sources other than traffic is not included; therefore, when non-traffic noise, such as aircraft, is considerable in an area, TNM will underpredict the actual noise level. Noise monitoring results were used to calibrate the existing-conditions noise model. The model includes the effects of roadway grade on traffic noise.

For noise-model calibration, the existing noise model was run with traffic volumes counted during noise measurements. The TNM model was able to model peak-hour noise levels at each of the eight measured sites within 1 dBA of the measured level, with the exception of two sites where overhead aviation noise was included in the noise measurement. Aviation noise makes up a substantial portion of the area's overall noise environment. The flight paths of Boeing Field and Sea-Tac Airport are in the area surrounding the South Park study area. While efforts were taken to not measure aircraft noise, a 3-dBA average increase in noise levels was observed at the two measured locations that included aviation noise. The aircraft noise fluctuates throughout the day depending on flight patterns.

Predicted noise levels were based on PM peak-hour traffic conditions to estimate worst-case noise levels. Existing traffic volumes for 2001 and expected future traffic volumes for 2027 were taken from the *South Park Bridge Project Transportation Technical Report* (see Table 6). For noise modeling purposes, the PM peak hours of the 24-hour reading were used to model that location. Truck percentages of 4 percent medium trucks and 7 percent heavy trucks, with the remaining 89 percent automobiles were estimated from field counts for 14th Avenue S., for arterial roads, and for local access streets. The truck percentages for the local access were higher than typical levels to account for the high level of commercial- and industrial-related trucks in and around the South Park community.

Eight measured receptors and seven additional modeled-only receptors were chosen as representative of similar noise-sensitive receptors in the area, although noise levels at adjacent receptors may vary because of terrain or distance. No noise-sensitive receptors are located north of the Duwamish River; all receptors analyzed are located south of the river. The receptors include both worst-case (closest to the subject area) and other local noise-sensitive receptors that could be affected by either increases or decreases in traffic noise as a result of this project. The eight measured receptors (Figure 16) are described below:

- Receptor 1 is located approximately 25 feet east of the intersection of 14th Avenue S. and S. Trenton Street. This receptor is representative of exterior noise levels at one of the Sea Mar Community Health Center buildings.
- Receptor 2 and Receptor 3 are located along S. Donovan Street, approximately 150 feet west of 14th Avenue S. Field readings for receptors 2 and 3 were taken from the same location to compare noise levels with and without aviation noise. Receptor 2 did not include aviation noise while aviation noise was included in the Receptor 3 field reading. These receptors represent exterior noise levels experienced by residents along S. Donovan Street.
- Receptor 4 is located at a multi-family residence along the east side of 14th Avenue S. between S. Donovan Street and S. Cloverdale Street. This receptor is representative of exterior noise levels of residences at this location.
- Receptor 5 is located along Dallas Avenue S. approximately 300 feet southeast of the southern end of the current South Park Bridge. This receptor is representative of exterior noise levels experienced by residents along Dallas Avenue S., east of 14th Avenue S.
- Receptor 6 is located along the portion of 14th Avenue S. that extends to the west of the South Park Bridge, approximately 50 feet west of the current bridge between Dallas Avenue S. and S. Orr Street. This receptor is representative of exterior noise levels at one residence located just west of the current South Park Bridge.
- Receptor 7 is located at S. Rose Street approximately 40 feet west of the Duwamish River. This receptor is representative of exterior noise levels experienced by residents located on S. Rose Street and S. Orr Street between 14th Avenue S. and 12th Avenue S.
- Receptor 8 is located between 14th Avenue S. and 12th Avenue S. along Dallas Avenue S.. This receptor is representative of exterior noise levels experienced in surrounding residences over a twenty-four hour period.

The seven additional modeled-only receptors were inserted into noise models for each alternative to further describe potential noise impacts within the study area.

Predicted noise levels were compared to the FHWA noise abatement criteria, and the number of receptors affected by each alternative was evaluated. Construction noise and operations noise for various land uses was qualitatively assessed and compared to King County property line regulations.

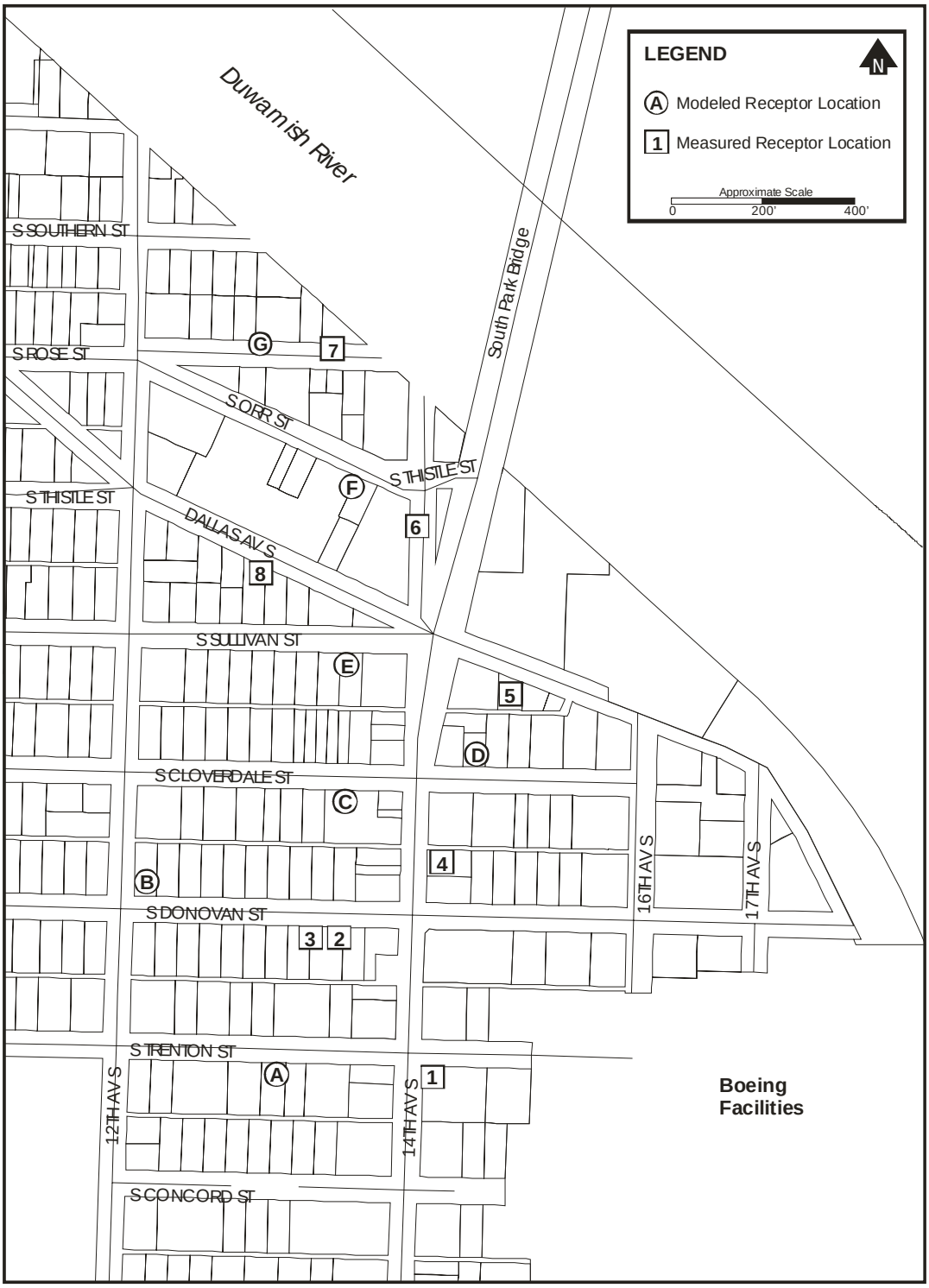


Figure 16
Noise Measurement and Mode

Table 6. Modeled Traffic Volumes

Location	Modeled Speed	2001 Existing Conditions			2027 No Action			2027 Rehabilitation		
		Cars	Medium Trucks	Heavy Trucks	Cars	Medium Trucks	Heavy Trucks	Cars	Medium Trucks	Heavy Trucks
14th Ave. NB, south of Donovan	**30 mph**	**475**	**21**	**37**	**371**	**17**	**29**	**855**	**38**	**67**
14th Ave. NB, south of Cloverdale	**30 mph**	**427**	**19**	**34**	**494**	**22**	**39**	**757**	**34**	**60**
14th Ave. NB, south of Sullivan	**30 mph**	**450**	**20**	**35**	**62**	**3**	**5**	**828**	**37**	**65**
South Park Bridge NB	**30 mph**	**528**	**24**	**42**	**62**	**3**	**5**	**882**	**40**	**69**
14th Ave. SB, south of Donovan	**30 mph**	**631**	**28**	**50**	**641**	**29**	**50**	**766**	**34**	**60**
14th Ave. SB, south of Cloverdale	**30 mph**	**636**	**29**	**50**	**360**	**16**	**28**	**878**	**39**	**69**
14th Ave. SB, south of Sullivan	**30 mph**	**821**	**37**	**65**	**81**	**4**	**6**	**1047**	**47**	**82**
South Park Bridge SB	**30 mph**	**813**	**37**	**64**	**53**	**2**	**4**	**1179**	**53**	**93**
Trenton WB, west of 14th Ave.	**25 mph**	**23**	**1**	**2**	**33**	**1**	**3**	**52**	**2**	**4**
Trenton WB, east of 14th Ave.	**25 mph**	**90**	**4**	**7**	**87**	**4**	**7**	**103**	**5**	**8**
Trenton EB, west of 14th Ave.	**25 mph**	**10**	**1**	**1**	**15**	**1**	**1**	**19**	**1**	**1**
Trenton EB, east of 14th Ave.	**25 mph**	**31**	**1**	**2**	**26**	**1**	**2**	**45**	**2**	**4**
Donovan WB, west of 14th Ave.	**25 mph**	**23**	**1**	**2**	**33**	**1**	**3**	**52**	**2**	**4**
Donovan WB, east of 14th Ave.	**25 mph**	**90**	**4**	**7**	**87**	**4**	**7**	**103**	**5**	**8**
Donovan EB, west of 14th Ave.	**25 mph**	**10**	**1**	**1**	**15**	**1**	**1**	**19**	**1**	**1**
Donovan EB, east of 14th Ave.	**25 mph**	**31**	**1**	**2**	**26**	**1**	**2**	**45**	**2**	**4**
Cloverdale WB, west of 14th Ave.	**30 mph**	**441**	**20**	**35**	**485**	**22**	**38**	**589**	**26**	**46**
Cloverdale WB, east of 14th Ave.	**30 mph**	**12**	**1**	**1**	**18**	**1**	**1**	**19**	**1**	**1**
Cloverdale EB, west of 14th Ave.	**30 mph**	**276**	**12**	**22**	**329**	**15**	**26**	**489**	**22**	**38**
Cloverdale EB, east of 14th Ave.	**30 mph**	**7**	**1**	**1**	**14**	**1**	**1**	**17**	**1**	**1**
S. Sullivan Street	**25 mph**	**33**	**1**	**3**	**45**	**2**	**4**	**45**	**2**	**4**
Dallas Ave. S.	**25 mph**	**33**	**1**	**3**	**45**	**2**	**4**	**45**	**2**	**4**
S. Orr Street	**25 mph**	**18**	**1**	**1**	**24**	**1**	**2**	**24**	**1**	**2**
S. Rose Street	**25 mph**	**9**	**1**	**1**	**12**	**1**	**1**	**12**	**1**	**1**
12th Ave. S. NB	**25 mph**	**89**	**4**	**7**	**89**	**4**	**7**	**89**	**4**	**7**
12th Ave. S. SB	**25 mph**	**89**	**4**	**7**	**89**	**4**	**7**	**89**	**4**	**7**
16th Ave. S.	**25 mph**	**33**	**1**	**3**	**45**	**2**	**4**	**45**	**2**	**4**
S. Thistle Street	**25 mph**	**9**	**1**	**1**	**12**	**1**	**1**	**12**	**1**	**1**
14th Ave. S., west of bridge	**25 mph**	**9**	**1**	**1**	**12**	**1**	**1**	**12**	**1**	**1**
Note: Traffic volumes based on findings of the *South Park Bridge Project Transportation Technical Report (February 2004)*										

Table 6. Modeled Traffic Volumes (continued)

Location	Modeled Speed	2027 Bascule Bridge			2027 Mid-Level			2027 High-Level		
		Cars	Medium Trucks	Heavy Trucks	Cars	Medium Trucks	Heavy Trucks	Cars	Medium Trucks	Heavy Trucks
14th Ave. NB, south of Donovan	**30 mph**	**855**	**38**	**67**	**855**	**38**	**67**	**739**	**33**	**58**
14th Ave. NB, south of Cloverdale	**30 mph**	**757**	**34**	**60**	**757**	**34**	**60**	**739**	**33**	**58**
14th Ave. NB, south of Sullivan	**30 mph**	**828**	**37**	**65**	**828**	**37**	**65**	**739**	**33**	**58**
South Park Bridge NB	**30 mph**	**882**	**40**	**69**	**882**	**40**	**69**	**792**	**36**	**62**
14th Ave. SB, south of Donovan	**30 mph**	**766**	**34**	**60**	**766**	**34**	**60**	**926**	**42**	**73**
14th Ave. SB, south of Cloverdale	**30 mph**	**878**	**39**	**69**	**878**	**39**	**69**	**926**	**42**	**73**
14th Ave. SB, south of Sullivan	**30 mph**	**1047**	**47**	**82**	**1047**	**47**	**82**	**926**	**42**	**73**
South Park Bridge SB	**30 mph**	**1179**	**53**	**93**	**1179**	**53**	**93**	**926**	**42**	**73**
Trenton WB, west of 14th Ave.	**25 mph**	**52**	**2**	**4**	**52**	**2**	**4**	**556**	**25**	**44**
Trenton WB, east of 14th Ave.	**25 mph**	**103**	**5**	**8**	**103**	**5**	**8**	**116**	**5**	**9**
Trenton EB, west of 14th Ave.	**25 mph**	**19**	**1**	**1**	**19**	**1**	**1**	**445**	**20**	**35**
Trenton EB, east of 14th Ave.	**25 mph**	**45**	**2**	**4**	**45**	**2**	**4**	**67**	**3**	**5**
Donovan WB, west of 14th Ave.	**25 mph**	**52**	**2**	**4**	**52**	**2**	**4**	**31**	**1**	**2**
Donovan WB, east of 14th Ave.	**25 mph**	**103**	**5**	**8**	**103**	**5**	**8**	**98**	**4**	**8**
Donovan EB, west of 14th Ave.	**25 mph**	**19**	**1**	**1**	**19**	**1**	**1**	**18**	**1**	**1**
Donovan EB, east of 14th Ave.	**25 mph**	**45**	**2**	**4**	**45**	**2**	**4**	**36**	**2**	**3**
Cloverdale WB, west of 14th Ave.	**30 mph**	**589**	**26**	**46**	**589**	**26**	**46**	**89**	**4**	**7**
Cloverdale WB, east of 14th Ave.	**30 mph**	**19**	**1**	**1**	**19**	**1**	**1**	**89**	**4**	**7**
Cloverdale EB, west of 14th Ave.	**30 mph**	**489**	**22**	**38**	**489**	**22**	**38**	**89**	**4**	**7**
Cloverdale EB, east of 14th Ave.	**30 mph**	**17**	**1**	**1**	**17**	**1**	**1**	**89**	**4**	**7**
S. Sullivan Street	**25 mph**	**45**	**2**	**4**	**22**	**1**	**2**	**22**	**1**	**2**
Dallas Ave. S.	**25 mph**	**45**	**2**	**4**	**22**	**1**	**2**	**22**	**1**	**2**
S. Orr Street	**25 mph**	**24**	**1**	**2**	**24**	**1**	**2**	**24**	**1**	**2**
S. Rose Street	**25 mph**	**12**	**1**	**1**	**12**	**1**	**1**	**12**	**1**	**1**
12th Ave. S.NB	**25 mph**	**89**	**4**	**7**	**89**	**4**	**7**	**400**	**18**	**31**
12th Ave. S.SB	**25 mph**	**89**	**4**	**7**	**89**	**4**	**7**	**249**	**11**	**20**
16th Ave. S.	**25 mph**	**45**	**2**	**4**	**45**	**2**	**4**	**45**	**2**	**4**
S. Thistle Street	**25 mph**	**12**	**1**	**1**	**12**	**1**	**1**	**24**	**1**	**2**
14th Ave. S., west of bridge	**25 mph**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Note: Traffic volumes based on findings of the *South Park Bridge Project Transportation Technical Report (February 2004*										

This page left intentionally blank

This page intentionally blank

Chapter 5 Affected Environment

5.1 Description of Study Area

Land use adjacent to the study area is a mixture of residential, commercial, light manufacturing, and limited undeveloped land. Topography in the study area generally slopes west to east towards the Duwamish River. North of the Duwamish River is primarily commercial and industrial uses with no sensitive noise receptors per FHWA guidelines. The current South Park Bridge spans the Duwamish River. South of the Duwamish River is the community of South Park. The area of South Park is where all sensitive noise receptors for this project are located.

South Park is comprised of commercial businesses along 14th Avenue S. with residential homes located to the west and east. A residential home and a storage building are currently located immediately adjacent to the west of the South Park Bridge. Single-family residential housing is predominant in the South Park community with a limited number of multi-family apartment buildings. Several Sea Mar Community Health Center buildings are located along 14th Avenue S. between S. Donovan, S. Trenton, and S. Concord streets. Another Sea Mar Community Health Center building is located approximately one-quarter mile southwest of the study area atop a nearby hill.

5.2 Existing Noise Levels

Existing noise levels were field measured at eight locations (see Figure 16). Ten- and fifteen-minute noise measurements were taken at seven locations during one or more periods of the day. At the eighth location, a 24-hour noise measurement was recorded (see Figure 17). For noise modeling purposes, the PM peak hours of the 24-hour reading were used to model the 24-hour measurement. The measured noise levels were used to validate the existing-conditions traffic noise model, as described in the methodology section of this report (see Chapter 4). The noise levels at the eight measured sites were modeled using TNM (see Table 7).

Seven additional sites were added to the TNM model to represent additional receptors in the community, including areas along S. Trenton Street and 12th Avenue S., which were not represented by the eight field measured sites (see Table 8).

Although automobile and truck traffic comprise a considerable portion of the noise in the study area, aviation noise contributes to the area's overall noise environment. The flight paths of Boeing Field and Sea-Tac Airport are in the area surrounding the South Park Bridge study area. While a 3-dBA average increase in noise levels was observed at the two measured locations that included aviation noise, this average fluctuates throughout the day depending on flight patterns.

Table 7. Noise Measurement Results

Measured Site		Date	Start Time	L_{eq} (dBA)
1	**8800 14th Avenue S., First Row**	May 29, 2002	2:40 PM	68
2	1249 S. Donovan Street, Second Row	May 29, 2002	3:05 PM	61
3*	1249 S. Donovan Street, Second Row	May 29, 2002	3:25 PM	63
4	8616 14th Avenue S., First Row	May 29, 2002	2:05 PM	71
5	8519 Dallas Avenue S., Second Row	May 28, 2002	12:45 PM	63
6	14th Avenue S. / S. Orr Street, First Row	May 28, 2002	11:45 AM	64
7	1239 S. Rose Street, Second Row	May 28, 2002	12:20 PM	62
24 HR*	8437 Dallas Avenue S., Third Row	May 28 & 29 2002	1:00 PM	58

15-minute average L_{eq} (dBA) readings for each measured site
24 HR = 24-hour measurement
*Measurement taken with aviation noise overhead

Table 8. Noise Modeling Results

Measured Site	Residence Represented	Existing (L_{eq})	No Action (L_{eq})	Rehabilitation (L_{eq})	Bascule Bridge (L_{eq})	Mid-Level Fixed-Span Bridge (L_{eq})	High-Level Fixed-Span Bridge (L_{eq})
1	2 *	**68**	**68**	**70**	**70**	**70**	**70**
2	4	64	63	**66**	**66**	**66**	65
3	0 **	64	63	**66**	**66**	**66**	65
4	4	**72**	**71**	**74**	**74**	**74**	**68**
5	2	64	62	**66**	**66**	65	65
6	1	63	59	65	**70**	65	61
7	5	61	58	62	63	64	63
8 (24 HR)	4	62	62	64	65	64	64
A	4	62	62	64	64	64	**73**
B	4	64	64	65	65	65	**69**
C	4	**69**	**69**	**70**	**70**	**70**	65
D	2	**66**	64	**68**	**67**	**67**	**68**
E	2	**66**	64	**67**	**68**	**67**	65
F	3	62	60	64	65	**66**	65
G	4	60	58	62	62	62	62

Bold numbers approach or exceed the FHWA traffic noise impact criteria
Sites A through G are modeled only sites
24 HR = 24-hour noise reading
Some Build L_{eq} values are less than Existing L_{eq} values due to bridge shielding noise from the sites
*Hospital use, equivalent residences per FHWA Noise Evaluation Procedures for Existing State Highways (Directive 22-22)
**No residences are considered at this location because Site 3 was taken to describe aviation noise

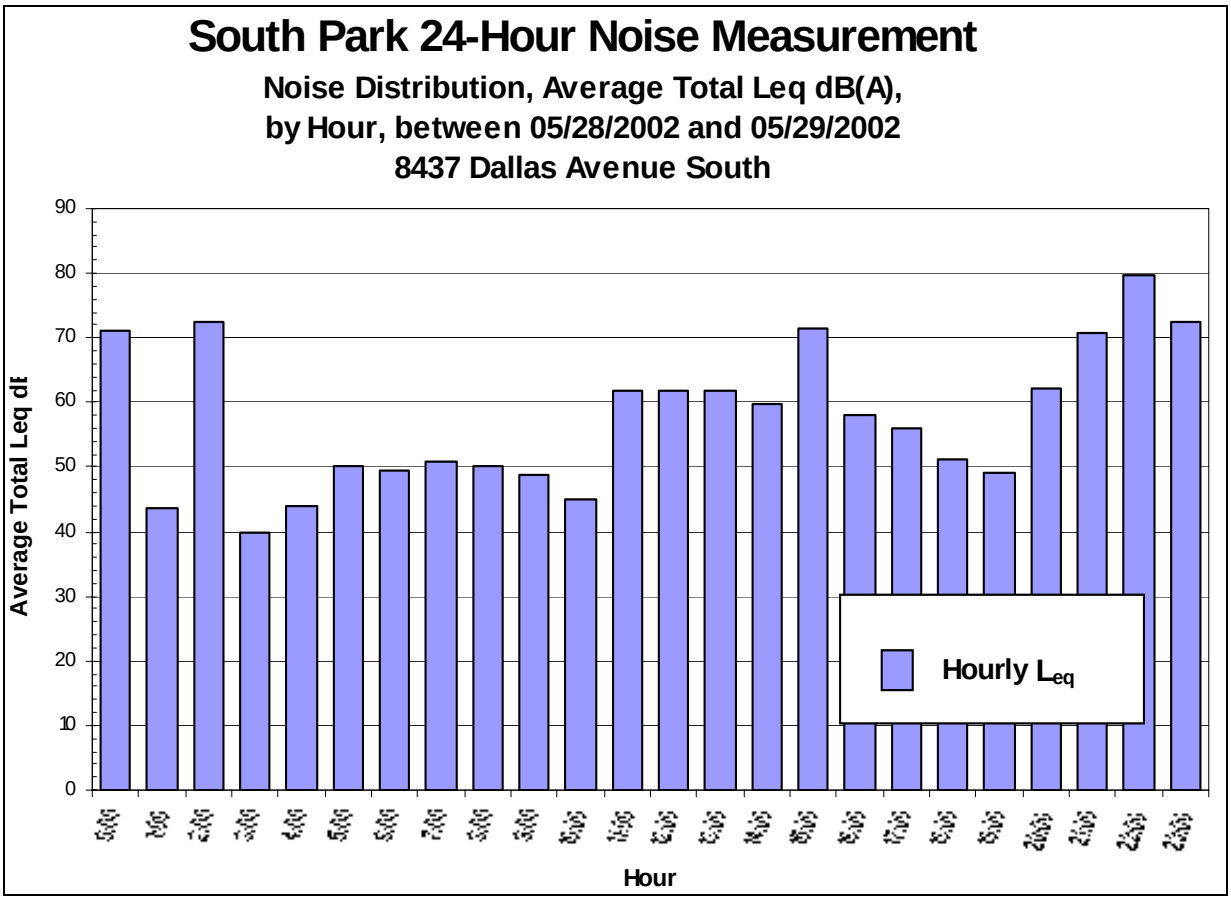


Figure 17
24-Hour Noise Measurement

The 24-hour noise measurement describes hourly L_{eq} and PM peak hour L_{eq} traffic noise readings in the subject area. A PM peak hour L_{eq} of 58 dBA was recorded at this location along Dallas Avenue S. (approximately 200 feet west of the southern end of the South Park Bridge). Nighttime peak noise levels may have resulted from emergency vehicles responding in the area, flight pattern changes with overhead aviation, or possibly residents near the meter in the late evening.

This page intentionally blank

Chapter 6 Impacts

This chapter describes direct, secondary, and cumulative impacts of each alternative resulting from the South Park Bridge Project.

6.1 Direct Impacts

6.1.1 No Action Alternative

6.1.1.1 Construction

Bridge construction associated with building a new bridge or rehabilitating the existing bridge would not take place under this alternative; therefore, there would be no construction noise impact. However, under the No Action Alternative, demolition noise impacts would be experienced. Demolition noise and vibration would be similar to the construction noise and vibration of the bridge alternatives to follow.

6.1.1.2 Operation

Under the No Action Alternative, noise levels are projected to decrease by 1 dBA at most receptors in the study area following demolition (see Table 8), as a result of future decreases in traffic. Traffic reduction would result from the demolition of the current bridge without constructing a replacement bridge. A 1- to 2-dBA increase or decrease is not perceptible to most individuals. Noise levels would approach or exceed the FHWA noise abatement criteria at 3 out of the 15 modeled sites, representing 10 receptors (residences) under the No Action Alternative.

6.1.2 Bridge Alternatives

Construction and operation noise impacts on the South Park community are expected to be similar for all bridge alternatives including: Rehabilitation Alternative, Bascule Bridge Alternative, Mid-Level Fixed-Span Bridge Alternative, and High-Level Fixed-Span Bridge Alternative.

6.1.2.1 Construction

Noise during the construction period could be bothersome to nearby residents. Construction workers also would be subject to construction noise while working on the site. Construction usually would be carried out in several reasonably discrete steps, each with its own mix of equipment and, consequently, its own noise characteristics. Bridge construction would involve clearing; performing cut-and-fill activities; removing the old bridge; drilling shafts for the new bridge foundation; constructing new bridge columns, piers, abutments, retaining walls, and superstructure; importing fill; and paving. For the South Park Bridge Project, the highest construction noise levels would be associated with demolition and with pile driving near wall and bridge structure construction. Construction noise is temporary and would vary widely both spatially and time-wise over the course of the project.

The most prevalent noise source at construction sites would be internal combustion engines. Earth-moving equipment, material-handling equipment, cranes, barges, and stationary equipment are all engine-powered. Mobile equipment operates in a cyclic fashion, but stationary equipment (e.g., generators and compressors) operates at sound levels that are fairly constant over time. Because trucks would be present during most phases and would not be confined to the project site, noise from trucks could affect more receptors. Other noise sources would include impact equipment and tools such as pile drivers. Impact tools could be pneumatically powered, hydraulic, or electric.

Construction noise would be intermittent at various locations in the project area. Construction duration would last between approximately 8 months (No Action Alternative) and 33 months (Bascule Bridge Alternative). (See Chapter 2 for specific construction periods for the different alternatives.) Construction noise levels would depend on the type, amount, and location of construction activities. The type of construction methods would establish the maximum noise levels of construction equipment used. The amount of construction activity would quantify how often construction noise would occur throughout the day. The location of construction equipment relative to adjacent properties would determine any effects of distance in reducing construction noise levels. The maximum noise levels of construction equipment under all build alternatives would be similar to the typical maximum construction equipment noise levels presented in Figure 18.

As shown in Figure 18, maximum noise levels from construction equipment would range from 69 to 106 dBA at 50 feet (15 meters). Construction noise at residences farther away would decrease at a rate of 6 dBA per doubling of distance from the source. The number of occurrences of the L_{max} noise peaks would increase during construction, particularly during pile-driving activities. Because various pieces of equipment would be turned off, idling, or operating at less than full power at any given time and because construction machinery is typically used to complete short-term tasks at any given location, average L_{eq} daytime noise levels would be less than the maximum noise levels presented in Figure 18.

Vibration impacts can occur to historic or other sensitive structures when the proposed project would cause damage to the structure. Vibration is usually measured as a root-mean-square velocity level, which is reported in velocity decibels (VdB) referenced to a vibration level of micro inches/second. Humans can perceive vibration levels above approximate 65 VdB. The damage threshold for minor damage to fragile buildings is approximately 100 VdB. The damage threshold may be reduced by 5 VdB for extremely fragile historic buildings. Buses and trucks frequently generate approximately 65 VdB at 8 meters (25 feet). Heavy construction equipment, such as large bulldozers and loaded trucks frequently generate between 85 and 87 VdB at 8 meters (25 feet). Pile driving may generate between 104 and 112 VdB at 8 meters (25 feet). Under ordinary conditions, these values are reduced by 6 VdB at 15 meters (50 feet) and 12 VdB at 30 meters (100 feet). Heavy construction is not expected within 8 meters (25 feet) of vibration sensitive structures, and pile driving is not expected within 30 meters (100 feet). At these distances, no damage is expected to the structure.

Construction noise levels could be reduced by the construction practices identified in the mitigation section (see Chapter 7).

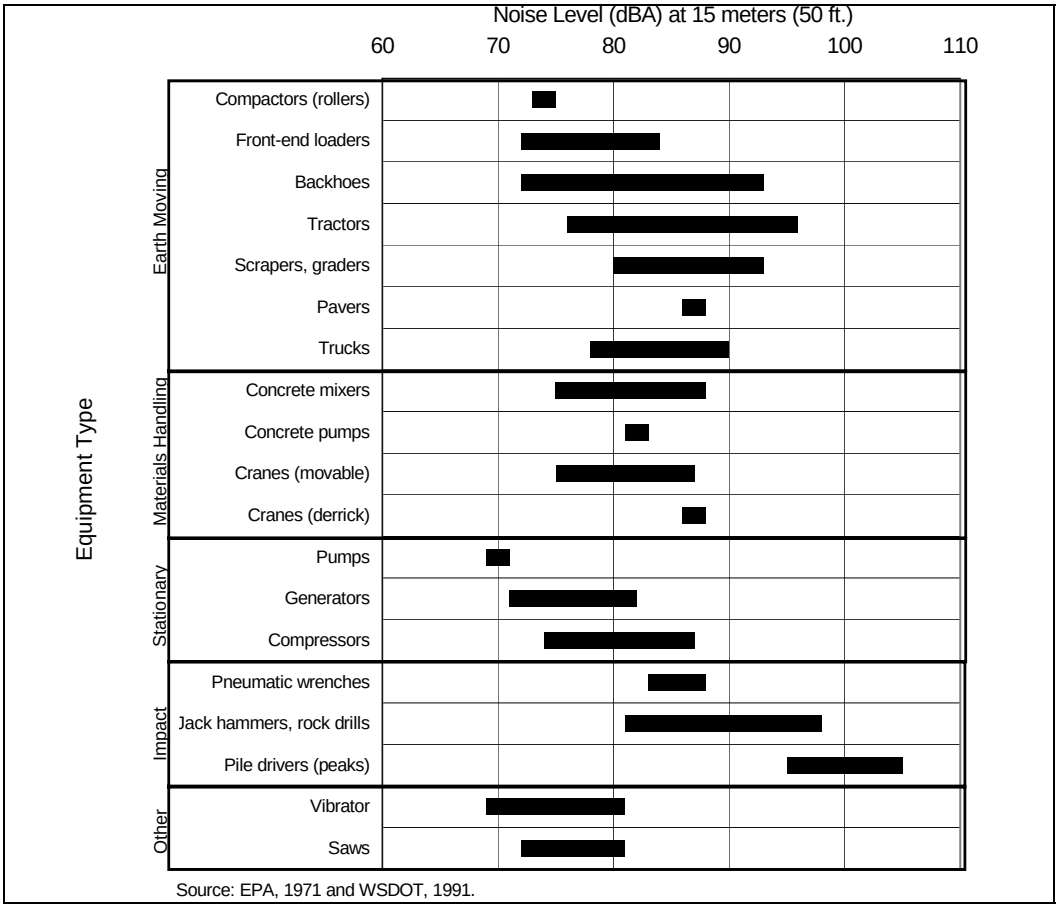


Figure 18
Construction Noise Levels

Construction noise levels could be reduced by the construction practices identified in the mitigation section of this report. Construction activities carried out between 7 AM and 10 PM are allowed to exceed King County property line standards, per the specific construction and equipment operation requirements (King County Code 12.88.040). Any activities completed between 10 PM and 7 AM that are expected to generate more than 45 dBA L_{eq}(h) at the nearest residence would require a noise variance from King County or the City of Seattle, depending on the jurisdiction at the location of the activity.

Rehabilitation Alternative

Receptors near the current bridge would experience temporary noise impacts during project construction. The magnitude of the noise would decrease with distance from the construction activities. The surrounding community may also experience short-term noise increases caused by movement of large vehicles and machinery assisting in bridge rehabilitation.

Bascule Bridge Alternative

Receptors from the area of the current bridge to at least S. Cloverdale Street would experience temporary noise impacts during project construction. The magnitude of the noise would decrease with distance from the construction activities. The surrounding community may also experience short-term noise increases caused by movement of large vehicles and machinery assisting in bridge construction and bridge demolition.

Mid-Level Fixed-Span Bridge Alternative

Receptors from the area of the current bridge to at least S. Donovan Street would experience temporary noise impacts during project construction. The magnitude of the noise would decrease with distance from the construction activities. The surrounding community may also experience short-term noise increases caused by movement of large vehicles and machinery assisting in bridge construction and bridge demolition.

High-Level Fixed-Span Bridge Alternative

Receptors from the area of the current bridge to at least S. Trenton Street and west to 12th Avenue S. and north to S. Cloverdale Street would experience temporary noise impacts during project construction. The magnitude of the noise would decrease with distance from the construction activities. The surrounding community may also experience short-term noise increases caused by movement of large vehicles and machinery assisting in bridge construction and bridge demolition.

6.1.2.2 Operation

The following is an individual discussion of operation impacts of each of the project alternatives, exclusive of the No Action Alternative.

Rehabilitation Alternative

Under the Rehabilitation Alternative, noise levels are projected in 2027 to increase by 2 dBA L_{eq}(h) at most receptors in the study area (see Table 8), as a result of future increases in traffic. Actual maximum noise-level increases may be less than predicted as congestion increases in the peak hour and slows traffic. A 1- to 2-dBA increase is not perceptible to most individuals. Traffic noise levels would approach or exceed the FHWA noise abatement criteria at 7 out of the 14 modeled sites, representing 20 receptors.

Traffic noise levels at 5 of the 14 modeled sites currently approach or exceed the FHWA criteria. The increase in noise levels under the Rehabilitation Alternative would be consistent between residences along the majority of the South Park Bridge study area with the exception of a few residences. The greatest traffic noise impacts for the Rehabilitation Alternative are predicted along 14th Avenue S. between S. Cloverdale and S. Donovan streets, with a high noise level of 74 dBA L_{eq}(h). In addition to the traffic noise modeled as part of this project, the South Park neighborhood also experiences aircraft noise associated with Boeing Field and Sea-Tac Airport.

Bascule Bridge Alternative

Under the Bascule Bridge Alternative, noise levels are projected to increase by 2 dBA L_{eq}(h) at most receptors in the study area (see Table 8), as a result of future increases in traffic. Actual maximum traffic noise-level increases may be less than predicted, if congestion increases in the peak hour and slows traffic. Traffic noise levels would

approach or exceed the FHWA noise abatement criteria at 8 out of the 14 modeled sites, representing 21 receptors.

The increase in traffic noise levels under the Bascule Bridge Alternative would be similar along the majority of the South Park Bridge study area with the exception of a few residences. The greatest traffic noise impacts for the Bascule Bridge Alternative are predicted along 14th Avenue S. between S. Cloverdale and S. Donovan streets, with a high noise level of 74 dBA L_{eq}(h). In addition to the traffic noise modeled as part of this project, the South Park neighborhood also experiences aircraft noise associated with Boeing Field and Sea-Tac Airport.

Mid-Level Fixed-Span Bridge Alternative

Under the Mid-Level Fixed-Span Bridge Alternative, noise levels are projected to increase by 2 dBA L_{eq}(h) at most receptors in the study area (see Table 8), as a result of future increases in traffic. Actual maximum noise-level increases may be less than predicted as congestion increases in the peak hour and slows traffic. Traffic noise levels would approach or exceed the FHWA noise abatement criteria at 7 out of the 14 modeled sites, representing 21 receptors.

The increase in traffic noise levels under the Mid-Level Fixed-Span Bridge Alternative would be consistent along the majority of the South Park Bridge study area with the exception of a few residences. The greatest traffic noise impacts for the Mid-Level Fixed-Span Bridge Alternative are predicted along 14th Avenue S. between S. Cloverdale and S. Donovan streets, with a high noise level of 74 dBA L_{eq}(h). In addition to the traffic noise modeled as part of this project, the South Park neighborhood also experiences aircraft noise associated with Boeing Field and Sea-Tac Airport.

High-Level Fixed-Span Bridge Alternative

Under the High-Level Fixed-Span Bridge Alternative, noise levels are projected to increase by an average of 1 dBA L_{eq}(h) at receptors in the study area (see Table 8), as a result of future increases in traffic. Actual maximum traffic noise-level increases may be less than predicted as congestion increases in the peak hour and slows traffic. Traffic noise levels would approach or exceed the FHWA noise abatement criteria at 5 out of the 14 modeled sites, representing 16 receptors.

The increase in traffic noise levels under the High-Level Fixed-Span Bridge Alternative would be consistent along the majority of the South Park Bridge study area with the exception of a few residences. The greatest traffic noise impacts for the High-Level Fixed-Span Bridge Alternative are predicted along S. Trenton Street, with a high noise level of 73 dBA L_{eq}(h). S. Trenton Street and 12th Avenue S. would have much higher traffic volumes under this alternative due to the re-design of these roadways to accommodate traffic from the High-Level Fixed-Span Bridge Alternative. One area of the project corridor that would experience lower than existing traffic noise levels is along 14th Avenue S. from S. Donovan Street north to the Duwamish River. The lower traffic noise levels identified under the High-Level Fixed-Span Bridge Alternative are the result of the bridge shielding nearby residences from S. Donovan Street north to the Duwamish

River. In addition to the traffic noise modeled as part of this project, the South Park neighborhood also experiences aircraft noise associated with Boeing Field and SeaTac.

6.2 Secondary and Cumulative Impacts

The noise analysis for this project is based on the transportation demand forecasting model, including the effects of unmet demand on the transportation system. By including unmet demand, the secondary effects of increased transportation capacity are included in the analysis. The noise analysis also includes the effects of both the proposed South Park Bridge improvements and the other regional baseline improvements. Because ambient noise levels in the affected area are not assumed to increase substantially in the future, the noise analysis captures the cumulative effects of noise within the affected area.

Chapter 7 Mitigation

Noise can be controlled/mitigated at three locations relative to the source of the noise: (1) at the source (e.g., with mufflers and quieter engines), (2) along the noise path, with barriers, and (3) at the receptor, with insulation. Noise abatement is necessary only where frequent human use occurs and where a lower noise level would have benefits (U.S. DOT, 1982).

7.1 Construction

Construction noise could be reduced by using enclosures or walls to surround noisy equipment, installing mufflers on engines, substituting quieter equipment or construction methods, minimizing operation time, and locating equipment farther from sensitive receptors. To reduce construction noise at nearby receptors, the following mitigation measures could be incorporated into construction plans and contractor specifications:

- Limiting construction activities to between 7 AM and 10 PM on weekdays and between 9 AM and 10 PM on weekends would reduce construction noise levels during sensitive nighttime hours.
- Equipping construction equipment engines with adequate mufflers, intake silencers, and engine enclosures would reduce their noise by 5 to 10 dBA (U.S. EPA, 1971).
- Specifying the quietest equipment available would reduce noise by 5 to 10 dBA.
- Requiring contractors to use Occupational Safety and Health Administration (OSHA)-approved ambient sound-level sensing backup alarms would reduce disturbances to nearby residents from backup alarms during quieter periods.
- Turning off construction equipment during prolonged periods of non-use would eliminate noise from construction equipment during those periods.
- Requiring contractors to maintain all equipment and train their equipment operators would reduce noise levels and increase operational efficiency.
- Locating stationary equipment away from receiving properties would decrease noise from that equipment in relation to the increased distance.
- Constructing temporary noise barriers or curtains around stationary equipment that must be located close to residences would decrease noise levels at nearby sensitive receptors.

7.2 Operation

A variety of mitigation measures can be effective at reducing traffic noise impacts. For example, noise impacts from the long-term operation of the project could be reduced by implementing traffic management measures: acquiring land as buffer zones, constructing noise barriers or berms, realigning the roadway, and insulating public use or nonprofit institutional structures. These mitigation measures were evaluated for their potential to reduce noise impacts from the proposed alternatives, and the results of the evaluation are summarized below.

For receptors determined to exceed the noise abatement criteria, noise mitigation is evaluated. The evaluation of mitigation is a two-step process. First the mitigation is evaluated to determine if it is feasible, or if it is possible to provide the mitigation in such a way that it would provide a substantial noise reduction. Second, it is evaluated for reasonableness. The reasonableness evaluation considers both the cost per benefited receptor and the preferences of the affected community.

Many factors are evaluated to determine whether or not mitigation would be feasible and/or reasonable. Determination of feasibility includes whether the mitigation could achieve a noise reduction of at least 7 dBA L_{eq}(h) at the closest receptors. Determination of reasonability includes the number of sensitive receptors benefited by at least 3 dBA L_{eq}(h); the cost-effectiveness of the mitigation; and concerns such as aesthetics, safety, and the desires of nearby residents. The cost-effectiveness reasonableness criteria used in the State of Washington for the mitigation costs allowed per benefited receptor is summarized in Table 9.

Table 9. State of Washington Mitigation Allowance for Impacts Caused by Traffic Noise Level

Design Year Traffic Noise Decibel Level	Allowed Mitigation Cost Per Household	Allowed Equivalent Barrier Area Per Household
66 dBA	$15,500	65.0 sq. meters (700 sq. ft.)
67 dBA	$17,000	71.5 sq. meters (770 sq. ft.)
68 dBA	$18,500	77.7 sq. meters (837 sq. ft.)
69 dBA	$20,000	84.0 sq. meters (905 sq. ft.)
70 dBA	$21,500	90.5 sq. meters (973 sq. ft.)
71 dBA	$23,000	96.7 sq. meters (1041 sq. ft.)
72 dBA	$24,500	103.0 sq. meters (1109 sq. ft.)
73 dBA	$26,000	109.2 sq. meters (1176 sq. ft.)
74 dBA	$27,500	115.5 sq. meters (1244 sq. ft.)

7.2.1 Traffic Management Measures

Traffic management measures include time restrictions, traffic control devices, signing for prohibition of certain vehicle types (e.g., motorcycles and heavy trucks), modified speed limits, and exclusive land designations. Restriction of vehicle types and lower speed limits on 14th Avenue S. and local side streets could worsen congestion. This could result in trucks taking longer routes which could produce results contrary to the Bridge's purpose. A transportation system management plan combined with increased transit facilities to encourage the continued use of car pools and public transit could reduce vehicle trips; however, a 3-dBA $L_{eq}(h)$ decrease in traffic noise would require a reduction in traffic of approximately 50 percent.

7.2.2 Land Acquisition for Noise Buffers or Barriers

Residential and commercial properties, including single- and multi-family units, border 14th Avenue S. south of the bridge. Land acquisition for noise buffers or barriers would require relocating residents and would be unreasonably expensive for noise mitigation purposes.

7.2.3 Realigning the Roadway

The horizontal alignment of a roadway is largely defined by available land adjacent to existing right-of-way. The vertical realignment of project elements is constrained by the structural clearance requirements. Lowering the South Park Bridge to provide noise reduction to some receptors would not be allowed due to clearance requirements of vessels traveling along the Duwamish River. Also, much of the noise in the neighborhood is from local streets; therefore, any mitigation that only affects the new bridge would have limited effectiveness.

7.2.4 Noise Insulation of Buildings

Insulation of buildings could be feasible, but this remedy does not apply to commercial and residential structures that constitute many of the impacted receptors in the project area. Noise insulation could be applicable to Receptor 1, the Sea Mar Community Health Center. Because noise insulation is only effective at reducing interior noise levels, it is less preferable than other mitigation measures. However, if it proves feasible and reasonable, it is likely to be appropriate for this project as other measures are not feasible. Additional evaluation is required prior to determining the final need and applicability of the insulation. Prior to issuance of the Draft EIS, an evaluation of the Sea Mar Community Health Center buildings is needed to determine if interior traffic noise impacts are likely to occur based on the building acoustics and use of rooms adjacent to 14th Avenue S. The evaluation must also assess whether buildings can be retrofitted with acoustic windows and/or other measures (if needed) and within the reasonableness criteria.

7.2.5 Noise Barriers

Noise barriers include noise walls, berms, and buildings that are not noise-sensitive. The effectiveness of a noise barrier is determined by its height and length as well as the project site's topography. To be effective, the barrier must block the "line of sight" between the highest point of a noise source (e.g., a truck's exhaust stack) and the highest

part of a receiver. It must be long enough to prevent sounds from passing around the ends, have no openings such as driveway connections, and be sufficiently dense such that noise would not be transmitted through it. Intervening rows of buildings that are not noise-sensitive could also be used as barriers (U.S. DOT, 1973).

Determination of engineering feasibility includes assessing whether barriers could be built in a location to achieve a noise reduction of at least 7 dBA L_{eq}(h) at the closest receptors. Determination of reasonability evaluates the number of sensitive receptors benefited by at least 3 dBA L_{eq}(h), the cost-effectiveness of the barriers, and concerns such as aesthetics, safety, and the desires of nearby residents. The reasonableness criteria for the barrier areas provided per benefited receptor are summarized in Table 9.

Future noise levels for each build alternative were modeled to approach or exceed the noise abatement criteria at several locations along the project corridor. In areas where the criteria were exceeded, noise walls were evaluated. The results of the evaluation are summarized in Table 10. Noise barriers were not evaluated for the No Action Alternative because the No Action Alternative assumes that the current bridge will not be replaced. After demolition, traffic volumes would decrease, and noise levels would decrease. The exact locations and sizes of the walls evaluated are provided wall-by-wall below.

Table 10. Summary of Walls Evaluated

Alternative and Wall Evaluated	Result
Rehabilitation West Wall	Not Feasible
Bascule Bridge West Wall	Not Feasible
Mid-Level Fixed-Span Bridge West Wall	Not Feasible
Mid-Level Fixed-Span Bridge East Wall	Not Feasible
High-Level Fixed-Span Bridge West Wall	Not Feasible
High-Level Fixed-Span Bridge East Wall	Not Feasible

7.2.5.1 Rehabilitation Alternative, West Wall (Not Feasible)

A wall was evaluated along the west shoulder of the South Park Bridge, approximately between Station 17 and Station 23 (see Table 11). This wall was found infeasible because it was not possible to obtain a 7-dBA L_{eq}(h) reduction for any of the residences located in the area. A substantial portion of the noise in this area results from traffic noise traveling on 14th Avenue S. and S. Sullivan Street, as well as aviation noise overhead.

Table 11 details the wall evaluated in this area. The maximum reduction provided by this wall design was less than 1 dBA L_{eq}(h). Two residences in this area were modeled to be affected by noise in the area of the west wall under the Rehabilitation Alternative. Extending the wall north to Station 24 would not further lower the noise level. Extending the wall south is not feasible due to existing roadway intersections. Based on these results, a noise wall would not be feasible on the west side of the bridge under the Rehabilitation Alternative.

Table 11. Rehabilitation Alternative, West Wall Area

Station	Bottom Elevation of Noise Wall on Bridge (Approximate)	Height
Station 17+00	19 feet	8 feet
Station 19+00	25 feet	8 feet
Station 21+00	41 feet	8 feet
Station 23+00	47 feet	8 feet

A noise wall was not evaluated along the eastern shoulder of the Rehabilitation Bridge because there are no sensitive receptors directly impacted by noise from the bridge.

7.2.5.2 Bascule Bridge Alternative, West Wall (Not Feasible)

A wall was evaluated along the west shoulder of the South Park Bridge, approximately between Station 17 and Station 23 (see Table 12). This wall was found infeasible because it was not possible to obtain a 7-dBA L_{eq}(h) reduction for any of the residences located in the area. A substantial portion of the noise in this area results from traffic noise traveling on 14th Avenue S. and S. Sullivan Street, as well as aviation noise overhead.

Table 12 details the wall evaluated in this area. The maximum reduction provided by this wall design was less than 2 dBA L_{eq}(h). Two residences in this area were modeled to be affected by noise in the area of the west wall under the Bascule Bridge Alternative. Extending the wall north to Station 24 would not further lower the noise level. Extending the wall south is not feasible due to existing roadway intersections. Based on these results, a noise wall would not be feasible on the west side of the bridge under the Bascule Bridge Alternative.

Table 12. Bascule Bridge Alternative, West Wall Area

Station	Bottom Elevation of Noise Wall on Bridge (Approximate)	Height
Station 17+00	19 feet	8 feet
Station 19+00	25 feet	8 feet
Station 21+00	41 feet	8 feet
Station 23+00	47 feet	8 feet

A noise wall was not evaluated along the eastern shoulder of the Bascule Bridge because there are no sensitive receptors directly impacted by noise from the bridge.

7.2.5.3 Mid-Level Fixed-Span Bridge Alternative, West Wall (Not Feasible)

A wall was evaluated along the west shoulder of the South Park Bridge, approximately between Station 13 to Station 23 (see Table 13). This wall was found infeasible because it was not possible to obtain a 7-dBA L_{eq}(h) reduction for any of the residences located in

the area. A substantial portion of the noise in this area results from traffic noise traveling on S. Sullivan and S. Cloverdale streets, as well as aviation noise overhead.

Table 13 details the wall evaluated in this area. The maximum reduction provided by this wall design was less than 1 dBA L_{eq}(h). Nine residences in this area were modeled to be affected by noise in the area of the west wall under the Mid-Level Fixed-Span Bridge Alternative. Extending the wall north to Station 24 would not further lower the noise level. Extending the wall south is not feasible due to existing roadway intersections. Based on these results, a noise wall would not be feasible on the west side of the bridge under the Mid-Level Fixed-Span Bridge Alternative.

Table 13. Mid-Level Fixed-Span Bridge Alternative, West Wall Area

Station	Bottom Elevation of Noise Wall on Bridge (Approximate)	Height
Station 13+00	24 feet	8 feet
Station 15+00	31 feet	8 feet
Station 17+00	41 feet	8 feet
Station 19+00	53 feet	8 feet
Station 21+00	75 feet	8 feet
Station 23+00	83 feet	8 feet

7.2.5.4 Mid-Level Fixed-Span Bridge Alternative, East Wall (Not Feasible)

A wall was evaluated along the east shoulder of the South Park Bridge, approximately between Station 13 to Station 23 (see Table 14). This wall was found infeasible because it was not possible to obtain a 7-dBA L_{eq}(h) reduction for any of the residences located in the area. A substantial portion of the noise in this area results from traffic noise traveling on S. Sullivan and S. Cloverdale streets, as well as aviation noise overhead.

Table 14 details the wall evaluated in this area. The maximum reduction provided by this wall design was less than 1 dBA L_{eq}(h). Two residences in this area were modeled to be affected by noise in the area of the east wall under the Mid-Level Fixed-Span Bridge Alternative. Extending the wall north to Station 24 would not further lower the noise level. Extending the wall south is not feasible due to existing roadway intersections. Based on these results, a noise wall would not be feasible on the east side of the bridge under the Mid-Level Fixed-Span Bridge Alternative.

Table 14. Mid-Level Fixed-Span Bridge Alternative, East Wall Area

Station	Bottom Elevation of Noise Wall on Bridge (Approximate)	Height
Station 13+00	24 feet	8 feet
Station 15+00	31 feet	8 feet
Station 17+00	41 feet	8 feet
Station 19+00	53 feet	8 feet
Station 21+00	75 feet	8 feet
Station 23+00	83 feet	8 feet

7.2.5.5 High-Level Fixed-Span Bridge Alternative, West Wall (Not Feasible)

A wall was evaluated along the west shoulder of the South Park Bridge, approximately between Station 7 to Station 23 (see Table 15). This wall was found infeasible because it was not possible to obtain a 7-dBA $L_{eq}(h)$ reduction for any of the residences located in the area. A substantial portion of the noise in this area results from traffic noise traveling on side streets, including S. Cloverdale, S. Donovan, and S. Trenton streets; and 12th Avenue S., as well as aviation noise overhead.

Table 15 details the wall evaluated in this area. The maximum reduction provided by this wall design was less than 1 dBA $L_{eq}(h)$. Eight residences in this area were modeled to be affected by noise in the area of the west wall under the High-Level Fixed-Span Bridge Alternative. Extending the wall north to Station 24 would not further lower the noise level. Extending the wall south is not feasible due to existing roadway intersections. Based on these results, a noise wall would not be feasible on the west side of the bridge under the High-Level Fixed-Span Bridge Alternative.

Table 15. High-Level Fixed-Span Bridge Alternative, West Wall Area

Station	Bottom Elevation of Noise Wall on Bridge (Approximate)	Height
Station 7+00	21 feet	8 feet
Station 9+00	26 feet	8 feet
Station 11+00	38 feet	8 feet
Station 13+00	50 feet	8 feet
Station 15+00	61 feet	8 feet
Station 17+00	73 feet	8 feet
Station 19+00	88 feet	8 feet
Station 21+00	107 feet	8 feet
Station 23+00	118 feet	8 feet

7.2.5.6 High-Level Fixed-Span Bridge Alternative, East Wall (Not Feasible)

A wall was evaluated along the east shoulder of the South Park Bridge, approximately between Station 7 to Station 23 (see Table 16). This wall was found infeasible because it was not possible to obtain a 7-dBA $L_{eq}(h)$ reduction for any of the residences located in the area. A substantial portion of the noise in this area results from traffic noise traveling on side streets, including S. Cloverdale, S. Donovan, and S. Trenton streets, as well as aviation noise overhead.

Table 16 details the wall evaluated in this area. The maximum reduction provided by this wall design was less than 1 dBA $L_{eq}(h)$. Four residences in this area were modeled to be affected by noise in the area of the east wall under the High-Level Fixed-Span Bridge Alternative. Extending the wall north to Station 24 would not further lower the noise level. Extending the wall south is not feasible due to existing roadway intersections. Based on these results, a noise wall would not be feasible on the east side of the bridge under the High-Level Fixed-Span Bridge Alternative.

Table 16. High-Level Fixed-Span Bridge Alternative, East Wall Area

Station	Bottom Elevation of Noise Wall on Bridge (Approximate)	Height
Station 7+00	21 feet	8 feet
Station 9+00	26 feet	8 feet
Station 11+00	38 feet	8 feet
Station 13+00	50 feet	8 feet
Station 15+00	61 feet	8 feet
Station 17+00	73 feet	8 feet
Station 19+00	88 feet	8 feet
Station 21+00	107 feet	8 feet
Station 23+00	118 feet	8 feet

7.2.5.7 Summary of Noise Barriers

Noise barriers were not found to be feasible or reasonable for any of the four build alternatives (Rehabilitation, Bascule Bridge, Mid-Level Fixed-Span Bridge, and High-Level Fixed-Span Bridge) considered for the South Park Bridge Project. Appendix A of this report contains transportation noise model results for each noise barrier analyzed.

King County Code. Chapter 12.88.020, *Noise Pollution* Control. Seattle, WA.

Seattle Municipal Code. Chapter 25.08, *Noise Control*. Seattle, WA.

U.S. Department of Transportation, Federal Highway Administration, 1972. *The Audible Landscape: A Manual for Highway Noise and Land Use*. Washington D.C.

U.S. Department of Transportation, Federal Highway Administration, 1973. *Fundamentals and Abatement of Highway Traffic Noise*. Washington D.C.

U.S. Department of Transportation, Federal Highway Administration, 1982. "Procedures for Abatement of Highway Traffic Noise and Construction Noise." *Federal-Aid Highway Program Manual.* Volume 7, Chapter 7, Section 3. Washington D.C.

U.S. Department of Transportation, Federal Transit Administration, 1995. *Transit Noise and Vibration Impact Assessment*. Washington D.C.

U.S. Department of Transportation, Federal Highway Administration, 1996. *Measurement of Highway Related Noise*. Washington D.C.

U.S. Department of Transportation, Federal Highway Administration, 1998. *FHWA Traffic Noise Model User's Guide*. Washington D.C.

U.S. Environmental Protection Agency, 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. Washington D.C.

U.S. Environmental Protection Agency, 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. Report Number 550/9-74-004.

Washington Administrative Code, 1989. Chapter 173-60. *Maximum Environmental Noise Levels*. Olympia, Washington.

Washington State Department of Transportation, March 1999. *Traffic Noise Analysis and Abatement Policy and Procedures*. Olympia, Washington.

This page intentionally blank

Appendices Traffic Noise Model Output

A Existing Conditions Traffic Noise Model

B 2027 No Action Alternative Traffic Noise Model

C 2027 Rehabilitation Alternative Traffic Noise Models

D 2027 Bascule Bridge Alternative Traffic Noise Models

E 2027 Mid-Level Fixed-Span Bridge Alternative Traffic Noise Models

F 2027 High-Level Fixed-Span Bridge Alternative Traffic Noise Models

This page intentionally blank

Appendix A

Existing Conditions Traffic Noise Model

This page intentionally blank

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
1	1	1	0.0	68.0	66	68.0	10	Snd Lvl	68.0	0.0	8	-8.0
2 3	2	1	0.0	63.9	66	63.9	10	----	63.9	0.0	8	-8.0
4	3	1	0.0	72.1	66	72.1	10	Snd Lvl	72.1	0.0	8	-8.0
5	4	1	0.0	64.0	66	64.0	10	----	63.9	0.1	8	-7.9
6	5	1	0.0	63.4	66	63.4	10	----	63.3	0.1	8	-7.9
7	6	1	0.0	61.1	66	61.1	10	----	60.9	0.2	8	-7.8
A	7	1	0.0	62.2	66	62.2	10	----	62.2	0.0	8	-8.0
B	8	1	0.0	64.2	66	64.2	10	----	64.1	0.1	8	-7.9
C	9	1	0.0	68.6	66	68.6	10	Snd Lvl	68.6	0.0	8	-8.0
D	10	1	0.0	65.9	66	65.9	10	----	65.9	0.0	8	-8.0
E	11	1	0.0	65.6	66	65.6	10	----	65.5	0.1	8	-7.9
F	12	1	0.0	62.5	66	62.5	10	----	62.1	0.4	8	-7.6
G	13	1	0.0	60.3	66	60.3	10	----	60.2	0.1	8	-7.9
24-1	14	1	0.0	62.5	66	62.5	10	----	62.4	0.1	8	-7.9

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	14	0.0	0.1	0.4
All Impacted	3	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

This page intentionally blank

Appendix B

2027 No Action Alternative Traffic Noise Model

This page intentionally blank

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Noise Reduction Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
1	1	1	0.0	67.5	66	67.5	10	Snd Lvl	67.5	0.0	8	-8.0
2 3	2	1	0.0	63.4	66	63.4	10	----	63.4	0.0	8	-8.0
4	3	1	0.0	71.4	66	71.4	10	Snd Lvl	71.4	0.0	8	-8.0
5	4	1	0.0	61.7	66	61.7	10	----	61.7	0.0	8	-8.0
6	5	1	0.0	58.6	66	58.6	10	----	58.6	0.0	8	-8.0
7	6	1	0.0	57.6	66	57.6	10	----	57.6	0.0	8	-8.0
A	7	1	0.0	62.0	66	62.0	10	----	62.0	0.0	8	-8.0
B	8	1	0.0	64.1	66	64.1	10	----	64.1	0.0	8	-8.0
C	9	1	0.0	68.6	66	68.6	10	Snd Lvl	68.6	0.0	8	-8.0
D	10	1	0.0	64.0	66	64.0	10	----	64.0	0.0	8	-8.0
E	11	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
F	12	1	0.0	59.5	66	59.5	10	----	59.5	0.0	8	-8.0
G	13	1	0.0	58.4	66	58.4	10	----	58.4	0.0	8	-8.0
24-1	14	1	0.0	62.0	66	62.0	10	----	62.0	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	14	0.0	0.0	0.0
All Impacted	3	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

This page intentionally blank

Appendix C 2027 Rehabilitation Alternative Traffic Noise Model

This page intentionally blank

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
1	1	1	0.0	69.9	66	69.9	10	Snd Lvl	69.9	0.0	8	-8.0
2 3	2	1	0.0	65.6	66	65.6	10	----	65.6	0.0	8	-8.0
4	3	1	0.0	74.0	66	74.0	10	Snd Lvl	74.0	0.0	8	-8.0
5	4	1	0.0	65.7	66	65.7	10	----	65.5	0.2	8	-7.8
6	5	1	0.0	65.1	66	65.1	10	----	64.9	0.2	8	-7.8
7	6	1	0.0	62.6	66	62.6	10	----	62.4	0.2	8	-7.8
A	7	1	0.0	63.9	66	63.9	10	----	63.9	0.0	8	-8.0
B	8	1	0.0	65.2	66	65.2	10	----	65.2	0.0	8	-8.0
C	9	1	0.0	70.4	66	70.4	10	Snd Lvl	70.4	0.0	8	-8.0
D	10	1	0.0	67.7	66	67.7	10	Snd Lvl	67.7	0.0	8	-8.0
E	11	1	0.0	67.2	66	67.2	10	Snd Lvl	67.1	0.1	8	-7.9
F	12	1	0.0	64.2	66	64.2	10	----	63.9	0.3	8	-7.7
G	13	1	0.0	61.6	66	61.6	10	----	61.5	0.1	8	-7.9
24-1	14	1	0.0	64.0	66	64.0	10	----	63.9	0.1	8	-7.9

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	14	0.0	0.1	0.3
All Impacted	5	0.0	0.0	0.1
All that meet NR Goal	0	0.0	0.0	0.0

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: BARRIER DESIGN
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: Rehabilitation West Wall 8'

ATMOSPHERICS: 68 deg F, 50% RH

Selected Receivers

Name	No.	Calc LAeq1h	Noise Reduction Calc	Noise Reduction Goal	Noise Reduction Calc-Goal	Important Barriers	Important Segments No.	Important Segments Height	Partial LAeq1h
		dBA	dB	dB	dB			ft.	dBA
24-1	14	63.8	0.2	8	-7.8	Barrier4	10	2.0	47.7
						Barrier4	9	2.0	46.6
						Barrier4	8	2.0	42.9
						Barrier4	11	2.0	41.5
F	12	63.8	0.4	8	-7.6	Barrier4	9	2.0	52.2
						Barrier4	10	2.0	51.5
						Barrier4	8	2.0	49.4
						Barrier4	11	2.0	41.6
6	5	64.5	0.6	8	-7.4	Barrier4	10	2.0	51.6
						Barrier4	9	2.0	48.2
						Barrier4	11	2.0	48.0
						Barrier4	8	2.0	40.8
Barrier4					$0				
		Total Cost, All Barriers			$0				
		Cost (Barrier) / DU Benefitted			$0				
Cost (Barrier + Miscellaneous Other) / DU Benefitted					$0				

Appendix D

2027 Bascule Bridge Alternative Traffic Noise Model

This page intentionally blank

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
1	1	1	0.0	69.9	66	69.9	10	Snd Lvl	69.9	0.0	8	-8.0
2 3	2	1	0.0	65.6	66	65.6	10	----	65.6	0.0	8	-8.0
4	3	1	0.0	74.0	66	74.0	10	Snd Lvl	74.0	0.0	8	-8.0
5	4	1	0.0	66.5	66	66.5	10	Snd Lvl	66.4	0.1	8	-7.9
6	5	1	0.0	69.5	66	69.5	10	Snd Lvl	69.7	-0.2	8	-8.2
7	6	1	0.0	63.4	66	63.4	10	----	63.2	0.2	8	-7.8
A	7	1	0.0	63.9	66	63.9	10	----	63.9	0.0	8	-8.0
B	8	1	0.0	65.2	66	65.2	10	----	65.2	0.0	8	-8.0
C	9	1	0.0	70.4	66	70.4	10	Snd Lvl	70.4	0.0	8	-8.0
D	10	1	0.0	67.4	66	67.4	10	Snd Lvl	67.4	0.0	8	-8.0
E	11	1	0.0	67.8	66	67.8	10	Snd Lvl	67.7	0.1	8	-7.9
F	12	1	0.0	65.3	66	65.3	10	----	64.9	0.4	8	-7.6
G	13	1	0.0	62.2	66	62.2	10	----	62.0	0.2	8	-7.8
24-1	14	1	0.0	65.4	66	65.4	10	----	65.2	0.2	8	-7.8

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	14	-0.2	0.1	0.4
All Impacted	7	-0.2	0.0	0.1
All that meet NR Goal	0	0.0	0.0	0.0

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: BARRIER DESIGN
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: Bascule Bridge West Wall 8'

ATMOSPHERICS: 68 deg F, 50% RH

Selected Receivers

Name	No.	Calc LAeq1h	Noise Reduction Calc	Noise Reduction Goal	Noise Reduction Calc-Goal	Important Barriers	Important Segments No.	Important Segments Height	Partial LAeq1h
		dBA	dB	dB	dB			ft.	dBA
6	5	68.0	1.5	8	-6.5	Barrier4	10	2.0	57.7
						Barrier4	11	2.0	51.1
						Barrier4	9	2.0	48.4
						Barrier4	8	2.0	41.4
24-1	14	65.2	0.2	8	-7.8	Barrier4	10	2.0	49.7
						Barrier4	9	2.0	48.0
						Barrier4	11	2.0	47.3
						Barrier4	8	2.0	44.3
F	12	64.6	0.7	8	-7.3	Barrier4	9	2.0	55.5
						Barrier4	10	2.0	51.9
						Barrier4	8	2.0	51.1
						Barrier4	11	2.0	40.2
G	13	61.9	0.3	8	-7.7	Barrier4	8	2.0	46.5
						Barrier4	9	2.0	45.0
						Barrier4	11	2.0	39.7
						Barrier4	10	2.0	39.7
7	6	63.0	0.4	8	-7.6	Barrier4	8	2.0	49.9
						Barrier4	9	2.0	47.5
						Barrier4	10	2.0	47.1
						Barrier4	11	2.0	39.2
Barrier4					$0				

RESULTS: BARRIER DESIGN

25317C

		Total Cost, All Barriers	$0				
		Cost (Barrier) / DU Benefitted	$0				
Cost (Barrier + Miscellaneous Other) / DU Benefitted			$0				

This page intentionally blank

Appendix E

2027 Mid-Level Fixed-Span Bridge Alternative Traffic Noise Model

This page intentionally blank

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: BARRIER DESIGN
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: Mid-Level Fixed-Span West Wall 8'

ATMOSPHERICS: 68 deg F, 50% RH

Selected Receivers

Name	No.	Calc LAeq1h	Noise Reduction Calc	Noise Reduction Goal	Noise Reduction Calc-Goal	Important Barriers	Important Segments No.	Important Segments Height	Partial LAeq1h
		dBA	dB	dB	dB			ft.	dBA
G	13	62.3	0.0	8	-8.0	Barrier4	8	2.0	48.5
						Barrier4	9	2.0	47.0
						Barrier4	11	2.0	45.1
						Barrier7	21	2.0	43.0
						Barrier4	10	2.0	41.6
						Barrier7	22	2.0	35.4
7	6	63.5	-0.1	8	-8.1	Barrier4	8	2.0	51.9
						Barrier4	10	2.0	49.4
						Barrier4	9	2.0	49.0
						Barrier4	11	2.0	46.9
						Barrier7	21	2.0	42.9
F	12	65.8	0.0	8	-8.0	Barrier4	9	2.0	57.9
						Barrier4	10	2.0	56.4
						Barrier4	8	2.0	54.6
						Barrier4	11	2.0	51.2
						Barrier7	21	2.0	45.6
6	5	64.8	0.0	8	-8.0	Barrier4	10	2.0	53.3
						Barrier4	11	2.0	51.5
						Barrier7	21	2.0	49.7
						Barrier4	9	2.0	46.5
						Barrier4	8	2.0	42.8
						Barrier7	22	2.0	41.1
						Barrier7	23	2.0	23.5

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Noise Reduction Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
1	1	1	0.0	69.9	66	69.9	10	Snd Lvl	69.9	0.0	8	-8.0
2 3	2	1	0.0	65.6	66	65.6	10	----	65.6	0.0	8	-8.0
4	3	1	0.0	74.1	66	74.1	10	Snd Lvl	74.1	0.0	8	-8.0
5	4	1	0.0	64.6	66	64.6	10	----	64.6	0.0	8	-8.0
6	5	1	0.0	64.8	66	64.8	10	----	64.8	0.0	8	-8.0
7	6	1	0.0	63.5	66	63.5	10	----	63.5	0.0	8	-8.0
A	7	1	0.0	63.8	66	63.8	10	----	63.8	0.0	8	-8.0
B	8	1	0.0	65.3	66	65.3	10	----	65.3	0.0	8	-8.0
C	9	1	0.0	70.4	66	70.4	10	Snd Lvl	70.4	0.0	8	-8.0
D	10	1	0.0	67.1	66	67.1	10	Snd Lvl	67.1	0.0	8	-8.0
E	11	1	0.0	66.8	66	66.8	10	Snd Lvl	66.8	0.0	8	-8.0
F	12	1	0.0	65.8	66	65.8	10	----	65.8	0.0	8	-8.0
G	13	1	0.0	62.3	66	62.3	10	----	62.3	0.0	8	-8.0
24-1	14	1	0.0	64.3	66	64.3	10	----	64.3	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	14	0.0	0.0	0.0
All Impacted	5	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

RESULTS: BARRIER DESIGN

25317C

24-1	14	64.3	0.0	8	-8.0	Barrier4	11	2.0	50.9
						Barrier4	10	2.0	50.9
						Barrier4	9	2.0	50.5
						Barrier4	8	2.0	49.1
						Barrier7	21	2.0	47.8
						Barrier7	22	2.0	45.2
						Barrier7	23	2.0	39.2
E	11	66.8	0.0	8	-8.0	Barrier7	21	2.0	56.7
						Barrier4	11	2.0	54.8
						Barrier7	22	2.0	54.5
						Barrier4	10	2.0	46.0
						Barrier7	23	2.0	44.7
						Barrier4	8	2.0	39.4
						Barrier4	9	2.0	38.3
Barrier4					$0				
Barrier7					$0				
		Total Cost, All Barriers			$0				
		Cost (Barrier) / DU Benefitted			$0				
Cost (Barrier + Miscellaneous Other) / DU Benefitted					$0				

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: BARRIER DESIGN
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: Mid-Level Fixed-Span East Wall 8'

ATMOSPHERICS: 68 deg F, 50% RH

Selected Receivers

Name	No.	Calc LAeq1h	Noise Reduction Calc	Noise Reduction Goal	Noise Reduction Calc-Goal	Important Barriers	Important Segments No.	Important Segments Height	Partial LAeq1h
		dBA	dB	dB	dB			ft.	dBA
D	10	67.0	0.1	8	-7.9	Barrier5	14	2.0	53.1
						Barrier5	13	2.0	51.9
						Barrier3	3	2.0	46.2
5	4	64.6	0.0	8	-8.0	Barrier5	15	2.0	53.9
						Barrier5	14	2.0	52.7
						Barrier3	3	2.0	50.0
						Barrier5	13	2.0	45.9
Barrier3					$0				
Barrier5					$0				
		Total Cost, All Barriers			$0				
		Cost (Barrier) / DU Benefitted			$0				
Cost (Barrier + Miscellaneous Other) / DU Benefitted					$0				

Appendix F

2027 High-Level Fixed-Span Bridge Alternative Traffic Noise Model

This page intentionally blank

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
1	1	1	0.0	70.2	66	70.2	10	Snd Lvl	70.2	0.0	8	-8.0
2 3	2	1	0.0	64.7	66	64.7	10	----	64.6	0.1	8	-7.9
4	3	1	0.0	67.5	66	67.5	10	Snd Lvl	67.5	0.0	8	-8.0
5	4	1	0.0	64.4	66	64.4	10	----	64.4	0.0	8	-8.0
6	5	1	0.0	60.9	66	60.9	10	----	60.9	0.0	8	-8.0
7	6	1	0.0	62.7	66	62.7	10	----	62.7	0.0	8	-8.0
A	7	1	0.0	73.2	66	73.2	10	Snd Lvl	73.2	0.0	8	-8.0
B	8	1	0.0	69.2	66	69.2	10	Snd Lvl	69.2	0.0	8	-8.0
C	9	1	0.0	65.1	66	65.1	10	----	65.1	0.0	8	-8.0
D	10	1	0.0	67.8	66	67.8	10	Snd Lvl	67.8	0.0	8	-8.0
E	11	1	0.0	65.5	66	65.5	10	----	65.4	0.1	8	-7.9
F	12	1	0.0	64.5	66	64.5	10	----	64.5	0.0	8	-8.0
G	13	1	0.0	61.5	66	61.5	10	----	61.5	0.0	8	-8.0
24-1	14	1	0.0	64.0	66	64.0	10	----	64.0	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	14	0.0	0.0	0.1
All Impacted	5	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: BARRIER DESIGN
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: High-Level Fixed-Span West Wall 8'

ATMOSPHERICS: 68 deg F, 50% RH

Selected Receivers

Name	No.	Calc LAeq1h	Noise Reduction Calc	Noise Reduction Goal	Noise Reduction Calc-Goal	Important Barriers	Important Segments No.	Important Segments Height	Partial LAeq1h
		dBA	dB	dB	dB			ft.	dBA
G	13	61.4	0.1	8	-7.9	Barrier4	8	2.0	48.5
						Barrier4	9	2.0	46.5
						Barrier4	11	2.0	42.3
						Barrier11	41	2.0	40.3
						Barrier4	10	2.0	40.1
						Barrier7	21	2.0	39.2
						Barrier11	43	2.0	37.2
						Barrier7	23	2.0	37.1
						Barrier7	22	2.0	36.1
						Barrier11	40	2.0	31.3
7	6	62.7	-0.0	8	-8.0	Barrier4	8	2.0	52.0
						Barrier4	9	2.0	48.9
						Barrier4	10	2.0	48.2
						Barrier4	11	2.0	45.7
						Barrier7	21	2.0	41.4
						Barrier11	41	2.0	41.1
						Barrier11	43	2.0	36.8
						Barrier7	23	2.0	35.6
						Barrier7	22	2.0	30.8
						Barrier11	40	2.0	27.8
F	12	64.4	0.1	8	-7.9	Barrier4	9	2.0	55.7
						Barrier4	8	2.0	53.0
						Barrier4	10	2.0	52.9

						Barrier4	11	2.0	48.8
						Barrier7	21	2.0	44.5
						Barrier11	41	2.0	39.3
						Barrier7	23	2.0	39.0
						Barrier7	22	2.0	36.0
						Barrier11	43	2.0	35.7
						Barrier11	40	2.0	35.5
6	5	60.8	0.1	8	-7.9	Barrier4	10	2.0	50.2
						Barrier4	11	2.0	46.6
						Barrier4	9	2.0	42.6
						Barrier7	21	2.0	39.2
						Barrier7	22	2.0	38.0
						Barrier4	8	2.0	37.9
						Barrier11	41	2.0	35.9
						Barrier11	40	2.0	35.3
						Barrier11	43	2.0	34.4
						Barrier11	42	2.0	28.0
24-1	14	63.9	0.1	8	-7.9	Barrier4	10	2.0	52.5
						Barrier4	11	2.0	51.6
						Barrier4	9	2.0	50.8
						Barrier4	8	2.0	50.5
						Barrier7	21	2.0	45.2
						Barrier7	22	2.0	43.7
						Barrier11	41	2.0	42.1
						Barrier11	43	2.0	39.1
						Barrier7	23	2.0	39.0
						Barrier11	40	2.0	35.7
E	11	65.4	0.1	8	-7.9	Barrier7	22	2.0	55.5
						Barrier7	21	2.0	53.4
						Barrier4	11	2.0	53.0
						Barrier7	23	2.0	49.7
						Barrier11	40	2.0	45.3
						Barrier11	41	2.0	43.0
						Barrier11	43	2.0	41.4
						Barrier4	10	2.0	40.1
						Barrier4	8	2.0	35.8
						Barrier4	9	2.0	34.9
C	9	65.0	0.1	8	-7.9	Barrier11	41	2.0	50.7

RESULTS: BARRIER DESIGN

						Barrier7	22	2.0	50.4
						Barrier7	23	2.0	48.4
						Barrier4	11	2.0	45.0
						Barrier11	40	2.0	43.3
						Barrier7	21	2.0	42.2
						Barrier11	43	2.0	41.7
						Barrier4	10	2.0	39.8
						Barrier11	42	2.0	30.3
						Barrier11	41	2.0	47.8
B	8	69.2	0.0	8	-8.0	Barrier11	43	2.0	45.8
						Barrier11	42	2.0	19.9
						Barrier11	41	2.0	53.4
2 3	2	64.5	0.2	8	-7.8	Barrier11	43	2.0	47.4
						Barrier7	23	2.0	43.3
						Barrier7	22	2.0	42.9
						Barrier4	11	2.0	41.6
						Barrier11	42	2.0	41.1
						Barrier7	21	2.0	37.4
A	7	73.2	0.0	8	-8.0				
Barrier4					$0				
Barrier7					$0				
Barrier11					$0				
		Total Cost, All Barriers			$0				
		Cost (Barrier) / DU Benefitted			$0				
Cost (Barrier + Miscellaneous Other) / DU Benefitted					$0				

Parsons Brinckerhoff
P. Romero

17 September 2002
TNM 1.1
Calculated with TNM 1.1

RESULTS: BARRIER DESIGN
PROJECT/CONTRACT: 25317C
RUN: South Park Bridge
BARRIER DESIGN: High-Level Fixed-Span East Wall 8'

ATMOSPHERICS: 68 deg F, 50% RH

Selected Receivers

Name	No.	Calc LAeq1h	Noise Reduction Calc	Noise Reduction Goal	Noise Reduction Calc-Goal	Important Barriers	Important Segments No.	Important Segments Height	Partial LAeq1h
		dBA	dB	dB	dB			ft.	dBA
5	4	64.4	0.0	8	-8.0	Barrier5	15	2.0	53.3
						Barrier5	14	2.0	53.0
						Barrier10	37	2.0	49.0
						Barrier3	3	2.0	48.9
						Barrier5	13	2.0	46.2
						Barrier10	38	2.0	41.3
						Barrier10	35	2.0	36.8
						Barrier10	36	2.0	27.2
D	10	67.7	0.1	8	-7.9	Barrier10	37	2.0	59.1
						Barrier5	13	2.0	56.2
						Barrier5	14	2.0	55.7
						Barrier10	38	2.0	54.0
						Barrier3	3	2.0	44.4
						Barrier10	35	2.0	42.0
						Barrier10	36	2.0	33.0
4	3	67.0	0.5	8	-7.5	Barrier10	37	2.0	62.8
						Barrier10	35	2.0	43.1
						Barrier10	36	2.0	37.5
						Barrier5	14	2.0	35.2
Barrier3					$0				
Barrier5					$0				
Barrier10					$0				

RESULTS: BARRIER DESIGN

25317C

		Total Cost, All Barriers	$0				
		Cost (Barrier) / DU Benefitted	$0				
Cost (Barrier + Miscellaneous Other) / DU Benefitted			$0				

Appendix T. Utilities Technical Report

This page intentionally blank

South Park Bridge Project

Utilities Technical Report

Prepared for the

King County
Department of Transportation
201 South Jackson Street
Seattle, Washington 98104

Prepared by

RoseWater Engineering, Inc.
101 Stewart Street, Suite 407
Seattle, Washington 98101

February 2004

This page intentionally blank

Technical Report
South Park Bridge Project

Utilities

February 2004

Prepared for:
King County Department of Transportation
201 South Jackson Street
Seattle, Washington 98104

Submitted by:
Parsons Brinckerhoff, Inc.
999 Third Avenue, Suite 2200
Seattle, Washington 98104

Prepared by:
RoseWater Engineering, Inc.
101 Stewart Street, Suite 407
Seattle, Washington 98101

printed on recycled paper

This page intentionally blank

Table of Contents

CHAPTER 1 EXECUTIVE SUMMARY 1

1.1 Affected Environment 1

1.2 Environmental Effects 2

1.3 Mitigation Measures 3

CHAPTER 2 INTRODUCTION 5

2.1 Description of Existing Conditions 5

2.1.1 The Project Area 5
2.1.2 The Existing South Park Bridge 7
2.1.3 Bridge Condition 7
2.1.4 Roadway Network 11
2.1.5 Freight, Transit, and Pedestrians 11

2.2 History of Project 12

2.2.1 Overview of Studies 12
2.2.2 Summary of Key Engineering Reports 12
2.2.3 Continuing Deterioration 14

2.3 Purpose and Need of Project 14

2.3.1 Function and Role of the South Park Bridge 14
2.3.2 Purpose of Proposed Project 15
2.3.3 Need for the Proposed Project 15
2.3.4 Key Issues 16

2.4 Description of Alternatives 17

2.4.1 Design Criteria 17
2.4.2 The Alternatives 20
2.4.3 Construction Durations and Activities 37
2.4.4 Cost Estimates for the Alternatives 41

2.5 Project Coordination 42

CHAPTER 3 STUDIES AND COORDINATION 45

CHAPTER 4 METHODOLOGY 47

4.1 Utility Data 47

4.2 Vertical Datum 48

CHAPTER 5 AFFECTED ENVIRONMENT 49

5.1 Overview of Utilities 49

5.2 Electricity 55

5.3 Natural Gas 55

5.4 Communications 55

5.5 Steam, Sanitary, and Combined Systems 56

5.6 Water 56

5.7 Boeing Utilities 57

CHAPTER 6 IMPACTS 59

6.1 Construction Impacts 59
6.1.1 Common to All Alternatives 59
6.1.2 No Action Alternative 63
6.1.3 Rehabilitation Alternative 63
6.1.4 Bascule Bridge Alternative 63
6.1.5 Mid-Level Fixed-Span Bridge Alternative 64
6.1.6 High-Level Fixed-Span Bridge Alternative 66

6.2 Operational Impacts 69

6.3 Secondary and Cumulative Impacts 69
6.3.1 Secondary Impacts 69
6.3.2 Cumulative Impacts 69

CHAPTER 7 MITIGATION 71

7.1 Construction Mitigation Measures 71

7.2 Operational Mitigation Measures 72

CHAPTER 8 REFERENCES 73

Tables

Table 1. Cost Estimates of the Project Alternatives 41
Table 2. Existing Utilities and Agencies.....49
Table 3. Bascule Bridge Alternative Utility Conflicts.....65
Table 4. Mid-Level Fixed-Span Bridge Alternative Utility Conflicts.....66
Table 5. High-Level Fixed-Span Bridge Alternative Utility Conflicts 68

Figures

Figure 1 Project Area and Vicinity 6
Figure 2 Existing South Park Bridge 9
Figure 3 Existing and Proposed Bridge Cross-Section Designs.....18
Figure 4 Existing Conditions Street Network.....22
Figure 5 No Action Alternative Street Network.....22
Figure 6 Rehabilitation Alternative 23
Figure 7 Rehabilitation Alternative Street Network.....26
Figure 8 Bascule Bridge Alternative Street Network 26
Figure 9 Bascule Bridge Alternative 27
Figure 10 Mid-Level Fixed-Span Bridge Alternative.....31
Figure 11 Mid-Level Fixed-Span Bridge Alternative Street Network 33
Figure 12 High-Level Fixed-Span Bridge Alternative Street Network.....33
Figure 13 High-Level Fixed-Span Bridge Alternative 35
Figure 14 Proposed Construction Staging Areas.....39
Figure 15 Pressurized and Non-Gravity Flow Utilities 51
Figure 16 Waste Water and Steam Utilities.....53
Figure 17 Potential Utility Impacts by Alternative.....61

This page intentionally blank

Chapter 1 Executive Summary

The purpose of the South Park Bridge Project is to find the most feasible long-term solution to address the deteriorated condition and increasing seismic vulnerability of the South Park Bridge, while maintaining a vital transportation linkage for cars, trucks, buses, bicyclists, and pedestrians across the Duwamish River

A total of five alternatives were selected for evaluation in the environmental review process: No Action Alternative, Rehabilitation Alternative, Bascule Bridge Alternative, Mid-Level Fixed-Span Bridge Alternative, and High-Level Fixed-Span Bridge Alternative. These alternatives were selected from an initial group of nine preliminary project alternatives that also included a low-level fixed-span bridge alternative, a vertical-lift bridge alternative, a swing bridge alternative, and a tunnel alternative. The alternatives proposed for evaluation in the environmental review process were selected because they had fewer potential environmental impacts than other preliminary alternatives.

King County proposes to rehabilitate or replace the existing South Park Bridge. This bridge is located in the Greater Duwamish Industrial Area south of Seattle's downtown. The following sections briefly describe the utilities located in the project area and the potential impacts to these utilities during construction and operation.

1.1 Affected Environment

The project area is in an urban environment. The South Park Bridge spans the Duwamish Waterway on 14th/16th Avenue S. The Boeing Company (Boeing) Plant 2 is located on the north side of the channel and the South Park community is located on the south side of the waterway. Rehabilitation or replacement of the bridge could affect utilities in the project corridor, including utilities on East Marginal Way S., 16th Avenue S. north of the bridge, 14th Avenue S. south of the bridge, S. Trenton Street, and 12th Avenue S. In addition, utilities crossing the project corridor could be affected.

There are many utilities located in the area that serve the residential, commercial, and industrial land uses. Public utilities in the project study area include the following: water, sanitary sewer, storm sewer, natural gas, electricity, telephone, and fiber optics. In addition, there are a number of privately owned and operated utilities in the project area. These are mostly located on the Boeing property and include fuel oil, steam, industrial waste, and specialized communications cables.

The utilities in the project study area are primarily located in the public right-of-way. Some utilities are overhead, such as the power lines mounted on wood poles along 14th Avenue S. Others are located underground, either in the right-of-way or on private property, such as the Boeing property. The utilities may be located in 14th Avenue S. or they may cross the project corridor. In addition, some of the utilities span the Duwamish Waterway, either overhead or buried in the channel sediments.

1.2 Environmental Effects

The proposed alternatives for the South Park Bridge, including the No Action Alternative, would affect various utilities during construction activities. In general, utilities may need to be abandoned in place, temporarily relocated, permanently relocated, or newly constructed to meet the utility needs of the rehabilitated bridge or one of the replacement bridge alternatives as well as continuing to serve existing utility customers.

Each of the alternatives would have some level of impact. Detailed lists of potential impacts to utilities are included in this report and identify the type of utility, extent of the disturbance, and the specific location where the disturbance would occur. These anticipated effects are summarized by alternative as follows:

- No Action Alternative: The No Action Alternative would involve demolition of the existing bridge and would have few utility impacts. Impacts associated with this alternative would include abandoning one water, one sewer, and one electrical line. These lines currently provide service to the existing bridge.

- Rehabilitation Alternative: The Rehabilitation Alternative has very few impacts to utilities. In the South Park community, construction disturbances would extend south of S. Sullivan Street. It is assumed that the bridge would continue to need the same service lines for this alternative as currently exist. With this assumption, there are no impacts other than to upgrade the existing utilities, if necessary.

- Bascule Bridge Alternative: This alternative has the fewest utility impacts of the three replacement alternatives. Construction disturbances in the South Park community would extend almost all the way to S. Cloverdale Street. Impacts would affect water, combined sewer, sanitary sewer, storm water, septic systems, fiber optics, electrical, and several other utilities associated with the Boeing property.

- Mid-Level Fixed-Span Bridge Alternative: The Mid-Level Fixed-Span Bridge Alternative has substantially more impacts on the existing utilities than either the Rehabilitation or Bascule Bridge alternatives. Ground disturbances during construction would extend south to S. Donovan Street. Impacts would affect water, combined sewer, sanitary sewer, storm water, septic systems, fiber optics, electrical, natural gas, side systems, and several other utilities located on the Boeing property. Due to the higher bridge elevation (approximately 65 feet) and associated road re-grading, these impacts extend further north and south than the Rehabilitation or Bascule Bridge alternatives. As such, the impacts are similar, only further reaching.

- High-Level Fixed-Span Bridge Alternative: The High-Level Fixed-Span Bridge Alternative has by far the most substantial impacts to utilities compared to all of the alternatives. In the South Park community, construction disturbances would extend south on 14th Avenue S. to S. Trenton Street, west on S. Trenton Street,

and north on 12th Avenue S. to S. Cloverdale Street. Impacts would affect water, combined sewer, sanitary sewer, storm water, septic systems, fiber optics, electrical, natural gas, side systems, and various other utilities associated with the Boeing plants. This alternative would also require providing new street drainage on the new S. Trenton Street and 12th Avenue S. connector road. This alternative reaches even further north and south compared to the Mid-Level Fixed-Span Bridge Alternative, thus increasing the number and potential severity of impacts to utilities dramatically.

Secondary and cumulative impacts of each of the project alternatives are anticipated to be minimal, with the exception of possible conflicts that could occur due to plans to construct a new sanitary sewer within the project area. The City of Seattle informed the project team that it has included sanitary sewer improvements for the project area on its current six-year public works capital improvement plan.

Following the construction of any one of the project alternatives, there would be no long-term effects related to the operation of the bridge and roadway and the continued operation of public and private utility services in the project area.

1.3 Mitigation Measures

As described above, the implementation of any one of the proposed project alternatives would result in impacts to public and private utilities in the project area during the construction. Potential impacts to utilities are primarily related to the length of each alternative. In addition, however, the duration of the construction period is correlated to the duration of potential effects on utilities in the project area. The anticipated duration of the demolition and construction activities for each of the alternatives is as follows:

- No Action Alternative—8 months
- Rehabilitation Alternative—32 months
- Bascule Bridge Alternative—33 months
- Mid-level Fixed-Span Bridge Alternative—20 months
- High-Level Fixed-Span Bridge Alternative—24 months.

A number of steps could be taken to avoid, reduce, or minimize potential effects on utilities. These include the following:

- During the preparation of preliminary engineering plans of the selected alternative, King County should maintain on-going coordination discussions with the City of Seattle to keep abreast of planned improvements to sewer facilities in the project area.

- When developing construction plans and sequencing for the selected alternative, King County should make sure the construction plans address all potential utility issues that could arise during construction and that adequate time is allowed in the construction schedule to resolve both anticipated and unanticipated problems.

- Well before the start of the construction activities, coordination should occur between King County and all public and private owners of utilities located in the project area. The objective of this coordination would be to ensure the project proponent has copies of the most current maps and other information regarding utilities that would likely be affected by construction activities.

- Prior to the start of construction activities, King County should establish communication protocols and procedures with potentially affected utility owners to ensure appropriate coordination and response to emergencies in the event that utilities are inadvertently damaged during construction.

- All planned utility work associated with the construction of the selected alternative should be coordinated with others on the project team knowledgeable of other related construction issues, including hazardous materials, archaeological and historical resources, water resources, transportation, and business impacts. Mitigation measures related to these other environmental issues should be coordinated with those developed to avoid, reduce, and minimize potential impacts to utilities.

- The abandonment, temporary relocation, permanent relocation, and construction of all new utilities shall be conducted in compliance with all applicable rules and regulations from regulatory agencies and purveyors.

Chapter 2 Introduction

Chapter 2 is an introduction to the technical analysis contained in this discipline report. This chapter describes existing conditions, the history of the project, the purpose and need for the project, and the five project alternatives being considered for environmental review. In addition, this chapter summarizes project coordination conducted to date with agencies, local governments, the community advisory group, and members of the public.

2.1 Description of Existing Conditions

This first section describes existing conditions pertinent to the proposed South Park Bridge Project. The project area is defined. The existing bridge and its current condition are described. The local roadway network in the South Park community is described. Non-vehicular transportation in the community is also summarized.

2.1.1 The Project Area

The South Park community is about four miles south of downtown Seattle (see Figure 1). The community lies south of the Duwamish Waterway, the man-made channel portion of the Duwamish River as it enters Elliott Bay. Though originally incorporated as its own city in 1905, much of the area was annexed by the City of Seattle in 1907.[1] The project area lies south of the industrial Georgetown area of Seattle and the King County International Airport (known as Boeing Field). It encompasses the roadway corridor defined by 16th Avenue S. between East Marginal Way S. and the South Park Bridge and 14th Avenue S. between the bridge and S. Trenton Street. Residents and business owners in the project area generally identify with the City of Seattle.

The project area, however, is governed by three local government jurisdictions. The area north of the Duwamish Waterway (between East Marginal Way S. and the waterway) lies within the city limits of both the City of Seattle (northern portion) and the City of Tukwila (southern portion). The area south of the Duwamish Waterway (between the waterway and S. Trenton Street) lies within unincorporated King County and the City of Seattle. The two-block area between the riverbank and Dallas Avenue S. is in King County, and the city blocks to the south are in the City of Seattle.

Land uses in the project area are mixed residential, retail commercial, and industrial. The Boeing Company's Plant 2 dominates the north side of the Duwamish Waterway. On the south side, retail commercial and light industrial land uses front on 14th Avenue S. and along the south bank upstream of the South Park Bridge. Single-family residences, however, generally characterize the area off of this main transportation artery.

---

[1] City of Seattle, *South Park Residential Urban Village Plan*, 1998.

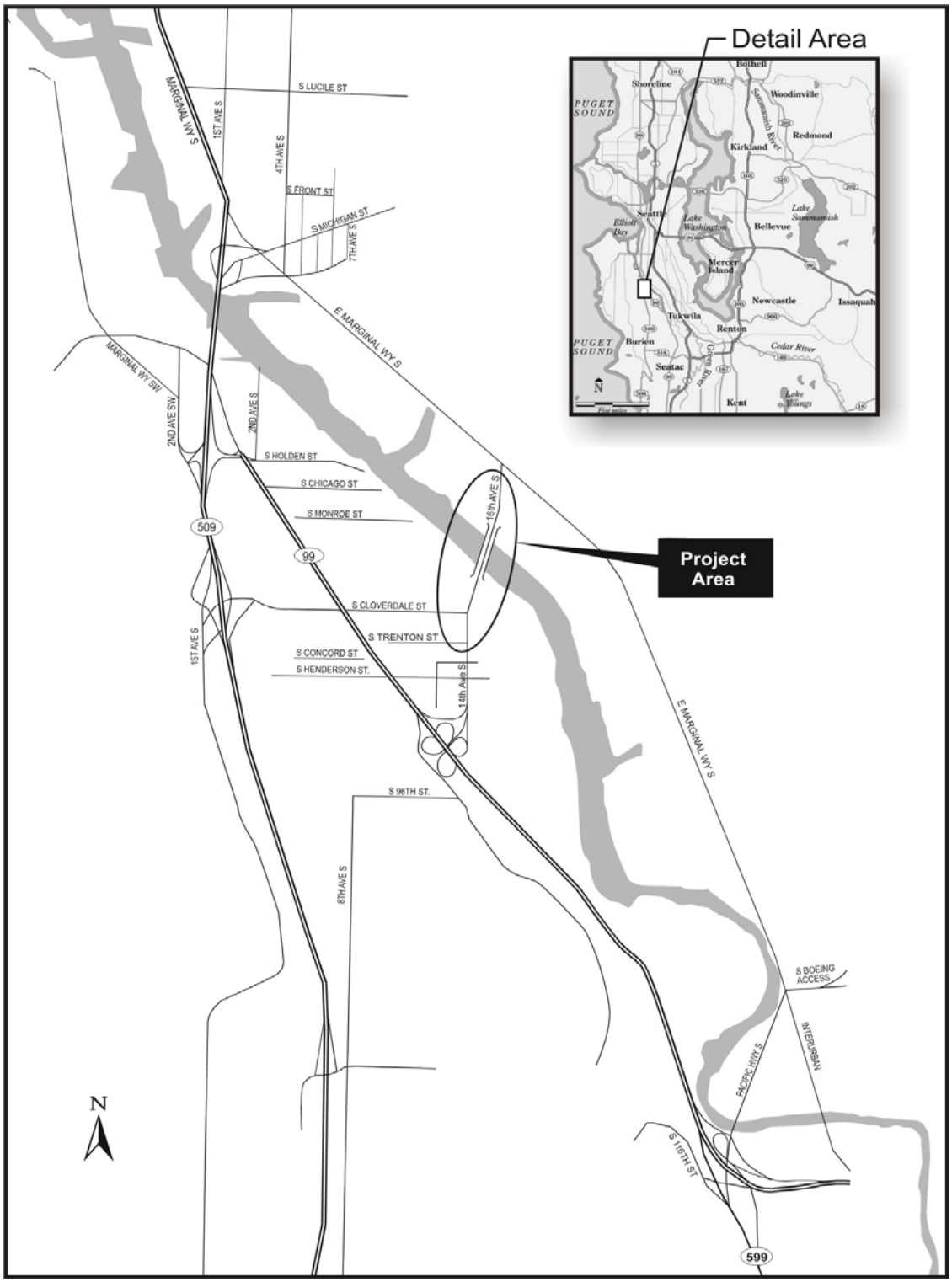


Figure 1
Project Area and Vicinity

2.1.2 The Existing South Park Bridge

The South Park Bridge was constructed in 1929-1931 (see Figure 2). The existing structure consists of a Scherzer rolling-lift double-leaf bascule movable span. Because it is the only operational example of a Scherzer rolling-lift bascule bridge in Washington, the bridge is listed on the National Historic Register.[2]

Each side is flanked by two truss approach spans and twelve concrete slab approach spans. The overall length of the bridge is approximately 1,045 feet abutment-to-abutment and approximately 1,340 feet in entirety to the grade match points. The double-leaf bascule movable span has a center-to-center distance between the front bearing points of approximately 190 feet. The roadway consists of four 9.5-foot lanes. The pavement is 38 feet with 6-foot sidewalks on both sides. Reinforced concrete piers founded on timber piling support the bascule span. Two large in-water piers support the counterweights, track supports, and racks for the rolling lift. The attached towers house the operating machinery, electrical equipment, and operator control room.

The South Park Bridge spans the Duwamish Waterway, which is used for industrial, commercial, and recreational purposes. The bridge is near the upstream limit of heavy industrial uses along the Duwamish Waterway, but it is within the section of the navigation channel maintained by the U.S. Army Corps of Engineers. The existing maximum vertical clearance of the bridge when closed is approximately 34 feet at Mean High Water (MHW). Bridge openings occur approximately three times per day on average to accommodate waterway traffic, although on some days the bridge does not open at all. The existing navigable horizontal clearances is approximately 118 feet at the water level (fender-to-fender), but narrows to 92 feet approximately 114 feet above the water between the open bascule leaves. The depth of the navigation channel is approximately 15 feet at Mean Lower Low-Water (MLLW).

2.1.3 Bridge Condition

In spite of substantial on-going maintenance and repairs, the South Park Bridge has suffered considerable deterioration over the past 70 years. In particular, the bascule piers are cracked and unstable resulting in the misalignment of the movable spans. Consequently, the center lock and glide tracks require on-going modifications and adjustments to allow the bridge to operate properly. Long-term, the stability of the entire bridge is at risk due to the original shallow placement of the supporting piles, which has resulted in movement of the bridge piers over the decades. The condition of the bridge worsened significantly following the Nisqually Earthquake in February 2001, and it remains vulnerable to future seismic events. A 2002 bridge inspection conducted by King County resulted in an existing condition rating of 6.0 out of a possible score of 100

---

[2] King County Landmarks and Heritage Commission. *Findings and Fact Decision – 14th Avenue South Bridge*, decision made December 19, 1996 and filed January 2, 1997.

This page intentionally blank

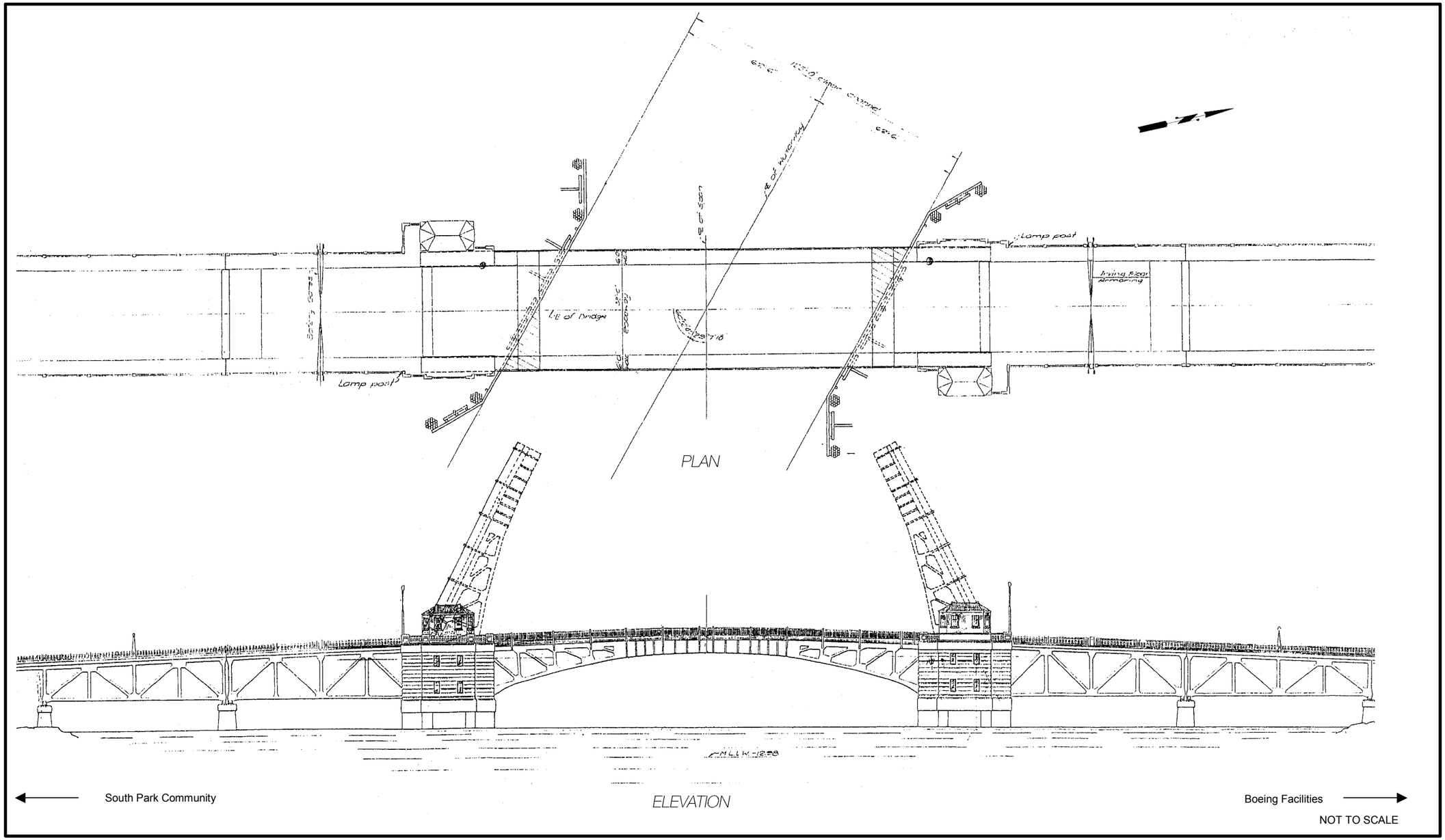


Figure 2
Existing South Park Bridge

This page intentionally blank

(based on Federal Highway Administration criteria).[3] This was among the lowest ratings given any bridge structure in the State of Washington in 2002.

2.1.4 Roadway Network

The bridge presently accommodates an average daily traffic volume of approximately 20,000 vehicles per day, based on 2001 City of Seattle traffic counts. Many of the vehicle trips originate in residential neighborhoods in the communities of West Seattle, White Center, and SeaTac. For South Park community residents, the bridge is the primary direct means of access to the north, downtown Seattle, and I-5.

The existing roadway network surrounding the South Park Bridge consists of a variety of roadway types. They range from local two-lane streets to major limited-access highways. Regional traffic movement in the South Park area is concentrated to three nearby north-south corridors including SR-99, SR-509, and East Marginal Way S. Local circulation is provided through a system of local and collector streets. Features such as the Duwamish Waterway and large-scale facilities such as Boeing Field and the Boeing Plant 2 create barriers within the road network and limit opportunities for access to and from the major regional routes.

2.1.5 Freight, Transit, and Pedestrians

Freight movement in peripheral areas of the South Park community is significant due to the high concentration of industrial and manufacturing uses in the general area. Major truck traffic is primarily directed along East Marginal Way S. and SR-99. The South Park Bridge and S. Cloverdale Street are also designated truck routes for oversized vehicles. Trucks use S. Cloverdale Street to access the City of Seattle South Recycling and Disposal Station located at 8105 Fifth Avenue S. as well as SR-509 and SR-99 located on the western edge of the South Park community. With respect to rail movements, the only train crossing in the study area exists immediately south of the intersection of East Marginal Way S. and 16th Avenue S.

Bus routes serving the South Park community are primarily located along major north-south corridors, including East Marginal Way S., 14th and 16th Avenues S., and S. Cloverdale Street. Six major King County Metro bus routes serve the area. Routes 60 and 130 cross the South Park Bridge and four of the six bus routes travel along S. Cloverdale Street.

Pedestrians and bicyclists are commonly seen in the South Park area, especially near the community's center near the intersection of 14th Avenue S. and S. Cloverdale Street. Mid-day pedestrian volumes are higher than the morning or evening commute periods due to shopping, transit use, and lunch-related walking trips.

---

[3] King County, *Bridge Inspection Report*, August 1, 2002.

2.2 History of Project

Since 1931, the moveable bridge has crossed the Duwamish Waterway in the South Park community of the City of Seattle. The following sections contain an overview of the studies preceding the start of the current environmental review effort, a summary of two key documents that framed the initial development of project alternatives, and ongoing reports documenting the changing condition of the bridge.

2.2.1 Overview of Studies

In recent history, over 20 engineering studies have been prepared on the South Park Bridge. Starting in 1987, when the bridge was 56-years-old, King County contracted for the preparation of a general engineering investigation report to assess the condition of the bridge. In 1991 and 1993, additional studies were completed including a geotechnical study, foundation design report, and a life-cycle cost analysis. This information led King County to undertake a series of studies in 1994 addressing liquefaction risks as well as the condition of the concrete, substructures, approach span joints and loading rating. In addition, a study was conducted to evaluate potential replacement alternatives for the bridge and another study investigated community issues related to the bridge. Since 1994, King County has recognized that the bridge required either rehabilitation or replacement and has continued to investigate the condition and vulnerabilities of the bridge in an effort to evaluate these options.

2.2.2 Summary of Key Engineering Reports

Two key engineering studies were conducted that helped to frame the current pursuit to evaluate potential alternatives to rehabilitate or replace the South Park Bridge. A 1994 Sverdrup study evaluated potential design options and a 1999 Entranco study researched and presented the likely steps required to conduct the necessary environmental review of the project alternatives and to complete necessary permitting. These studies are summarized below.

2.2.2.1 Sverdrup Study

In November 1994, Sverdrup Civil, Inc. completed a report titled *14th/16th Avenue South Park Bridge Rehabilitation/Replacement – Design Report* for the King County Department of Public Works. The objective of that report was to evaluate alternative alignments and bridge types, impacts of the alternatives studied and to present to King County results, findings, conclusions, and recommendations of a preferred replacement bridge for the existing South Park Bridge.

The 1994 design report studied five alternatives: rehabilitation of the existing bridge; two fixed-span bridge replacements (a 100-foot vertical clearance bridge and a 60-foot vertical clearance bridge); a new moveable bridge (double-leaf bascule bridge); and bridge closure (permanent closure and demolition of the existing bridge). Other alternatives that had been evaluated but were not carried forward, according to this report were: locating the replacement bridge immediately east (upstream) of the existing

alignment; matching the existing alignment; and locating the northbound and southbound lanes on separate structures. These three alternatives were not considered feasible and thus were not studied further.

The 1994 design report concluded that the 60-foot vertical clearance fixed-span bridge design could be used to replace the existing South Park Bridge, with consideration of mitigation of impacts to some users.

2.2.2.2 Entranco Study

In July 1999, Entranco completed the *16th Avenue S. Bridge Replacement Project: Environmental Review Report* for the King County Department of Transportation. The objective of this report was to present to King County a summary of environmental review and permitting activities that would likely be required for replacing the bridge.

The report identified the proposed project as a replacement of the existing bridge, including improvements to the approach road – 14th Avenue S. to the south and 16th Avenue S. to the north of the Duwamish Waterway. The project limits were identified as East Marginal Way S. on the north and S. Cloverdale Street on the south. The report asserted three build alternatives should be selected for evaluation in the EIS, including alternatives with differing alignments and bridge types. It was further noted that three alternatives would be the least number needed to provide a reasonable range of alternatives under National Environmental Policy Act (NEPA) and Washington State Environmental Policy Act (SEPA) regulations.

Entranco outlined the various tasks that would be required under the WSDOT Environmental Procedures Manual and Federal Highway Administration (FHWA) guidelines. The report identified these tasks to include the following: the development of bridge alternatives, screening, and selection of alternatives for analysis in the EIS; preliminary engineering design, including an update to the1994 rehabilitation/replacement report; survey and mapping work; hydraulic and geotechnical studies, and conceptual-level design documentation. The report concluded that the alternatives proposed, including rehabilitation of the existing bridge, had not been designed in enough detail to make a decision regarding a preferred alternative. Related to the environmental review process, the report recommended the public involvement program include coordination with an Interdisciplinary Team (IDT) of agency representatives and a community advisory committee. The report also listed 17 specific environmental discipline reports that would likely be required for the preparation of the EIS.

The findings and recommendations presented in the Entranco report formed the basis from which King County staff developed the current contracted scope of work for environmental review. The scope includes engineering, environmental review, agency coordination, and public involvement tasks.

2.2.3 Continuing Deterioration

Since 1999, King County has continued to move forward to develop alternatives for rehabilitating or replacing the existing South Park Bridge. Bridge conditions have worsened since the engineering studies were conducted in the mid-1990s. In February 2001, the Puget Sound Nisqually Earthquake caused significant and widespread damage to the bridge. Over $740,000 was required to repair the bridge in order to keep it operational.[4] The King County 2001 bridge inspection report recorded a rating of 8.0 out of a total possible score of 100 (based on FHWA criteria).[5] The following year, this rating decreased to 6.0.[6]

2.3 Purpose and Need of Project

As a required element of the EIS, a Purpose and Need Statement was developed for the South Park Bridge Project to clarify the underlying basis for the proposed action. The development of the initial draft Purpose and Need Statement involved review and comment by a number of parties including King County staff and the Project Advisory Committee (PAC) that includes agencies with jurisdiction over the proposed project. The draft Purpose and Need Statement was also revised based on comments received at several public involvement events. In April 2002, King County forwarded the draft Purpose and Need Statement to the Federal Highways Administration (FHWA) for review and approval. The text of the FHWA-approved version of the Propose and Need Statement is presented in the following sub-sections, although minor revisions and footnotes have been included for clarification.

2.3.1 Function and Role of the South Park Bridge

The King County Department of Transportation (KCDOT) is proposing the rehabilitation or replacement of the South Park Bridge located in King County, Washington. Since 1931 the moveable span bridge has carried traffic along the 14th Avenue South and 16th Avenue South corridor across the Duwamish Waterway. On a typical workday, a mix of approximately 20,000 cars, trucks and buses use the bridge to access employment centers in downtown Seattle and the Duwamish industrial area. Many of the vehicle trips originate in residential neighborhoods in the communities of West Seattle, White Center, and SeaTac. For residents of the community of South Park, the bridge is the only immediate means of access to and from destinations east of the community. The moveable structure spans the navigation channel of the Duwamish Waterway. When open, large-size industrial and recreational vessels have access to upriver destinations. The South Park Bridge is also a major route for heavy truck traffic traveling to and from large industrial manufacturers including the Boeing Company.

---

[4] Tim Lane, King County Department of Transportation, Telephone Conversation, September 23, 2002.

[5] King County, *Bridge Inspection Report*, August 21, 2001.

[6] King County, *Bridge Inspection Report*, August 1, 2002.

2.3.2 Purpose of Proposed Project

The purpose of the proposed action is to find the most feasible long-term solution to address the deteriorated condition and increasing seismic vulnerability of the South Park Bridge. The proposed action must also maintain the vital transportation linkage for cars, trucks, buses, bicyclists and pedestrians across the Duwamish Waterway.

2.3.3 Need for the Proposed Project

In spite of substantial ongoing maintenance and repairs, the South Park Bridge has suffered substantial deterioration over the past 70 years. Existing problems with the bridge worsened significantly following the Nisqually Earthquake in February 2001 and the bridge remains vulnerable to future seismic events. A recent 2002 bridge inspection conducted by King County resulted in an existing condition rating of 6.0 out of a possible score of 100 (based on FHWA criteria).[7] This is among the lowest ratings given any bridge structure in the State of Washington.

The bridge could be closed as a consequence of excessive structural deterioration or failure of the moveable span operations (particularly in the event of another seismic event). Closure of the bridge would have a significant impact on the transportation system and traffic conditions throughout the lower Duwamish industrial area-- including SR-99, SR-509, First Avenue S. and East Marginal Way S. Improvements are required in the near future to protect public safety and to maintain a transportation corridor that is critical to the local and regional economy.

2.3.3.1 Seismic Vulnerability

The February 28, 2001 Nisqually earthquake (magnitude 6.8, located 35 miles from Seattle and deep below the surface) caused significant damage to the South Park Bridge. Since the earthquake, operation of the moveable span has been less reliable, requiring the bridge to be closed for repairs intermittently for several days. The continuing periodic closure of the bridge for repairs has heightened the awareness of the need for rehabilitation or replacement of the existing bridge.

2.3.3.2 Roadway Design Deficiencies

The South Park Bridge does not meet current roadway design standards and has many design deficiencies. For example, the overall bridge width including lane widths, shoulders and sidewalks should be 64 feet according to current design standards. The existing bridge width is currently only 52 feet (measured outside-to-outside).

2.3.3.3 Transportation Issues

An average of 20,000 daily vehicle trips cross the Duwamish Waterway on the South Park Bridge. It is a significant link between the east and west side of the Duwamish, both locally and regionally. The South Park Bridge is also a route for heavy and oversize truck

---

[7] The original text of the FHWA-approved Purpose and Need Statement cited the condition rating of 8.0 from the 2001 King County Bridge Inspection Report. The current cited condition rating of 6.0 is from the King County *Bridge Inspection Report* dated August 1, 2002.

traffic. According to previous studies, closure of the bridge would have a significant noticeable impact on the transportation system and traffic conditions throughout the lower Duwamish industrial area – including the Highway 99 and East Marginal Way S. corridors.

2.3.4 Key Issues

2.3.4.1 Community Impacts

The existing South Park Bridge is a highly valued feature of the South Park community. There is widespread concern in the community that changes to the bridge could have a significant adverse impact on the community and the emerging economic vitality of the South Park business district centered along 14th Avenue South. The *South Park Residential Urban Village Plan of 1998* (the neighborhood plan) identified one of its primary objectives as "finding a solution for the South Park Bridge that is sensitive to the needs of the community."

The South Park community is also ethnically diverse. Approximately 30 percent of the populations' primary language is not English. These factors require greater emphasis on the consideration of environmental justice[8] in order to ensure that the potential adverse effects from the proposed project do not have a disproportionate impact on lower-income or minority populations.

2.3.4.2 Aquatic Habitat Protection

The Duwamish Waterway is an important route for juvenile and adult salmon migrating between the upper Green River, Elliott Bay and the Pacific Ocean. However, much of the waterway in the vicinity of the South Park Bridge currently provides poor habitat for chinook salmon (listed as threatened under the Endangered Species Act) and other marine organisms. The armored shoreline along the waterway in the project area provides minimal habitat for young chinook salmon during their critical rearing period. Recovery plans now underway for threatened and endangered salmon will address potential means of enhancing habitat favorable to the survival and growth of young salmon from the Duwamish/Green River system. Restoration of the shoreline in the vicinity of the project would address immediate and long-term needs for habitat improvement along the Duwamish Waterway.[9]

2.3.4.3 Duwamish Waterway Navigation

The Duwamish Waterway is used for industrial, commercial and recreational purposes. The South Park Bridge is near the upstream limit of heavy industrial uses along the waterway, but it is within the section of the waterway maintained by the U.S. Army

---

[8] Environmental justice concerns the need to avoid disproportionate, significant adverse impact on minority and/or low-income communities.

[9] This section highlights the importance of addressing aquatic habitat values in the project area, as well as the implications for species currently listed under the ESA; however, it is not intended as a complete characterization of the factors that need to be considered in this regard.

Corps of Engineers as a navigation channel. A number of local businesses, as well as the U.S. Coast Guard, have emphasized to King County that any engineering solutions for the South Park Bridge must maintain navigational access upstream of the existing bridge.

2.4 Description of Alternatives

This section describes the No Action Alternative, the Rehabilitation Alternative, and the three replacement bridge alternatives (Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridge alternatives). The first section explains the transportation engineering criteria and standards used to design the Rehabilitation Alternative and the three replacement bridge alternatives. The second section describes the horizontal and vertical profile of the bridge alternatives, navigation channel clearances, and impacts to the local road network. The last section describes construction activities associated with each of the five alternatives for the South Park Bridge Project.

2.4.1 Design Criteria

Except for the No Action Alternative, construction of any of the project alternatives would incorporate current transportation engineering design criteria for the cross-section, alignment, design speed, maximum grade, and transition segment. The road cross-section design is a key design element that would change for any of the build alternatives (see Figure 3). The existing bridge cross-section incorporates four 9.5-foot travel lanes, raised curbs on both sides of the pavement, and a 6-foot sidewalk on either side of the roadway. The outside-to-outside dimension of the existing bridge is 52 feet. These lane widths are non-standard and would be changed for the Rehabilitation Alternative and for the three replacement bridge alternatives. For the Rehabilitation Alternative, the pavement would remain approximately the same width as it is currently, but would be reconfigured for three standard lanes. There would be two 12-foot lanes on the outside and one 11-foot lane in the middle of the roadway. Traffic would use one 12-foot lane for northbound travel and the other two lanes for southbound travel. The 6-foot sidewalk on either side of the roadway would be enlarged to approximately 7.5 feet. In contrast, each of the replacement bridge alternatives would be designed with four standard 11-foot lanes, traffic barriers or a painted median down the center, a traffic barrier on each side of the pavement, and a single combined 13-foot pedestrian/bike path on the west (downstream) side of the bridge. The width of the cross-section for the new replacement bridge alternatives including the exterior barriers would total approximately 68 feet (outside-to-outside of the bridge structure).

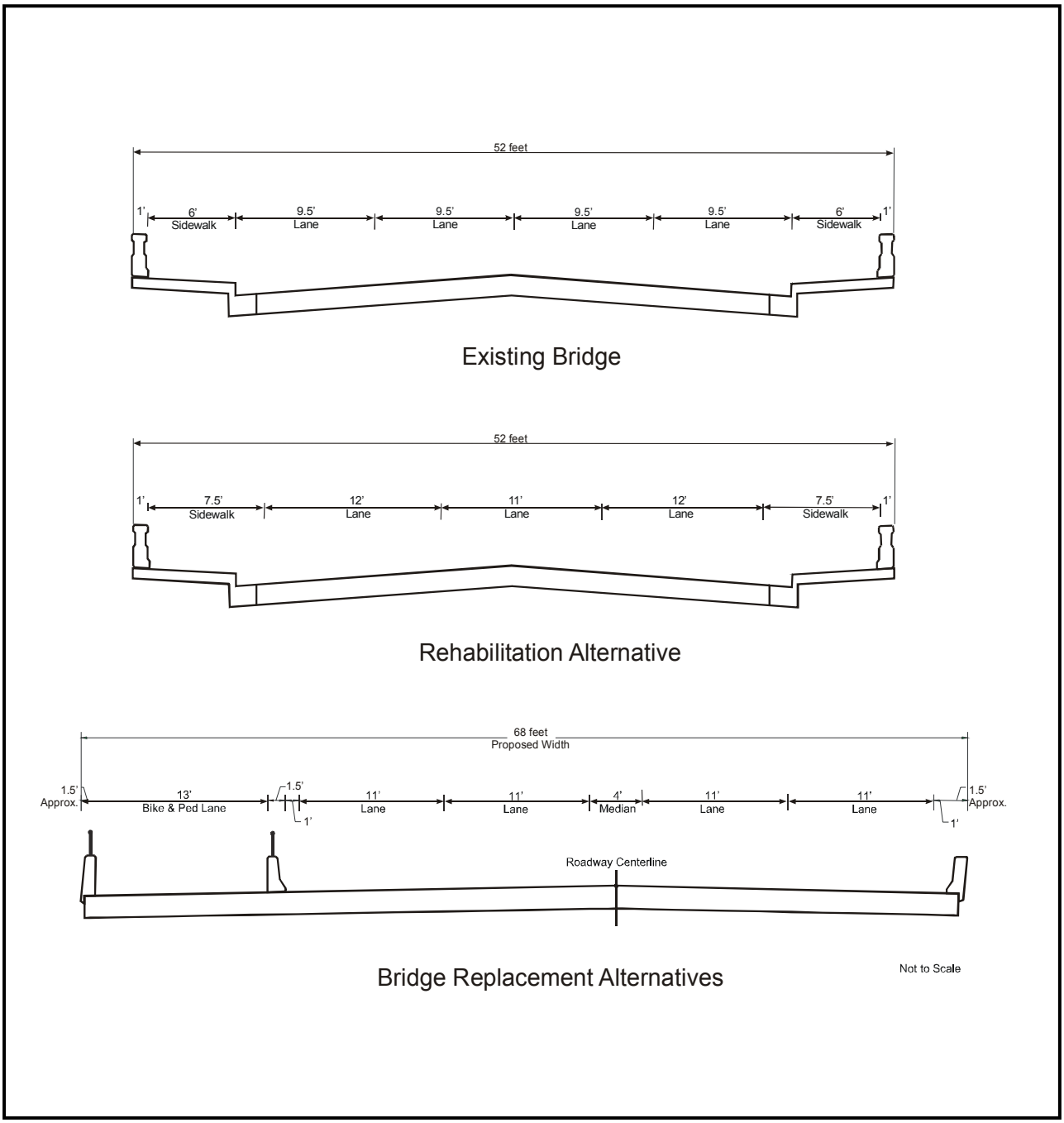


Figure 3
Existing and Proposed
Bridge Cross-Section Designs

An initial range of potential bridge alternatives and alignments was considered based on earlier studies,[10] current input from stakeholders, and the project team. During the course of this initial alternatives development process, it was determined that there were no practical alternative alignments for a replacement bridge other than to parallel the existing bridge. It was determined that replacement bridge alternatives should be aligned to the west (downstream) of the existing bridge in order to minimize impacts to existing land uses. Conceptual engineering for the replacement bridge alternatives set the alignment for these bridges at approximately 80 feet to the west of the centerline of the existing bridge (i.e., as close to the existing structure as practicable without compromising constructability). The initial alignment of the new roadway was the same as the existing road alignment on the south side of the waterway. The existing roadway is quite narrow. Matching the centerline of the new bridge alternatives to the existing would require acquisition of both land and buildings on both sides of 14th Avenue S. To minimize these impacts, the alignment of the new transition segment was shifted slightly to the east of the existing road alignment because there are fewer parcels and buildings located on the east side of the road compared to the west. In addition, more of the buildings located on the east side are set back from the existing sidewalk than on the west side. In this way, the proposed alignment for the replacement alternatives has been developed to avoid or minimize potential land use and relocation impacts.

Other design factors affecting impacts to adjacent properties include the new bridge's design speed and maximum grade. King County road standards call for a 35 mph design speed and a maximum of 8 percent grade. Initially, these standards were incorporated into each of the alternatives. Implementation of an 8 percent maximum grade for the High-Level Fixed-Span Bridge Alternative, however, would have resulted in a very long bridge (project terminus to terminus). For example, the north terminus would have extended across East Marginal Way S. and into Boeing Field. To reduce impacts to land use, the maximum grade for the High-Level Fixed-Span Bridge Alternative would need to slightly exceed 8 percent. In this manner, the north side of the bridge would terminate south of East Marginal Way S. This grade change reduced the overall length of the bridge on both south and north ends of the bridge by several hundred feet for the High-Level Fixed-Span Alternative.

Community impacts would also be affected depending on the design of the transition segment. This is the segment of the roadway that merges the differing widths of the new roadway and the existing narrow roadway. Typically, transition segments begin at the point the grade of the bridge matches the grade of the existing roadway and extends beyond some distance. The actual rate at which the width of the roadway is reduced is defined by transportation engineering design standards. To minimize impacts to land uses along 14th Avenue S., King County proposes to start the transition segment from the abutment for all alternatives. This means that by the time the bridge matches the grade of the existing roadway, the width of the new bridge is nearly the same width as the existing road. As a result, the total length of the roadway is reduced potentially several hundred

[10] Entranco, Inc., *Environmental Review Report: 16th Avenue S. Bridge Replacement*, July 1999.

feet in length. In addition, the width of the transition segment for the Mid-Level Fixed-Span Alternative is further reduced by having the single combined 13-foot pedestrian/bike path split off from the main bridge structure at approximately S. Orr Street and descended to ground level in a zigzag fashion. This design modification further reduced the overall impact of the Mid-Level Fixed-Span Alternative.

Together, the design criteria discussed in this section would allow for the construction of a replacement bridge that provides increased safety for vehicles, bicyclists, and pedestrians.

2.4.2 The Alternatives

A total of five alternatives were selected for evaluation in the environmental review process including: the No Action Alternative, the Rehabilitation Alternative, the Bascule Bridge Alternative, the Mid-Level Fixed-Span Bridge Alternative, and the High-Level Fixed-Span Bridge Alternative. These alternatives were selected from an initial group of nine preliminary project alternatives.[11] The alternatives proposed for evaluation in the environmental review process were selected because they had fewer potential impacts than the other preliminary alternatives. Based on comparison ratings for seven evaluation criteria (regional mobility, local access, navigation, community impacts, aquatic habitat, construction impacts, and estimated project costs), the following preliminary alternatives were dropped from further consideration: a low-level fixed-span bridge, a movable swing bridge, a vertical lift movable bridge, and a tunnel option. The following sections describe each of the proposed project alternatives to be considered in the environmental review process based on conceptual civil and structural engineering.[12] [13]

2.4.2.1 No Action Alternative

The No Action Alternative assumes that the existing bridge structure's poor condition would require it to be closed at some time in the future. Deterioration due to use could allow the bridge to continue to operate for the foreseeable future, but at some time in the future, the bridge would need to be closed. As such, for purposes of environmental review, it is assumed the existing bridge would be closed permanently sometime before 2027.

However, the bridge could be closed for other reasons than simply deteriorated condition. Another earthquake could cause an unexpected emergency closure of the bridge at any time. The on-going movement of the bridge foundations could eventually cause the moveable spans to become misaligned to the extent that repairs would be infeasible. Or,

---

[11] Parsons Brinckerhoff. *South Park Bridge Project: Summary Technical Memo - Alternatives Development and Screening*, September 6, 2002.

[12] Parsons Brinckerhoff. *South Park Bridge Project: Conceptual Plans*, June 2003.

[13] Parsons Brinckerhoff. *South Park Bridge Project: Structural Alternatives Study*, November 2003.

the cost of maintaining the bridge could become more than King County is willing to expend. Under any of these circumstances, the bridge would be closed.

When closed, no vehicular, bicycle, or pedestrian traffic would be allowed to use the bridge. As a navigable waterway, the U.S. Coast Guard regulates bridges that span waterways such as the Duwamish Waterway. If the bridge were no longer operating, the U.S. Coast Guard regulations would require demolition and removal of the bridge. With no structures remaining, there would be no potential navigation obstructions in the Duwamish Waterway.

Under this alternative, there would be no change in the local street network except 14th and 16th Avenue S. would be dead-ended on both the south and north shores of the Duwamish Waterway. Figure 4 shows the existing local street network and Figure 5shows the local street network following the removal of the existing bridge in the No Action Alternative. As the road does not currently provide direct access to the adjacent Boeing Company properties, the exact location of the road closure on the north side would need to be negotiated with Boeing as well as the owner of the railroad tracks immediately south of East Marginal Way S. In addition, the site of the removed bridge would be restored.

2.4.2.2 Rehabilitation Alternative

For the Rehabilitation Alternative, much of the existing bridge structure would need to be replaced. The existing steel trusses of the approach spans and the bascule leaves would be refurbished and reused. The mechanical and electrical operating systems would be refurbished and/or replaced. Studies have confirmed the existing bridge piers are gradually shifting because the foundation pilings were not originally driven to a sufficient depth. Although the initial goal was to rehabilitate the existing piers, the design team's structural analyses determined that the existing bascule piers and truss approach span piers must be replaced in order to ensure the long-term (approximately 75 years) integrity of the bridge. If the bascule piers were reconstructed, the longevity of the Rehabilitation Alternative would be similar to the expected minimum life of a new bridge structure.

For the Rehabilitation Alternative, the new bascule piers are proposed to be approximately the same size, location, and historic character as the existing piers (see Figure 6). To construct the new bascule piers, the bascule leaves and steel approach spans would need to be removed. The steel truss elements of the bridge structure would be taken to another site for repair, refurbishment, and/or painting before they are re-installed following the construction of the new piers. The concrete shafts or pilings supporting the foundations of the new piers would extend below the existing pilings to a depth beneath the riverbed where stable soils exist. The removal of the steel truss spans would also allow for replacement of the steel approach piers. The concrete approach spans and bridge abutments would be replaced and the bridge deck would be reconstructed. Like the existing bridge, there would be piers both on land and in the water. The first on-land piers would be only an estimated 20 feet from the top of the south embankment and the closest in-water piers would be approximately 20 feet from the top of the embankment. The piers on the north shoreline would extend through the

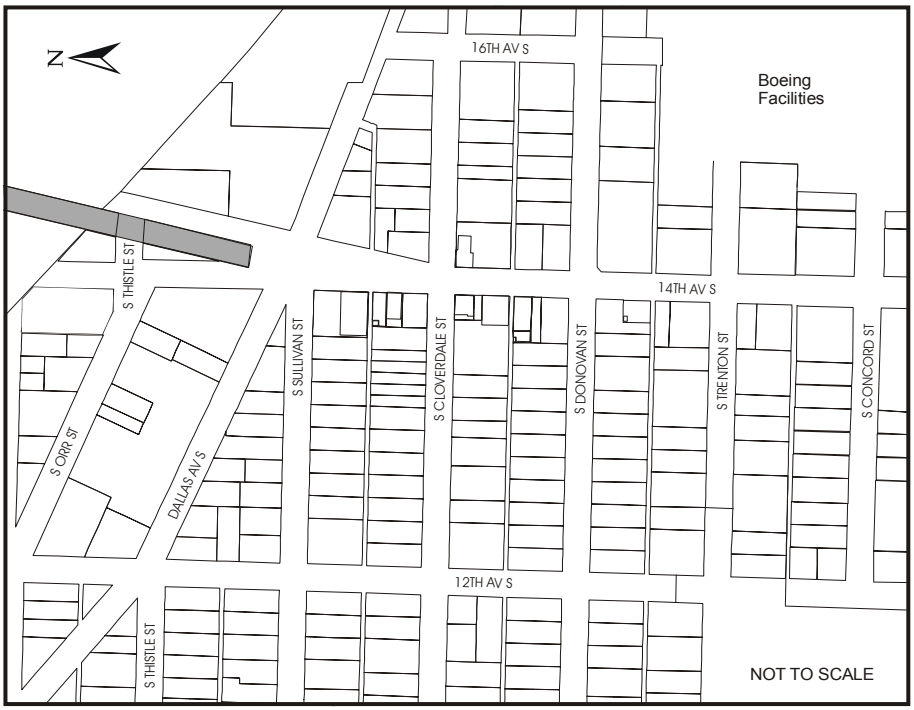


Figure 4
Existing Conditions Street Network

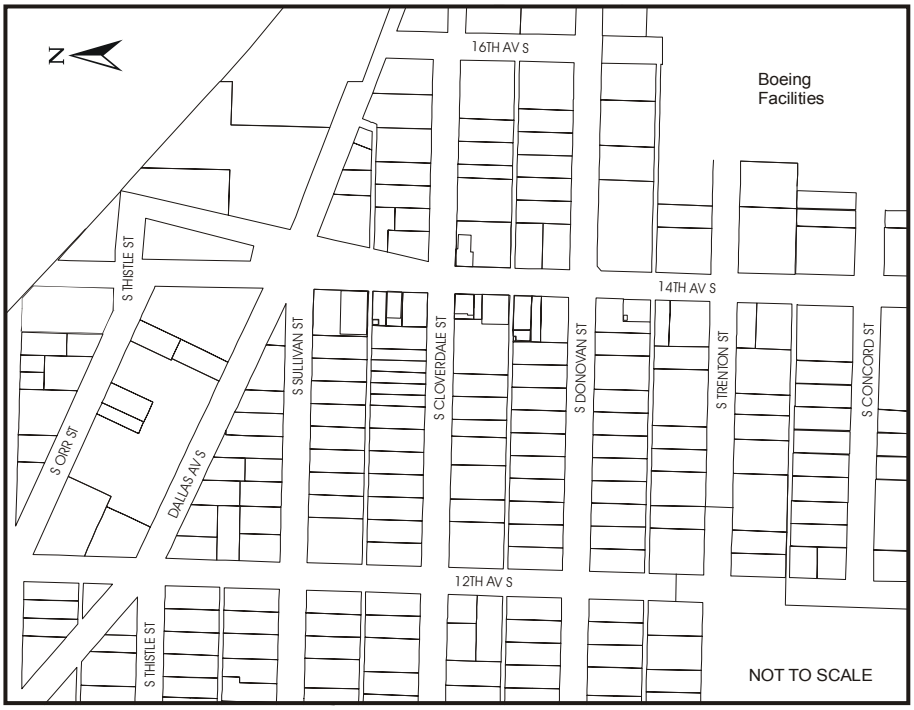


Figure 5
No Action Alternative Street Network

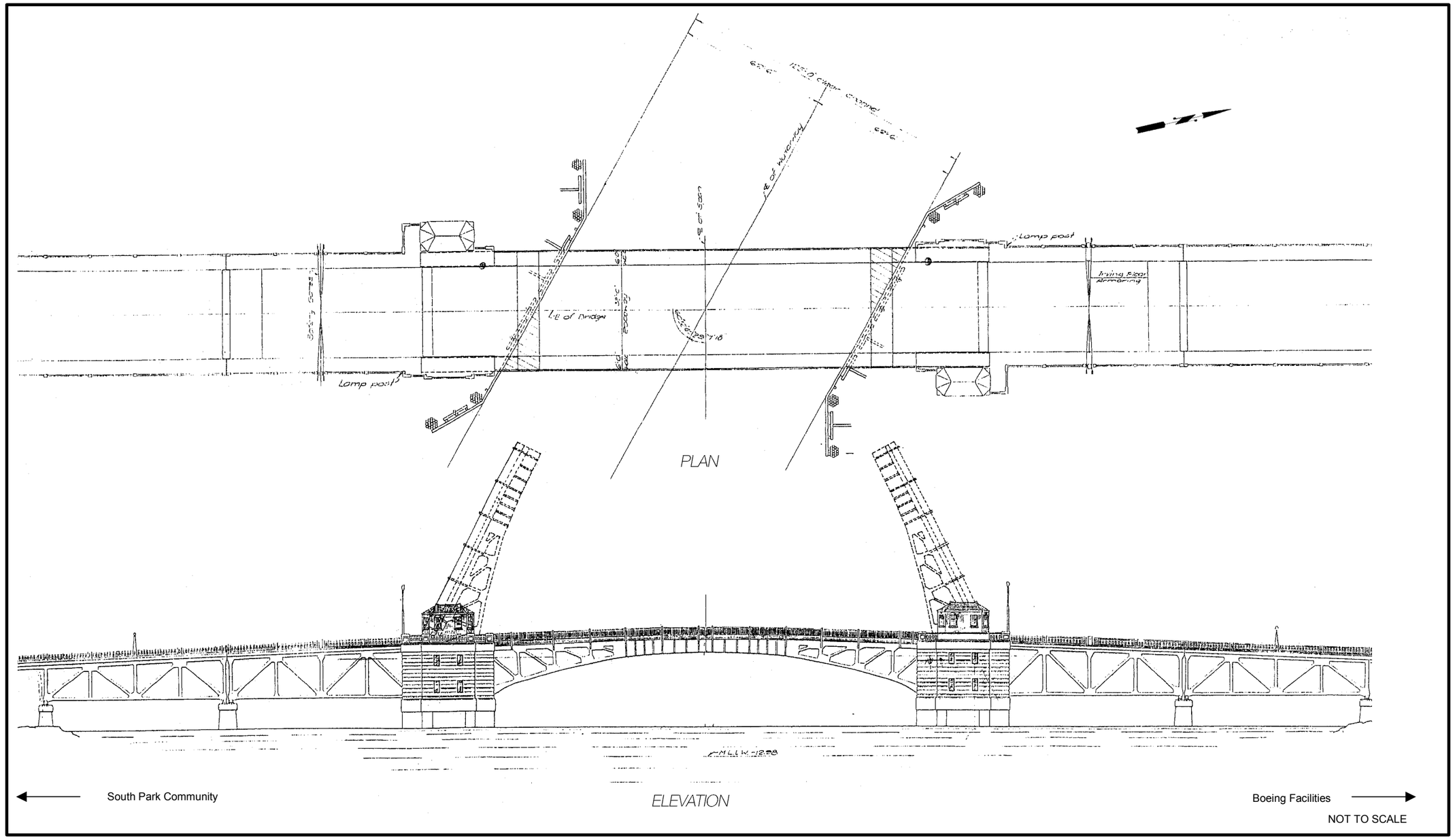


Figure 6
Rehabilitation Alternative

This page intentionally blank

existing Boeing dock. The conceptual engineering analysis also determined that the mechanical and electrical systems should be replaced. Any required construction activities, including replacement of the bridge railings, bridge tender towers, and lamp posts, would be done in a manner that preserves the historic character of the existing bridge to the greatest extent possible.

To meet current roadway design standards, the new bridge deck would remain approximately the same as the existing, but the pavement would be striped to accommodate three standard traffic lanes. Bicycle and pedestrian traffic would continue to be able to use the bridge via a 7.5-foot pedestrian path on each side of the bridge.

Following construction, the existing 118-foot navigable channel width would be preserved so existing waterway users would be able to continue to use the navigation channel to travel upriver of the South Park Bridge. The extended closure of the bridge during construction, however, would have a significant temporary impact on access to the South Park community.

Following construction, there would be only slight changes in the local street network. Figure 7 shows the local street network in the South Park community following construction activities for the rehabilitation of the existing bridge. The figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. (For comparison, Figure 8 shows the local street network following the construction of the Bascule Bridge Alternative.) To improve vehicular safety, S. Sullivan Street would intersect Dallas Avenue S., which would become the main cross street intersection with 14th Avenue S. The 16th Avenue S. (immediately east of the bridge) intersection with Dallas Avenue S. as well as 14th Avenue S. may also need to be reconfigured. Access to points north via the South Park Bridge would be maintained.

2.4.2.3 Bascule Bridge Alternative

The Bascule Bridge Alternative would result in the construction of a new movable bridge immediately downriver of the existing bridge (see Figure 9). The bridge mechanism could be a Scherzer rolling lift type (no longer a common design for new movable bridges) or another type. The bridge length would be approximately 935 feet from abutment-to-abutment, not including roadway approaches. Road improvements would extend from a point just north of S. Cloverdale Street on the south side of the waterway and north to a point opposite the northeast corner of Boeing Building 2-15. The interior walls of the bridge abutments would be approximately 200 feet from the top of the embankment, or approximately 50 feet closer to the shore than the existing bridge. With fewer piers than the existing bridge, the first on-land piers of this alternative would be approximately 55 feet from the top of the south embankment at the shortest distance and the closest in-water piers would be approximately 65 feet away. On the north shoreline, the closest in-water piers would be approximately 95 feet from the top of the embankment and the closest on-land piers would be approximately 30 feet away. Unlike

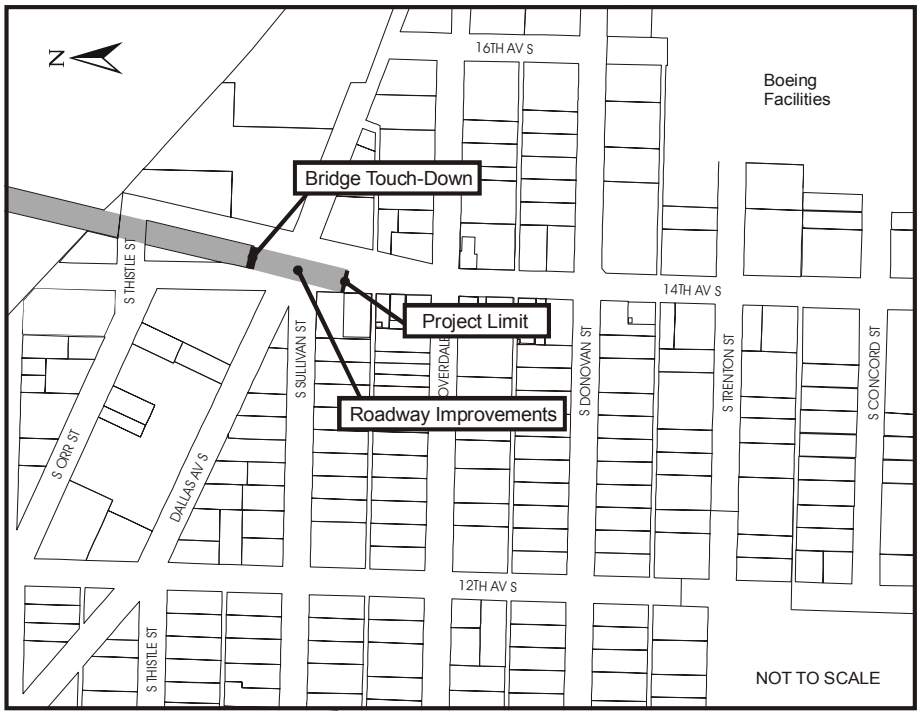


Figure 7
Rehabilitation Alternative Street Network

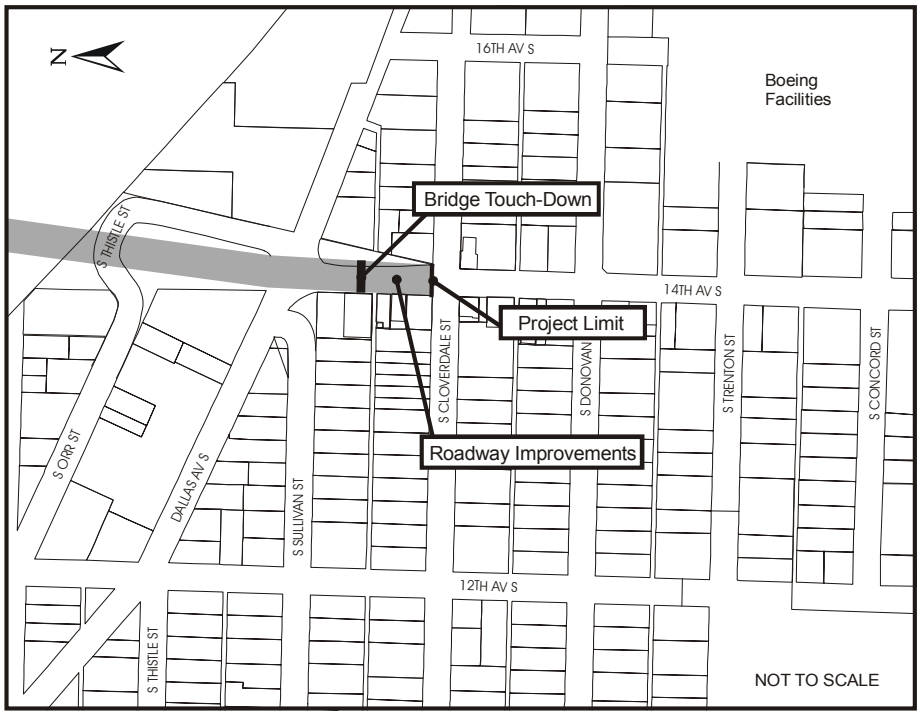
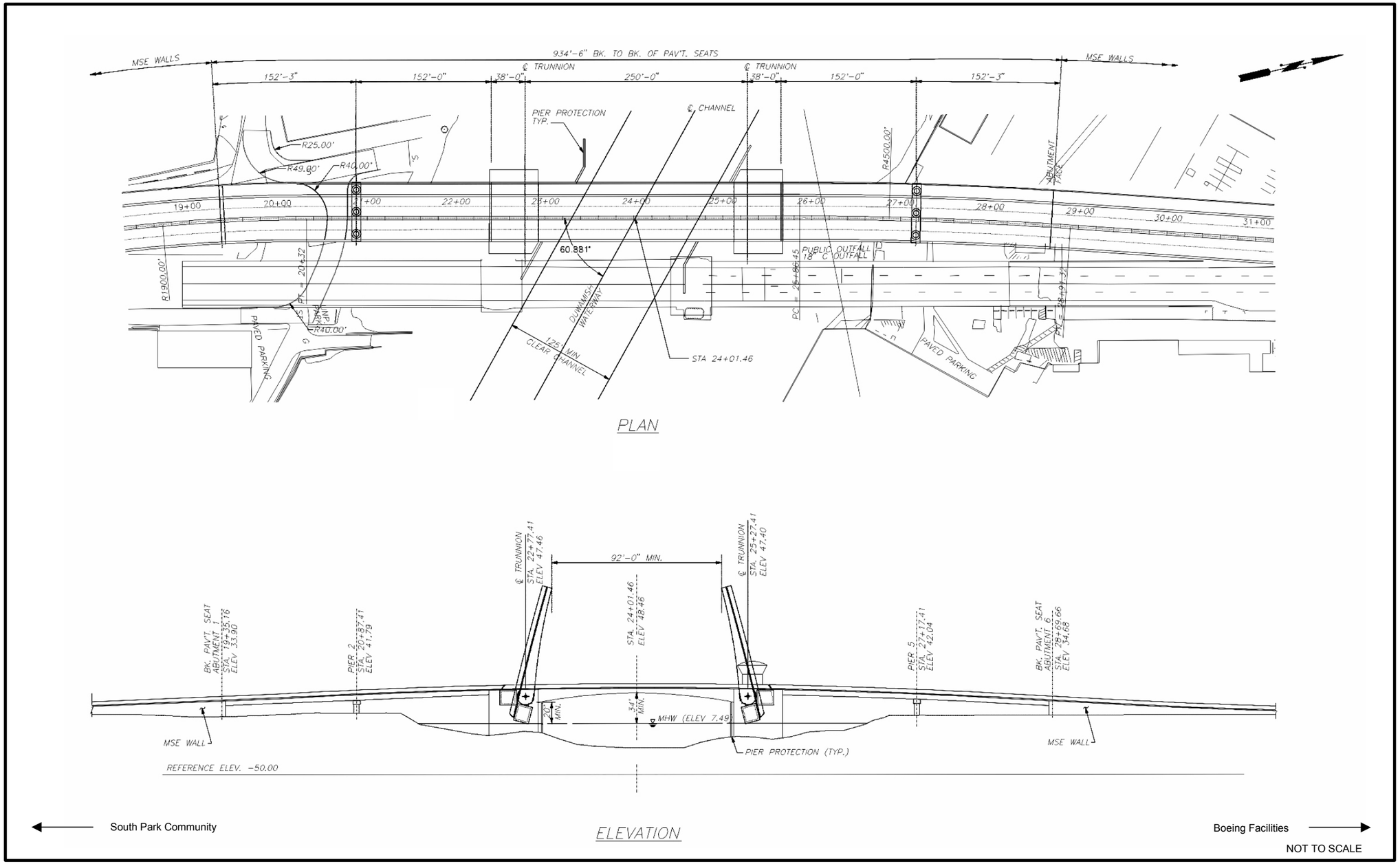


Figure 8
Bascule Bridge Alternative Street Network



PLAN

ELEVATION

South Park Community

Boeing Facilities

NOT TO SCALE

Figure 9
Bascule Bridge Alternative

This page intentionally blank

the existing bridge's grated bascule leaves, the bridge deck of the bascule leaves would be solid surface to improve vehicle traction and to control stormwater runoff.

Similar to the existing bascule bridge, this bridge profile would be approximately 34 feet above the Duwamish Waterway when in the closed position. The mid-section span would be comprised of two movable leaves that could be raised to open the bridge. The navigation channel would be approximately 125 feet in width (slightly greater than the existing 118-foot-wide channel). This two-leaf bascule bridge would not impose limitations to the height of waterway users passing the bridge, because the new bridge would be approximately 125 feet between the tips of the raised spans.

Following construction, there would be some change in the local street network (see Figure 8). S. Sullivan Street would be permanently closed or reconfigured to improve traffic safety and vehicular and truck turning movements from the new bascule bridge to Dallas Avenue S. S. Sullivan Street would no longer have direct access to 14th Avenue S. and the bridge. The intersection of 16th Avenue S. (immediately east of the bridge) and Dallas Avenue S. may also need to be reconfigured. To ensure adequate vertical clearance for vehicles, S. Thistle Street would need to be slightly realigned further to the north and closer to the Duwamish Waterway. This figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. Access to points north via the South Park Bridge would be maintained. Following construction and transfer of the traffic to the new bridge, the existing bridge would be demolished and removed as described for the No Action Alternative.

2.4.2.4 Mid-Level Fixed-Span Bridge Alternative

The Mid-Level Fixed-Span Bridge Alternative would result in the construction of a non-movable bridge (see Figure 10). The bridge length would be approximately 1,660 feet abutment-to-abutment, not including roadway approaches. The interior walls of the abutments would be approximately 550 feet from the top of the Duwamish Waterway embankment, or 300 feet further setback than the existing bridge. The closest on-land piers would be approximately 85 feet from the south embankment and the closest in-water piers would be approximately 100 feet away. On the north side, the closest in-water piers would be approximately 130 feet from the top of the embankment and the closest on-land piers would be approximately 65 feet away. Road improvements would extend slightly north of S. Donovan Street and north to a point approximately 320 feet south of East Marginal Way S.

The mid-point of the bridge profile across the Duwamish Waterway would be approximately 65 feet above MHW of the Duwamish Waterway. The horizontal clearance would be approximately 125 feet, or slightly greater than the existing clearance. The vertical clearance, however, would restrict use of some waterway traffic, including some tugs and barges. Most vessels that currently pass the existing bridge would continue to be able to use the navigation channel. As described earlier in the discussion of the design considerations, the width of the new mid-level bridge is reduced

when the bike-pedestrian path is separated from the elevated approach roadway near the south side abutment. This design feature reduces land use and relocation impacts.

Following construction, there would be changes in the local street network (see Figure 11 (For comparison, Figure 12 shows the local street network following the construction of the High-Level Fixed-Span Bridge Alternative.) The location of the south abutment and its vertical clearance would require modification of Dallas Avenue S. and S. Sullivan Street. S. Sullivan Street would likely be merged into Dallas Avenue S. just west of the new structure and a new roadway would be constructed under the new bridge. The alignment of this roadway would be slightly to the north to ensure it would have a minimum allowable vertical clearance. Neither street would have direct access to the new South Park Bridge. Figure 11 also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. A retaining wall supporting the elevated approach roadway would be constructed immediately adjacent to properties fronting on the both sides of 14th Avenue S. for the majority of the distance between S. Sullivan Street and S. Cloverdale Street. Traffic would be able to access the bridge at S. Cloverdale Street, which would be raised a maximum of approximately 5 feet at the intersection to meet the descending grade of the bridge. This change in the intersection would allow traffic on S. Cloverdale Street to continue to have direct access to 14th Avenue S. though a retaining wall would also need to be constructed around the four corners of the intersection of S. Cloverdale Street and 14th Avenue S. due to the grade change. S. Orr Street would be closed due to the location of the support structures for the proposed separated pedestrian/bike path, which would allow bicyclists and pedestrians to descend from the bridge level to the street level. In addition, S. Thistle Street would be closed as it would no longer be able to connect to S. Orr Street. Following construction and transfer of the traffic to the new bridge, the existing bridge would be demolished and removed as described for the No Action Alternative.

2.4.2.5 High-Level Fixed-Span Bridge Alternative

The High-Level Fixed-Span Bridge Alternative is a non-movable bridge (see Figure 13). The bridge length would be approximately 2,332 feet abutment-to-abutment, not including roadway approaches. The interior walls of the abutments would be approximately 900 feet from the top of the Duwamish Waterway embankment, or 650 feet further set back than the existing bridge. The on-land and in-water piers of this alternative are approximately in the same location as proposed for the Mid-Level Fixed-Span Bridge Alternative. Road improvements would extend from S. Trenton Street and continue north to East Marginal Way S. This alternative would require minor modification of the 16th Avenue S. East Marginal Way S. intersection and of the existing railroad track crossing immediately south of this intersection.

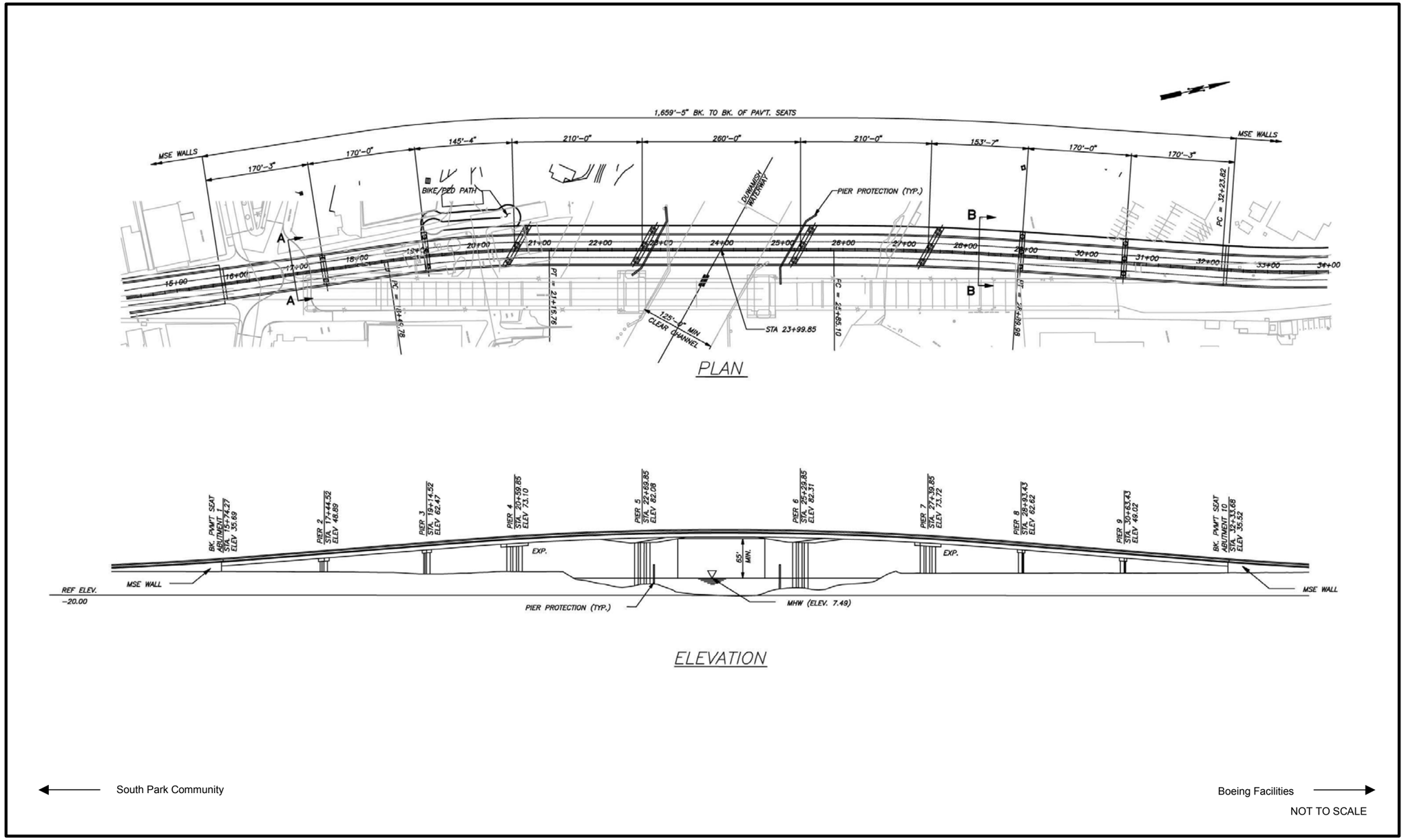


Figure 10
Mid-Level Fixed-Span
Bridge Alternative

This page intentionally blank

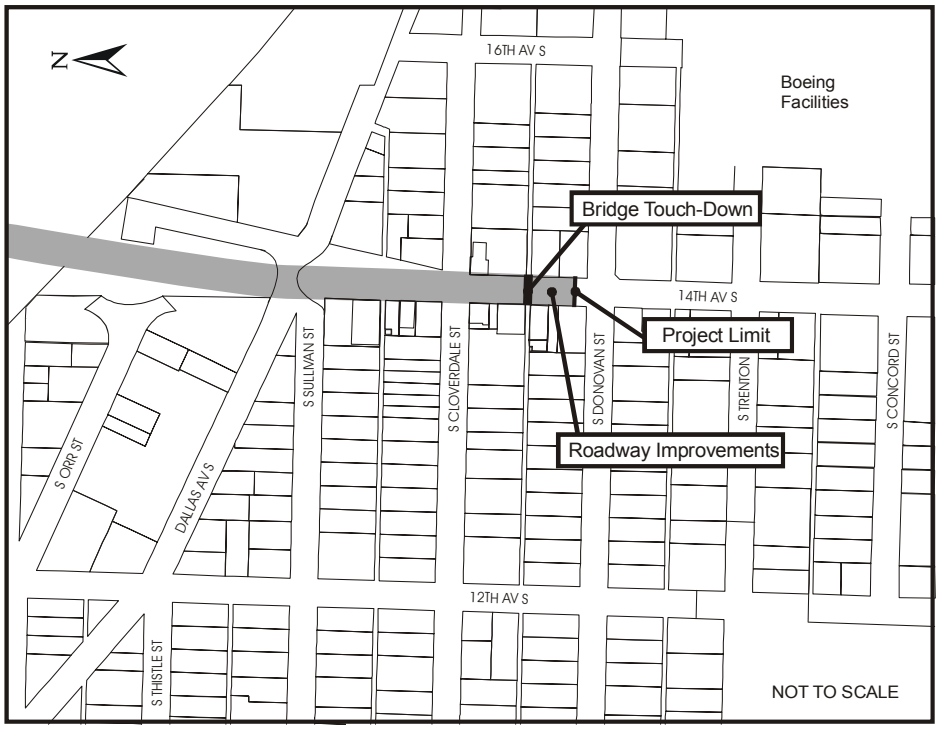


Figure 11
Mid-Level Fixed-Span Bridge Alternative Street Network

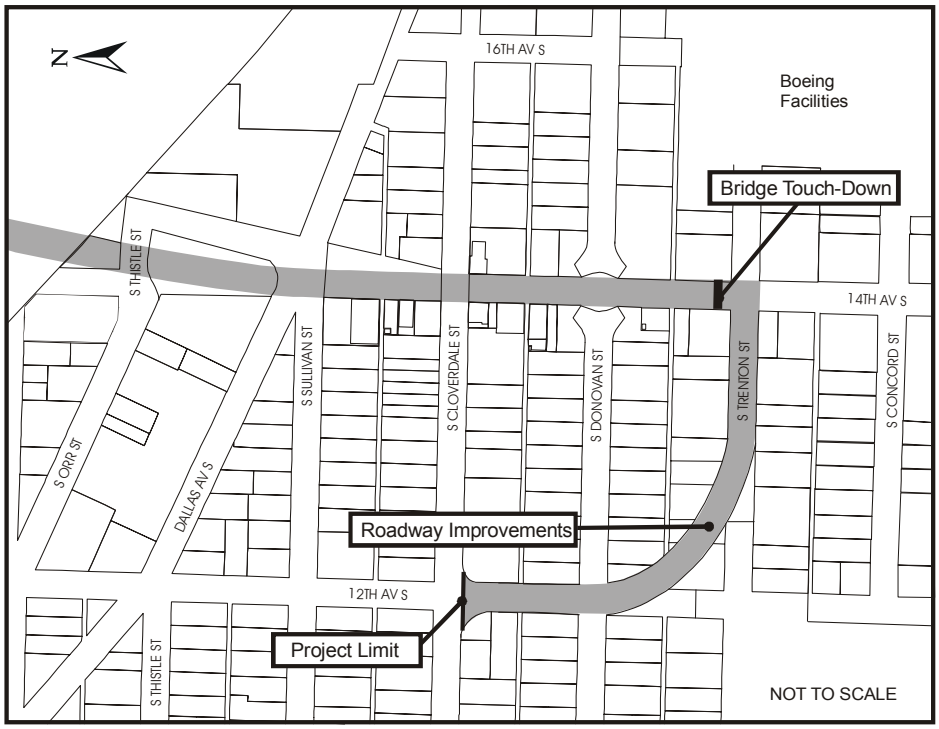
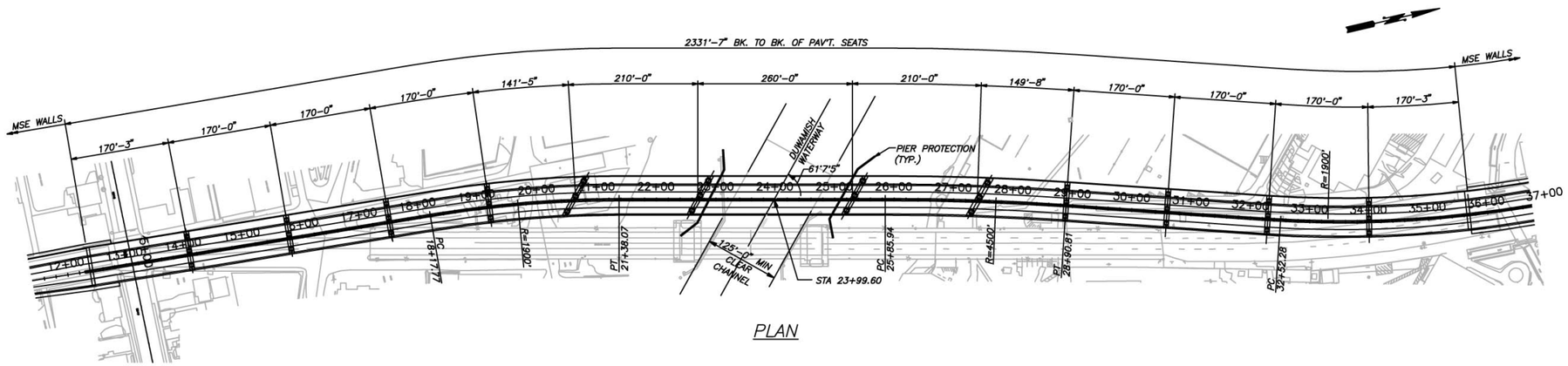
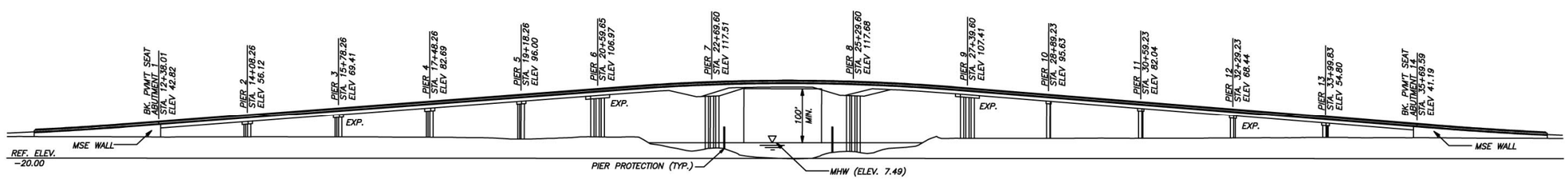


Figure 12
High-Level Fixed-Span Bridge Alternative Street Network

This page intentionally blank



PLAN



ELEVATION

South Park Community

Boeing Facilities

NOT TO SCALE

Figure 13
High-Level Fixed-Span Bridge Alternative

This page intentionally blank

The bridge design would allow for approximately 100 feet of vertical clearance above the MHW of the Duwamish Waterway as requested by the U.S. Coast Guard. The horizontal waterway clearance for the navigation channel would be approximately 125 feet, which is slightly greater than the existing 118-foot clearance (fender-to-fender). The bridge's vertical clearance would not be expected to limit the height of boats and barges currently passing the bridge. However, vessels larger than those currently using the navigation channel might not be able to pass the bridge in the future.

Following construction, there would be numerous changes in the local street network as shown in Figure 12. The figure also shows the portion of the project alternative that would be elevated for the bridge structure, the bridge touch-down point, and the portion that would have surface roadway improvements. The bridge south abutment would require Dallas Avenue S., S. Sullivan Street, and S. Cloverdale Street to be converted to underpasses under the new South Park Bridge. A retaining wall supporting the elevated approach roadway would be constructed immediately adjacent to properties fronting on both sides of 14th Avenue S. for the majority of the two-block distance between S. Cloverdale Street and S. Trenton Street. S. Donovan Street would be closed at 14th Avenue S. due to obstruction from the bridge abutment and a vehicle turn-around would be constructed on either side of the abutment on S. Donovan Street. To allow traffic to access the new South Park Bridge, a new principle arterial roadway would need to be constructed between S. Trenton Street and 12th Avenue S. and road improvements would be required on 12th Avenue S. north to S. Cloverdale Street. This new route would allow traffic, trucks, and buses to continue to access the new South Park Bridge from S. Cloverdale Street via 12th Avenue S. and S. Trenton Street. Following construction and transfer of the traffic to the new bridge, the existing bridge would be demolished and removed as described for the No Action Alternative.

2.4.3 Construction Durations and Activities

Construction of a rehabilitation or replacement bridge for the existing South Park Bridge is planned to take approximately two to three years, including the demolition and removal of the existing bridge. Construction is anticipated to start within the next several years and opening of the rehabilitation or a replacement bridge is currently anticipated to occur by 2009. The actual time required for construction activities vary for each of the alternatives. Construction activities associated with the No Action Alternative involves only demolition of the existing bridge and restoration of the site. The construction period for this alternative would be the shortest of all alternatives, approximately 8 months. The other alternatives would additionally require rehabilitation or construction of a new replacement bridge. Anticipated construction durations (demolition of existing and construction of new) would be approximately 32 months for the Rehabilitation Alternative, 33 months for the Bascule Bridge Alternative, 20 months for the Mid-Level Fixed-Span Bridge Alternative, and 24 months for the High-Level Fixed-Span Bridge Alternative.[14]

[14] Parsons Brinckerhoff. *South Park Bridge Project: Structural Alternatives Study*, November 2003.

From a construction perspective, the five project alternatives include three different types of construction activities. The No Action Alternative assumes the existing bridge condition would eventually require closure and removal of the bridge structures. Construction activities would focus on demolishing the existing bridge and restoring the project area. The Rehabilitation Alternative would require bridge closure for approximately 30 months for rehabilitation or replacement of various elements of the existing bridge. The Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridge alternatives would all result in constructing a replacement bridge approximately 80 feet downstream of the existing bridge. For these three alternatives, the new bridge would be constructed while the existing bridge continues to be operational. When the new bridge is connected to the existing road, there would be short-term temporary bridge closures. These closures could be limited to weekends or could extend for approximately one month, depending on the alternative. Once the new bridge is completed, traffic would be rerouted to the new bridge and then the existing bridge structure would be demolished in a similar fashion as described for the No Action Alternative.

Rehabilitation of the existing bridge would require closure of the existing bridge for approximately 30 months, although efforts would be made to minimize the closure period as much as possible. Reconstruction activities would begin as soon as possible after completion of design engineering and acquisition of construction permits. Traffic would be given advance notice to take alternate routes prior to closure of the existing bridge. The construction of a temporary dock and a construction staging area would be required on both banks of the waterway (see Figure 14). Construction of the new bascule piers would likely be the first major construction activity. This would entail removing the existing pier protection fenders, installing temporary supports for the bridge superstructure, removing the bascule leaves as well as the steel truss spans, installing cofferdams around the existing steel truss approach piers and bascule piers, and demolishing the existing piers.

The bascule leaves and steel truss approach spans would be removed from the construction site for refurbishment. Construction of the new piers would involve drilling shafts through the existing timber piles, constructing the pile cap, dewatering the construction area inside the cofferdam, constructing the upper portions of the pier, removing the cofferdam, and finally reconstructing the upper portions of the bascule pier and bridge towers. Workers would reconstruct the concrete approach spans and replace the abutments. Workers would also reconstruct the bridge deck and replace the mechanical and electrical systems used to operate the bridge. Replacement of the piers, bridge tender towers, bridge railings, and lamp posts would be done in a manner that would preserve the historic character of these features of the existing bridge.

Major construction activities and sequencing would be similar for the Bascule, Mid-Level Fixed-Span, and High-Level Fixed-Span bridge alternatives. The construction duration and the impact area for each of these three alternatives, however, would clearly differ. Following completion of design engineering, acquisition of construction permits, purchase of needed property, and relocation of residents and businesses, construction

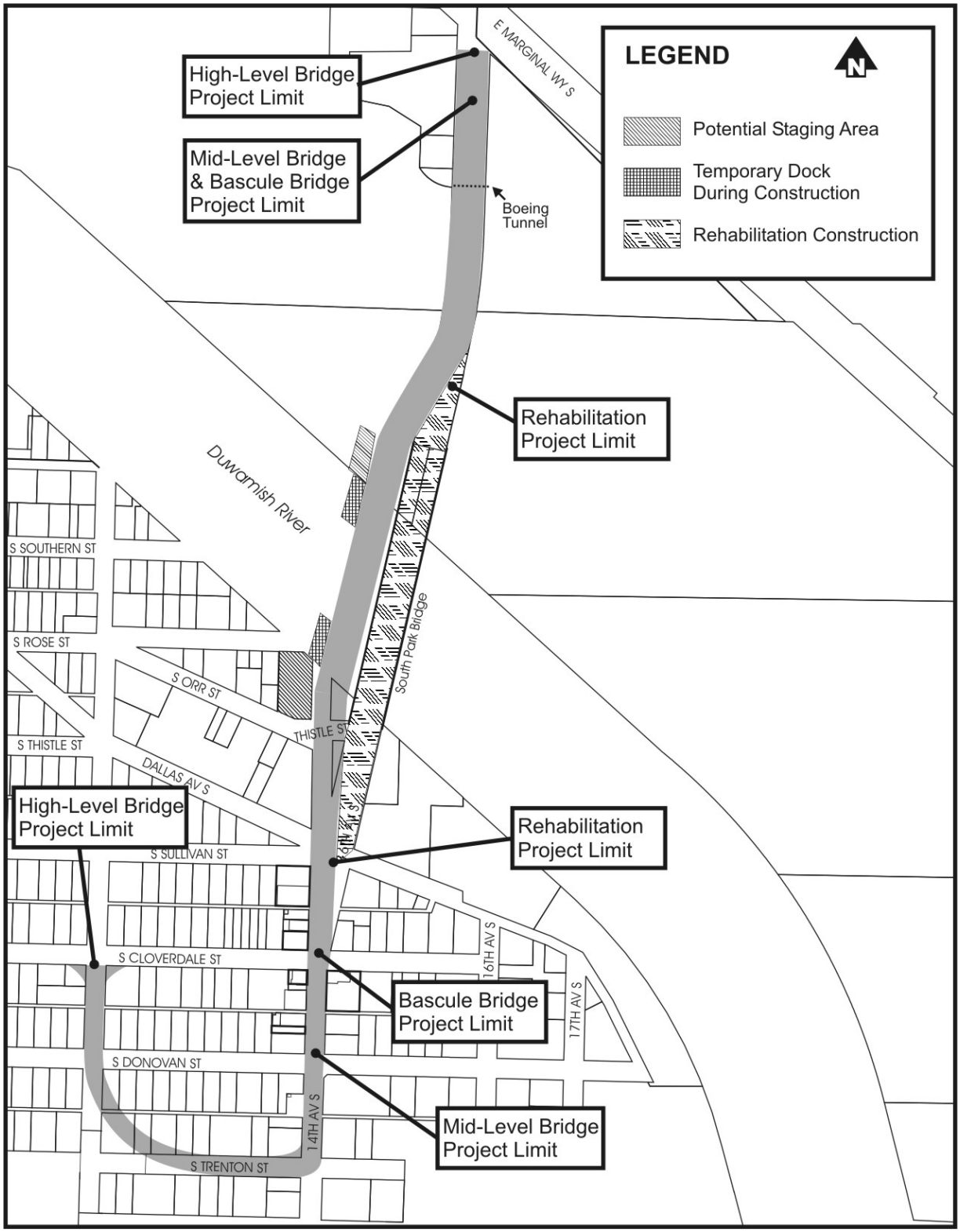


Figure 14
Proposed Construction Staging Areas

activities would begin. The first activities would include establishing the construction staging areas and constructing temporary docks with pilings on both sides of the waterway (see Figure 14).

Buildings affected by the construction activities would be demolished and utilities would be either temporarily or permanently relocated. To minimize traffic impacts, construction activities would begin with the construction of the in-water piers. Construction activities would progress landward from the central portion of each bridge alternative. Both in-water and on-land construction would begin with construction of the sub-structures (piers and abutment) and would be followed by placement of the superstructure (beams, deck, rails). On-land construction of the piers, abutment, retaining walls, and transition segments at either end of the bridge would likely require temporary closure of adjacent or nearby roads and rerouting of local traffic. If possible, these temporary closures would be limited to weekend and/or night times to minimize impacts to the community. Construction activities on the north and south portions of the new bridge structures could also occur either separately or concurrently. The last of the construction activities would be the construction of the new curb and gutter of the at-grade roadway, and paving the roadway to match the existing width of 14th Avenue S. Figure 14 shows the project limits, or start and end points, of construction activities for each of the project build alternatives.

For the rehabilitation and new bridge alternatives, new girders and other oversized materials would most likely be delivered to the project site by barge. Large cranes located on the barges or temporary docks would off-load the materials and place them in the nearby construction staging area. Removal of the existing bridge pier foundations and construction of the new bascule and steel truss piers would all require the use of cofferdams to isolate the construction activities. Construction of the new approach-span piers would use drilled shafts, which would likely incorporate the use of temporary casings to isolate the construction activities. This in-water work would be performed by equipment operated from the temporary docks or from barges.

Demolition of the existing bridge would involve disassembly and removal of the existing bascule leaves, superstructure, bridge piers, protection fenders, and abutment. Cranes would use the existing bridge structure and approaches as much as possible to remove the various elements of the bridge. Barges would likely be used to remove oversized materials. At this time, this demolition work is not planned to require construction of temporary docks or the acquisition or temporary use of property on the banks of the Duwamish Waterway for a staging area. Removal of the abutment foundations, however, would likely require temporary short-term closure of adjacent and/or nearby streets. During this time, local traffic would be temporarily rerouted from the immediate area.

Following the completion of the construction activities associated with any of the project alternatives, disturbed areas would be restored. Conceptual site restoration plans would be developed for each alternative based on additional consultation with resource agencies and other stakeholders.

2.4.4 Cost Estimates for the Alternatives

Cost estimates for each of the proposed project alternatives have been prepared by the project engineers (see Table 1).[15] The cost estimate for each project alternative, including the No Action alternative, is broken down into the following components: 1) plans, specifications, and estimates (PS&E), 2) right-of-way costs, and 3) construction and construction-related costs. The total cost estimates are provided in 2003 dollars as well as estimated costs escalated for 2008, the anticipated mid-point of the project construction period. These cost estimates were calculated based on the conceptual engineering plans that were prepared for each of the alternatives.[16]

Clearly, the No Action Alternative is the least expensive as the existing bridge would not be rehabilitated nor would a new replacement bridge be constructed. The cost to remove the existing bridge structure would be approximately $7,000,000 (2003 dollars). The estimated costs to either rehabilitate or replace the existing bridge structure range between approximately $62 million to $77 million in 2003 dollars. The least costly of the build alternatives is the proposed Mid-Level Fixed-Span Alternative, which is estimated to cost approximately $61,523,000 to design and construct. The Rehabilitation Alternative is estimated to cost approximately $63,930,000 and the High-Level Fixed-Span Alternative is estimated to cost approximately $70,460,000. The most costly of the build alternatives is the Bascule Bridge Alternative, which is estimated to cost $77,334,000. The escalated 2008 dollar estimates to design and construction the project alternatives are also shown in the table.

Table 1. Cost Estimates of the Project Alternatives

	PS&E	Right-of-Way	Construction	Total (2003 dollars)	Total (2008 dollars)
No Action	$ 250,000	$ 0	$ 6,750,000	$ 7,000,000	$ 9 M
Rehabilitation	$ 6,843,000	$ 754,000	$56,333,000	$63,930,000	$ 74 M
Bascule	$ 8,253,000	$ 3,655,000	$ 65,426,000	$ 77,334,000	$ 90 M
Mid-Level Fixed-Span	$ 4,235,000	$ 6,377,000	$ 50,911,000	$61,523,000	$ 71 M
High-Level Fixed-Span	$ 5,261,000	$ 15,310,000	$ 49,889,000	$ 70,460,000	$ 82 M

Source: Parsons Brinckerhoff, November 2003.

[15] Parsons Brinckerhoff. *South Park Bridge Project: Structural Alternatives Study*, November 2003.

[16] Parsons Brinckerhoff. *South Park Bridge Project: Conceptual Plans*, June 2003.

2.5 Project Coordination

Coordination to date for the South Park Bridge Project has involved members of the public, a special community advisory group, and representatives of government agencies. Formal scoping was initiated through publication of the NEPA Notice of Intent and the SEPA Determination of Significance and Scoping Notice on February 7, 2002 and February 14, 2002, respectively. Separate scoping meetings were conducted in the South Park community for relevant agencies and members of the public. Both meetings were held on February 28, 2002. Written and verbal comments received through the scoping process were reviewed by King County and used in the development of the project alternatives and topics for environmental impact assessment.

A public involvement plan for the proposed South Park Bridge Project was developed during the initial stages of project planning. The Project Advisory Committee (PAC) and the Community Advisory Group (CAG) reviewed this document and provided comments to King County. The first public involvement efforts began prior to the formal scoping period. A public workshop was held in the South Park community on January 17, 2002. At this meeting, the nine preliminary project alternatives were presented. A second public workshop was held on June 19, 2002. At this meeting, the five proposed project alternatives were presented. Members of the public were encouraged to provide comments at both of these meetings. To facilitate participation and input from Hispanic persons living in the community, a bilingual translator attended all meetings. In addition, handouts and newsletters for the project were published in English and Spanish, and public notices were published in "Siete Dias", a local Spanish-speaking newspaper. Future opportunities for public involvement are also planned, including a public hearing and workshop following publication of the Draft Environmental Impact Statement in 2004.

Establishing a CAG was a significant component of the public involvement plan. A total of 17 individuals were chosen to participate in the CAG to represent community stakeholder interests and public concerns. The CAG meets periodically to be briefed on the progress of the project and to provide input to the South Park Bridge project team. Again, a bilingual English-Spanish translator attends the meeting to facilitate communication with Spanish-speaking individuals on the CAG. To date, CAG meetings have been held on April 10, May 21, June 4, June 11, and October 29 of 2002 and on January 7 and November 18, 2003. Additional CAG meetings are planned for the future.

As part of the environmental review process, King County periodically meets with the Project Advisory Committee (PAC) to give a status report of the project, answer questions, and to solicit comments. This committee is comprised of members of various agencies that have potential jurisdiction over the proposed South Park Bridge Project. The committee is the Interdisciplinary Team (IDT) required under NEPA implementation guidelines and provides technical support to King County staff. To date, the PAC has met on January 10, February 20, May 9, May 23, and October 10 of 2002. Coordination with the PAC is planned at critical future steps in the environmental review process.

A non-scientific survey was also conducted of South Park businesses located on 14th Avenue S. during the late spring of 2003.[17] The goal of the survey was to help assess potential impacts to businesses, especially minority-owned and –operated (employees) businesses. The survey respondents were also asked to identify their particular concerns about the proposed rehabilitation or replacement of the existing South Park Bridge. A total of 18 businesses were successfully surveyed. Spanish and Vietnamese translators were provided, as needed, to assist business representatives understand and respond to the questions. In addition, the data was used to assess the potential effects displaced businesses and jobs would have on the South Park community. The analysis of the survey findings are discussed in detail in the Economic, Social, and Relocation technical reports supporting the analysis in the EIS.

As key issues have arisen during development of the project alternatives and in assessing potential environmental impacts, special meetings have also been held with key stakeholders and organizations in the South Park community, as well as with other government agencies and jurisdictions with an interest in the project. For example, on December 3, 2002, King County met with owners of property along 14th Avenue S, and information booths were set up at the Sea-Mar Community Health Center-sponsored annual Fiesta Patrias on September 14, 2002 and at a family night event held at the Concord Elementary School on September 27 and November 22 of 2002. Periodic coordination meetings have also been held with representatives of the City of Seattle and the City of Tukwila, and other government agencies. These coordination activities will continue to occur on an on-going basis as the EIS is prepared and finally adopted.

[17] Parsons Brinckerhoff. *South Park Bridge Project: Survey of 14th Avenue South Businesses*, August 22, 2003.

This page intentionally blank

Chapter 3 Studies and Coordination

As a part of this report, contacts and interviews were conducted with interested and affected parties. Some of these include the City of Seattle, the City of Tukwila, King County, private entities such as Boeing, and fiber optic owners. The parties are as follows:

- Mike Quesic from the City of Tukwila was contacted regarding any City of Tukwila utilities that may be located within the project area. The City of Tukwila provided one paper drawing that highlighted a 4-inch sanitary sewer line and 1-inch water line that services the bridge tower.

- City of Seattle utility information was obtained from the City's 'sewer cards.' The City GIS information was provided by Parsons Brinckerhoff. Information was also obtained about the City of Seattle utilities located in the South Park community that are listed as planned capital improvement projects.

- King County utility information was primarily obtained in the form of utility GIS information. In addition, contact was made with King County to determine if the County is planning any utility capital improvement projects in the South Park community.

- Boeing was contacted on August 18, 2002. A meeting was held with Boeing representatives, including Dennis Donovan, Wyman Henckel, and C. Stewart.

In addition, prior reports and studies on the South Park Bridge were evaluated as mentioned in Chapter 2. Reports that have been reviewed for potential utility impacts include:

- "14th/16th Avenue S. Park Bridge Rehabilitation/Replacement—Design Report," prepared by Sverdrup Civil, Inc. in November 1994.

- "16th Avenue S. Bridge Replacement Project: Environmental Review Report," prepared by Entranco, Inc. in July, 1999.

- "South Park Bridge Project: Summary Technical Memo—Alternatives Developments and Screening," prepared by Parsons Brinckerhoff, Inc., on Sept. 6, 2002. This report briefly addresses some minor utility impacts to the project. It identifies the need for relocating overhead power, telecommunications, lighting, underground drainage utilities in the public right-of-way of 16th Avenue S., and many other minor utilities in the public right-of-way of 14th Avenue S. and 16th Avenue S.

This page intentionally blank

Chapter 4 Methodology

The following sections will describe the method by which the utility information was obtained and the methodology used to evaluate potential affects on utilities for each of the proposed project alternatives.

4.1 Utility Data

The utility information for the project area was obtained from several sources by Parsons Brinckerhoff and was provided to the project team. All of the information that was obtained by Parsons Brinckerhoff was compiled into the project basemap. From this basemap, the initial evaluation of the utility impacts was determined. Parsons Brinckerhoff's sources of information for the basemap include King County GIS, City of Seattle, City of Tukwila, and Boeing as-built record drawings. Additional information was also obtained from City of Seattle sewer cards. Several site visits were made by project team members, including staff from RoseWater Engineering and Parsons Brinckerhoff. The purpose of these site visits was to verify conflicting data from the many sources.

The King County GIS maps include information for the following utilities located in public right-of-way: water, sewer, stormwater, telephone, and natural gas service connections.

Boeing also provided hard copy utility reference drawings for the following utilities: sanitary sewer, stormwater, electrical, water, and HVAC for the Boeing Plant 2 facility. In addition, Boeing provided electronic copies of maps of the utilities specifically located within the project area. This information primarily included storm water and sanitary sewer data, including utility pipe sizes and materials.

The City of Tukwila provided information for the sanitary sewer and water line that serves the South Park Bridge.

The City of Seattle provided information for stormwater, combined sewer, and sanitary sewer utility lines located in the project corridor. This information was provided in two forms—sewer cards and GIS maps.

The information obtained from the different sources was combined into a basemap. This preliminary utility information was verified through several site visits and contact with utility locator services. An in-depth survey prior to construction would be required to verify utility locations and grades.

4.2 Vertical Datum

The vertical project datum used on the basemap is NAVD88. All collected information that was not received in the NAVD88 format was converted to this datum prior to being added to the project basemap.

5.1 Overview of Utilities

Existing utilities within the project area consist of both overhead and underground utilities. Table 2 is a summary of several utilities and purveyors located in the project area. See Figures 15 and 16 for utilities located in the project area.

Table 2. Existing Utilities and Agencies

Utility	Owner	Agency/Purveyor
Natural Gas	Puget Sound Energy	Puget South Energy
Water	City of Seattle City of Tukwila	Seattle Public Utilities
Sanitary Sewer	City of Seattle City of Tukwila King County	Seattle Public Utilities Dept. of Natural Resources and Parks
Storm sewer	City of Seattle King County King County City of Tukwila	Seattle Public Utilities Dept. of Natural Resources and Parks Department of Transportation
Fuel Oil	Boeing Facilities	
Telephone	Qwest	
Electrical	City of Seattle	Seattle City Light
Fiber Optic	Multiple Owners	
Steam	Boeing Facilities	

Underground utilities include storm drainage, combined and sanitary sewers (gravity systems). Overhead utilities include electrical, telephone, and fiber optic lines. These utilities are shown in Figures 15 and 16. Figure 15 includes underground natural gas, Boeing water line, fiber optics, telephone, water, and power. Figure 16 includes storm water, combined sewer, sanitary sewer, Boeing industrial waste, and Boeing steam.

This page intentionally blank

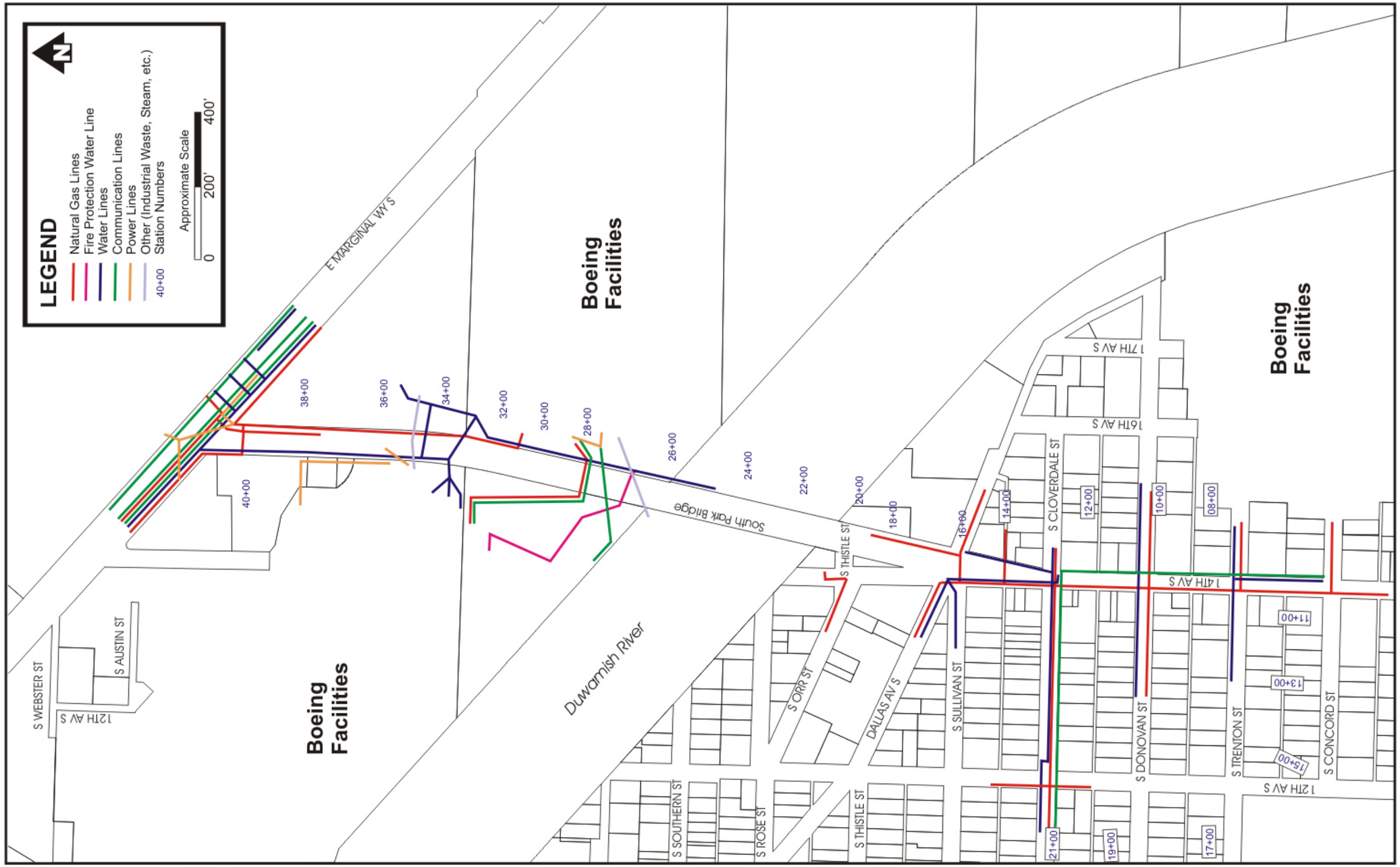


Figure 15
Pressurized and Non-Gravity Flow Utilities

This page intentionally blank

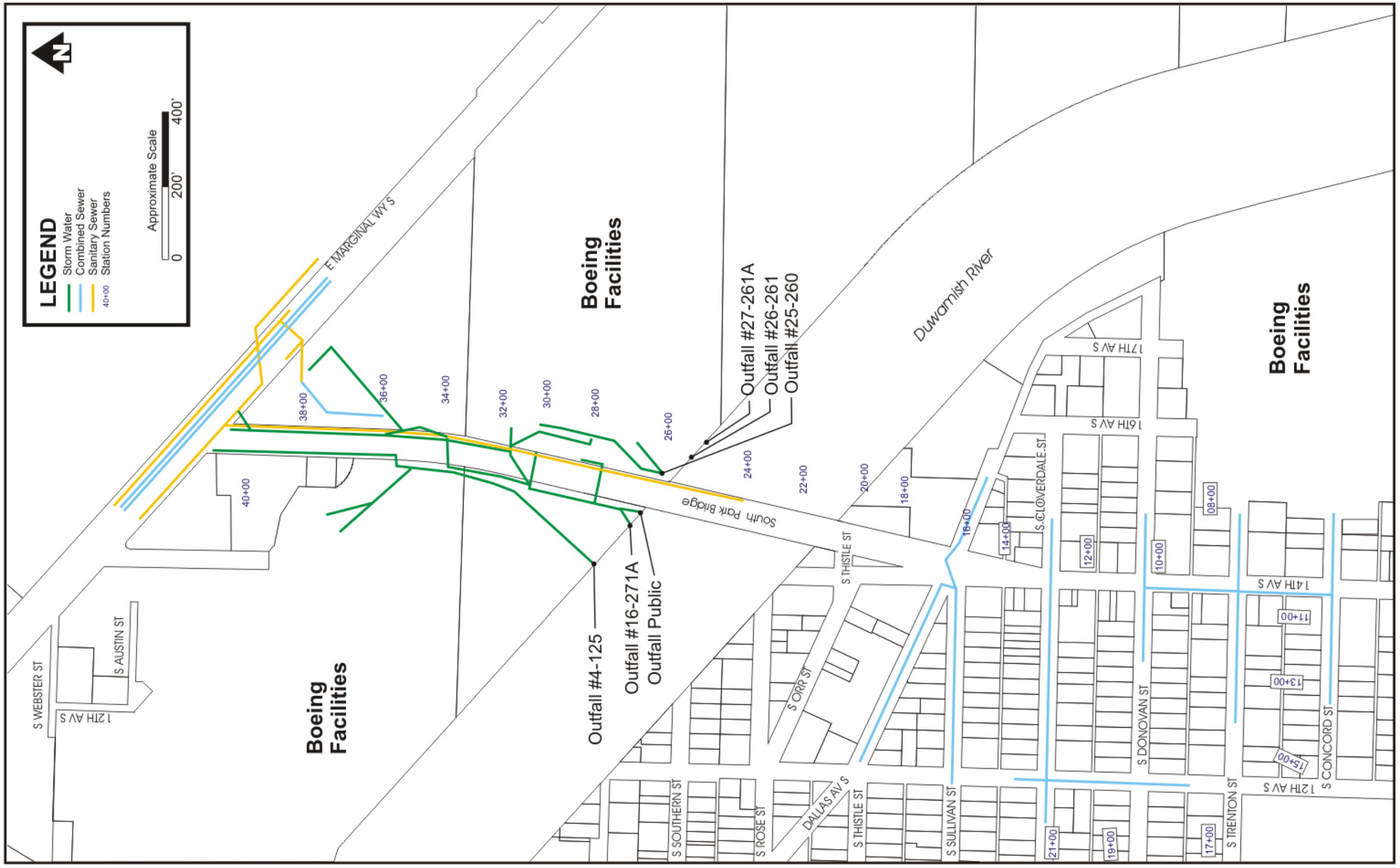


Figure 16
Waste Water and Steam Utilities

This page intentionally blank

Utilities in the project area are owned by various municipalities and private enterprises. The three municipalities within the project area are the City of Seattle, the City of Tukwila, and King County. Each of these local government jurisdictions have public utilities, including sanitary and storm sewers, water, and electrical, that are located in the project area. The investor-owned utility companies are natural gas (Puget Sound Energy), telephone (Qwest), and cable and fiber optics (multiple purveyors). Although these utilities are privately held, they are regulated by the Washington State Utilities and Transportation Commission (WUTC).

5.2 Electricity

Seattle City Light supplies electric power to customers in Seattle, portions of King County, and the Boeing Plant 2 facility within the entire project area. Overhead power lines on utility poles are located on the east side of 16th Avenue S. north of the Duwamish Waterway and the west side of 14th Avenue S. south of the waterway. Many underground power vaults and electrical ducts are also located on Boeing property. Street lights are located along both 14th and 16th Avenue S. A submarine electrical cable also provides power to the existing bascule bridge. Outside of the project limits to the east, a Seattle City Light low-voltage transmission line crosses the Duwamish River with an overhead clearance of approximately 90 feet. Seattle City Light has started the planning and engineering activities to raise the vertical clearance of this power line to meet minimum U.S. Coast Guard requirements.

5.3 Natural Gas

Puget Sound Energy (PSE) provides natural gas service throughout the project area (see Figure 15). A grid of high and intermediate pressure natural gas mains, located in the public right-of-ways in the project area, serve customers including Boeing. Natural gas mains of this type are typically 4- to 12-inch diameter steel pipe conduits. Small diameter pressurized natural gas mains are often enclosed in larger diameter steel pipe or plastic pipe. Gas mains and conduits typically have 2 to 3 feet of ground cover. PSE often has joint use agreements with other utilities such as steam, fiber, and water.

5.4 Communications

Qwest (formerly US West Communications) provides telephone service throughout the project area (see Figure 15). Telephone lines of this type are typically located within street right-of-ways, above ground on utility poles, as well as underground (such as on the Boeing property). Telephone lines typically have approximately 1 to 3 feet of ground cover.

Several private companies maintain fiber optic cables and/or provide long-distance and other telecommunications services within the project area (see Figure 15). Boeing has a major fiber optic line crossing 16th Avenue S. at approximate station 29+00. This line

serves several buildings at Plant 2. Fiber optic and other smaller utilities often share underground telephone duct banks.

5.5 Steam, Sanitary, and Combined Systems

Seattle Public Utilities (SPU) owns and supplies wastewater services in the majority of the project area and manages the surface water runoff in the project area (see Figures 15 and 16). A portion of the project area, however, is in unincorporated King County. This area extends from the south bank of the Duwamish Waterway south to the centerline of Dallas Avenue S. The buildings and structures within this area are not served by any public sewer system. Instead, owners have privately owned and maintained sewer septic tanks.

There are several storm water outfalls to the Duwamish Waterway, including several on the Boeing property and one public (SPU-owned) outfall located immediately west of the South Park Bridge in the public right-of-way. To the north of the Duwamish Waterway, stormwater from 16th Avenue S. is conveyed south on 16th Avenue S. to outfalls into the Duwamish Waterway (see Figure 16). Sanitary sewage is conveyed to a King County 42-inch trunk line (Elliott Bay Interceptor) on East Marginal Way S.

To the south of the Duwamish Waterway (see Figure 16), storm and sanitary sewer flows are conveyed through a grid system of combined sewer mains. These pipes are located in the right-of-way. Eventually, combined sewage from these two systems flows to King County trunk lines located south of the Duwamish Waterway. Eventually, the pipe system conveys the combined stormwater and sanitary wastewater to the West Point Treatment Plant located approximately 4 miles northwest of downtown Seattle near Discovery Park.

Gravity mains in residential and commercial areas are typically concrete pipes, 12 inches or larger in diameter, and have 10 to 15 feet of ground cover. SPU owns and maintains the drainage system, consisting of both sanitary, combined, and storm systems. For a complete description of the storm water system please see the South Park Bridge Project Water Quality Technical Report.

The City of Tukwila owns a 4-inch plastic sanitary sewer pipe. The sewer pipe comes from East Marginal Way S. on the east side of 16th Avenue S. This pipe continues southwards on the east side of 16th Avenue S. and along the upstream side of the bridge to the bridge tender's tower.

5.6 Water

Seattle Public Utilities maintains the water system in the project area. There are water lines running the length of 14th / 16th Avenue S. in the project corridor. In addition, water lines are located in the right-of-way of each of the cross streets.

The City of Tukwila owns a 1-inch galvanized steel water pipe in the project area. The pipe comes from East Marginal Way S. on the west side of 16th Avenue S. and then crosses over to the east side just before crossing the edge of the waterway. The pipe continues southwards on the east side of the bridge to the bridge tender's tower.

5.7 Boeing Utilities

Boeing also operates a utility system that serves the Plant 2 facilities. These utilities include steam, fire protection (water), fiber optic, electrical, telephone, fuel oil, sanitary, and storm water mains (see Figures 15 and 16). There is a steam tunnel crossing (under 16th Avenue S. at approximate station 34+00), which contains both 6-inch and 12-inch steel pipes. Structures associated with these utilities are located throughout Boeing property and include manholes, catch basin, telephone, and water valve vaults.

This page intentionally blank

Chapter 6 Impacts

6.1 Construction Impacts

6.1.1 Common to All Alternatives

Many utilities in the South Park Bridge corridor would be directly impacted during the construction of one of the proposed project alternatives. Several factors, detailed below, influence whether utilities within the project area would require relocation, abandonment, and/or protection prior to, during, and following construction.

- Clearance requirements are mandated by the utility owners between an aerial structure and final grade of the ground surface where underground utilities are installed. Many existing utilities are presently located in areas with less than 25 feet of clearance based on proposed heights of the aerial portions of the proposed build alternatives, rehabilitation or replacement bridges. Utility owners would require that minimum acceptable clearance be maintained for access to utility structures that may lie under or near the alignment of the new proposed bridges. Boeing has indicated that a minimum clearance standard should incorporate the legal maximum truck height of 14 feet. The WSDOT Design Manual M22-01 gives the minimum vertical clearance of a new bridge over an existing roadway as 16.5 feet.

- The location of the proposed footings and piers must respect utility guidelines for minimum acceptable clearances and ground cover for both underground utility lines as well as vaults.

- Overhead utilities including electrical distribution and transmission lines, telephone, and fiber optic lines must maintain industry-required vertical and horizontal clearance from adjacent structures. Neither a new structure nor the temporary use of construction equipment may violate these clearance requirements. If violated, then the utilities may need to be either temporarily or permanently relocated.

- Utility services associated with demolished buildings and structures would need to be capped and abandoned. Utility owners have individual standards, which would determine how to abandon these utilities.

- The existing Boeing combined pedestrian/utility tunnel entrance may conflict with one or more of the proposed build alternatives and may have to be reconstructed or relocated outside of the proposed alignments. The utilities shown in the tunnel include a trench drain collecting surface runoff and lighting.

It is probable that construction of one of the build alternatives would affect some utilities and they would need to be rerouted. Rerouting some utilities may be quite extensive and

would result in construction impacts outside of the immediate project area. The extent of such rerouting may be as substantial as rerouting pipes to adjacent streets, thus expanding the impacted area by as much as one city block (see Figure 17).

During the design phase of the project, construction sequencing will be reviewed in order to determine whether any temporary utility relocation will be necessary. It is not anticipated that many temporary utilities would be required during the construction phase. The exception to this may be in the construction mobilization work areas. Activities within these areas will be reviewed in order to determine whether these related activities would require utility service and if utilities need to be temporarily extended to the site. Construction related to utility relocations would be sequenced to minimize disruption of services to the utility customers.

During construction, it will be necessary to temporarily reroute traffic. Local traffic on the south side of the bridge may be routed through side streets, while through traffic, traffic wishing to cross the South Park Bridge, may be rerouted using SR-99. Similarly on the north side of the Duwamish Waterway, local traffic may be rerouted through side streets, while through traffic may be rerouted using SR-99.

A detailed assessment of utility impacts has not been conducted. The full extent of potential impacts will be assessed during the preliminary and final design phases of the project once a preferred alternative has been selected.

For purposes of discussing the particular utility impacts of the individual project alternatives, the project alignments are divided into three sections—aerial, retained fill, and at-grade. The aerial section primarily consists of the bridge. The retained fill section primarily consists of the approach ramp areas and re-graded side streets. The at-grade sections include any side streets that may be impacted and/or portions of the 14th/16th Avenue S. corridor that are improved either under the aerial section of the bridge or transition sections of roadway (between bridge touchdown and project terminus). Utility conflicts and issues will be handled differently for each of the sections listed above. How each of these sections may be treated is described below.

- An aerial section of the bridge would be supported by piers and abutments. For the aerial sections, clearance, access, and proximity to proposed piers would govern utility relocations.

- Retained fill sections are located on each end between the abutments to where the vertical alignment matches existing grade. For transition fill sections, there are three options for existing utilities: (1) utilities may be relocated outside the fill section; (2) they may be raised to their maximum allowable ground cover; or (3) if the utility owner permits the additional cover, they may be left in place. For this analysis, it is assumed that utilities located within fill sections would require relocation to an area outside the fill section.

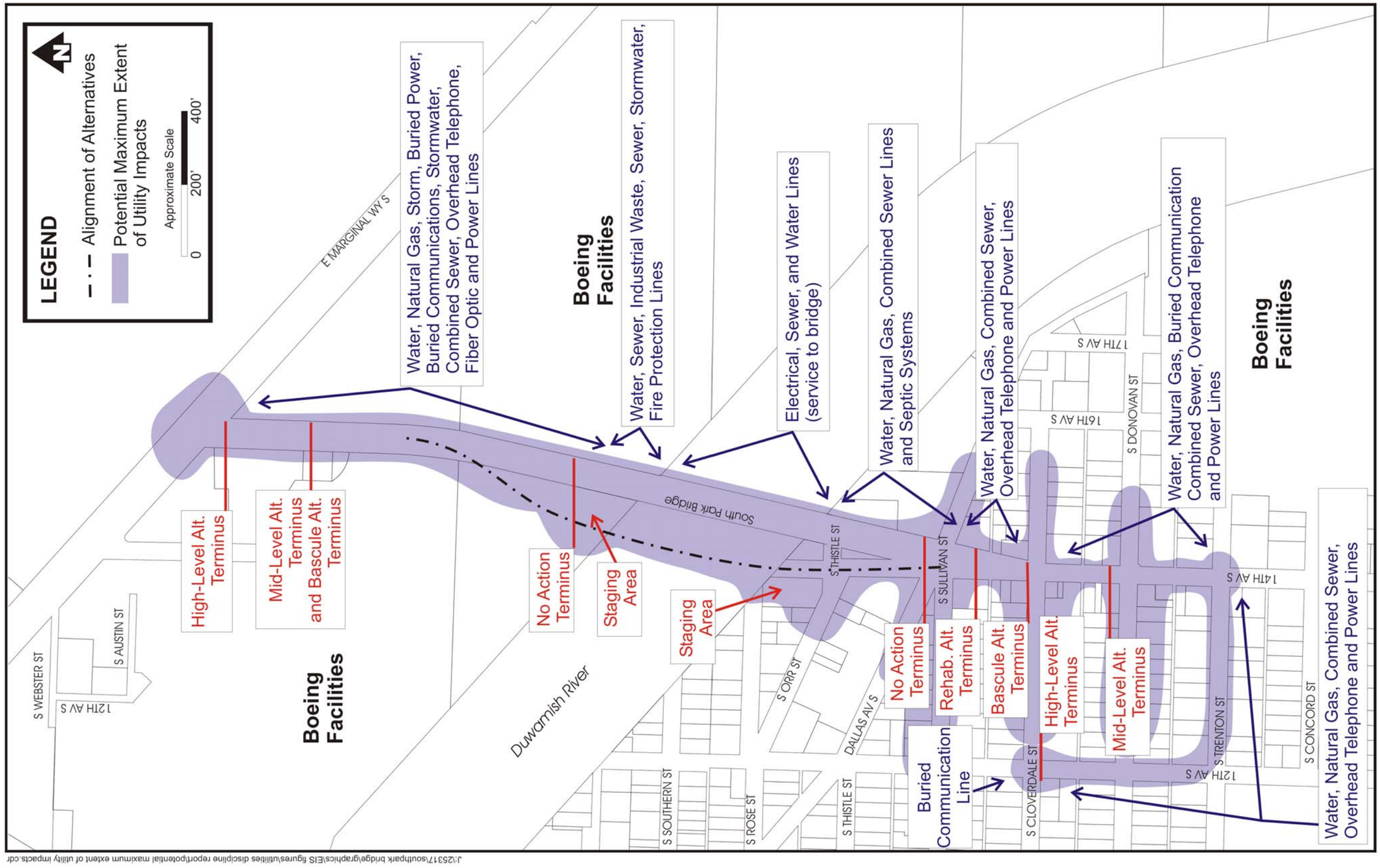


Figure 17
Potential Utility Impacts by Alternative

This page intentionally blank

- The at-grade section would be a transition segment between the bridge touchdown and the project terminus. Here, potential utility impacts would be expected to be minimal and would likely consist mostly of new road base, pavement, curb and gutter, and new sidewalk.

6.1.2 No Action Alternative

This alternative assumes that the existing bridge structure would be closed in future years. No vehicular, bicycle, or pedestrian traffic would be allowed to use the bridge. All existing structural elements (e.g., moveable spans, abutments, piers, mechanical elements) would be demolished and removed.

The No Action Alternative would have minimal impact on the existing project area utility systems. Until the bridge is abandoned, there would be no utility impacts. However, when the bridge is abandoned, there would be some minimal utility impacts consisting primarily of removing or abandoning the existing submerged electrical service, sanitary sewer line, and the water line that serve the bridge towers. Short-term temporary utility service outages may be required because of demolition activities. Utilities located near footings, piers and abutments would have to be protected during demolition.

6.1.3 Rehabilitation Alternative

The Rehabilitation Alternative assumes the existing bridge would generally remain in place. The bascule piers would be replaced, structural elements would be repaired and refurbished, and the electrical and mechanical equipment used to operate the bridge would be refurbished and/or replaced. The existing bridge would likely be closed for approximately 32 months to complete this construction work.

The Rehabilitation Alternative would have no significant utility impacts during construction. It would likely involve minor utility relocations for the new approach structure area on the bridge. In addition, electrical wiring in the bridge (including a submerged electrical cable) would likely need upgrading. Also, the water and sewer lines that service the tower would likely need upgrading.

6.1.4 Bascule Bridge Alternative

This alternative design has approximately 700 feet of fill area along the entire alignment located at the north and south end of the project area. Within these areas, natural gas, water, fire protection, and telecommunication lines north of the bridge would most likely be relocated.

In the northern section of this alternative, the fill section extends approximately 400 feet and the approximate maximum fill height is 25 feet through the Boeing property. A major fiber optic duct and several associated utility structures would likely require relocation. In addition, natural gas and water mains running parallel to the alignment would either be relocated or adjusted to grade. An electrical duct crossing north of the project area may need to be raised or protected in place. Street lighting and electric poles in this section would also be relocated.

In the aerial section of this alternative, clearance and/or access conflicts in addition to conflicts with proposed footings may require natural gas, telephone, fiber optic, and water line relocations.

This alternative would require demolition of several building structures to the south in unincorporated King County. Any utility services and/or septic tanks associated with these building structures along with the associated building structures would need to be abandoned and/or removed.

The southern fill section extends approximately 300 feet with an approximate maximum fill height of 20 feet. Manholes and natural gas mains in this area would likely be relocated.

Table 3 itemizes the utility conflicts associated with the Bascule Bridge Alternative by type and location. The station numbers used to identify locations are those shown on the map.

6.1.5 Mid-Level Fixed-Span Bridge Alternative

This alternative would have utility conflicts similar to those described for the High-Level Fixed-Span Bridge Alternative. The Mid-Level Fixed-Span Bridge Alternative has approximately 900 feet of fill along the proposed alignment in the area of the proposed Mechanical Stabilized Earth (MSE) retaining walls. Gas, telephone, water, and electrical lines would most likely have to be relocated outside these areas.

The northern fill section for this alternative extends approximately 450 feet with an approximate maximum fill height of 35 feet. Water mains and electrical ducts running parallel to the alignments would likely be relocated. In addition, Boeing has a major steam line and electrical duct crossing in this section. These would likely be relocated or adjusted to grade. Electrical poles and street lighting would also need to be relocated. In this case, it appears that there may not be sufficient room in the pubic right-of-way to relocate the utility poles, thus it may be necessary for the utility to purchase a separate right-of-way.

Table 3. Bascule Bridge Alternative Utility Conflicts

STATION	Utility Type and Size	Owner	Potential Utility Conflicts	Possible Resolution	Fill/Aerial
16+20	Sewer manholes	SPU	access to MH, clearance <5 ft	relocate MH to outside the alignment footprint	Fill
17+50 to 18+ 15	MSE walls		fill area	any utilities in this area may need to be relocated	Fill
15+25 to 16+85	Natural gas line	PSE	access to main, clearance <5 ft	relocate	Fill
18+90 to 19+40	Service utilities (may include septic tanks, water services)	private	Bldg removals may require service abandonment	abandon service connections	
20+40 to 21+00	Septic tank	private	bldg removal may involve septic tank abandonment		
20+35	Gas meter	PSE?	footing location clearance	relocate meter	
27+40 to 28+75	Water (fire protection)	Boeing	clearance ranges from 20-15 feet	protect in place	
27+80	Telephone	Boeing	clearance		
27+92	Fire (12-inch)	Boeing	conflict with pier location	adjust pier location	
29+22	Fiber optic	Boeing	conflict with pier # 9 location	adjust pier location	
29+22	Gas	Boeing	conflict with pier # 9 location	adjust pier location	
30+00	Fiber optic	Boeing	abutment conflict	relocate utility	Fill
30+00	Gas	Boeing	abutment conflict	relocate utility	Fill
32+10	Fiber vault	Boeing	clearance/access	relocate vault	Fill
32+90	Water vaults	Boeing	access/clearance <3 ft	relocate water valves or adjust to new grade	Fill
32+95	Water	Boeing	access/clearance <3 ft	relocate	Fill
34+10	Steam	Boeing	new roadway at grade	protect in place during construction	

Similar to the Bascule Bridge Alternative, several building structures in unincorporated King County would be demolished. Any utility services and/or septic tanks associated with these building structures along with the associated building structures would need to be abandoned or removed. Within the aerial section, major fire protection and fiber optics utilities serving the Boeing Plant 2 may have clearance and/or access conflicts. There are also footing conflicts with natural gas and fiber utilities.

The southern fill section extends approximately 430 feet with a maximum fill height of approximately 35 feet. S. Cloverdale Street would be raised (filled) to match the bridge grade at this intersection. Natural gas, water, and sewer mains in S. Cloverdale Street would require grade adjustments. Similar to the northern portion, the southern section for this alternative; the electrical and lighting poles would need to be relocated.

Table 4 describes the possible utility conflicts associated with this alternative by type and location.

Table 4. Mid-Level Fixed-Span Bridge Alternative Utility Conflicts

STATION*	Utility Type	Owner	Potential Utility Conflicts	Possible Resolution	Fill/Aerial
11+50 to 15+73	telephone	Qwest	fill area	relocate	Fill
12+90(Cloverdale)	sewer manholes	SPU	fill area @Cloverdale	relocate MH outside alignment footprint or adjust to grade	Fill
13+20	water valves	SPU	fill area @Cloverdale	relocate MH outside alignment footprint or adjust to grade	Fill
12+90 to 15+73	water main	SPU	fill area	relocate/ or adjust to grade/Ok by agency for increased cover	Fill
11+50 to 12+80	telephone lines	Qwest??	access@Cloverdale	relocate/ or adjust to grade/Ok by agency for increased cover	Fill
Cloverdale ST Intersection relocations					
9+00 to 12+00	sewer main	SPU	fill area @Cloverdale	check with owner to allow increased cover or readjust to grade	
9+00 to 12+00	water main	SPU	fill area @Cloverdale	check with owner to allow increased cover	
28+90	gas main	PSE ?	pier #8 conflict		
30+65	gas main	Boeing	Pier #9 conflict	place footings in-between utilities	
30+65	fiber optic	Boeing	Pier#9 conflict		
32+90 to 37+00	water main	SPU	parallel	Relocate outside of alignment	Fill
32+60 to 33+00	electrical	Boeing	crossing fill area	Adjust to new grade	Fill
34+05	12-in steam lines	Boeing	crossing fill area	adjust to grade	Fill
35+30 to 36+20	electrical	SCL	parallel	Relocate outside of alignment	Fill
36+00 to 36+30	storm drain structures	SPU	clearance/access	Adjust to grade	Fill

* For stationing -See South Park Bridge Project-10% Conceptual Engineering Drawings/ Sept. 17, 2002

6.1.6 High-Level Fixed-Span Bridge Alternative

For the High-Level Fixed-Span Bridge Alternative, a new bridge structure would be constructed downstream approximately 80 feet (centerline to centerline) west of the existing bridge and similar to the other replacement bridge alternatives. The existing bridge structure would be removed after the completion of construction. The bridge length would be approximately 2,332 feet, not including roadway approaches. This alternative has approximately two sections of 450 feet of fill along the alignment. The bridge design would allow for a 100-foot minimum vertical clearance and 125-foot minimum horizontal clearance for river traffic.

This alternative can be split into three relative areas: the northern portion, the southern portion, and the aerial section. The utilities that are impacted within each of these three areas may include overhead utilities, natural gas, water, storm drainage, sanitary sewer, electrical, steam, fiber optic, fire protection, telecommunications, septic systems, and combined sewer.

The northern portion of the project may require roadway improvements to maintain access to various Boeing buildings. Within the transition fill area, the raised roadway elevation may affect the existing overhead utilities located on 16th Avenue S. north of the bridge to the intersection of 16th Avenue S. and East Marginal Way S. These overhead utilities may need relocation. The High-Level Fixed-Span Bridge Alternative affects about twice as many electrical poles as the Mid-Level Fixed-Span Bridge Alternative. There are also many large diameter gravity (storm and sanitary) mains, associated with Boeing facilities that would require protection and/or relocation. Vertical clearance limits between the bridge and the existing surface would dictate which utilities and structures (manholes, catch basins, meter vaults, etc.) would require relocation.

The southern portion of the project area includes road improvements that extend from S. Trenton Street north along the existing right-of-way of 14th Avenue S. to the bridge abutment. The project also includes modification of S. Trenton Street so that it is extended to connect to 12th Avenue S., which must also be improved north to S. Cloverdale Street. S. Cloverdale Street would be modified to pass under the bridge. This portion of the project area would likely have utility relocations associated with this work. Water and sewer mains may require extensions.

The area within unincorporated King County is served by septic tanks rather than city sewer. This alternative may require that several building structures be removed. Septic tanks associated with these structures would need to be abandoned and/or removed.

Within the aerial portion of this alternative, septic tanks also may need to be removed because of potential conflicts with the bridge footings or because the structures that were served by the septic system would be abandoned. A portion of the impacted area for this alternative falls within the King County “Sliver” (south side of the project area). This King County area is not on the City’s sewer system. Therefore, that residence or business should have a septic system. At this time, it is unknown where these septic systems lie on the respective properties. The exact location of these systems would be determined during the design phase of the project. Electrical lines may also need relocation for the same reasons. Also, much of the existing combined sewer and water mains in 16th Avenue S. under the aerial section may have to be relocated as access or clearance may be limited.

Table 5 lists the utility conflicts associated with this alternative by type and location.

Table 5. High-Level Fixed-Span Bridge Alternative Utility Conflicts

STATION *	Utility Type	Owner	Potential Utility Conflicts	Possible Resolution
7+40 to 16+00	gas	PSE	under fill area south	relocate
7+40 to 12+80	telephone	Qwest	fill area	
9+90	gas-cross	PSE	accessibility - fill area	
9+60	storm drain	SPU	under alignment - fill area	remove, relocate
10+10	sanitary sewer	SPU	crosses- fill area	
11+00	gas cross	PSE	crosses - fill area	
12+90	water	SPU	crosses - footing	
13+20 to 14+40	water	SPU	parallel - footings	relocate
13+20 to 16+40	water	SPU	parallel - footings	relocate
14+60	gas	PSE	crosses - footing	
16+10	gas	PSE	crosses - footing	
20+40	gas	PSE	connections to existing buildings - footings	remove, abandon
27+00	industrial waste	Boeing	crosses - accessibility, footings	remove, abandon
27+40 to 28+60	fire protection	Boeing	accessibility, crosses, footings	relocate
27+80	telephone	Boeing	crosses, footing	relocate
28+80 to 32+20	fiber	Boeing	footing, accessibility	relocate
28+80 to 32+20	gas		footing, accessibility	relocate
26+40 to 39+10	storm drain		footing, new roadway abutments, fill area	relocated to service new bridge
32+60	electric x4		crosses, accessibility, footings	relocate
32+90 to 40+90	water		accessibility, footings, fill area	relocate
34+00	steam x2	Boeing	accessibility, footings	maintain
35+30 to 36+30	electric	Boeing	accessibility, footings	relocate
36+40 to 37+50	10-in. storm drain	SPU	footings	relocate
36+10 to 40+90	storm drain	SPU??	new bridge footing for ramps	raise rim elevations o relocate
37+50 to 40+90	gas x2	PSE	footings, fill area, accessibility	relocate
39+80	gas cross	Boeing	fill area, accessibility	relocate/protect

* For stationing -See South Park Bridge Project-10% Conceptual Engineering Drawings/ Sept. 17, 2002

6.2 Operational Impacts

There are no significant operational utility impacts associated with any of the five alternatives. The level of service provided by the utility purveyors would not be affected long term by any operational aspect of any of the bridge alternatives. Power demands for the new bascule bridge would not be significantly different than the existing bridge.

6.3 Secondary and Cumulative Impacts

6.3.1 Secondary Impacts

No secondary impacts are anticipated at this time.

6.3.2 Cumulative Impacts

Potential construction of a new sanitary sewer within the project area would possibly be needed. The portion of unincorporated King County in the southern project area may be annexed to the City of Seattle. The City of Seattle informed the project team that sanitary sewer improvements in this area are in their current capital improvement program. Construction of sewer improvements could conflict with project related utility relocations if prior planning and design is not coordinated.

This page intentionally blank

Chapter 7 Mitigation

7.1 Construction Mitigation Measures

There are adverse impacts associated with utilities for the proposed alternatives for the South Park Bridge Project. The following measures should be implemented to avoid, reduce, or minimize construction impacts on utilities:

- Require temporary erosion and sedimentation controls for trench excavation and earthwork removal.
- Comply with local government jurisdiction (City of Seattle, King County, and City of Tukwila) building codes, fire codes, design standards, and other requirements applicable to utilities into all design aspects of the system, stations, and maintenance facilities.
- Continue to meet and coordinate closely with both local municipal agencies and private utility purveyors to provide acceptable and safe relocation of manholes and other access points for ongoing utility maintenance.
- Adopt utility access standards for repair and maintenance of utilities.
- Use industry standard methods to reduce impact of vibration on underground pipes and special infrastructure concerns, such as lead pipe joints.
- Comply with applicable utility policies as specified in adopted operational comprehensive plans, including those provisions related to levels of service, conservation strategies, and coordination of service providers. King County may discuss the under-grounding of relocated aboveground utilities with the local jurisdictions and purveyors.
- Closely coordinate with utility owners to determine appropriate measures to protect utilities against potential ground settlement at the aerial, fill, and at-grade sections.
- Work with property and business owners to maintain access as much as possible to property/business during construction.
- Provide “Business Open” and other signs as necessary during utility work and construction of the bridge alternative.
- Coordinate transportation and economical mitigation measures to control the construction impacts to the local traffic patterns and the local businesses. The mitigation measures for construction impacts, associated with the transportation and economical impacts for the local businesses and residents are listed in their specific discipline report.

- Coordinate with any archaeological and cultural resources preservation work and any pre-existing and new hazardous materials work. These coordination efforts may include additional utility reroutes and/or alternative measures for ensuring that the utility services are interrupted minimally. These respective mitigation measures are more completely discussed in their associated technical reports.

7.2 Operational Mitigation Measures

There would be no operational impacts. All affected utilities would be restored to their preconstruction operational modes. With no adverse impacts, no mitigation measures would be required.

Chapter 8 References

Entranco, Inc., 1999. *16th Avenue S. – Bridge Replacement Project: Environmental Review Report*. Seattle, Washington, July 1999.Parsons Brinckerhoff, 2002. *South Park Bridge Project: Summary Technical Memo – Alternatives Developments and Screening*. Prepared for King County Department of Transportation, Seattle, Washington, September 6, 2002.

Sverdrup Civil, Inc., 1994. *14th/16th Avenue S. Park Bridge Rehabilitation/Replacement – Design Report*. Seattle, Washington, November 1994.

This page intentionally blank