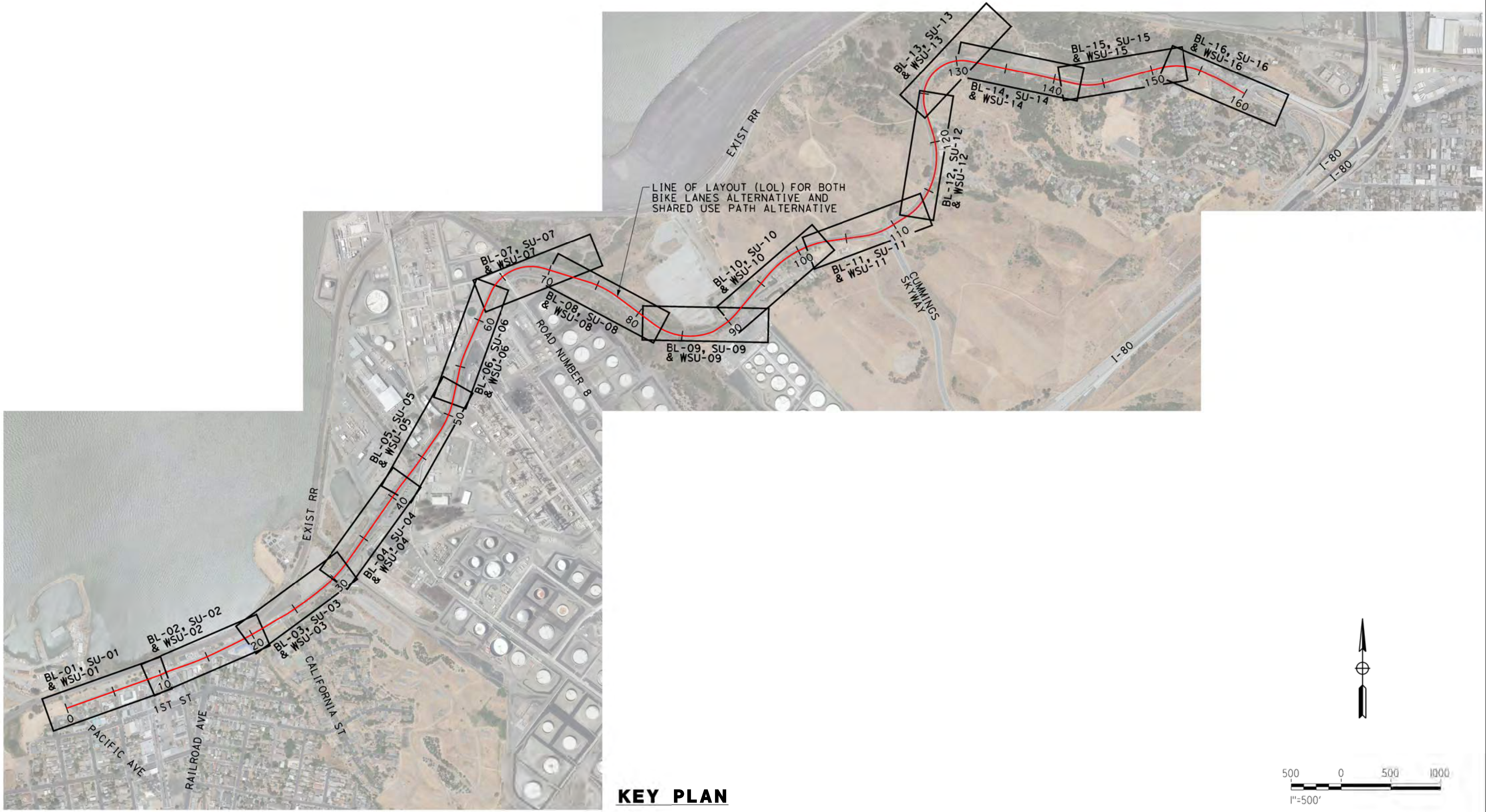
Appendices

Table of Contents

Appendix A: Alternative Concept Plans

Appendix A.1: Alternative 1 (Bike Lanes)



KEY PLAN

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Client
CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT

Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title
KEY PLAN

Scale: 1" = 500'

File Name: INFO-ARUP22X34H.DWG

Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

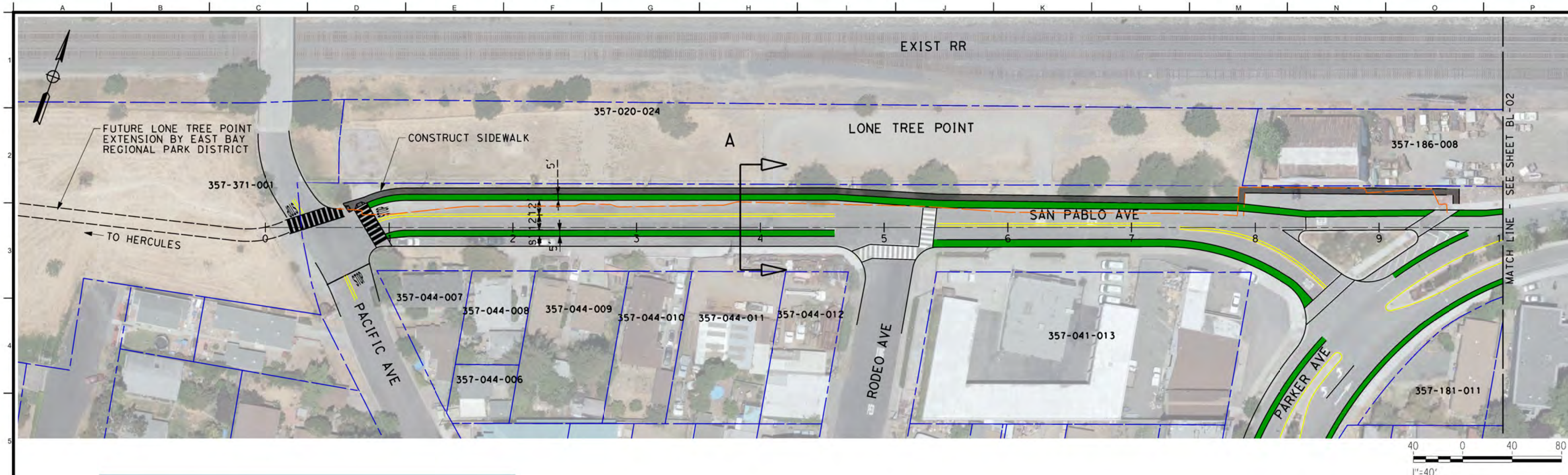
Drawn By: J. STITT

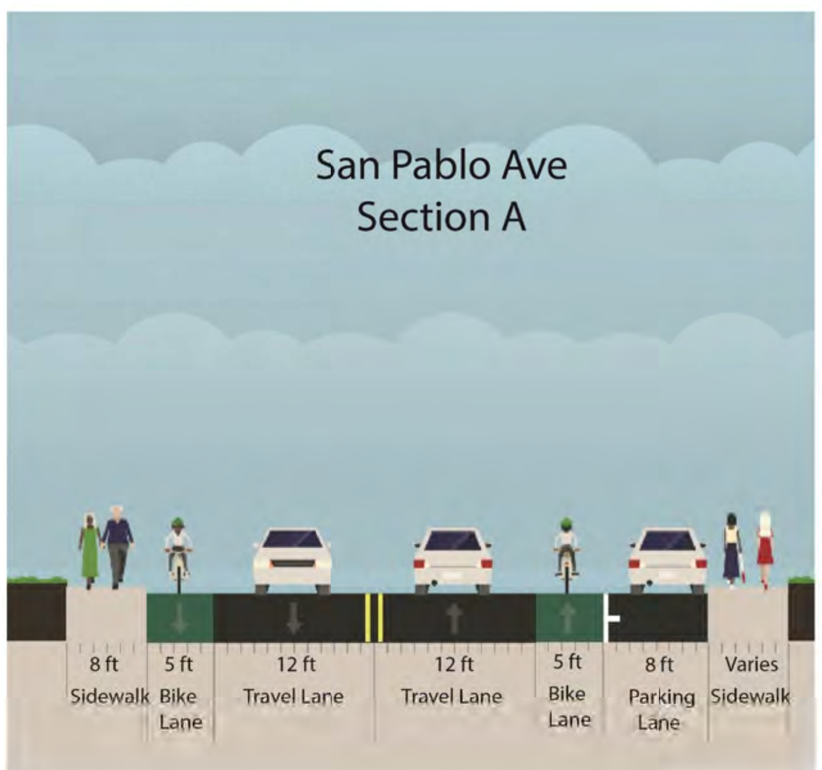
Checked By: M. ISWALT

Job No: 243261

Drawing No: BL-SU-WSU-00

DWG NAME: C:\Users\alton.connon\Desktop\Bord-Arup22x34h.dwg
MOD. BY: Alton.connon
MOD. TIME: 12/4/2015 10:53 AM
PLOT BY: Alton Connon
PLOT TIME: ####





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER

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Stamp

Key Plan

Drawing Title: BIKE LANES ALTERNATIVE

STA 00+00.00 TO STA 10+00.00

SEGMENT 1 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

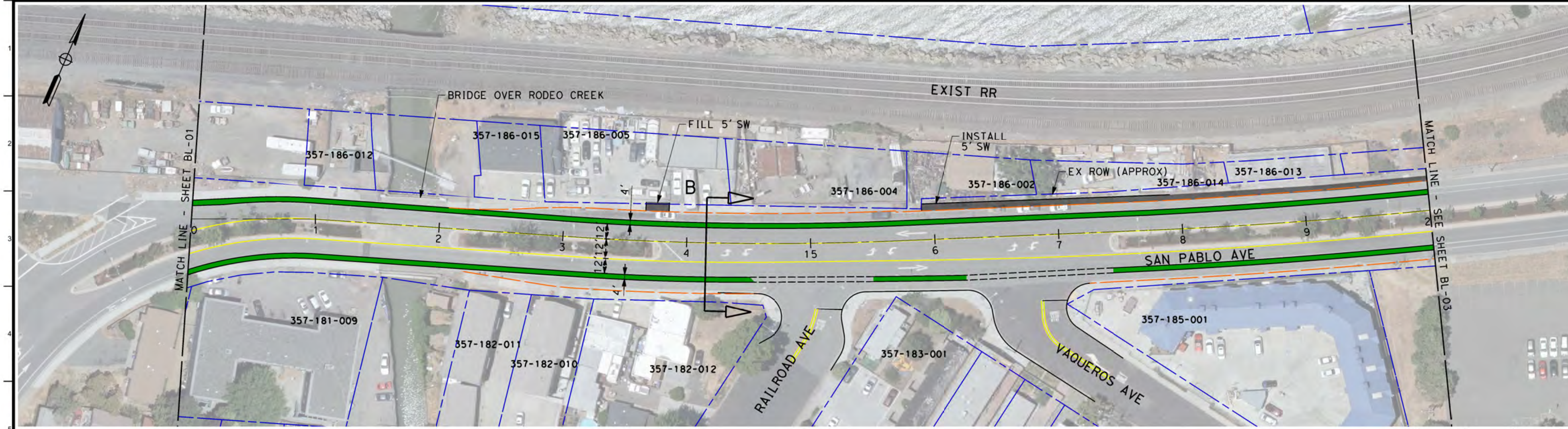
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: BL-01



NOTE: BIKE LANE AND PARKING LANE ARE NARROWER THAN STANDARD. THIS MATCHES EXISTING CONDITIONS.

LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

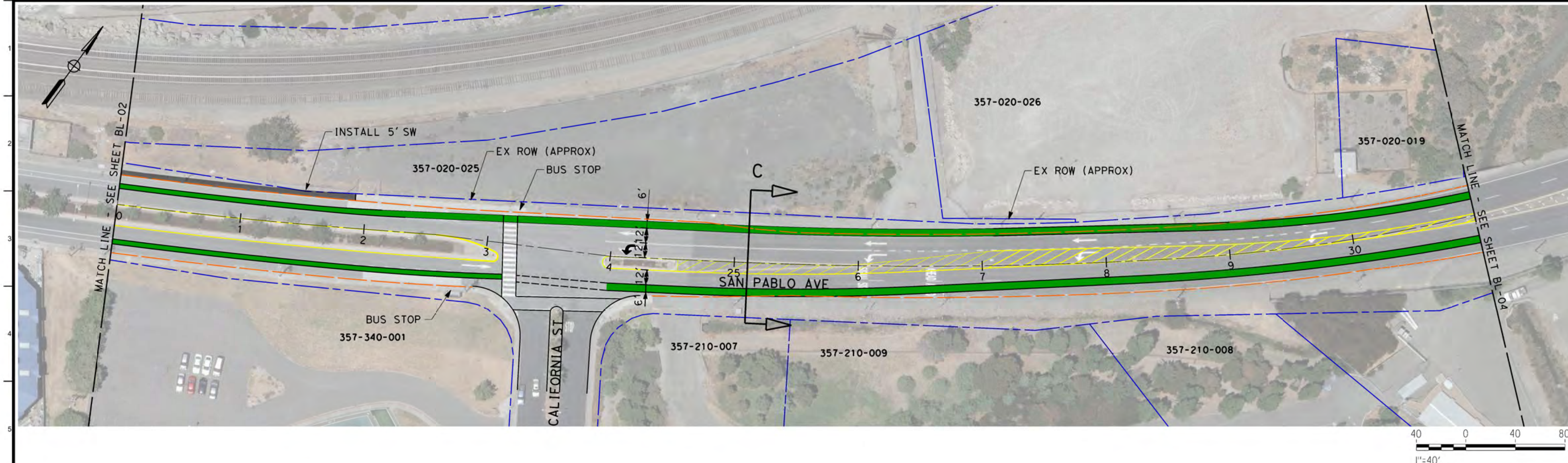
Key Plan

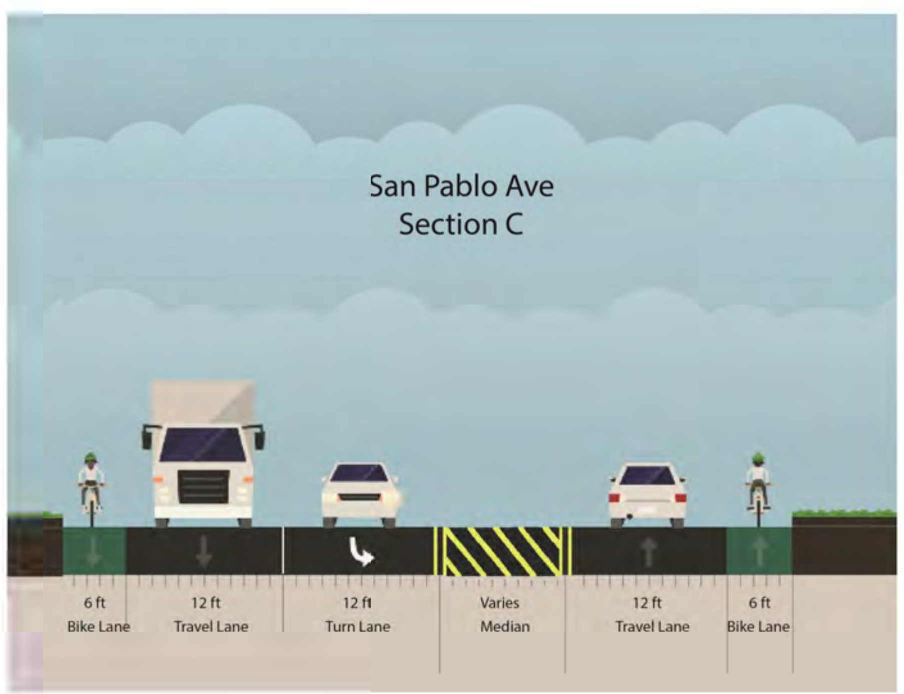
Drawing Title: BIKE LANES ALTERNATIVE

STA 10+00.00 TO STA 20+00.00

SEGMENT 2 OF 16

Scale	1" = 40'
File Name	INFO-ARUP22X34H.DWG
Drawing Status	DRAFT - FOR DISCUSSION ONLY
Drawn By	J. STITT
Checked By	M. ISWALT
Job No	243261
Drawing No	BL-02





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER

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Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

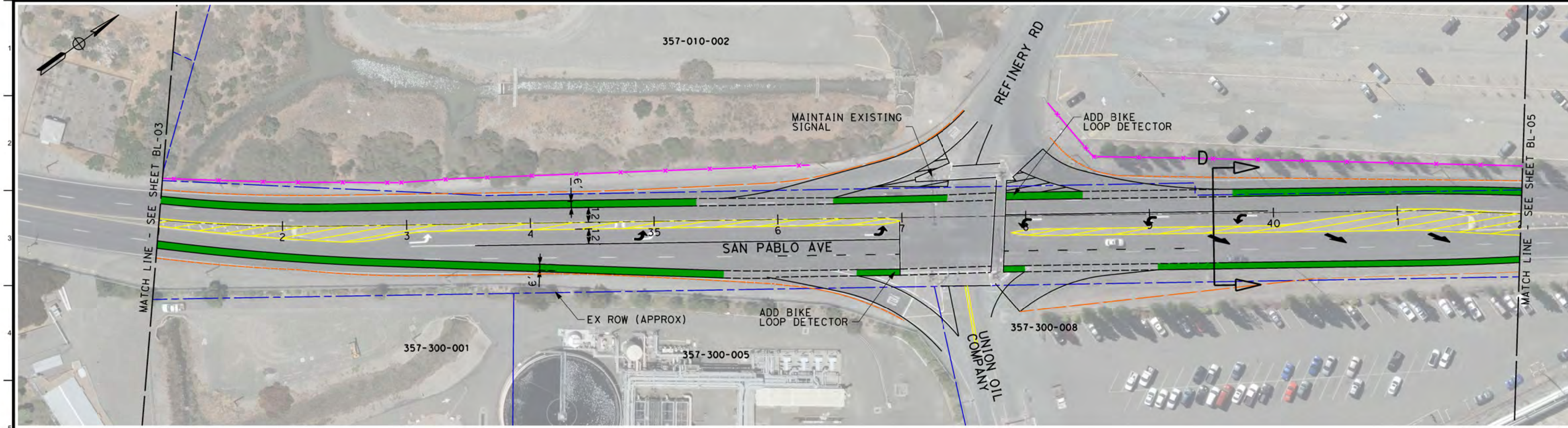
Key Plan

Drawing Title
BIKE LANES
ALTERNATIVE

STA 20+00.00 TO
STA 31+00.00

SEGMENT 3 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status DRAFT - FOR DISCUSSION ONLY
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No BL-03



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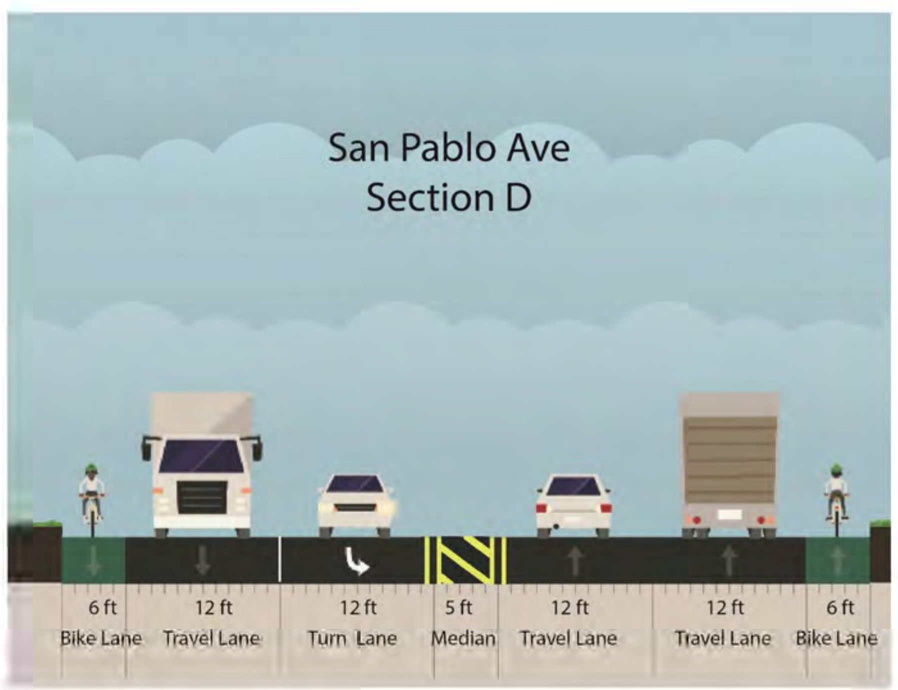
1"=40'



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- EXISTING FENCE

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Stamp

Key Plan

Drawing Title: BIKE LANES ALTERNATIVE

STA 31+00.00 TO STA 42+00.00

SEGMENT 4 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

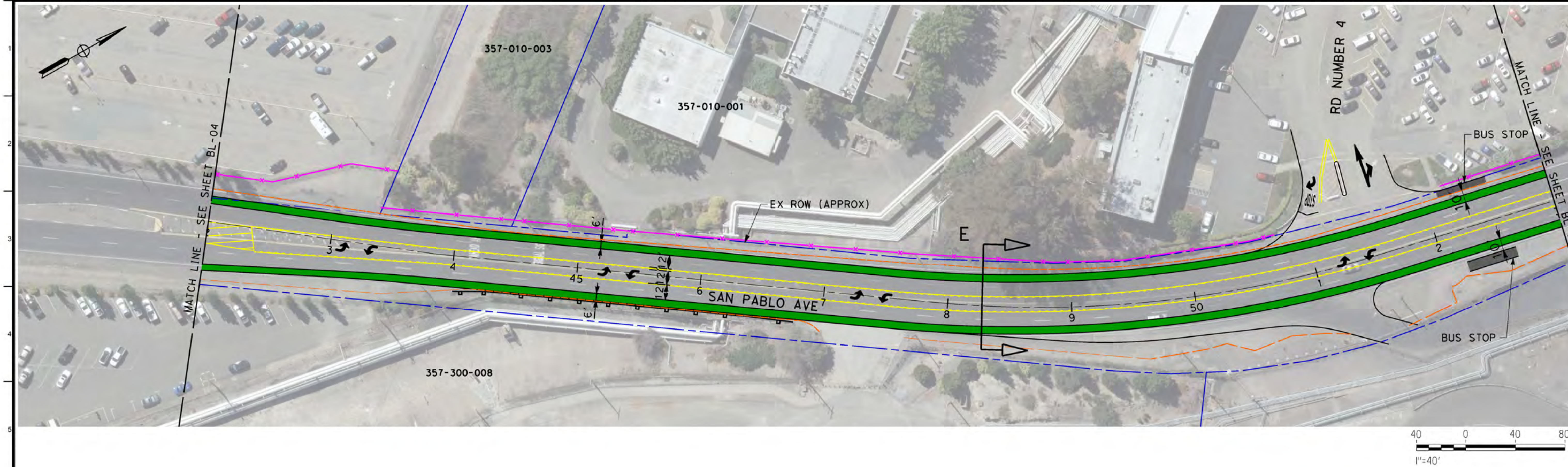
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: BL-04

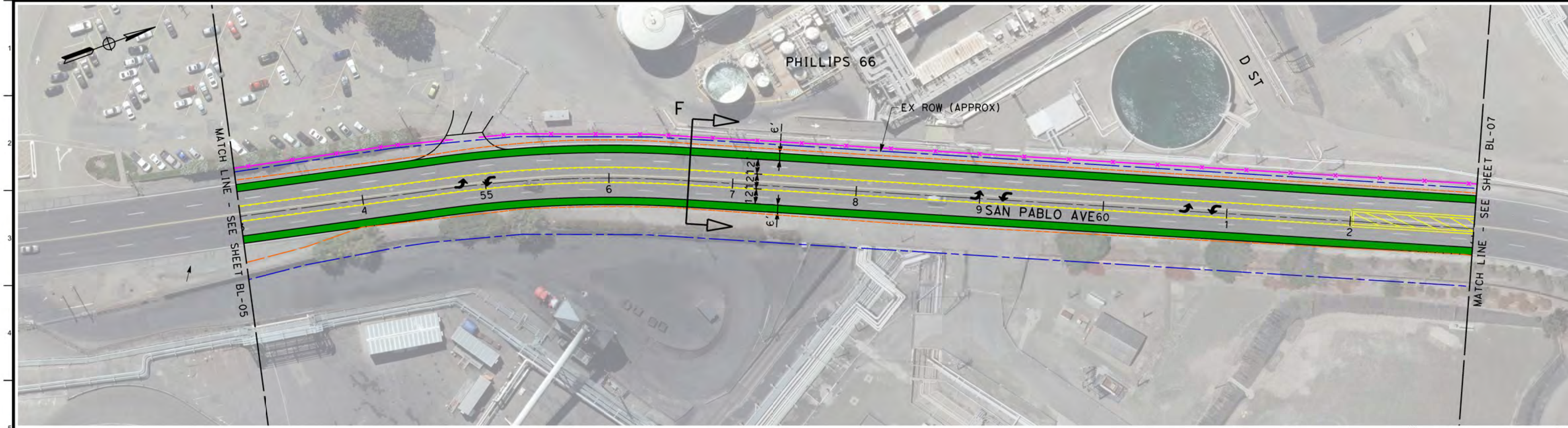


LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- EXISTING FENCE

ARUP Arup North America Ltd. 560 Mission Street, Suite 700 San Francisco, CA 94105 USA Tel (415) 957 9445 Fax (415) 957 9096 www.arup.com	Client CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT	Job Title SAN PABLO AVENUE COMPLETE STREETS STUDY	Drawing Title BIKE LANES ALTERNATIVE STA 42+00.00 TO STA 53+00.00 SEGMENT 5 OF 16	Scale 1" = 40' File Name INFO-ARUP22X34H.DWG Drawing Status DRAFT - FOR DISCUSSION ONLY Drawn By J. STITT Checked By M. ISWALT	Job No 243261 Drawing No BL-05

NO.	REVISION	DATE 9/21/2016



40 0 40 80
1"=40'

LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- EXISTING FENCE

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Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

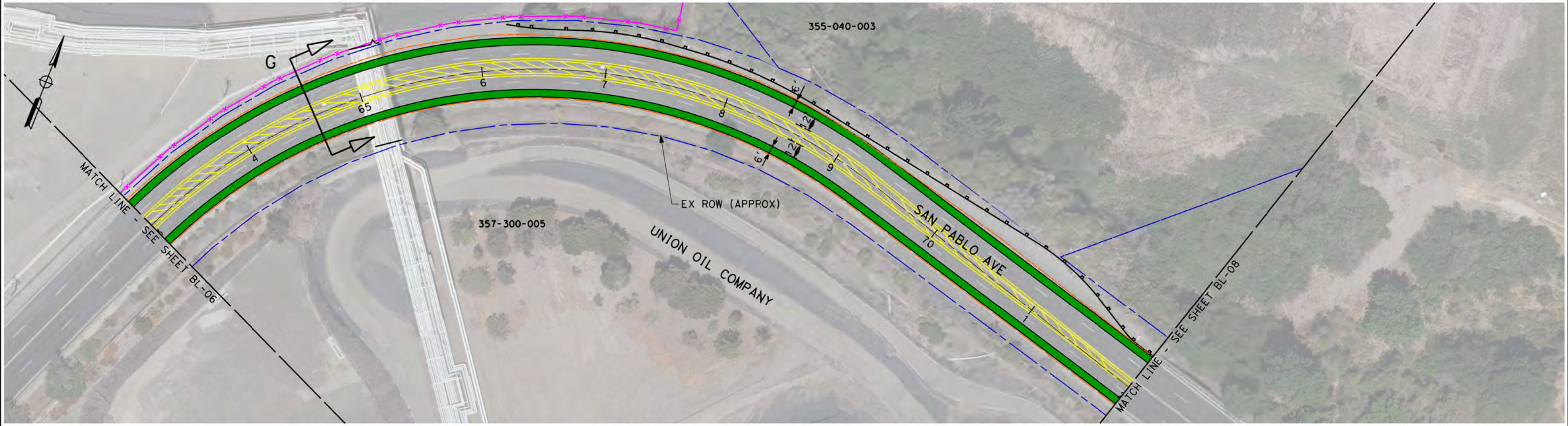
Key Plan

Drawing Title
BIKE LANES
ALTERNATIVE

STA 53+00.00 TO
STA 63+00.00

SEGMENT 6 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status DRAFT - FOR DISCUSSION ONLY
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No BL-06



40 0 40 80
1"=40'

LEGEND

EXISTING RIGHT OF WAY

BICYCLE FACILITY

EXISTING EDGE OF PAVEMENT

GUARD RAIL

CONCRETE BARRIER

EXISTING FENCE

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PUBLIC WORKS DEPARTMENT

Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

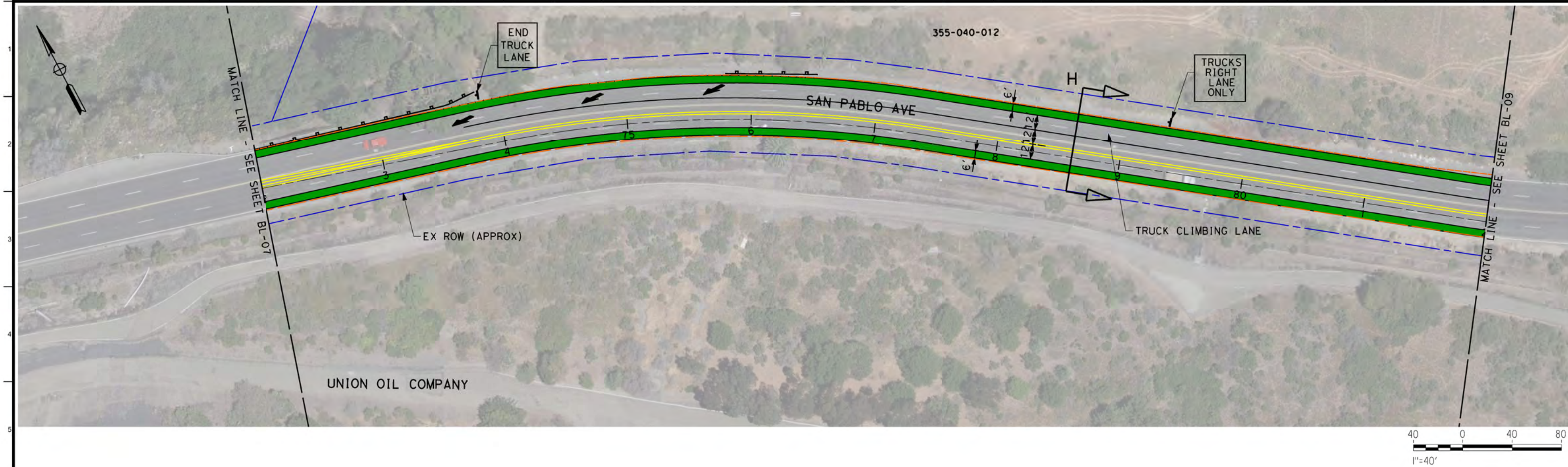
Key Plan

Drawing Title
BIKE LANES
ALTERNATIVE

STA 63+00.00 TO
STA 72+00.00

SEGMENT 7 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status
DRAFT - FOR DISCUSSION ONLY
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No BL-07



LEGEND

— · — · —	EXISTING RIGHT OF WAY
(green bar)	BICYCLE FACILITY
— — —	EXISTING EDGE OF PAVEMENT
┴ ┴ ┴	GUARD RAIL
—v—v—	CONCRETE BARRIER

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: BIKE LANES ALTERNATIVE

STA 72+00.00 TO STA 82+00.00

SEGMENT 8 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

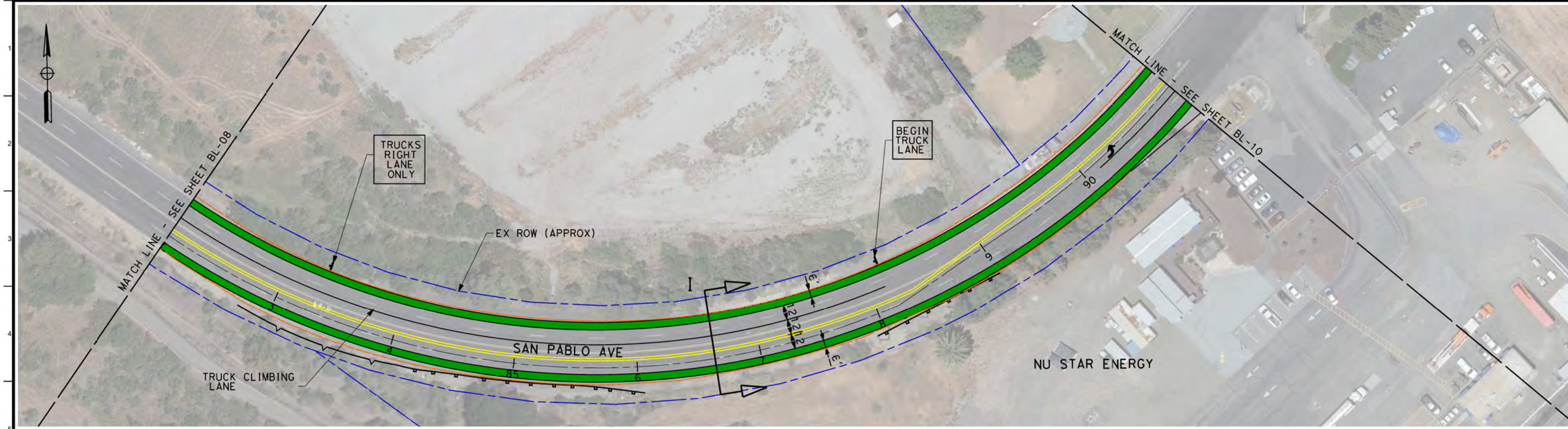
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: BL-08



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER

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Stamp

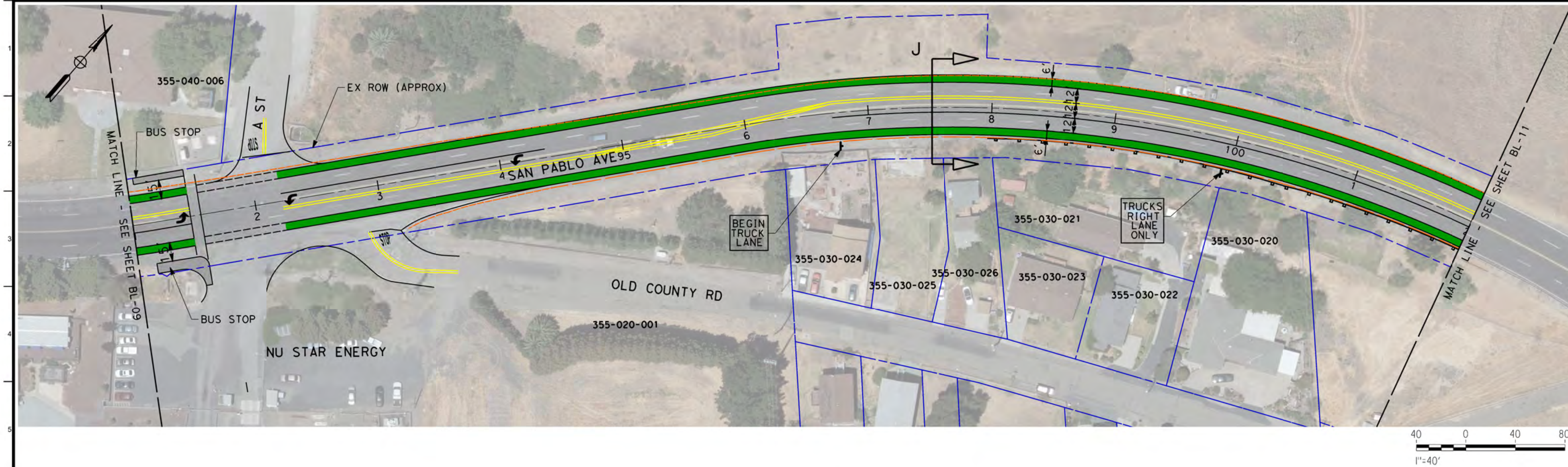
Key Plan

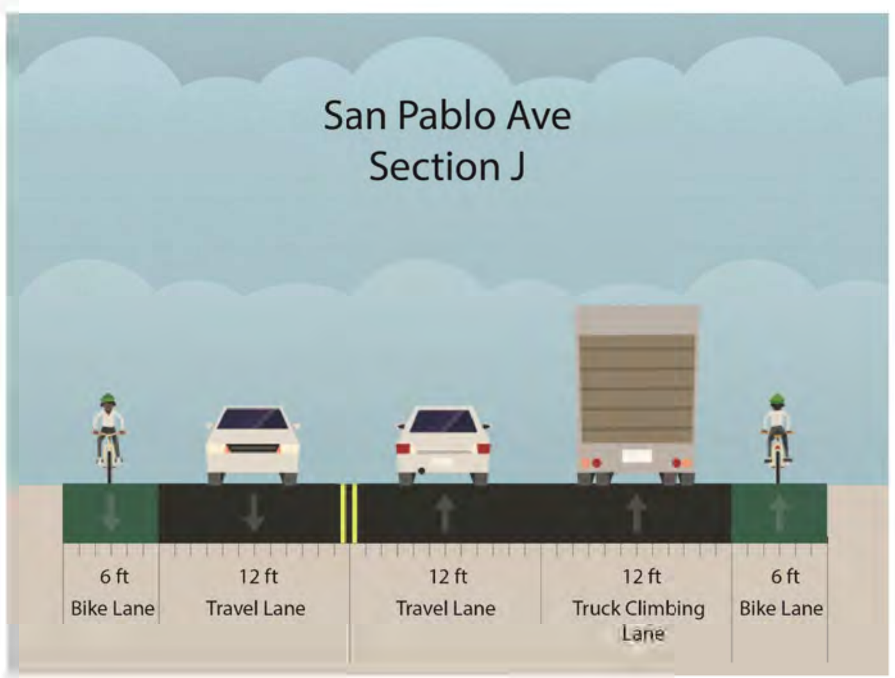
Drawing Title: BIKE LANES ALTERNATIVE

STA 82+00.00 TO STA 91+00.00

SEGMENT 9 OF 16

Scale: 1" = 40'
File Name: INFO-ARUP22X34H.DWG
Drawing Status: DRAFT - FOR DISCUSSION ONLY
Drawn By: J. STITT
Checked By: M. ISWALT
Job No: 243261
Drawing No: BL-09





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: BIKE LANES ALTERNATIVE

STA 91+00.00 TO STA 102+00.00

SEGMENT 10 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

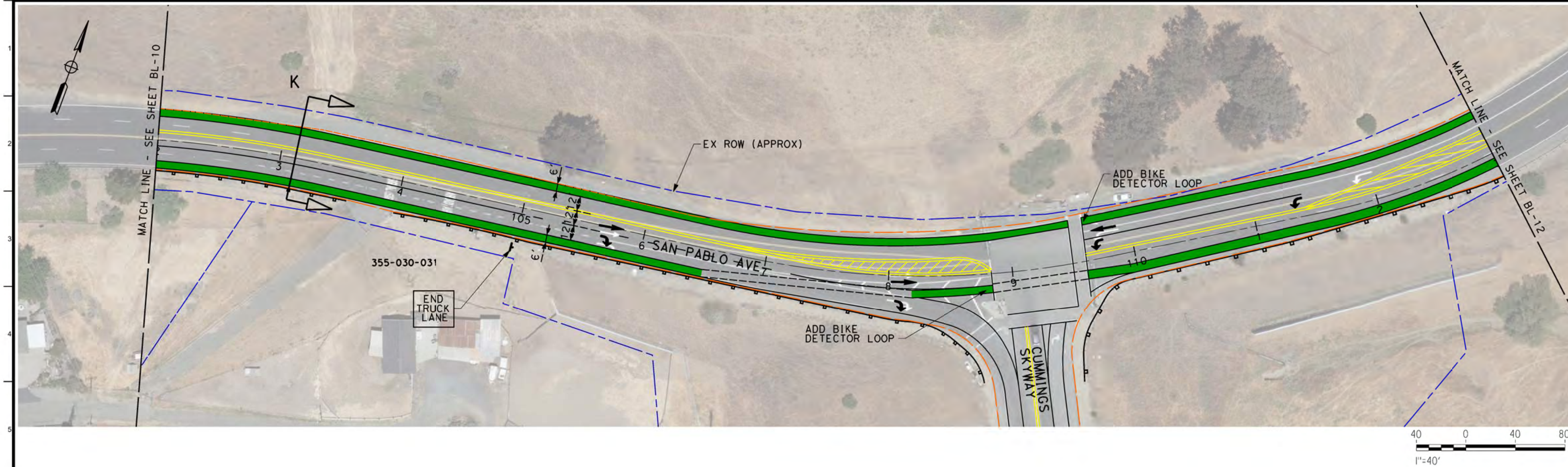
Drawing Status: DRAFT - FOR DISCUSSION ONLY

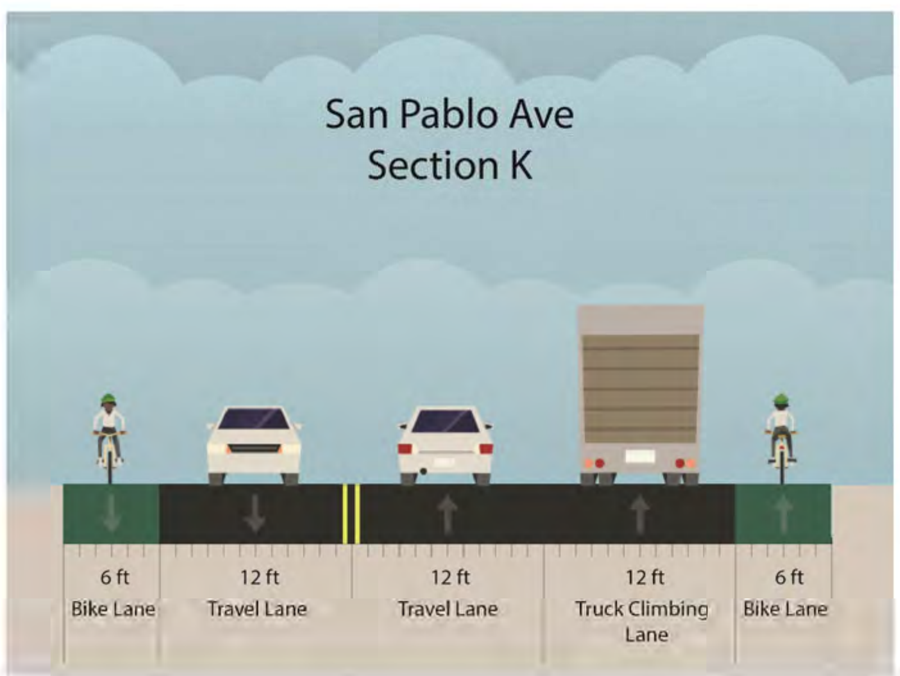
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: BL-10





LEGEND

(blue dash-dot line)	EXISTING RIGHT OF WAY
(green bar)	BICYCLE FACILITY
(orange dashed line)	EXISTING EDGE OF PAVEMENT
(line with posts)	GUARD RAIL
(line with notches)	CONCRETE BARRIER

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Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

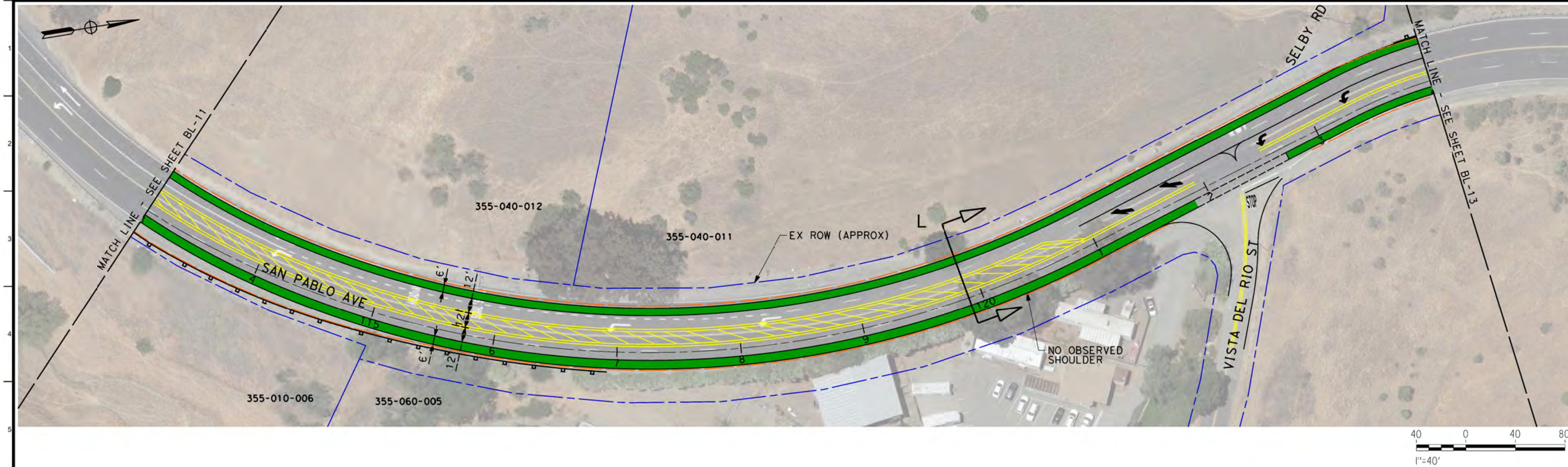
Key Plan

Drawing Title
BIKE LANES
ALTERNATIVE

STA 102+00.00 TO
STA 113+00.00

SEGMENT 11 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status
DRAFT - FOR DISCUSSION ONLY
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No BL-11



LEGEND

EXISTING RIGHT OF WAY

BICYCLE FACILITY

EXISTING EDGE OF PAVEMENT

GUARD RAIL

CONCRETE BARRIER

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: BIKE LANES ALTERNATIVE

STA 113+00.00 TO
STA 124+00.00

SEGMENT 12 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

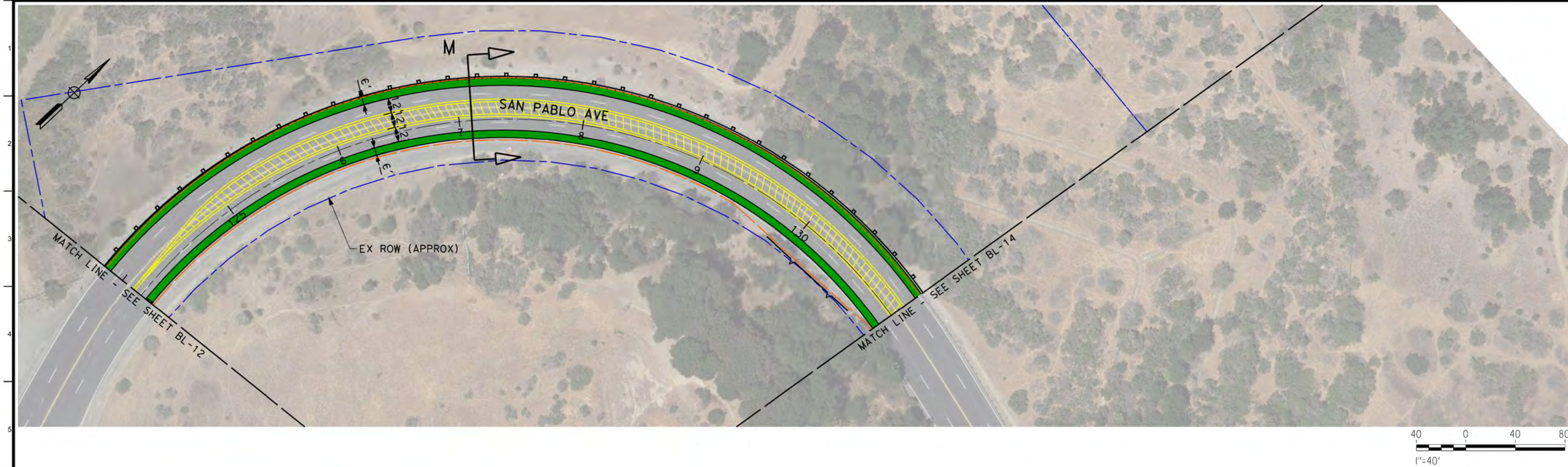
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: BL-12



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: BIKE LANES ALTERNATIVE

STA 124+00.00 TO STA 131+00.00

SEGMENT 13 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

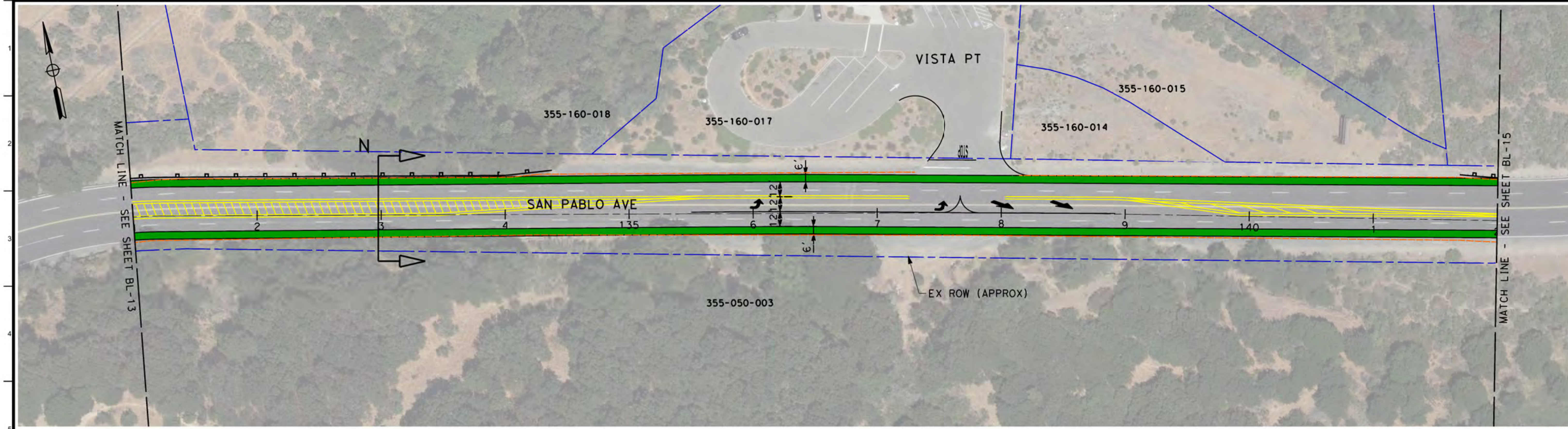
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: BL-13



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

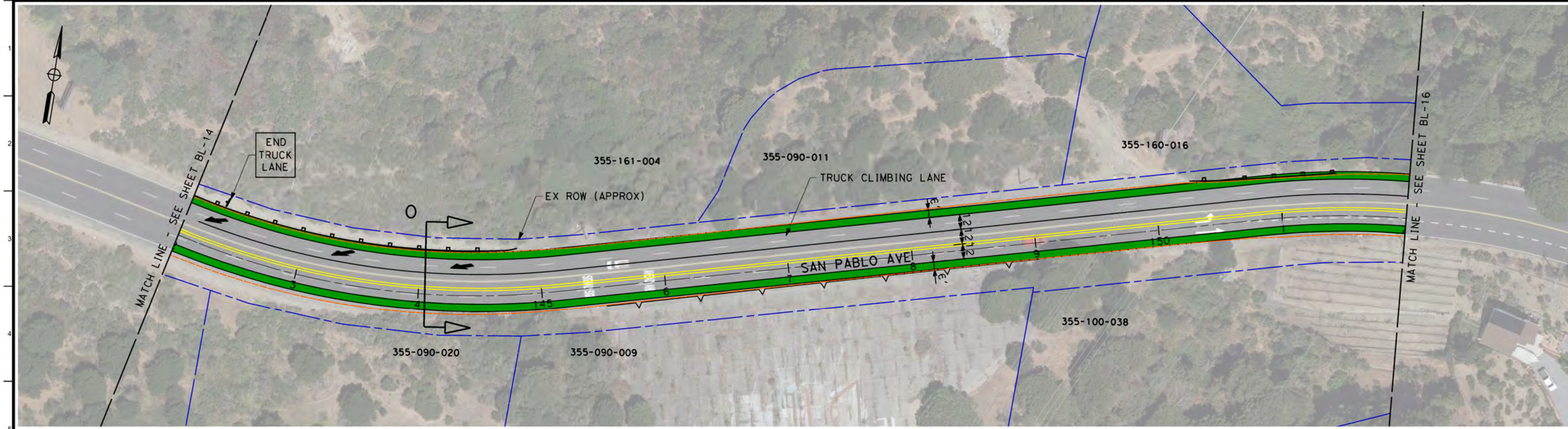
Key Plan

Drawing Title: BIKE LANES ALTERNATIVE

STA 131+00.00 TO STA 142+00.00

SEGMENT 14 OF 16

Scale	1" = 40'
File Name	INFO-ARUP22X34H.DWG
Drawing Status	DRAFT - FOR DISCUSSION ONLY
Drawn By	J. STITT
Checked By	M. ISWALT
Job No	243261
Drawing No	BL-14



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: BIKE LANES ALTERNATIVE

STA 142+00.00 TO
STA 152+00.00

SEGMENT 15 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

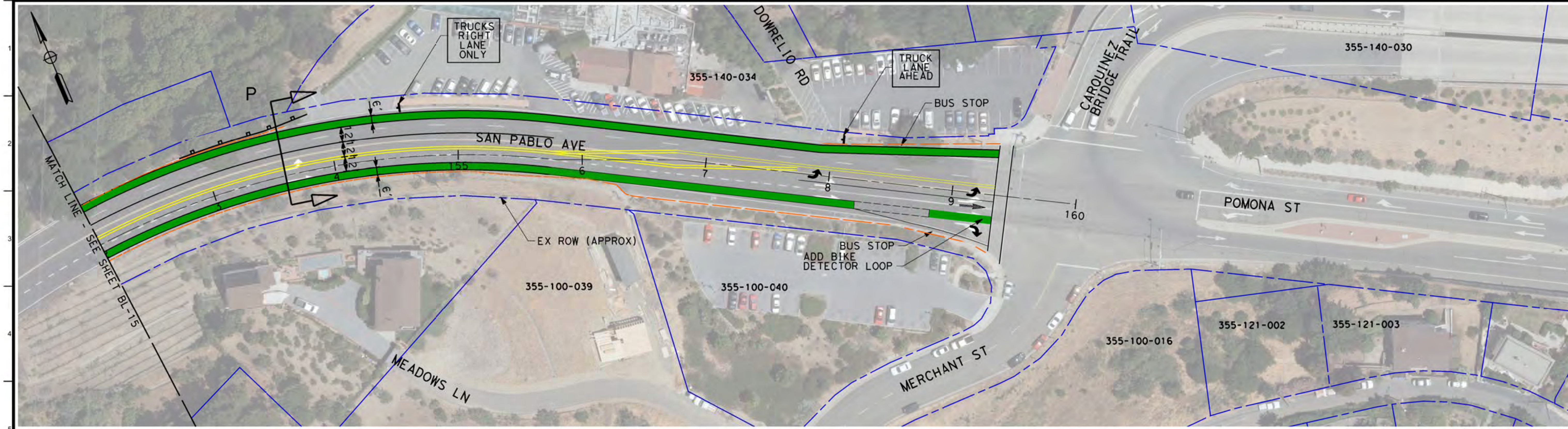
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: BL-15



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER

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Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

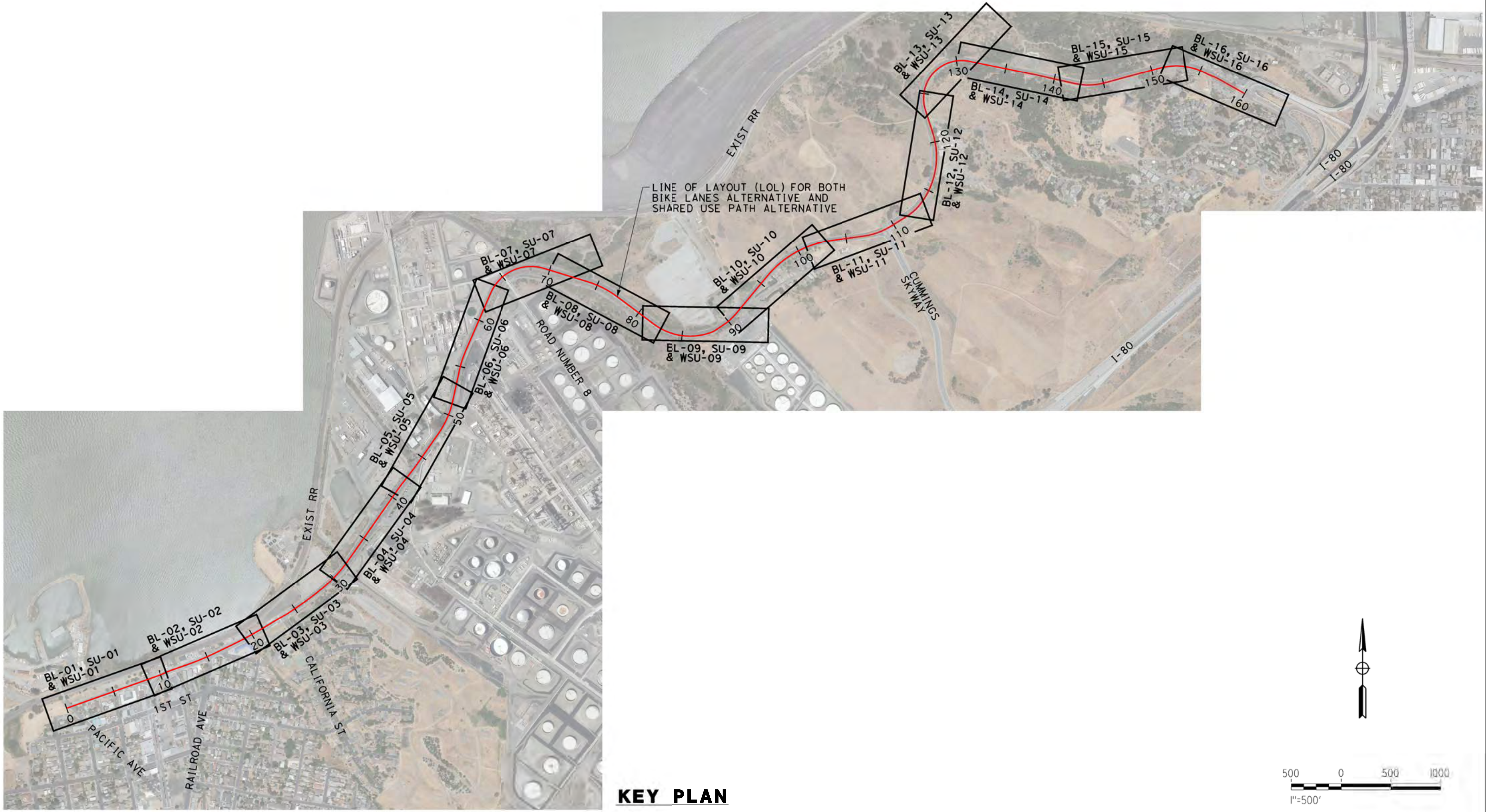
Drawing Title: BIKE LANES ALTERNATIVE

STA 152+00.00 TO
STA 160+00.00

SEGMENT 16 OF 16

Scale: 1" = 40'
File Name: INFO-ARUP22X34H.DWG
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**
Drawn By: J. STITT
Checked By: M. ISWALT
Job No: 243261
Drawing No: BL-16

Appendix A.2: Alternative 2 (Shared Use Path)



KEY PLAN

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: KEY PLAN

-

-

Scale: 1" = 500'

File Name: INFO-ARUP22X34H.DWG

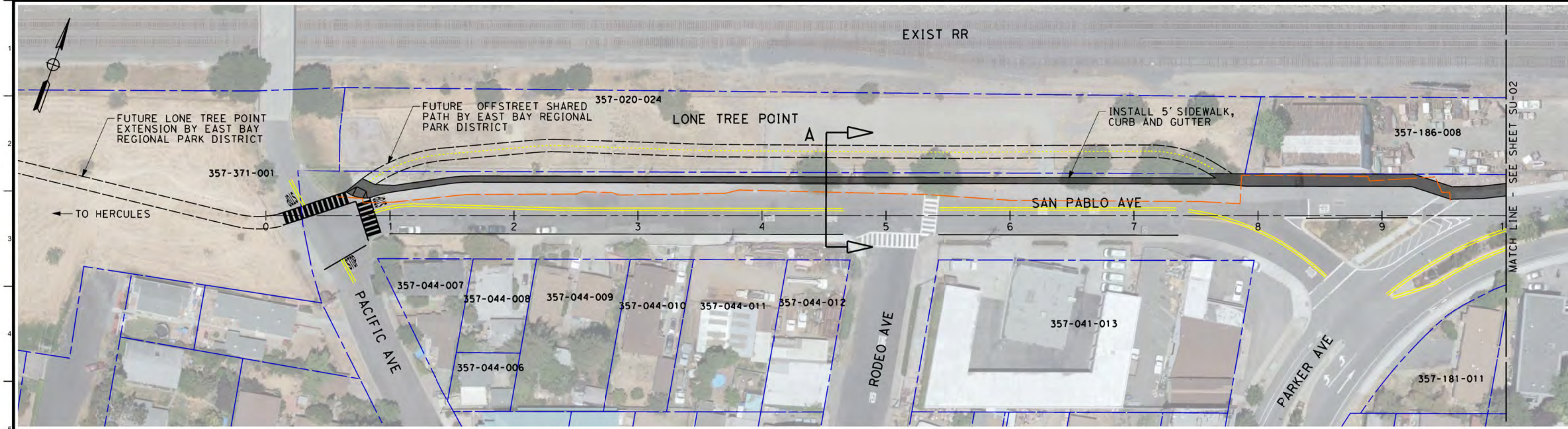
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: BL-SU-WSU-00



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Client
CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT

Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

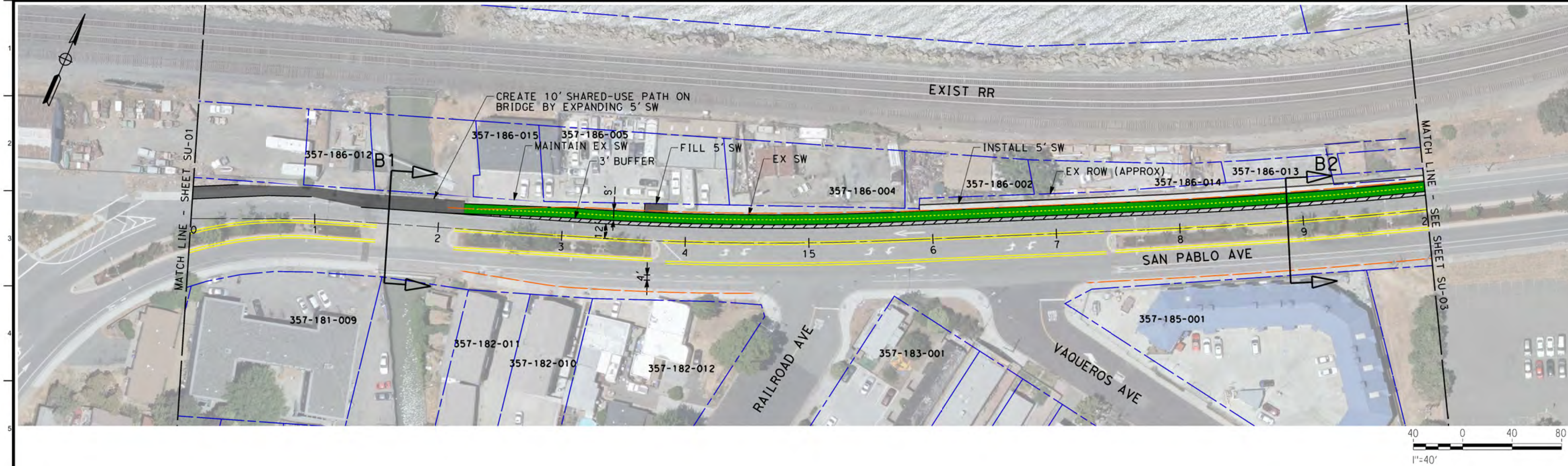
Key Plan

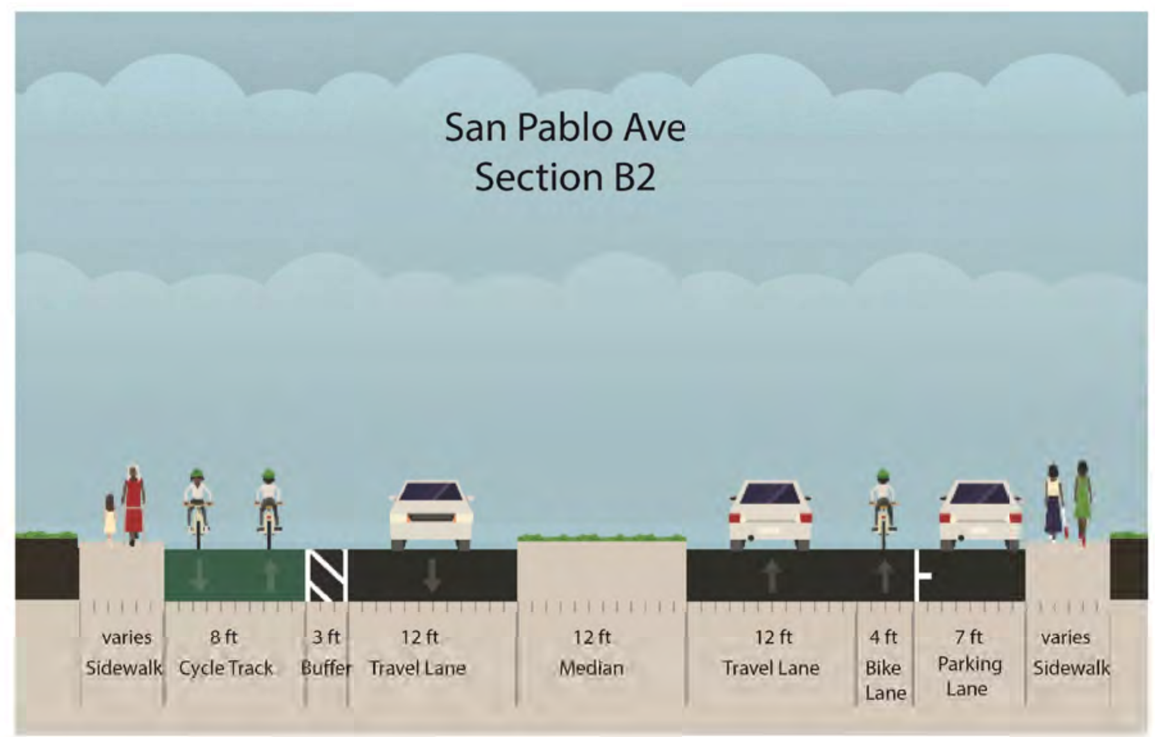
Drawing Title
SHARED-USE PATH
ALTERNATIVE

STA 00+00.00 TO
STA 10+00.00

SEGMENT 1 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status **DRAFT - FOR DISCUSSION ONLY**
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No SU-01





LEGEND

EXISTING RIGHT OF WAY

BICYCLE FACILITY

EXISTING EDGE OF PAVEMENT

GUARD RAIL

CONCRETE BARRIER

PROPOSED STREETLIGHT

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NO.	REVISION	DATE 11/01/2016

Client
CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT

Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

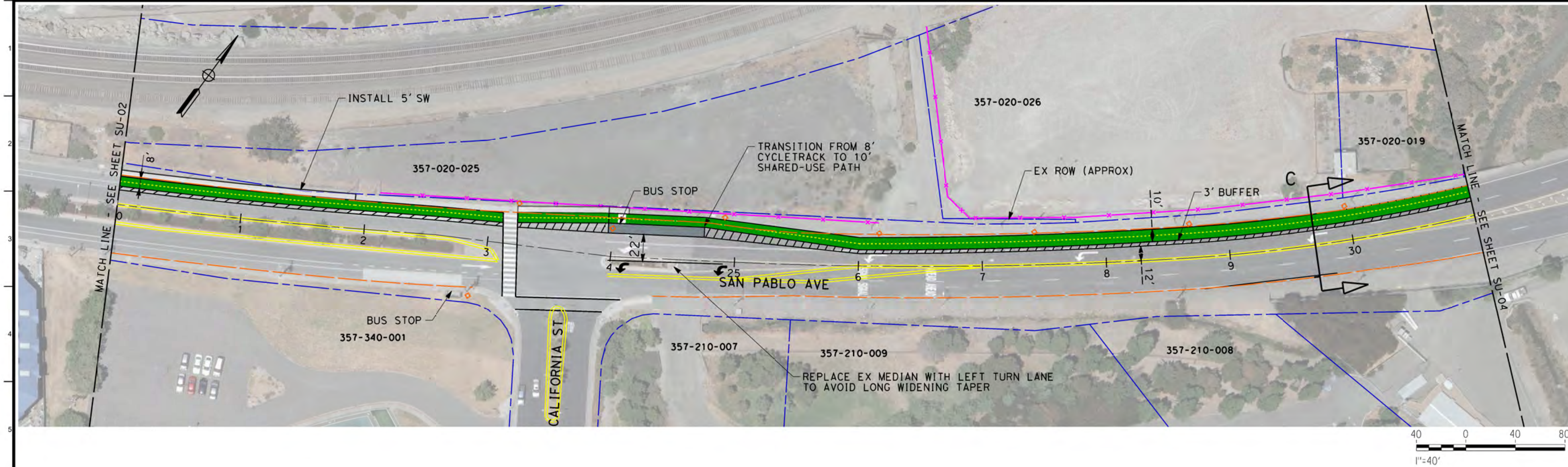
Key Plan

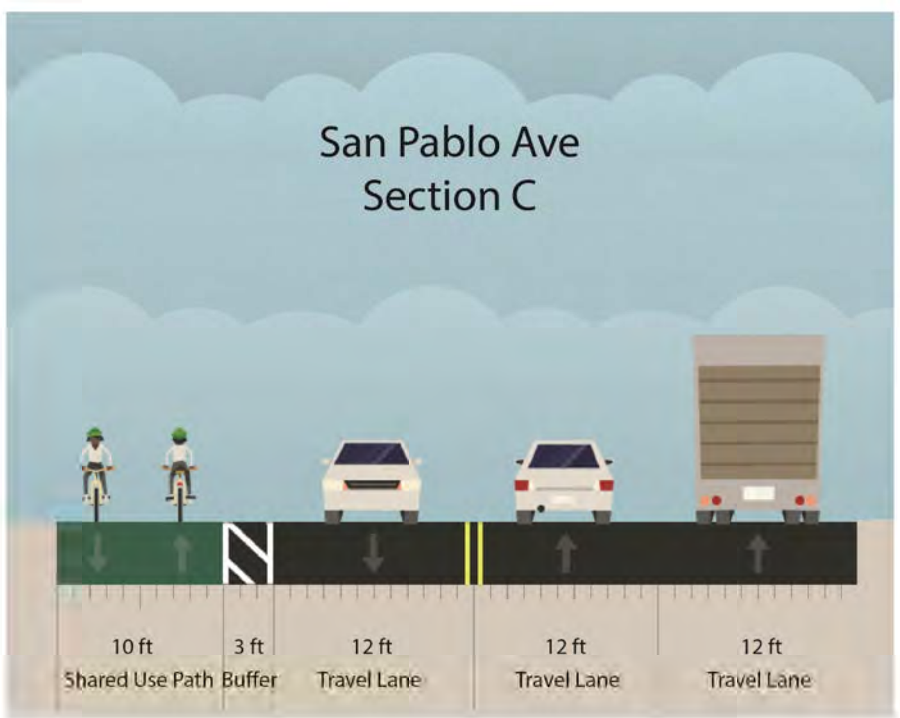
Drawing Title
SHARED USE PATH
ALTERNATIVE

STA 10+00.00 TO
STA 20+00.00

SEGMENT 2 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status DRAFT - FOR DISCUSSION ONLY
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No SU-02





LEGEND

	EXISTING RIGHT OF WAY
	BICYCLE FACILITY
	EXISTING EDGE OF PAVEMENT
	EXISTING GUARD RAIL
	EXISTING CONCRETE BARRIER
	EXISTING FENCE
	PROPOSED STREETLIGHT

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Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

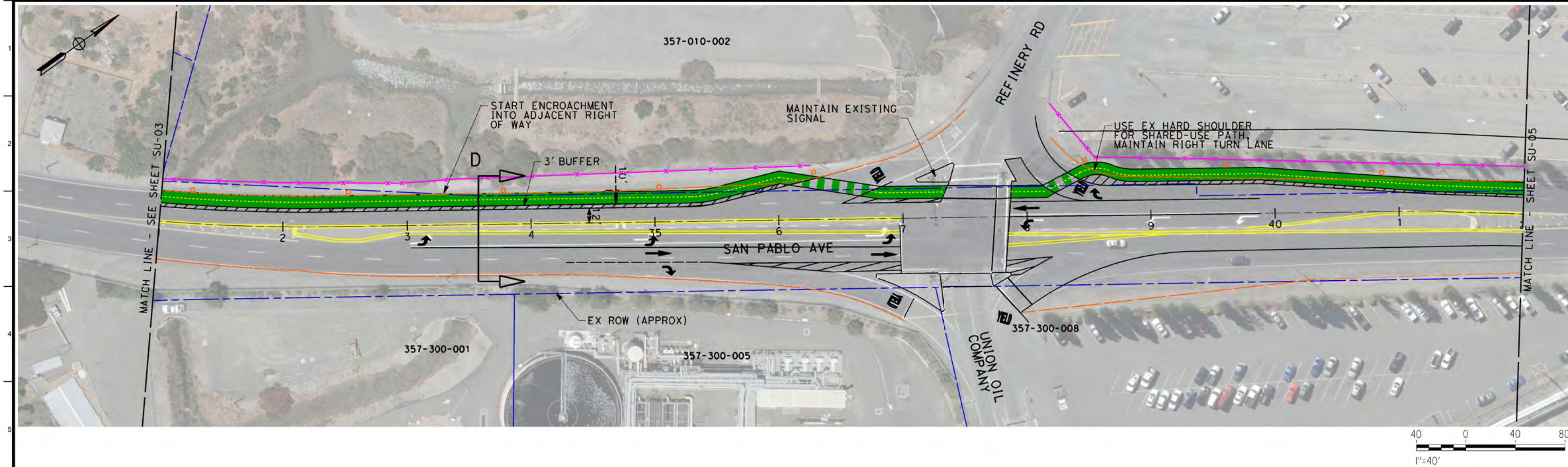
Key Plan

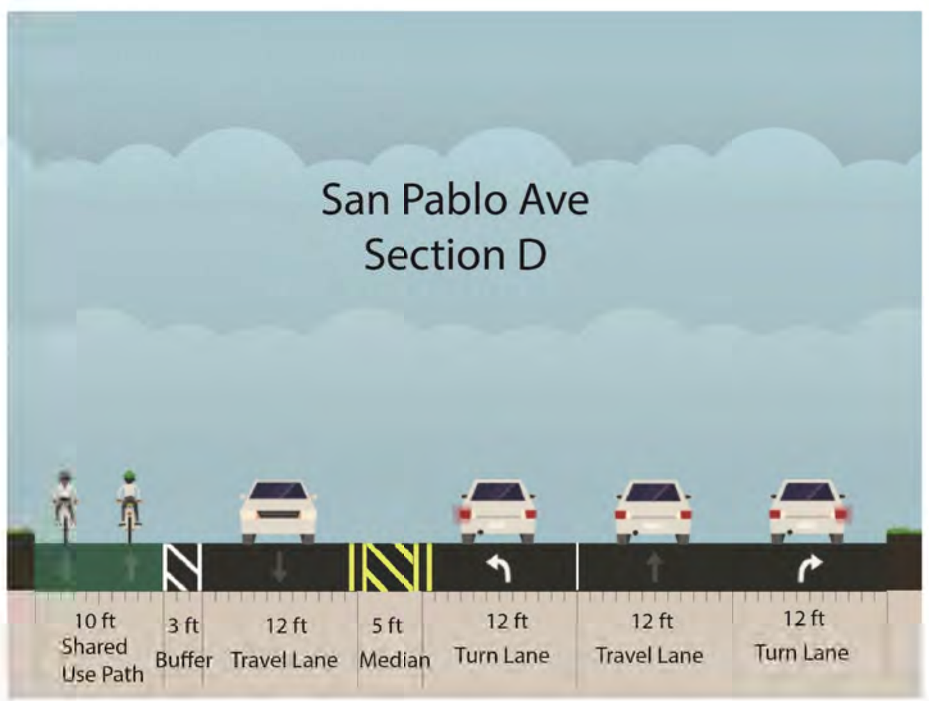
Drawing Title
SHARED-USE PATH
ALTERNATIVE

STA 20+00.00 TO
STA 31+00.00

SEGMENT 3 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status DRAFT - FOR DISCUSSION ONLY
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No SU-03





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- EXISTING FENCE
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: SHARED USE PATH ALTERNATIVE

STA 31+00.00 TO STA 42+00.00

SEGMENT 4 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

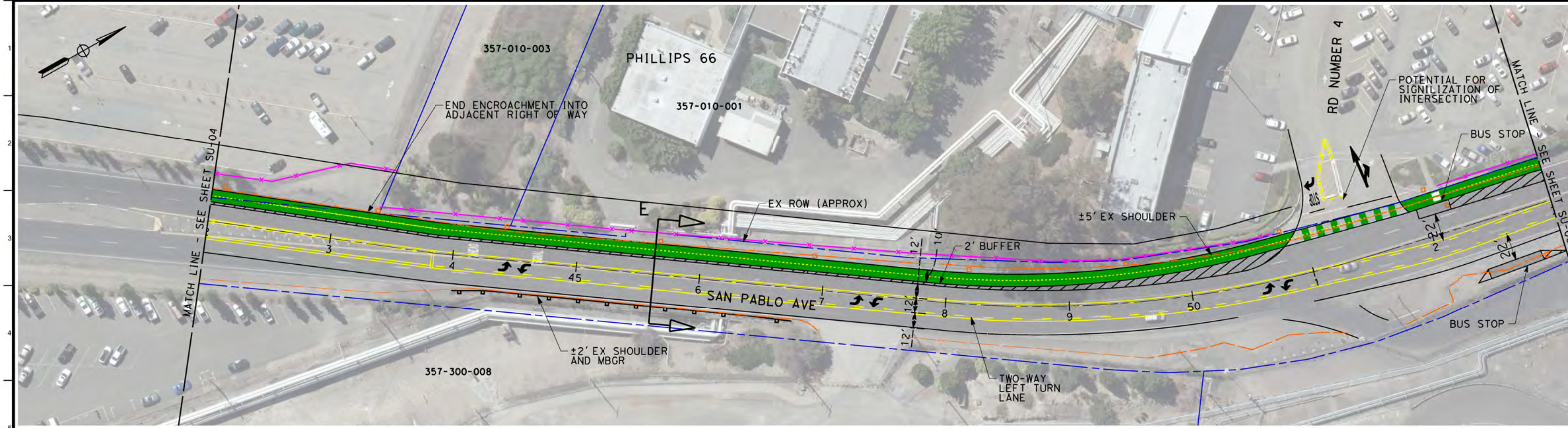
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: SU-04



40 0 40 80
1"=40'

LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- EXISTING FENCE
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: SHARED-USE PATH ALTERNATIVE

STA 42+00.00 TO STA 53+00.00

SEGMENT 5 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

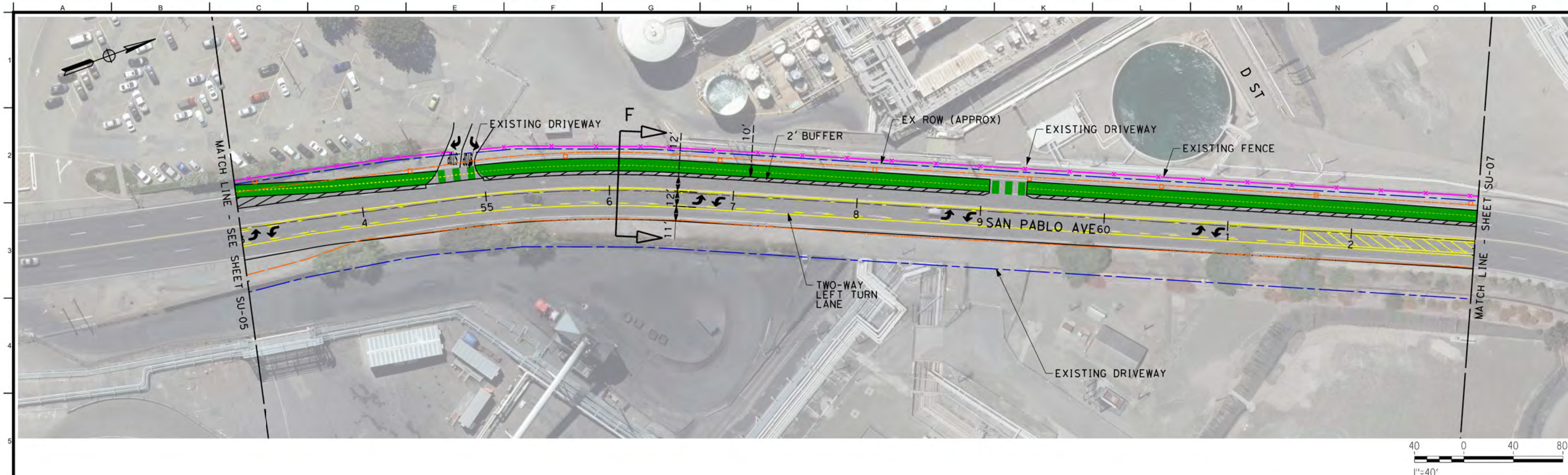
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: SU-05



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- EXISTING FENCE
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

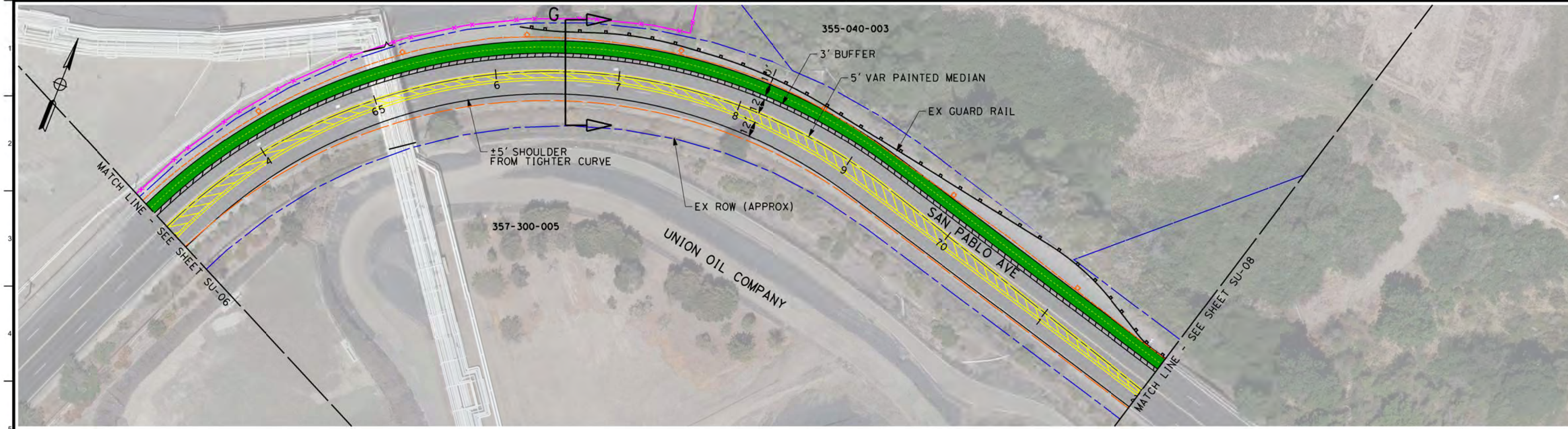
Key Plan

Drawing Title: SHARED USE PATH ALTERNATIVE

STA 53+00.00 TO STA 63+00.00

SEGMENT 6 OF 16

Scale	1" = 40'
File Name	INFO-ARUP22X34H.DWG
Drawing Status	DRAFT - FOR DISCUSSION ONLY
Drawn By	J. STITT
Checked By	M. ISWALT
Job No	243261
Drawing No	SU-06



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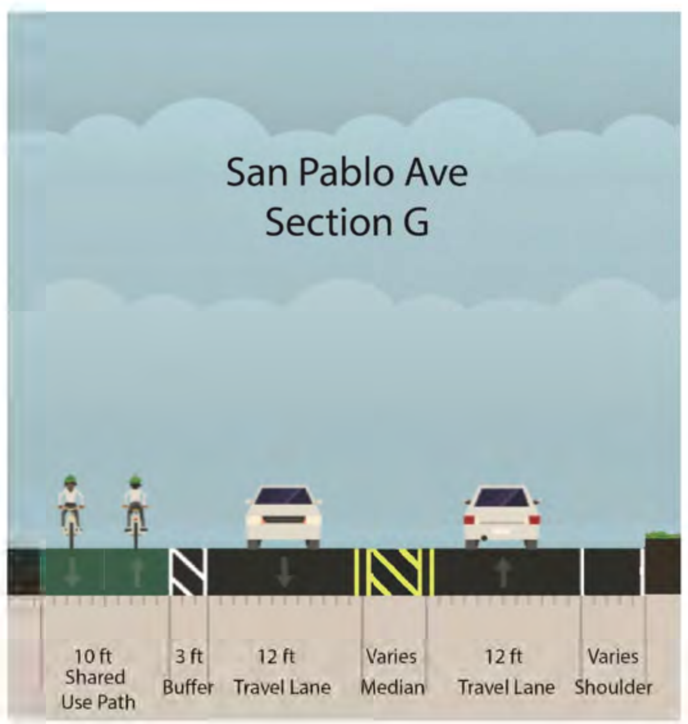
1"=40'



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- EXISTING FENCE
- PROPOSED STREETLIGHT

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Stamp

Key Plan

Drawing Title: SHARED-USE PATH ALTERNATIVE

STA 63+00.00 TO
STA 72+00.00

SEGMENT 7 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

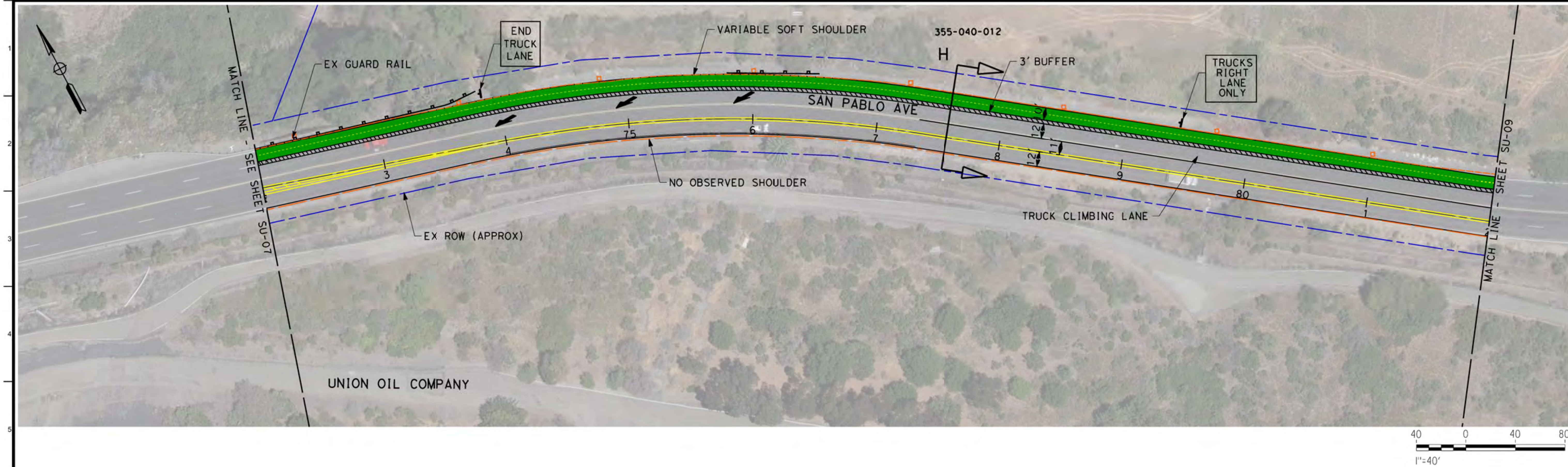
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

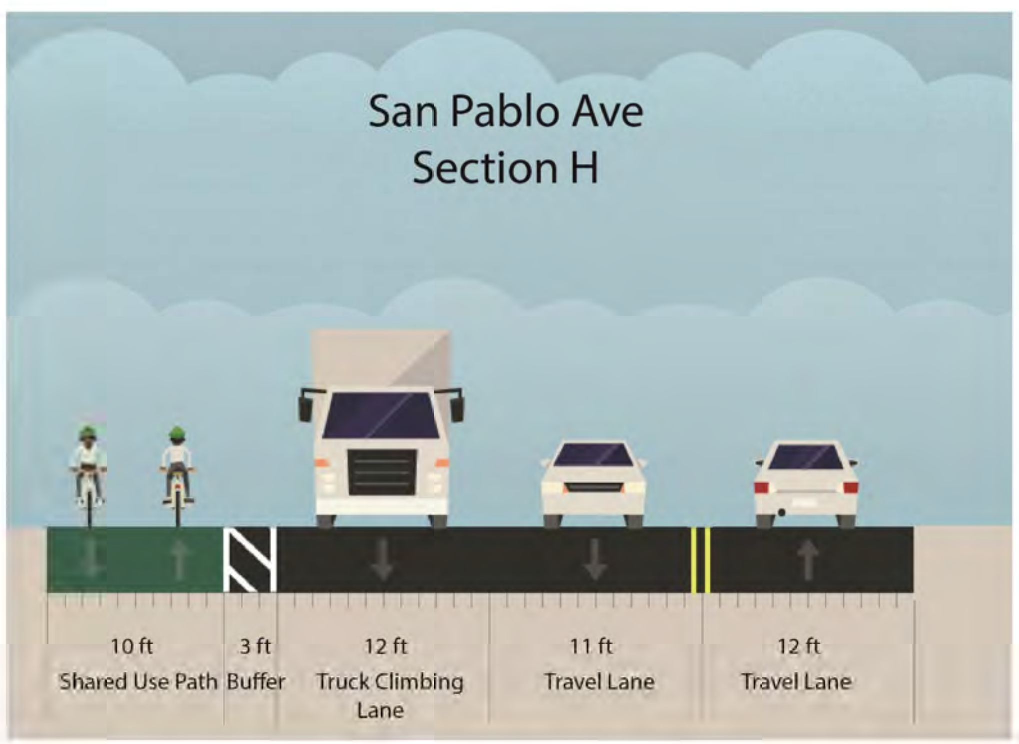
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: SU-07





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: SHARED USE PATH ALTERNATIVE

STA 72+00.00 TO STA 82+00.00

SEGMENT 8 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

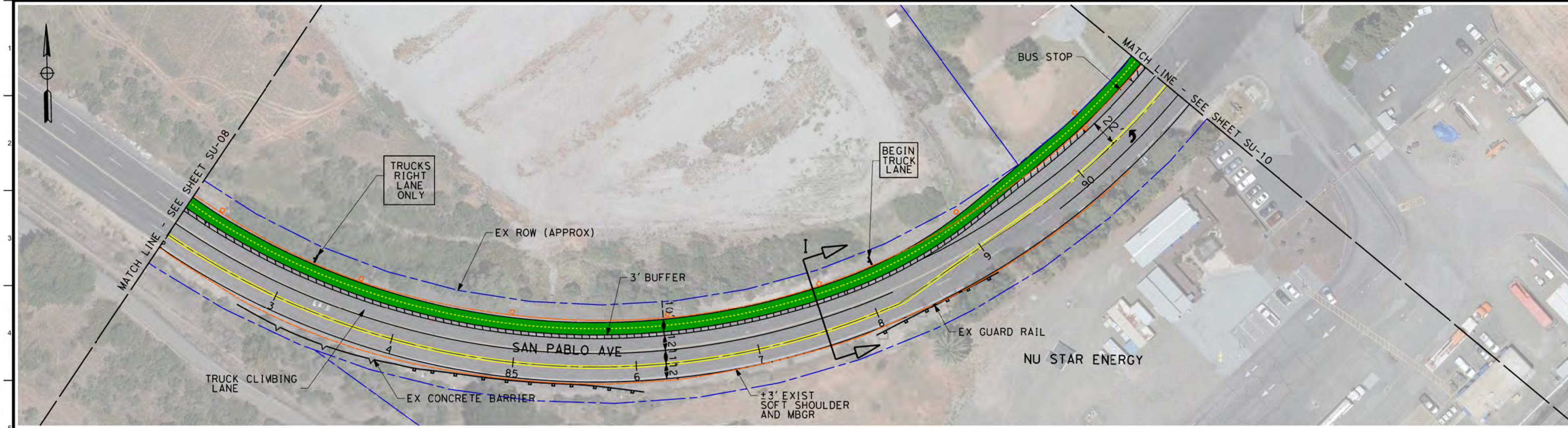
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

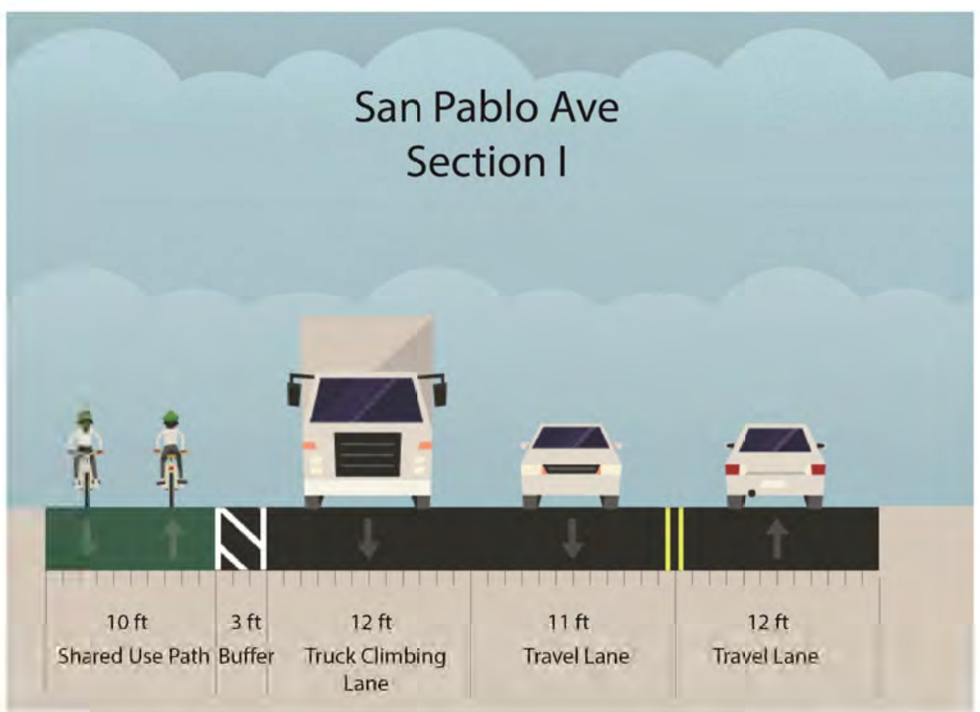
Job No: 243261

Drawing No: SU-08



40 0 40 80

1"=40'



LEGEND

	EXISTING RIGHT OF WAY
	BICYCLE FACILITY
	EXISTING EDGE OF PAVEMENT
	GUARD RAIL
	CONCRETE BARRIER
	PROPOSED STREETLIGHT

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Job Title
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COMPLETE STREETS STUDY

Stamp

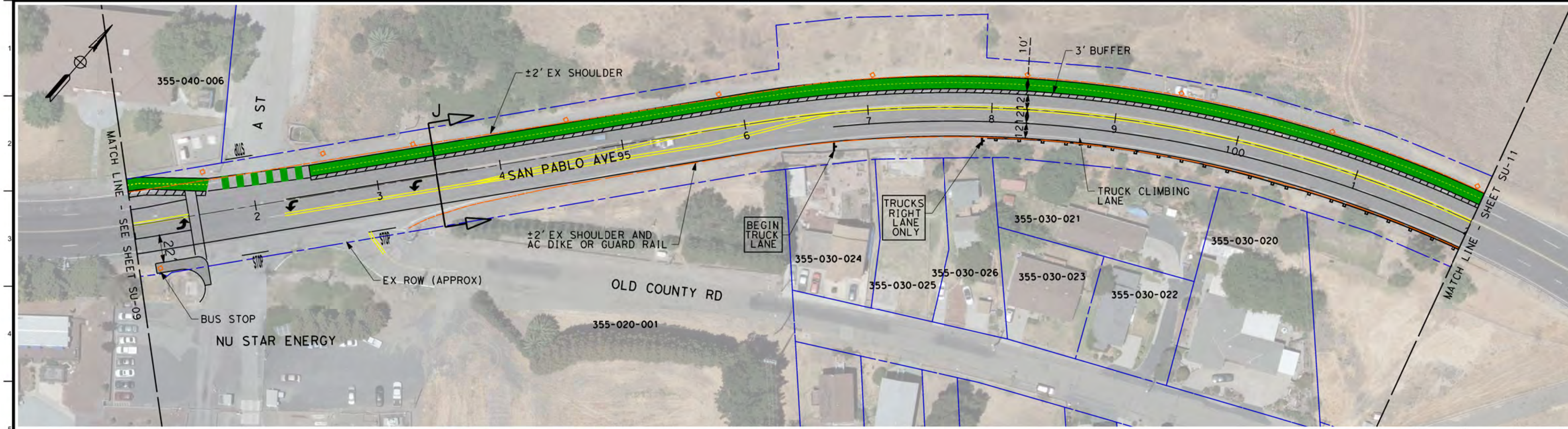
Key Plan

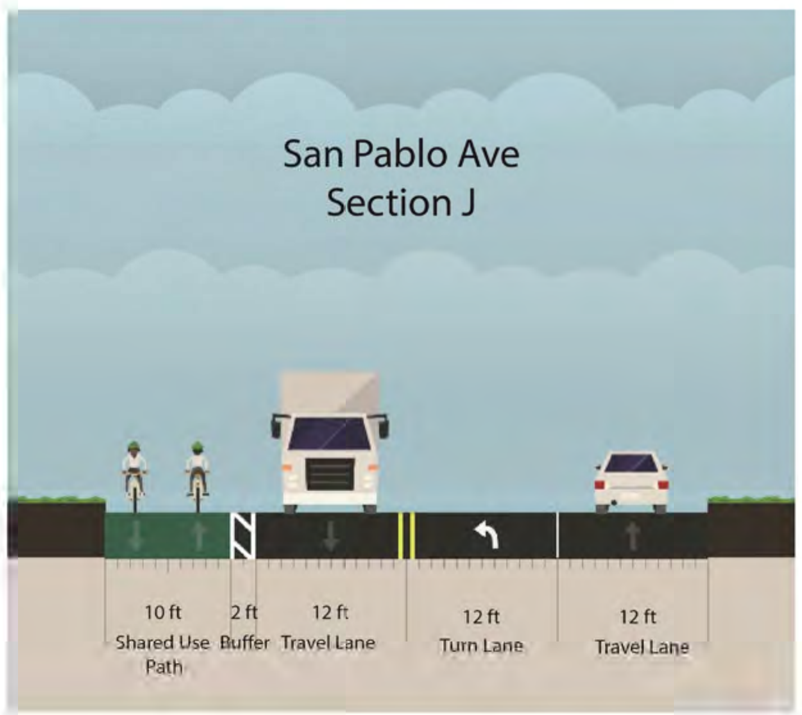
Drawing Title
SHARED-USE PATH
ALTERNATIVE

STA 82+00.00 TO
STA 91+00.00

SEGMENT 9 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status **DRAFT - FOR DISCUSSION ONLY**
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No SU-09





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: SHARED USE PATH ALTERNATIVE

STA 91+00.00 TO STA 102+00.00

SEGMENT 10 OF 16

Scale: 1"=40'

File Name: INFO-ARUP22X34H.DWG

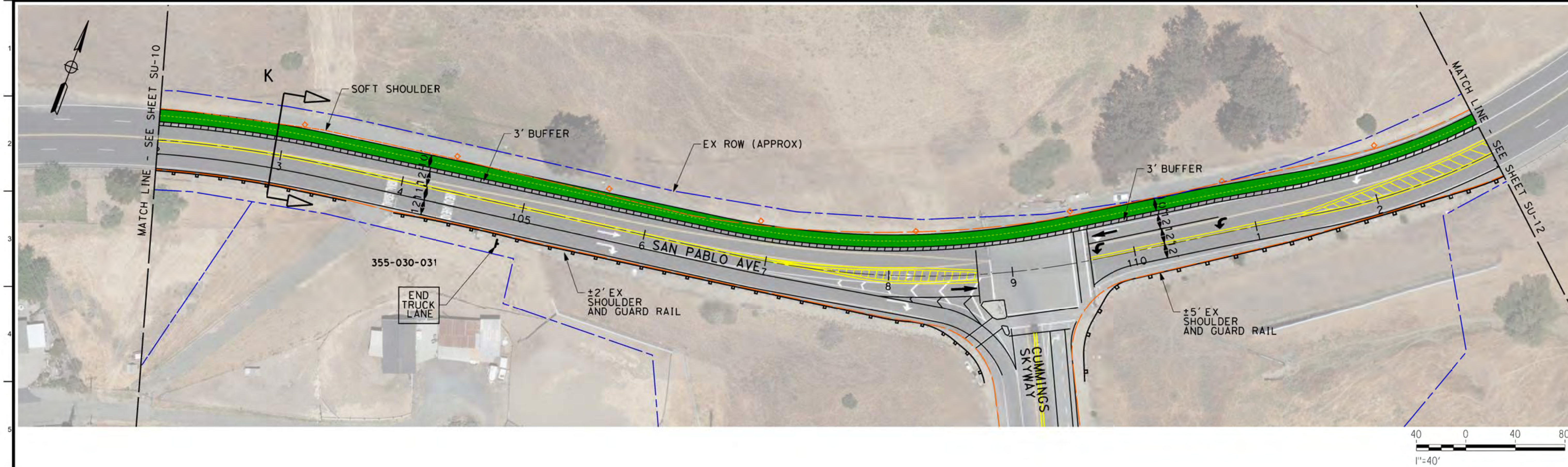
Drawing Status: DRAFT - FOR DISCUSSION ONLY

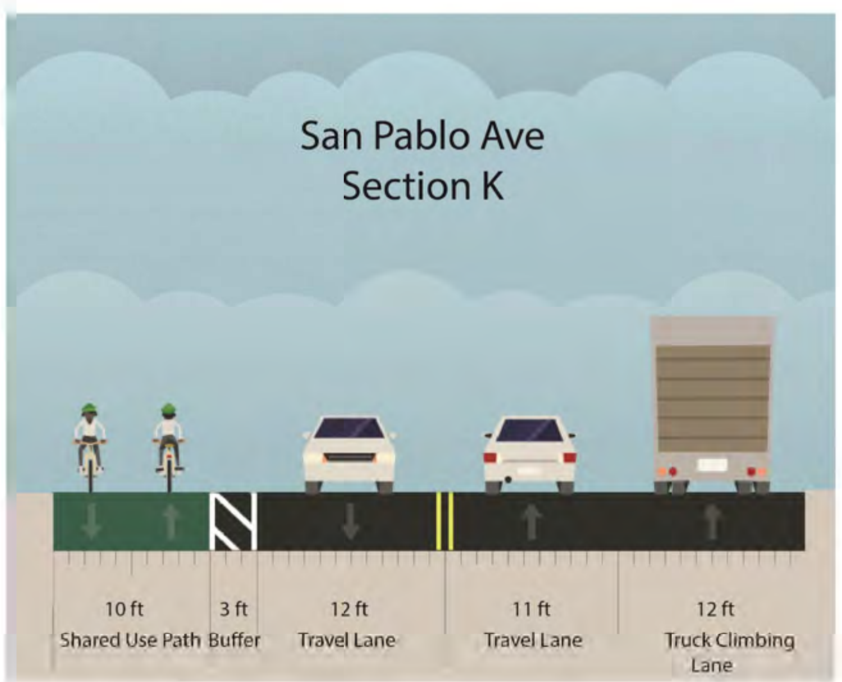
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: SU-10





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: SHARED-USE PATH ALTERNATIVE

STA 102+00.00 TO STA 113+00.00

SEGMENT 11 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

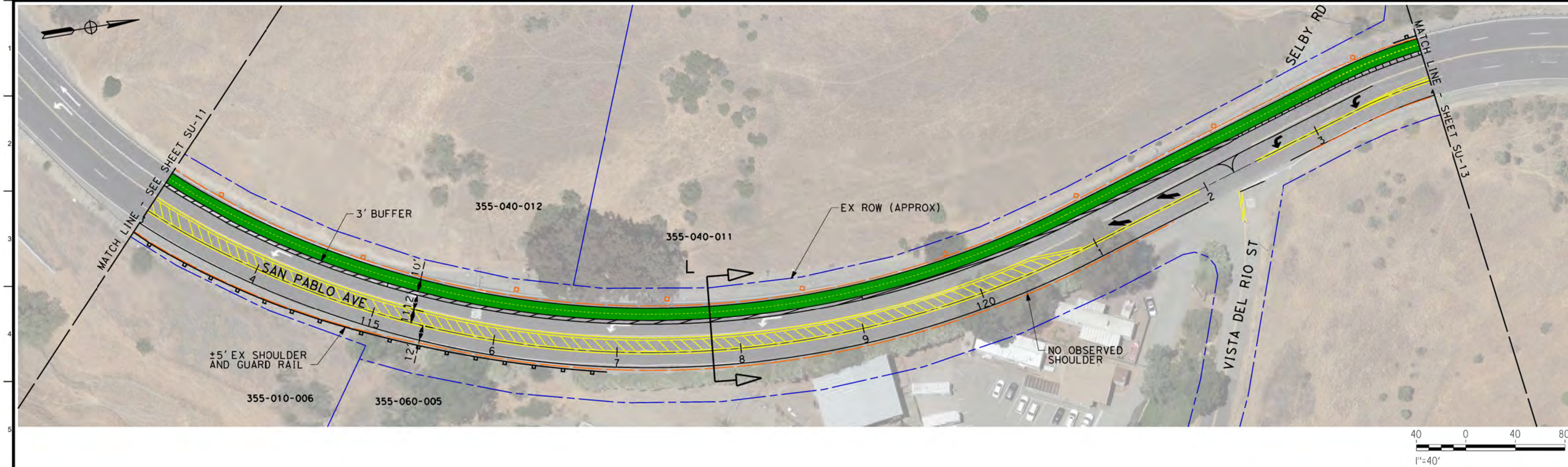
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: SU-11



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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PUBLIC WORKS DEPARTMENT

Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

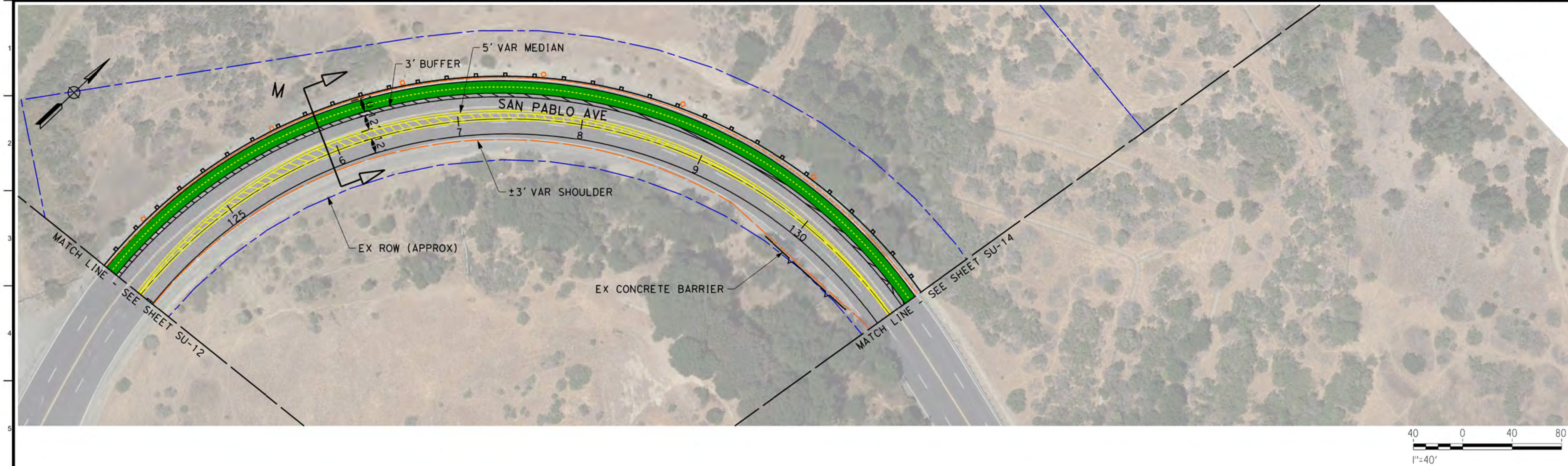
Key Plan

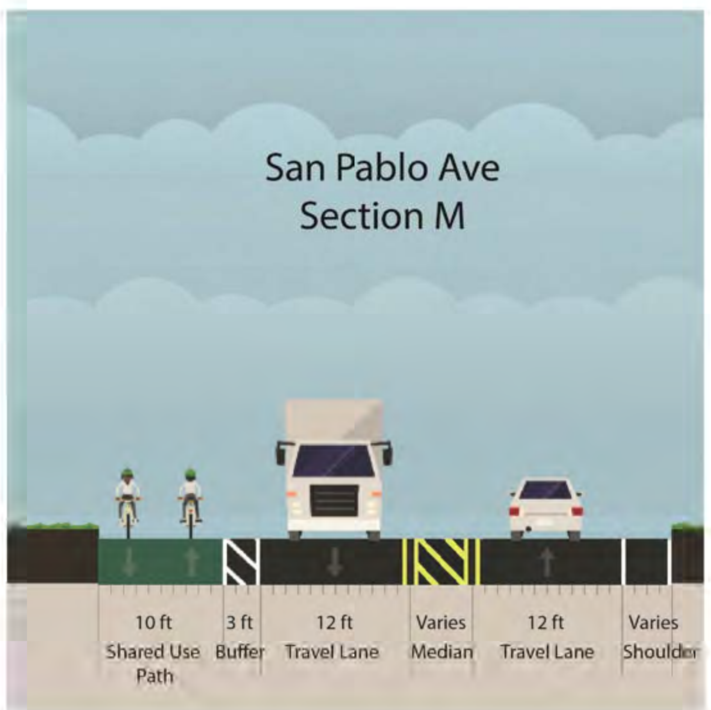
Drawing Title
SHARED USE PATH
ALTERNATIVE

STA 113+00.00 TO
STA 124+00.00

SEGMENT 12 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status DRAFT - FOR DISCUSSION ONLY
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No SU-12





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Drawing Title: SHARED-USE PATH ALTERNATIVE

STA 124+00.00 TO STA 131+00.00

SEGMENT 13 OF 16

Scale: 1" = 40'

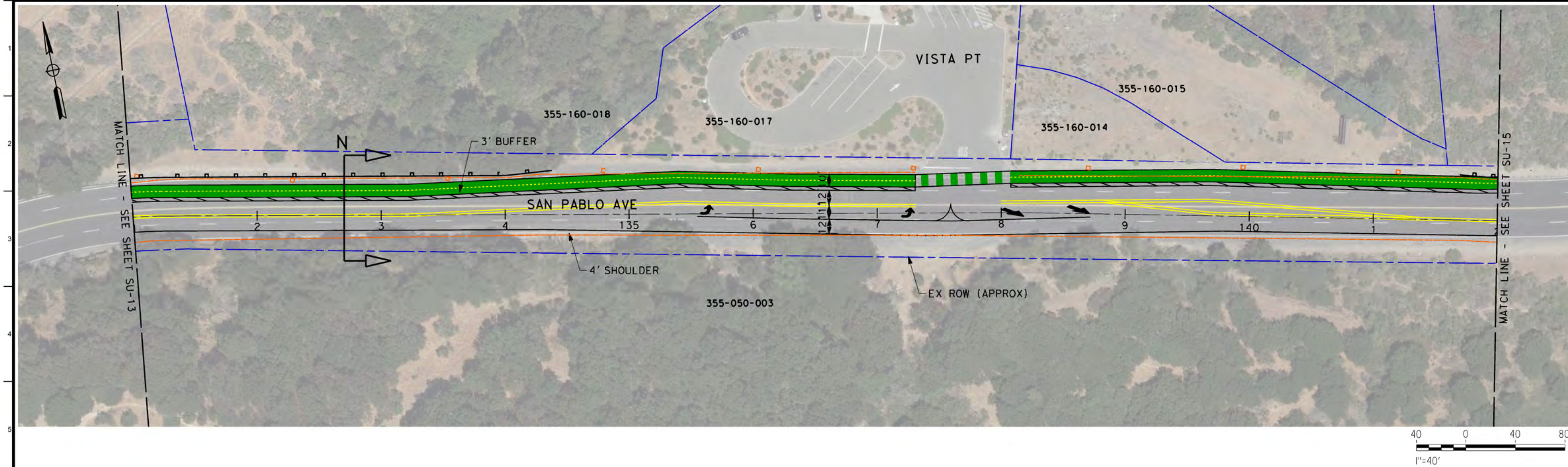
Drawing Status: DRAFT - FOR DISCUSSION ONLY

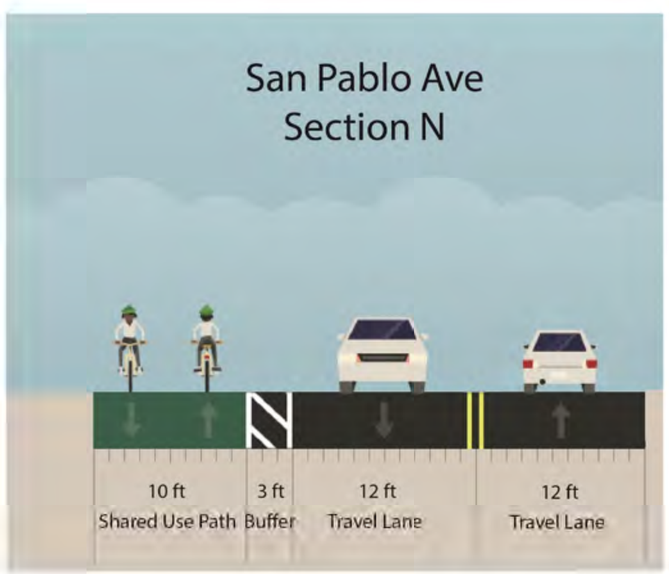
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: SU-13





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: SHARED USE PATH ALTERNATIVE

STA 131+00.00 TO STA 142+00.00

SEGMENT 14 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

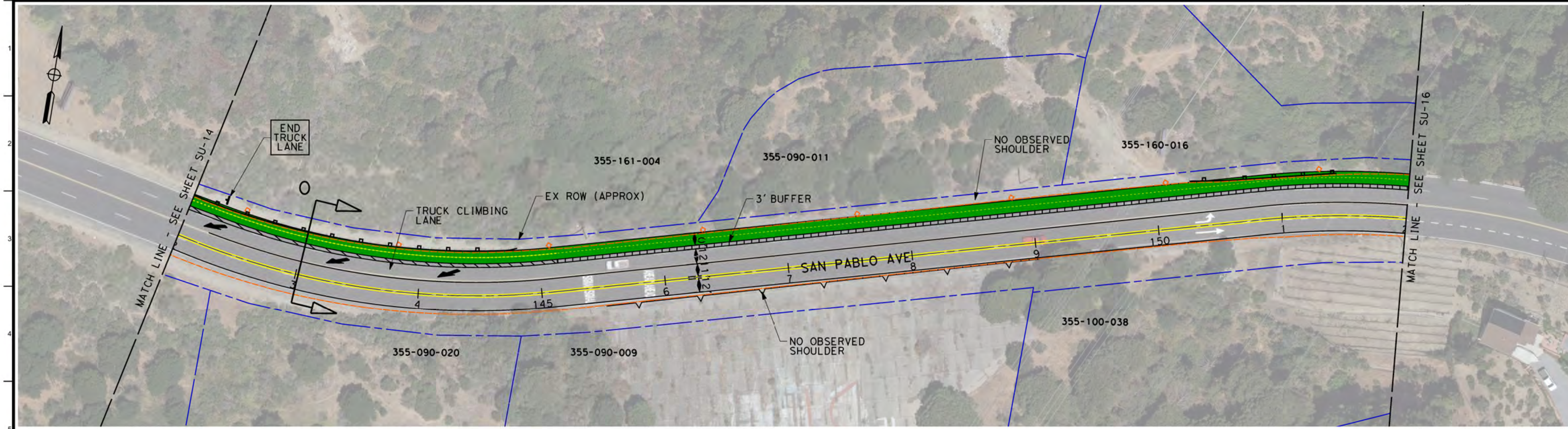
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

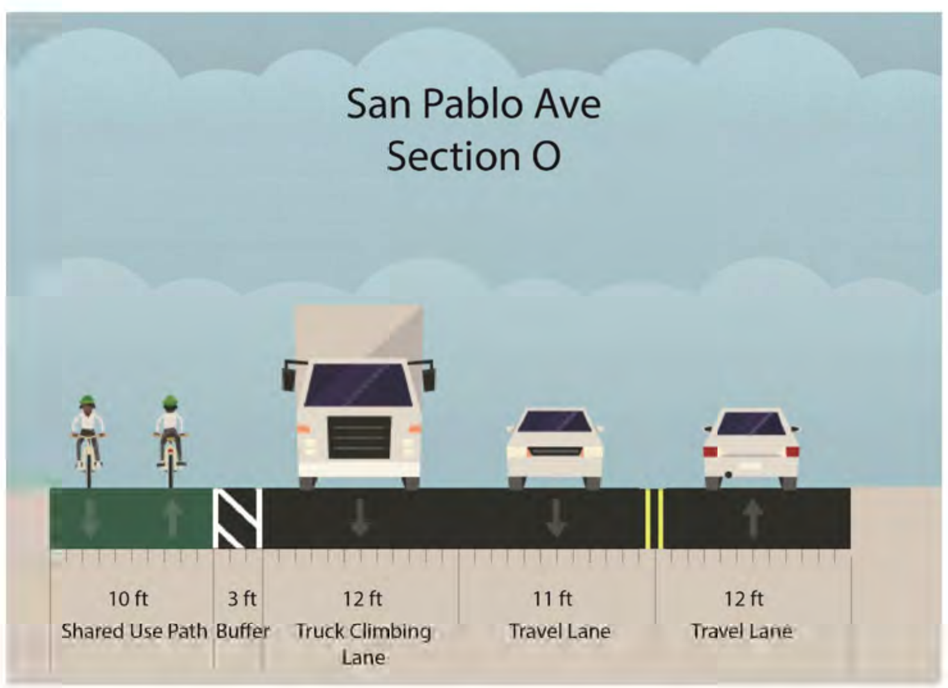
Checked By: M. ISWALT

Job No: 243261

Drawing No: SU-14



40 0 40 80
1"=40'



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

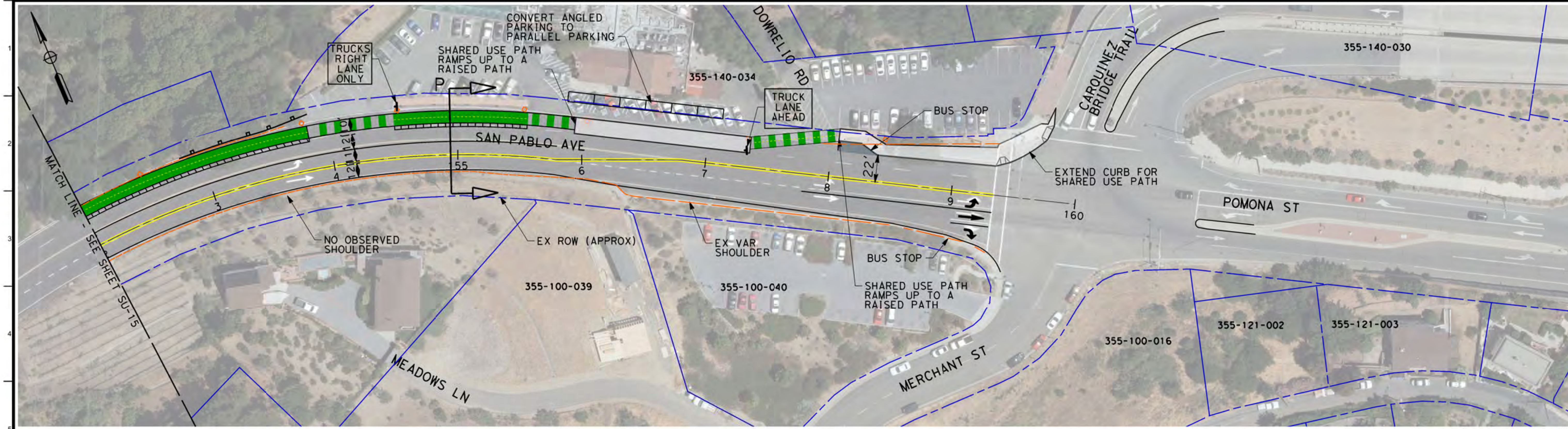
Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

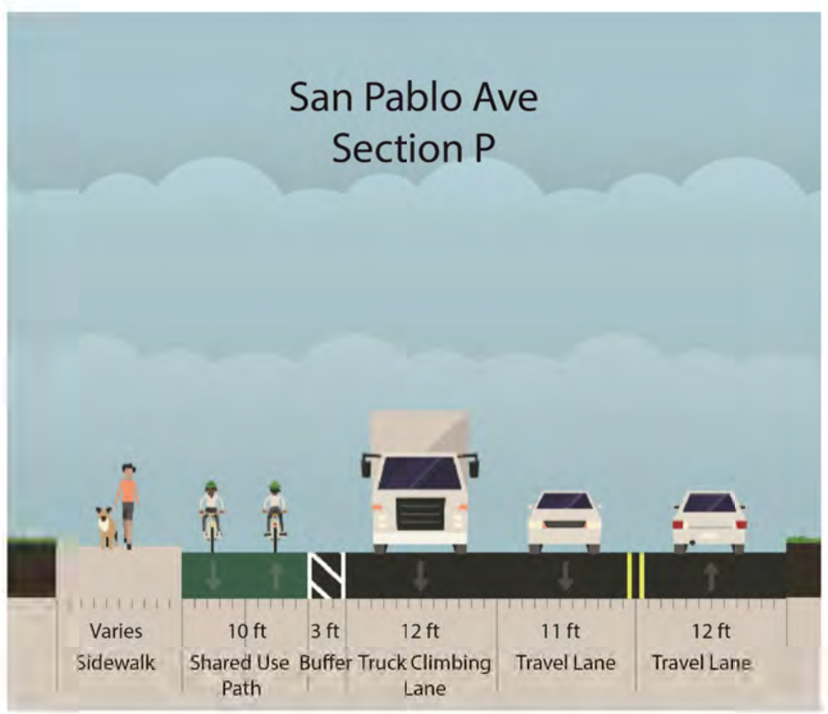
Stamp

Key Plan

Drawing Title: SHARED-USE PATH ALTERNATIVE
STA 142+00.00 TO STA 152+00.00
SEGMENT 15 OF 16

Scale: 1" = 40'
File Name: INFO-ARUP22X34H.DWG
Drawing Status: DRAFT - FOR DISCUSSION ONLY
Drawn By: J. STITT
Checked By: M. ISWALT
Job No: 243261
Drawing No: SU-15





LEGEND

EXISTING RIGHT OF WAY

BICYCLE FACILITY

EXISTING EDGE OF PAVEMENT

GUARD RAIL

CONCRETE BARRIER

PROPOSED STREETLIGHT

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Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

Key Plan

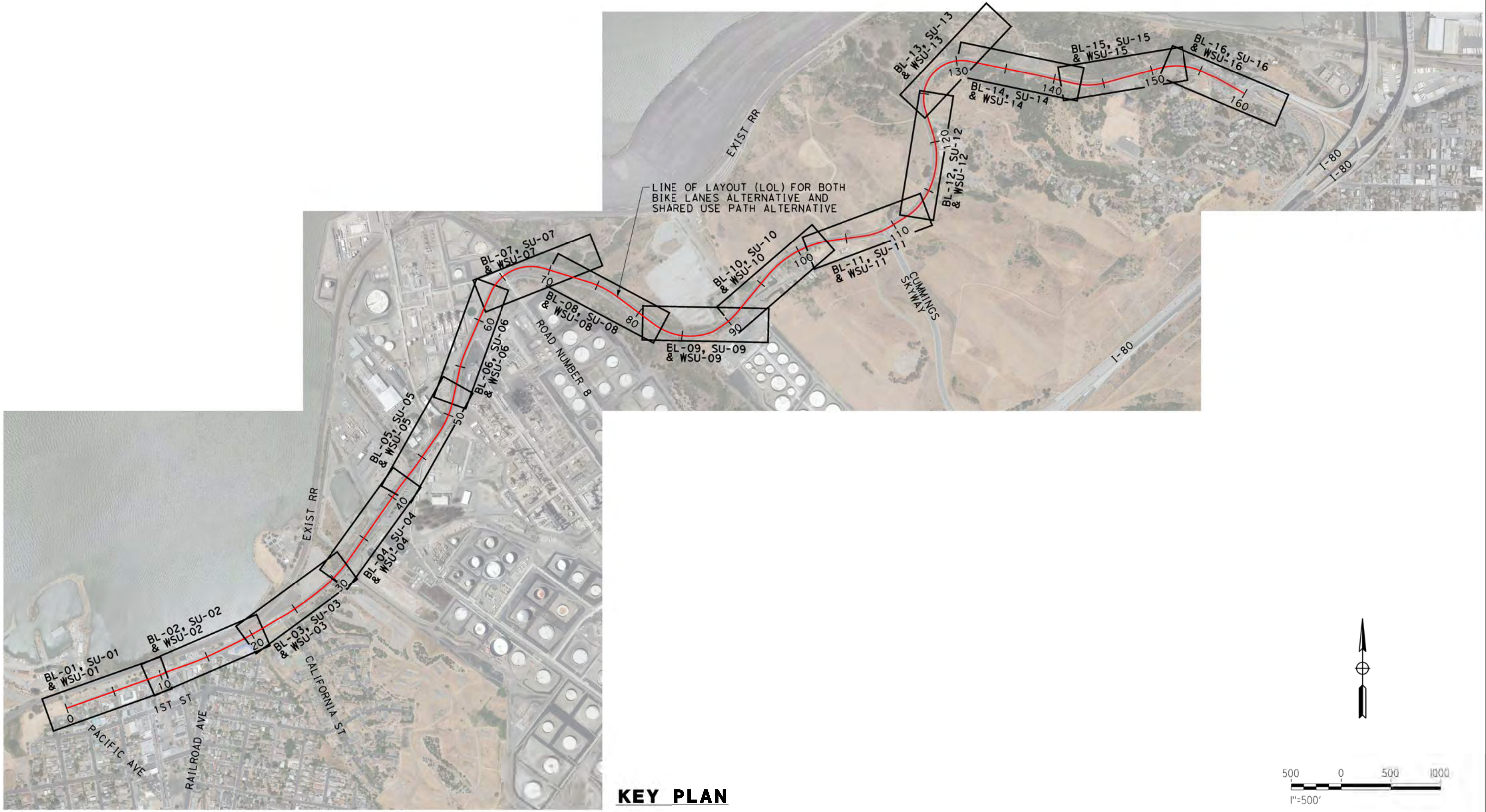
Drawing Title
SHARED USE PATH
ALTERNATIVE

STA 152+00.00 TO
STA 160+00.00

SEGMENT 16 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status DRAFT - FOR DISCUSSION ONLY
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No SU-16

Appendix A.3: Alternative 3 (Widened Shared Use Path)



KEY PLAN

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Client
CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT

Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

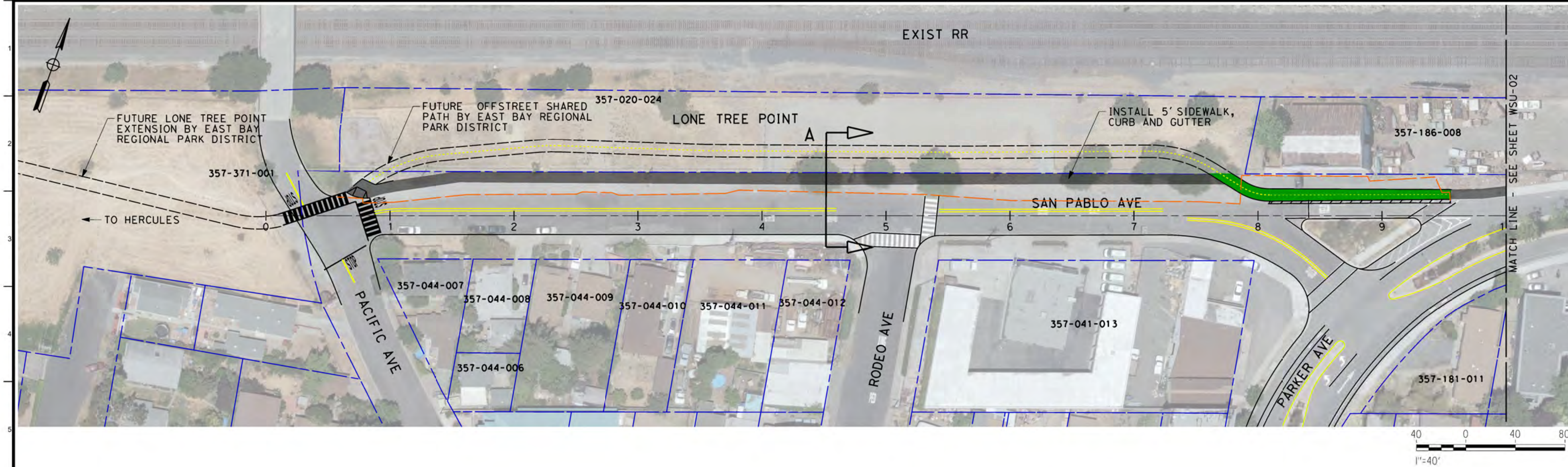
Stamp

Key Plan

Drawing Title
KEY PLAN
-
-

Scale	1" = 500'
File Name	INFO-ARUP22X34H.DWG
Drawing Status	DRAFT - FOR DISCUSSION ONLY
Drawn By	J. STITT
Checked By	M. ISWALT
Job No	243261
Drawing No	BL-SU-WSU-00

DWG NAME: C:\Users\alton.connon\Desktop\Bord-Arup22x34h.dwg
MOD BY: Alton.connon MOD TIME: 12/4/2015 10:53 AM
PLOT BY: Alton Connon PLOT TIME: ####



LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: WIDENED SHARED-USE PATH ALTERNATIVE

STA 00+00.00 TO STA 10+00.00

SEGMENT 1 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

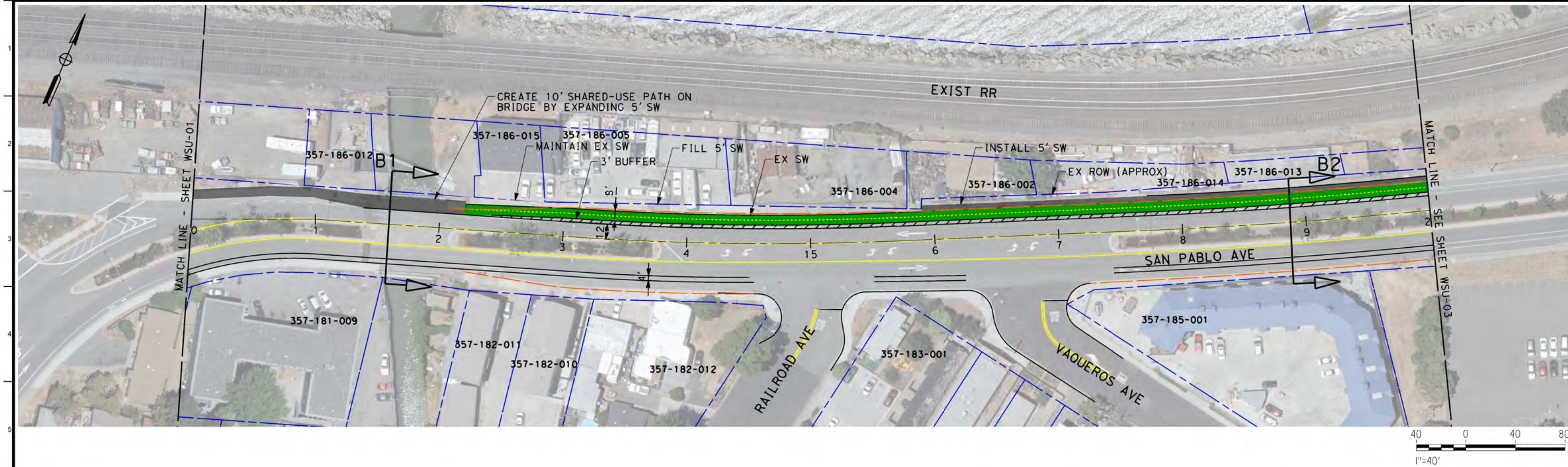
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: WSU-01



LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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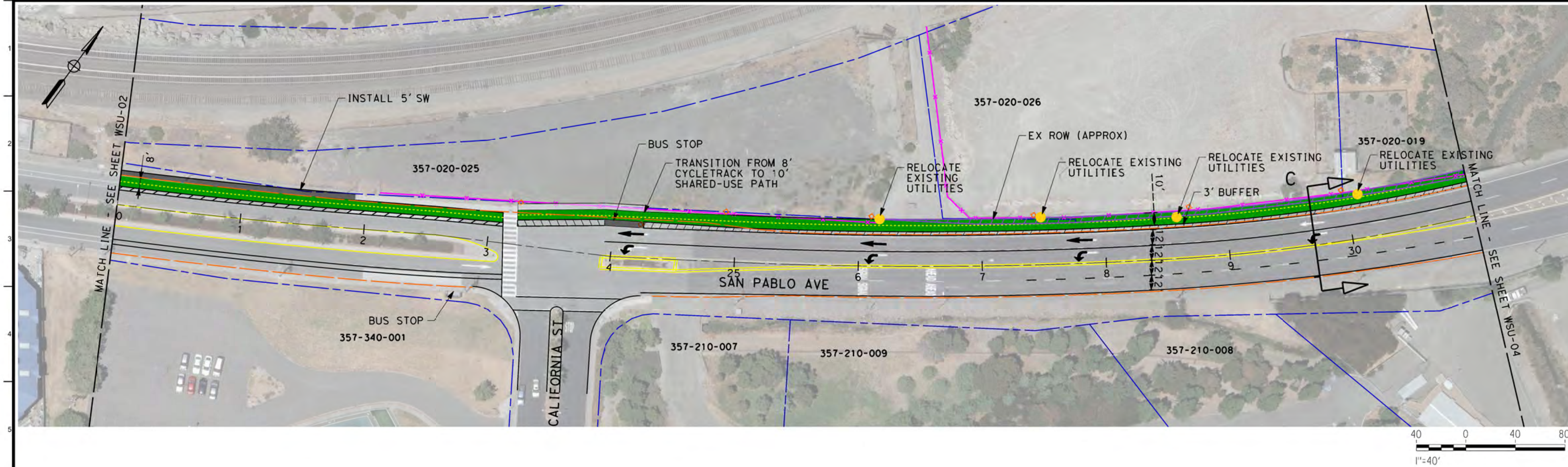
NO.	REVISION	DATE 11/01/2016

Client	CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT
Job Title	SAN PABLO AVENUE COMPLETE STREETS STUDY
Drawing Title	WIDENED SHARED USE PATH ALTERNATIVE STA 10+00.00 TO STA 20+00.00 SEGMENT 2 OF 16
Scale	1" = 40'
File Name	INFO-ARUP22X34H.DWG
Drawing Status	DRAFT - FOR DISCUSSION ONLY
Drawn By	J. STITT
Checked By	M. ISWALT
Job No	243261
Drawing No	WSU-02



LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Client
CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT

Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

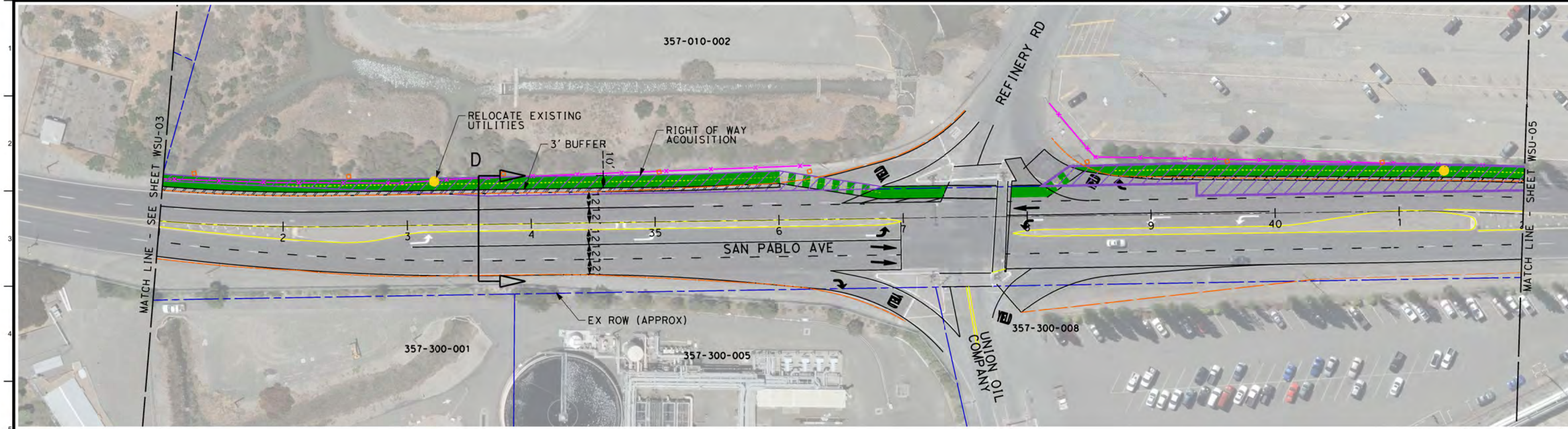
Key Plan

Drawing Title
WIDENED SHARED-USE
PATH ALTERNATIVE

STA 20+00.00 TO
STA 31+00.00

SEGMENT 3 OF 16

Scale: 1" = 40'
File Name: INFO-ARUP22X34H.DWG
Drawing Status: DRAFT - FOR DISCUSSION ONLY
Drawn By: J. STITT
Checked By: M. ISWALT
Job No: 243261
Drawing No: WSU-03



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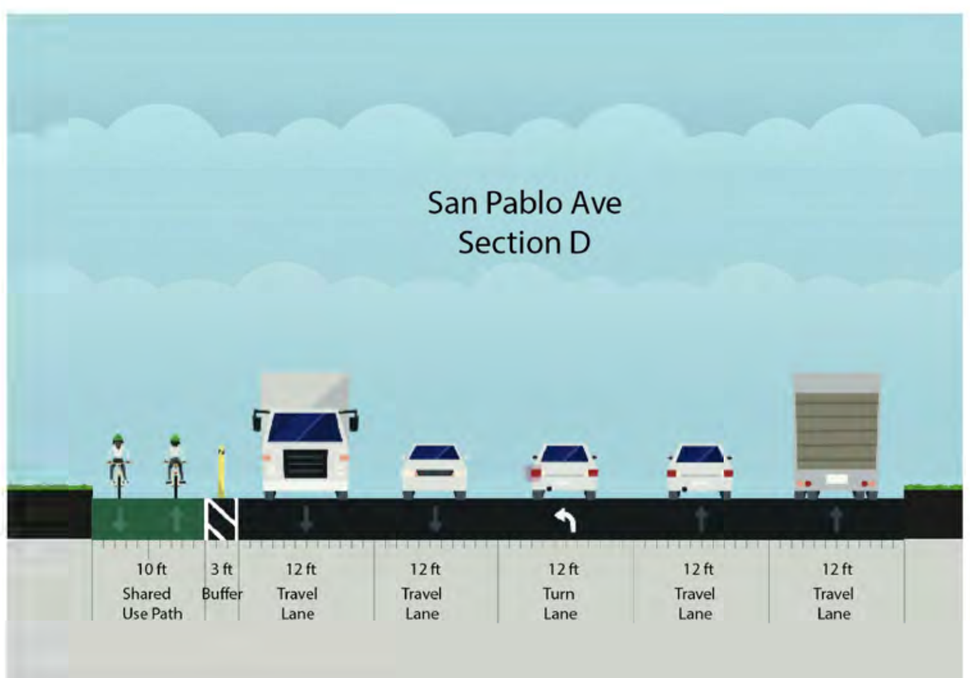

LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: WIDENED SHARED USE PATH ALTERNATIVE

STA 31+00.00 TO STA 42+00.00

SEGMENT 4 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

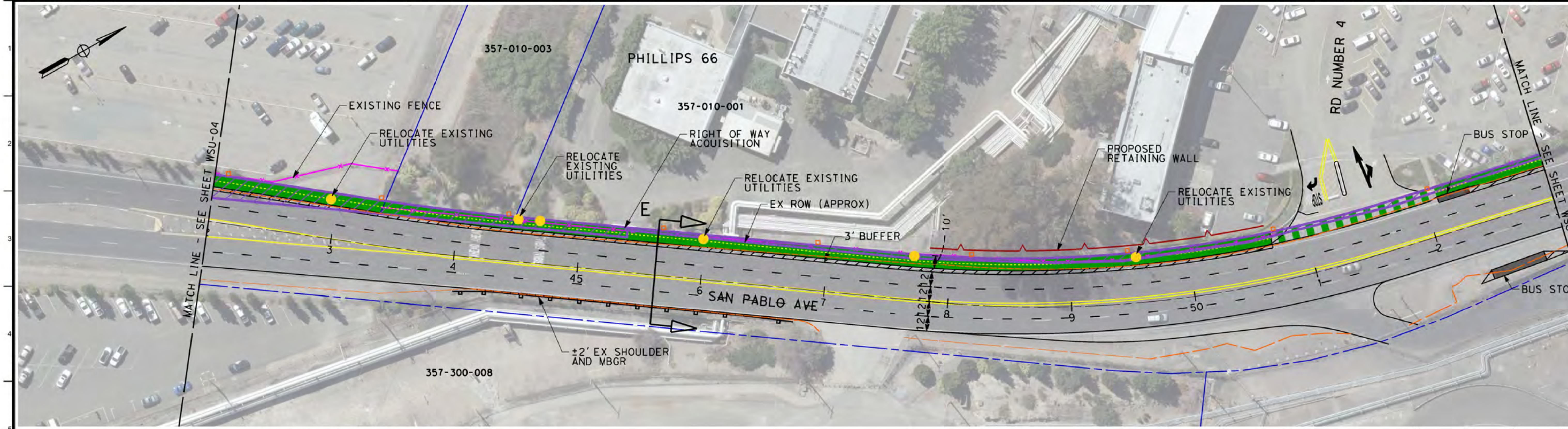
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: WSU-04



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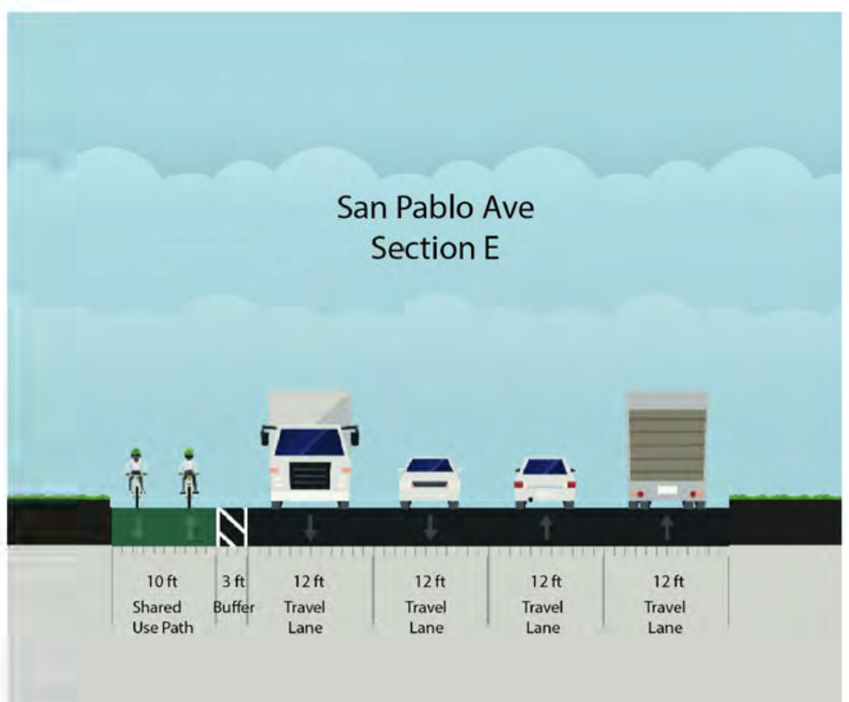

LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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PUBLIC WORKS DEPARTMENT

Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

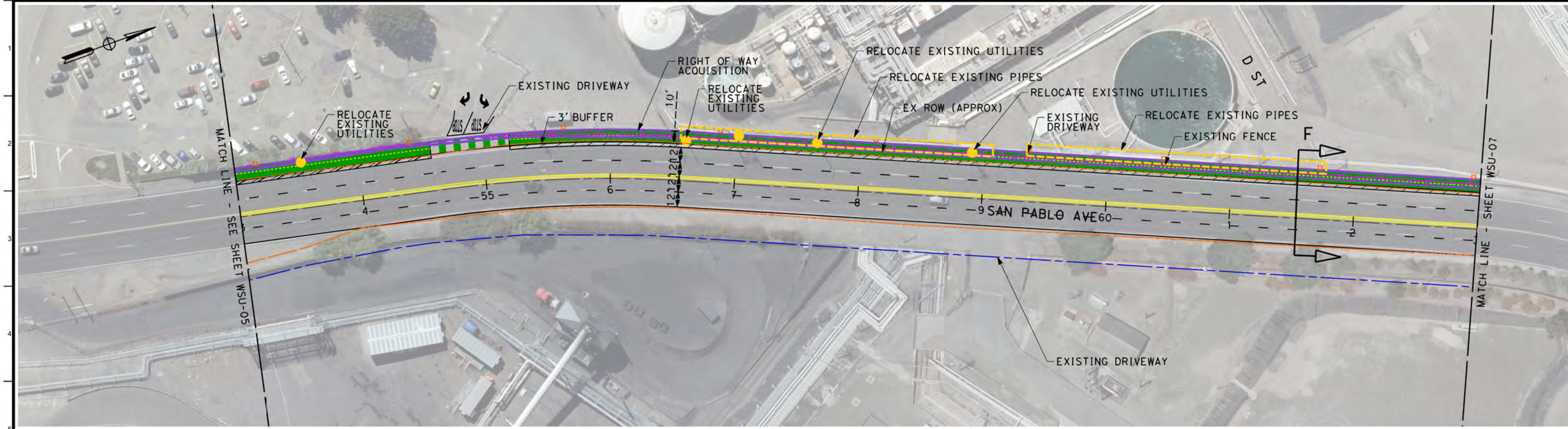
Key Plan

Drawing Title
WIDENED SHARED-USE PATH ALTERNATIVE

STA 42+00.00 TO
STA 53+00.00

SEGMENT 5 OF 16

Scale	1" = 40'
File Name	INFO-ARUP22X34H.DWG
Drawing Status	DRAFT - FOR DISCUSSION ONLY
Drawn By	J. STITT
Checked By	M. ISWALT
Job No	243261
Drawing No	WSU-05



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LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

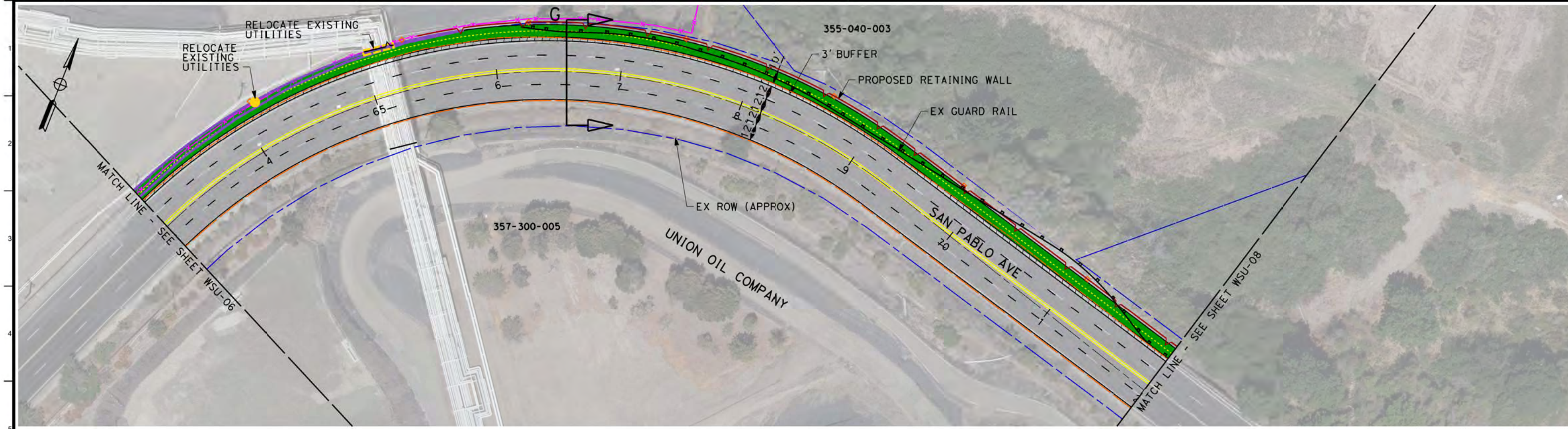
Key Plan

Drawing Title: WIDENED SHARED USE PATH ALTERNATIVE

STA 53+00.00 TO STA 63+00.00

SEGMENT 6 OF 16

Scale	1" = 40'
File Name	INFO-ARUP22X34H.DWG
Drawing Status	DRAFT - FOR DISCUSSION ONLY
Drawn By	J. STITT
Checked By	M. ISWALT
Job No	243261
Drawing No	WSU-06



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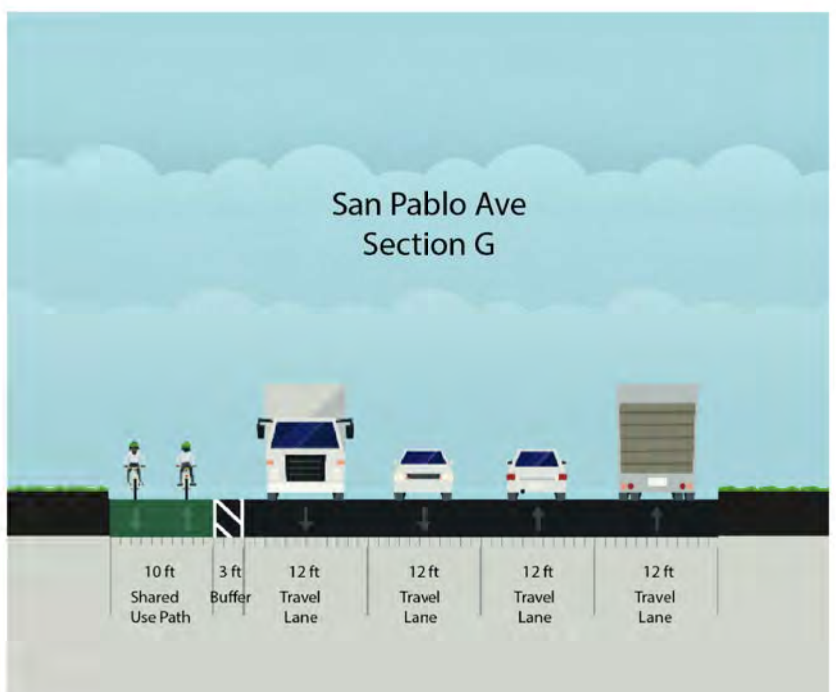

LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: WIDENED SHARED-USE PATH ALTERNATIVE

STA 63+00.00 TO STA 72+00.00

SEGMENT 7 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

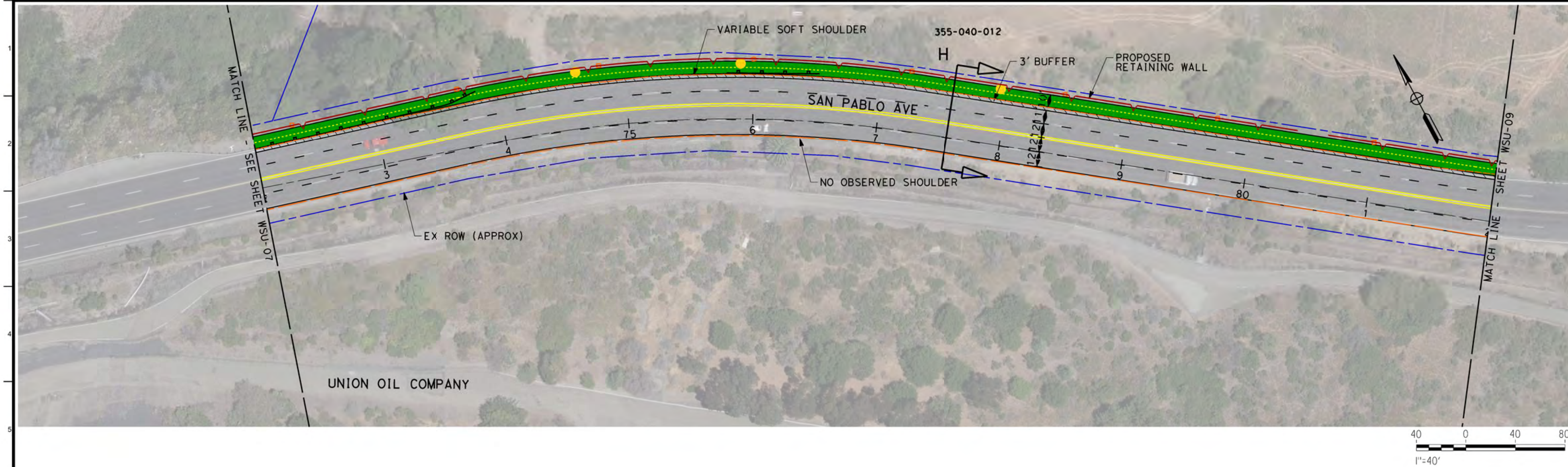
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

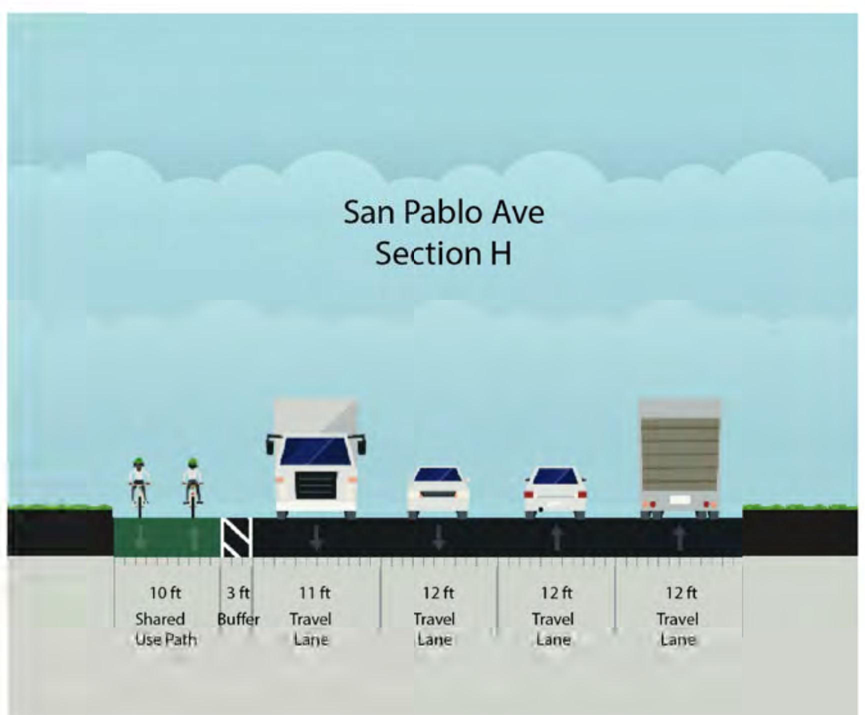
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: WSU-07





LEGEND

	EXISTING RIGHT OF WAY
	PROPOSED BICYCLE FACILITY
	EXISTING EDGE OF PAVEMENT
	EXISTING GUARD RAIL
	EXISTING CONCRETE BARRIER
	PROPOSED RETAINING WALL
	RELOCATE EXISTING PIPES
	RELOCATE EXISTING UTILITIES
	EXISTING FENCE
	RIGHT OF WAY ACQUISITION
	PROPOSED STREETLIGHT

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Client
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PUBLIC WORKS DEPARTMENT

Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

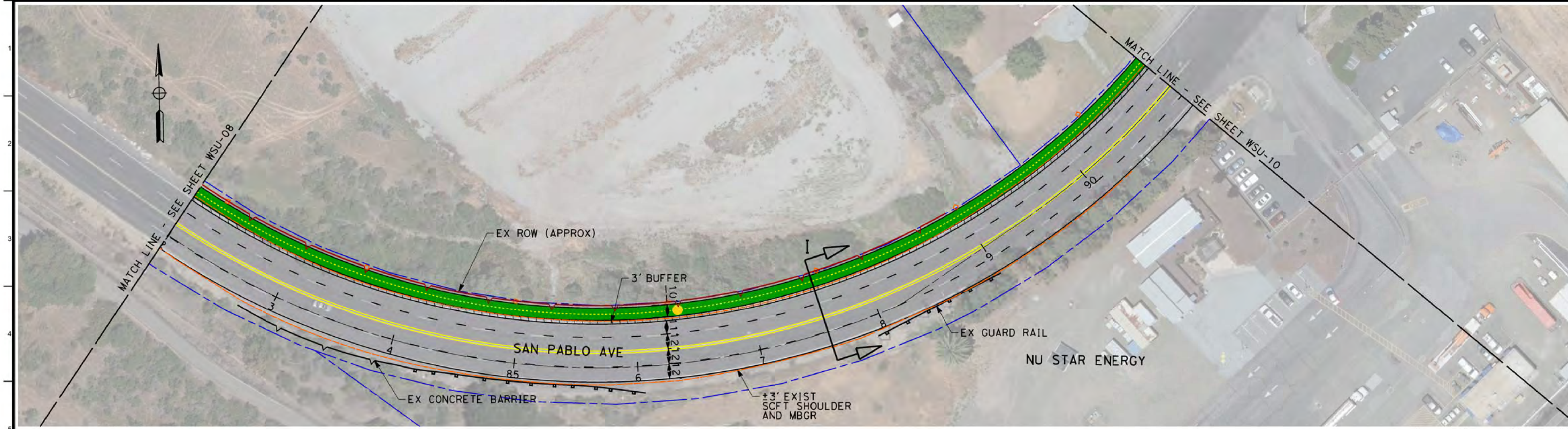
Key Plan

Drawing Title
WIDENED SHARED USE PATH ALTERNATIVE

STA 72+00.00 TO
STA 82+00.00

SEGMENT 8 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status **DRAFT - FOR DISCUSSION ONLY**
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No WSU-08



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1"=40'

LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Drawing Title: WIDENED SHARED-USE PATH ALTERNATIVE

STA 82+00.00 TO STA 91+00.00

SEGMENT 9 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

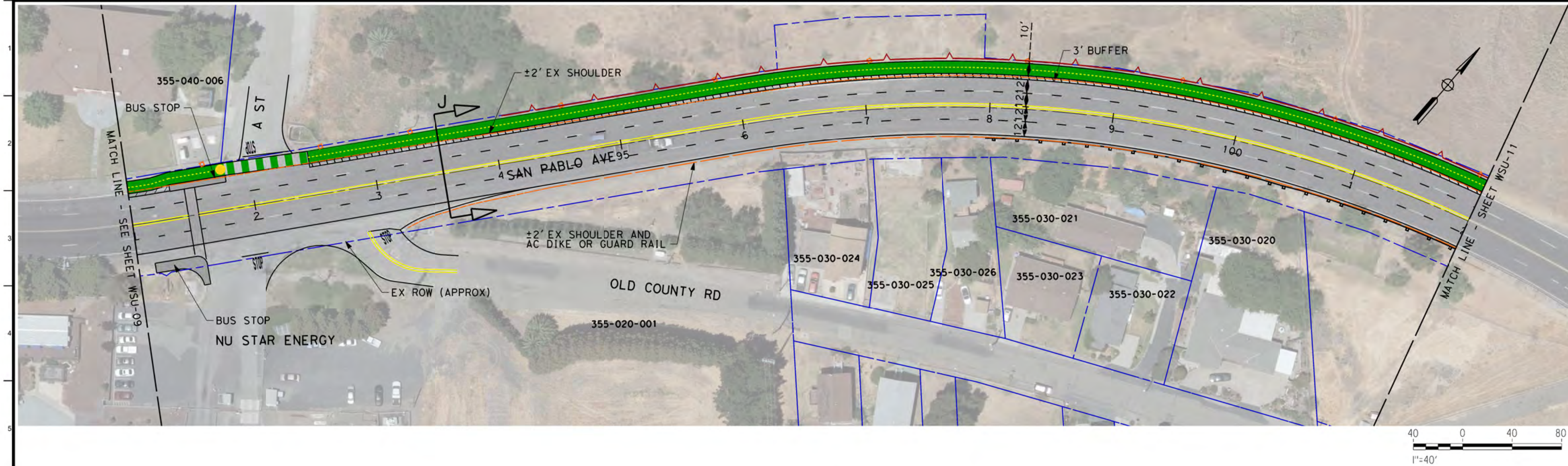
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: WSU-09



LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: WIDENED SHARED USE PATH ALTERNATIVE

STA 91+00.00 TO STA 102+00.00

SEGMENT 10 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

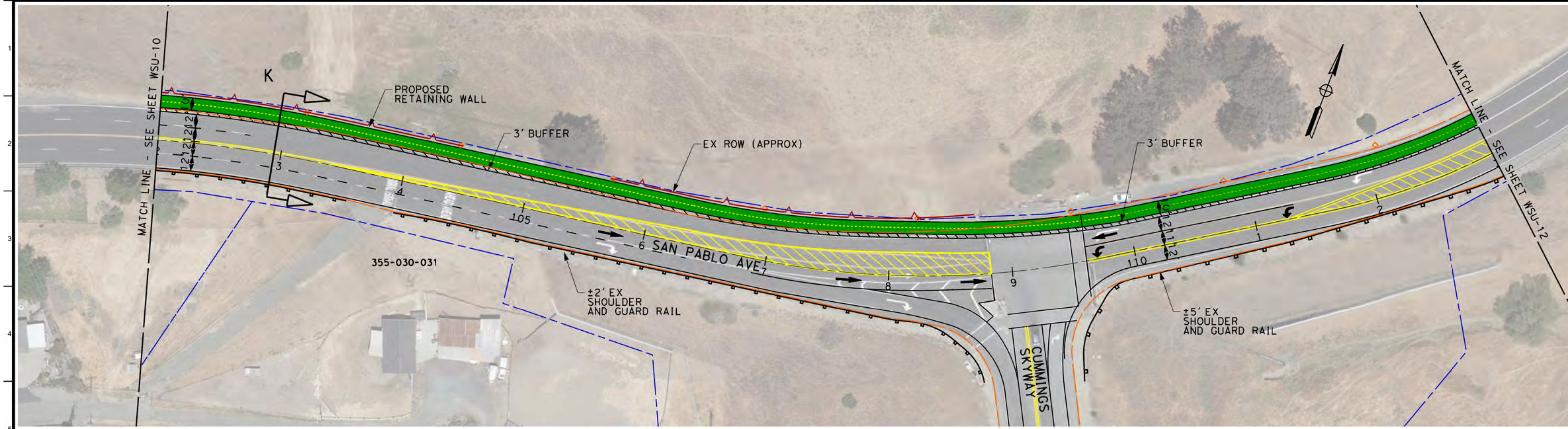
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: WSU-10



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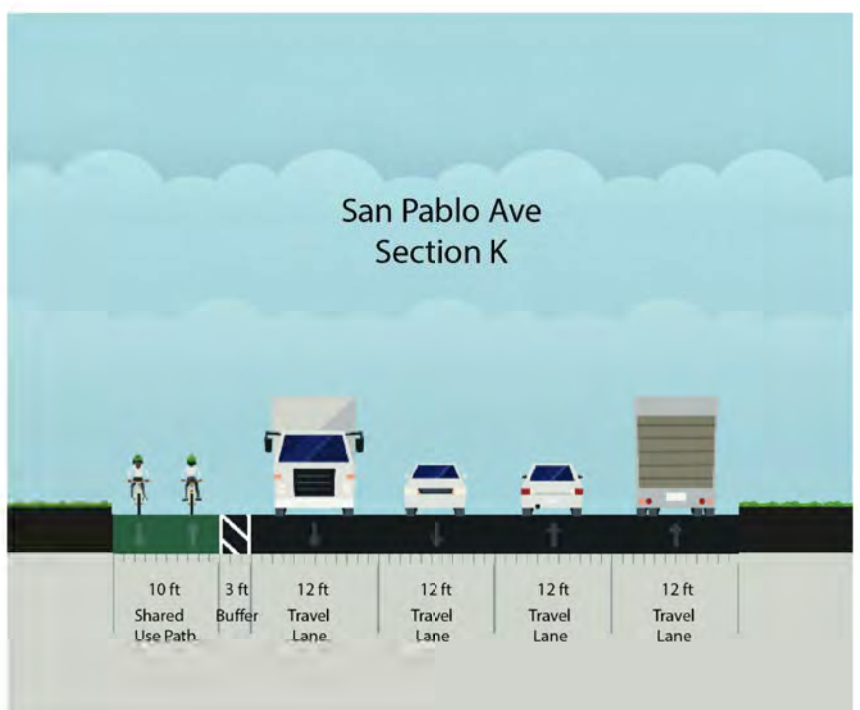

LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: WIDENED SHARED-USE PATH ALTERNATIVE

STA 102+00.00 TO STA 113+00.00

SEGMENT 11 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

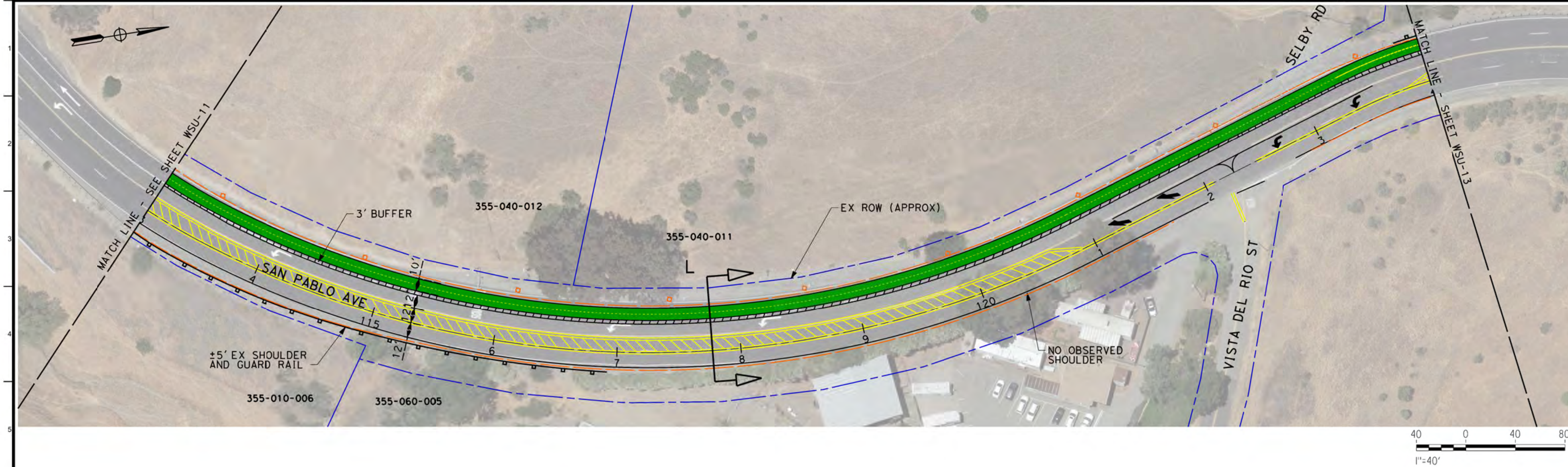
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: WSU-11



LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: WIDENED SHARED USE PATH ALTERNATIVE

STA 113+00.00 TO STA 124+00.00

SEGMENT 12 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

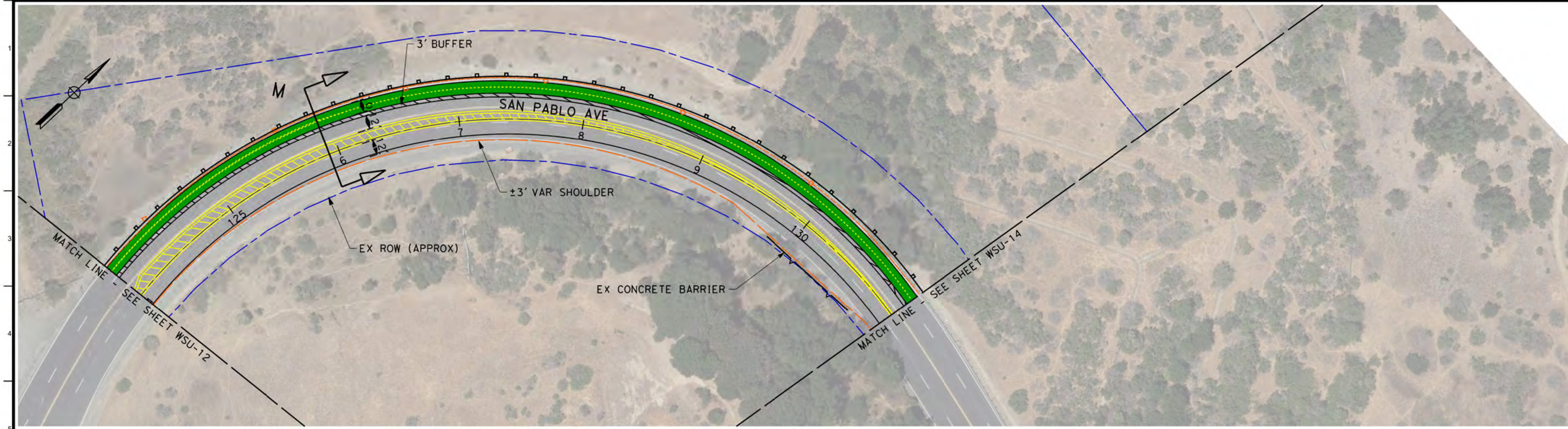
Drawing Status: DRAFT - FOR DISCUSSION ONLY

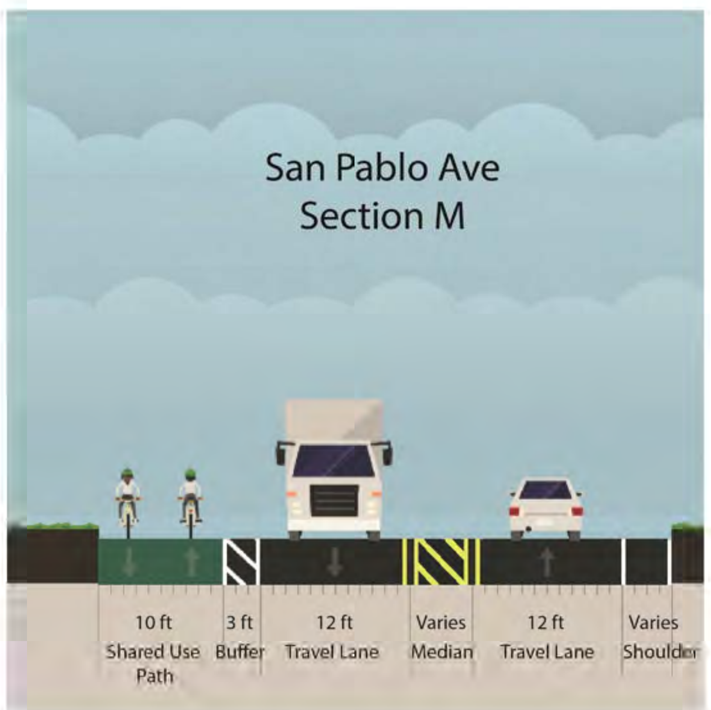
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: WSU-12





LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: WIDENED SHARED-USE PATH ALTERNATIVE

STA 124+00.00 TO STA 131+00.00

SEGMENT 13 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

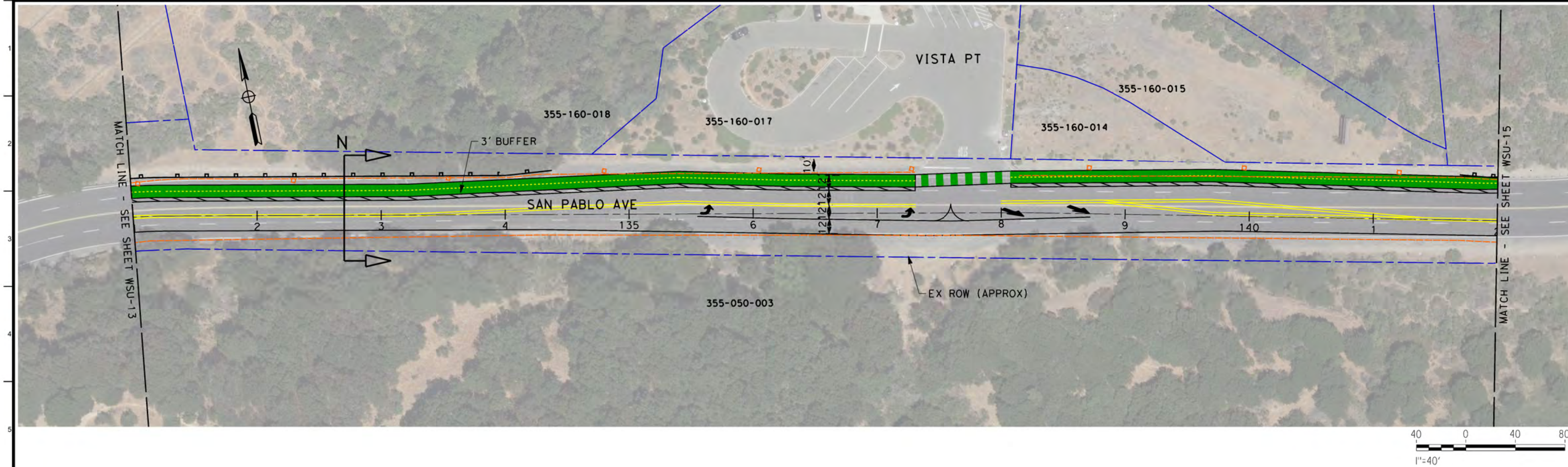
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

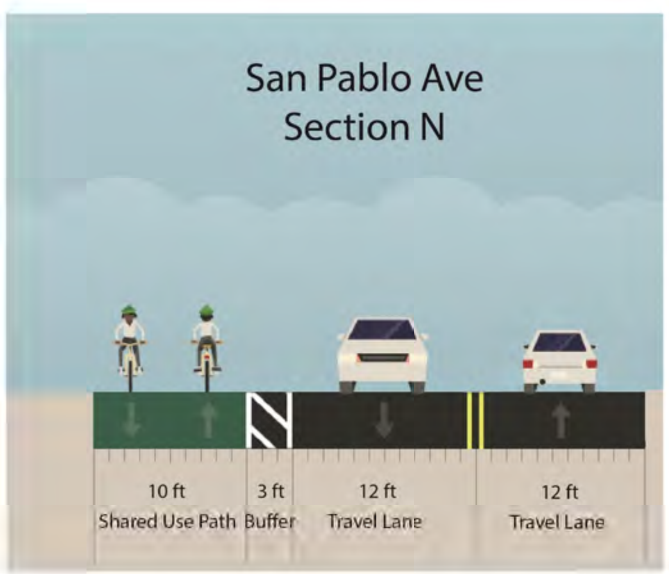
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: **243261**

Drawing No: **WSU-13**





LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: WIDEND SHARED USE PATH ALTERNATIVE

STA 131+00.00 TO STA 142+00.00

SEGMENT 14 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

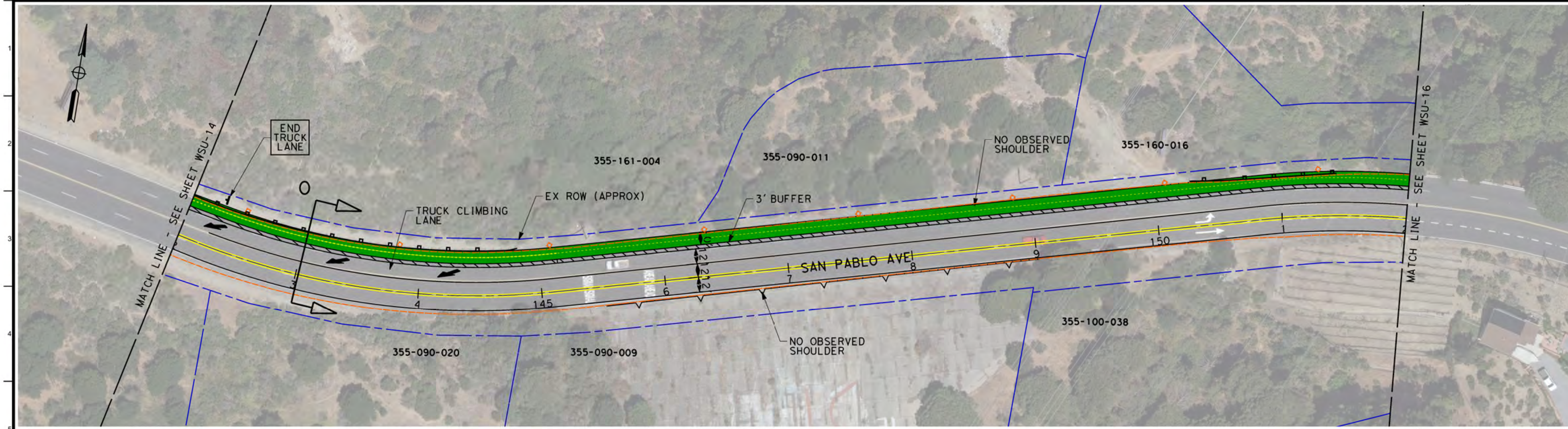
Drawing Status: DRAFT - FOR DISCUSSION ONLY

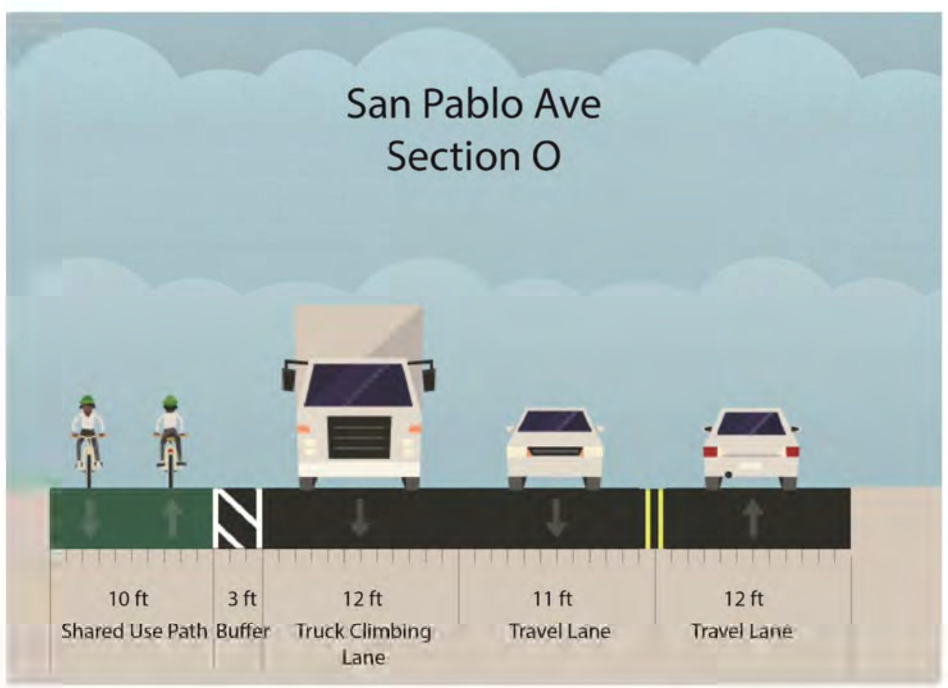
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: WSU-14





LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: WIDENED SHARED-USE PATH ALTERNATIVE

STA 142+00.00 TO STA 152+00.00

SEGMENT 15 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

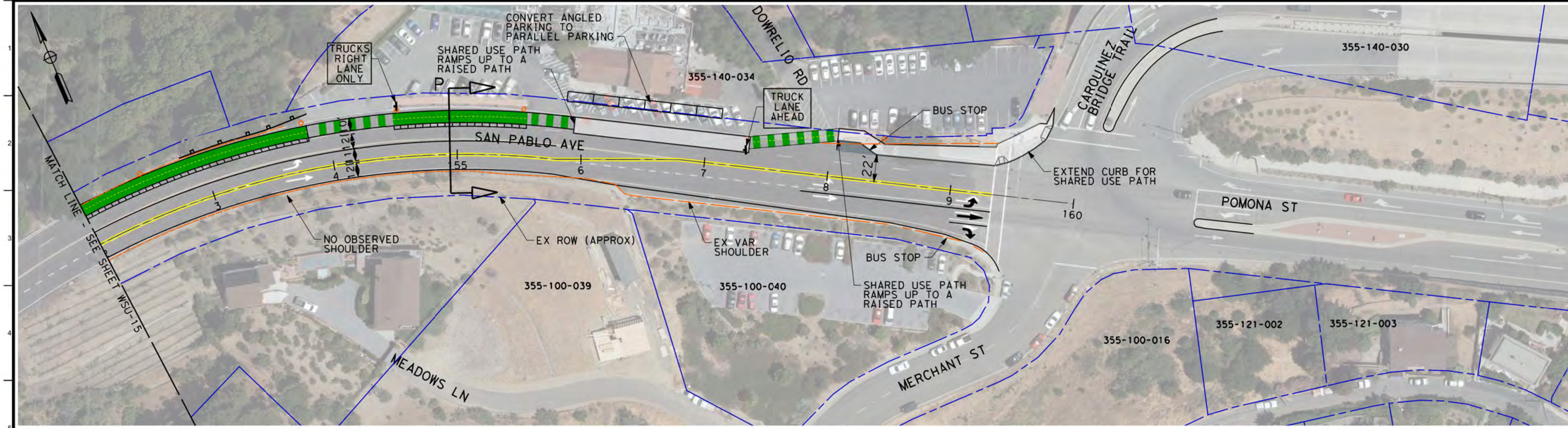
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: WSU-15



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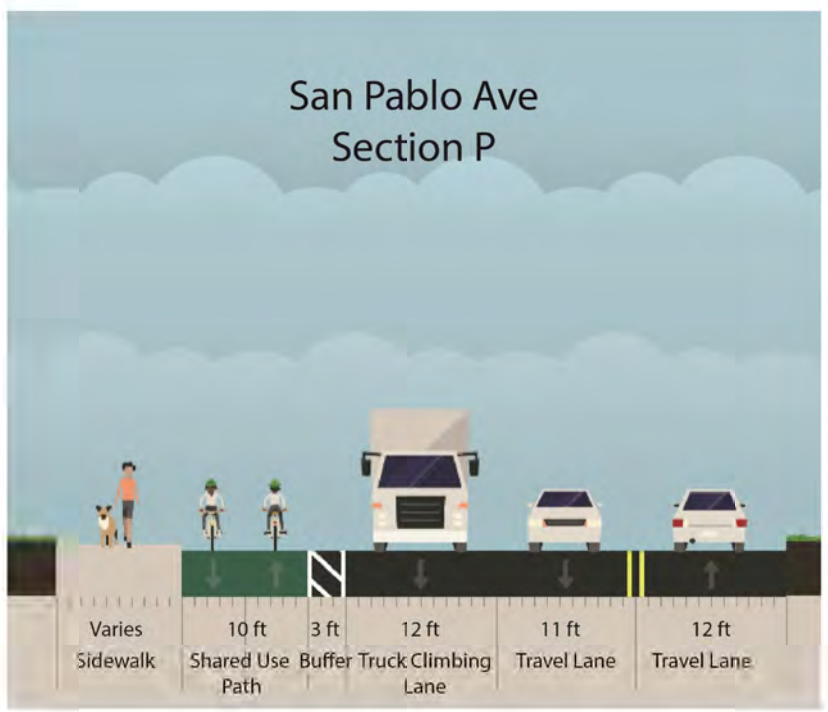

LEGEND

- EXISTING RIGHT OF WAY
- PROPOSED BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- EXISTING GUARD RAIL
- EXISTING CONCRETE BARRIER
- PROPOSED RETAINING WALL
- RELOCATE EXISTING PIPES
- RELOCATE EXISTING UTILITIES
- EXISTING FENCE
- RIGHT OF WAY ACQUISITION
- PROPOSED STREETLIGHT

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NO.	REVISION	DATE 11/01/2016

Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

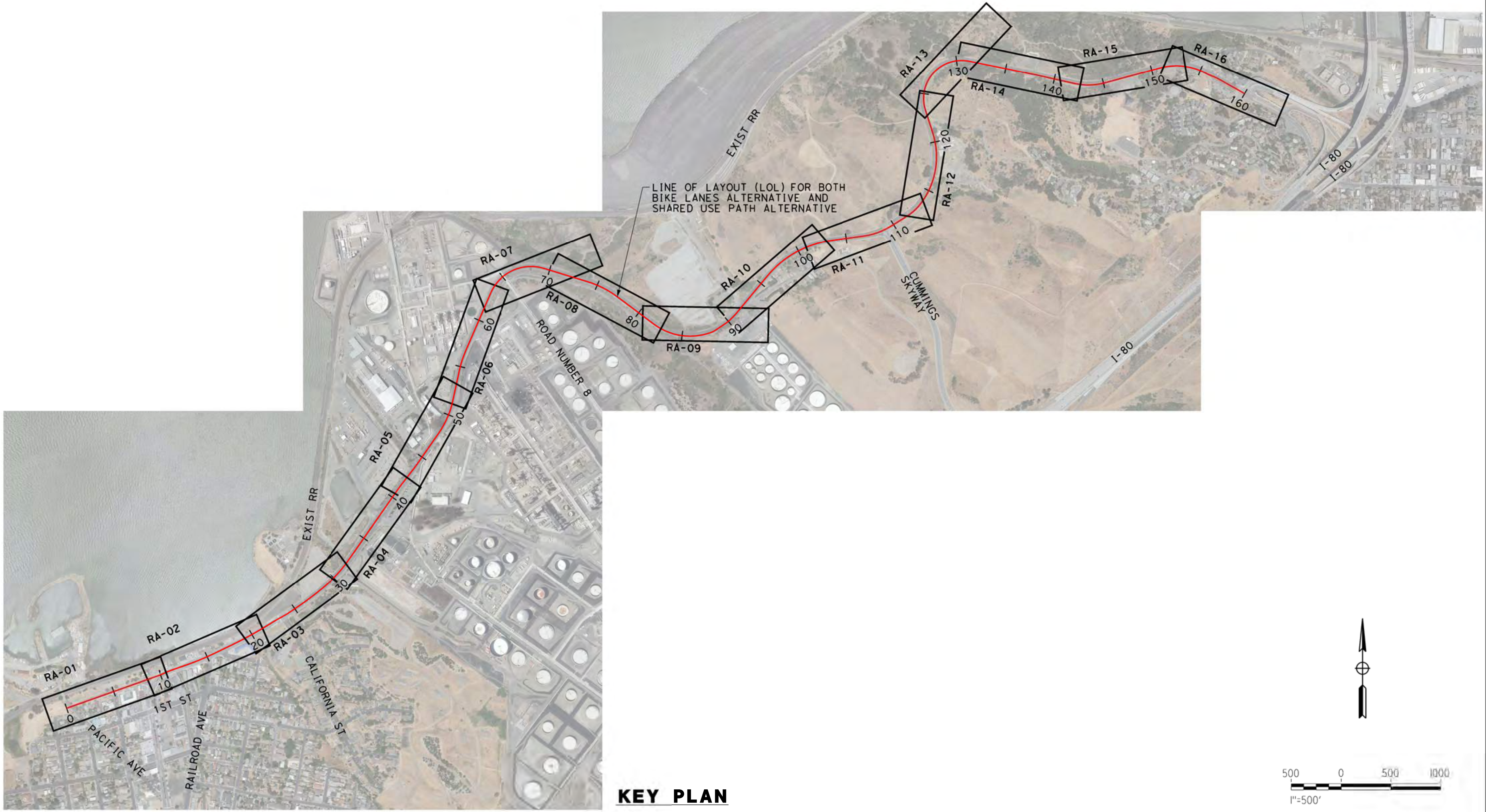
Drawing Title: WIDENED SHARED USE PATH ALTERNATIVE

STA 152+00.00 TO STA 160+00.00

SEGMENT 16 OF 16

Scale	1" = 40'
File Name	INFO-ARUP22X34H.DWG
Drawing Status	DRAFT - FOR DISCUSSION ONLY
Drawn By	J. STITT
Checked By	M. ISWALT
Job No 243261	Drawing No WSU-16

Appendix A.4: Recommended Alternative



KEY PLAN

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NO.	REVISION	DATE 02/23/2017

Client
CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT

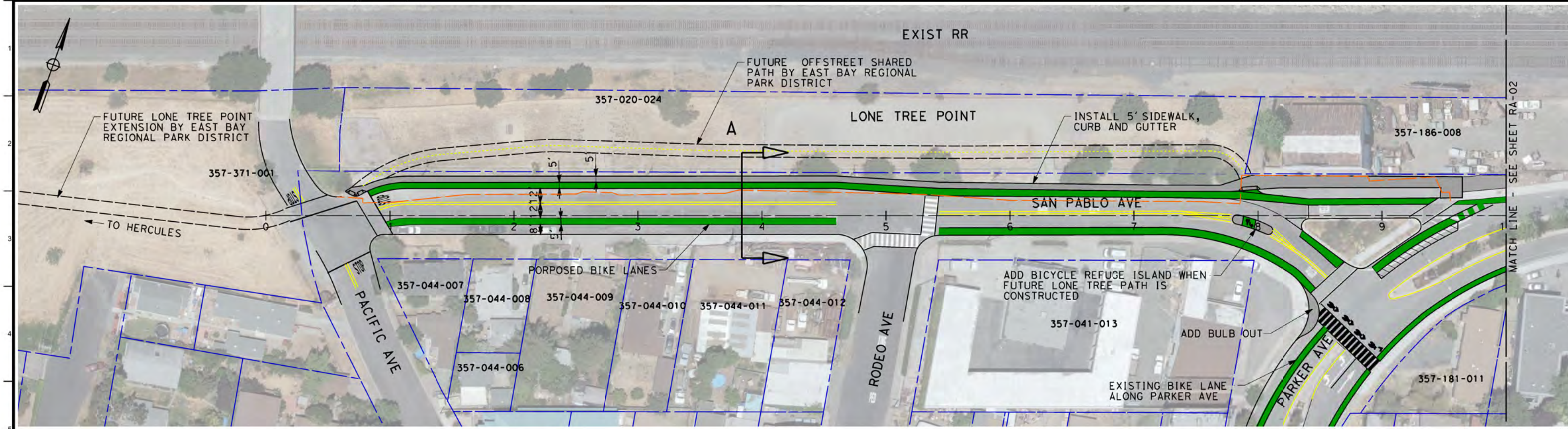
Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title
RECOMMENDED
ALTERNATIVE
KEY PLAN
-
-

Scale 1" = 500'
File Name INFO-ARUP22X34H.DWG
Drawing Status
DRAFT - FOR DISCUSSION ONLY
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No RA-00



NOTE: BICYCLE FACILITY SHOWN IN GREEN TO HIGHLIGHT LOCATION. CORRIDOR WIDE PROPOSED BICYCLE FACILITY PAINT COLOR NOT SPECIFIED.

LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: RECOMMENDED ALTERNATIVE

STA 00+00.00 TO STA 10+00.00

SEGMENT 1 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

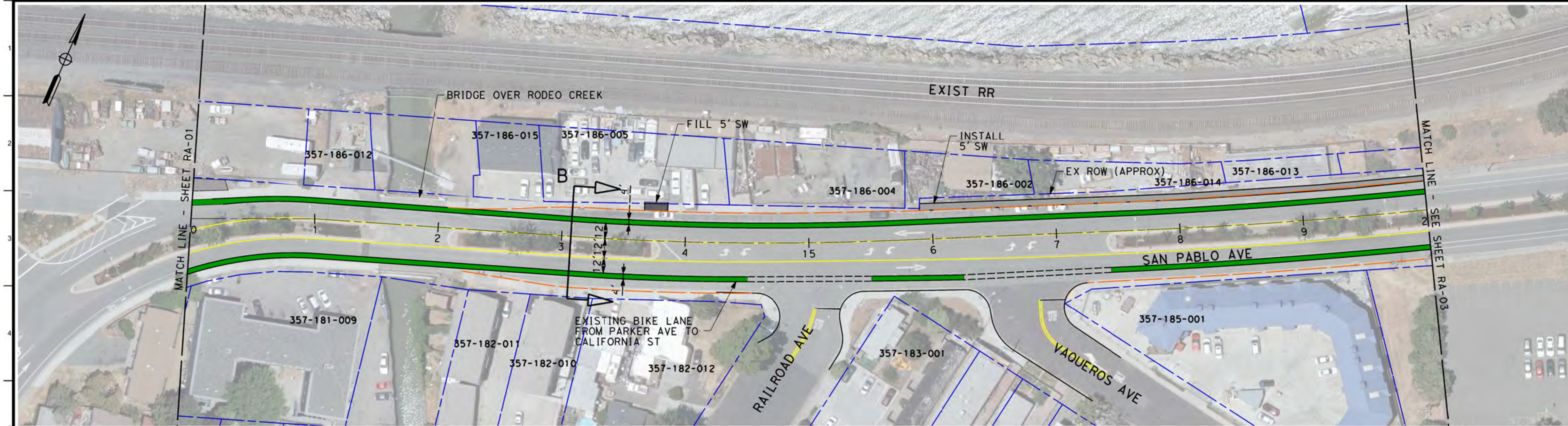
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: RA-01



40 0 40 80

1"=40'

LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Stamp

Key Plan

Drawing Title: RECOMMENDED ALTERNATIVE

STA 10+00.00 TO STA 20+00.00

SEGMENT 2 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

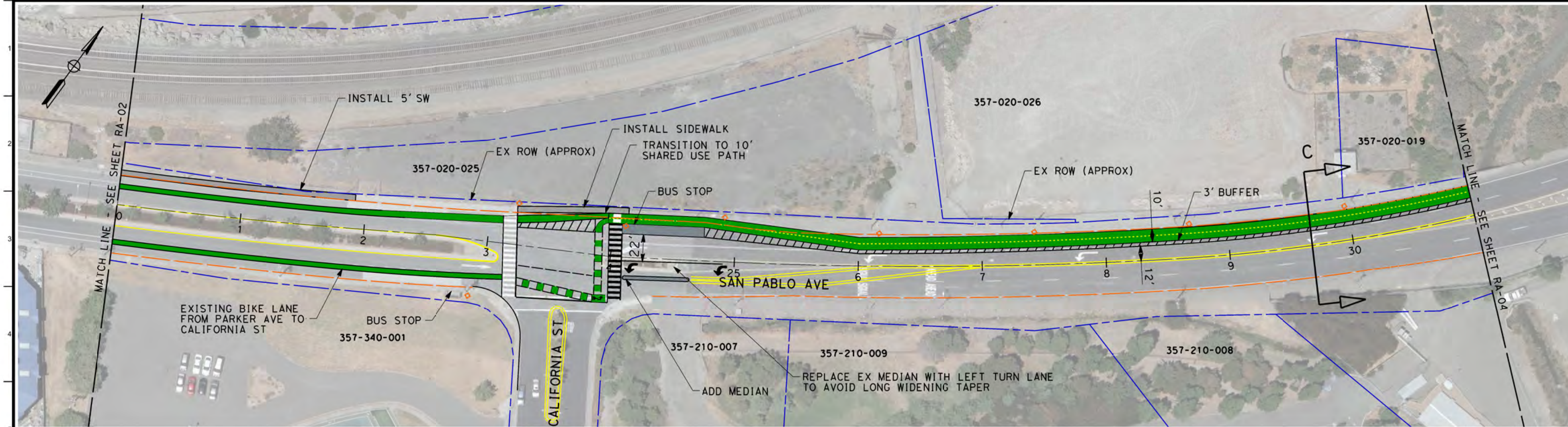
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: RA-02



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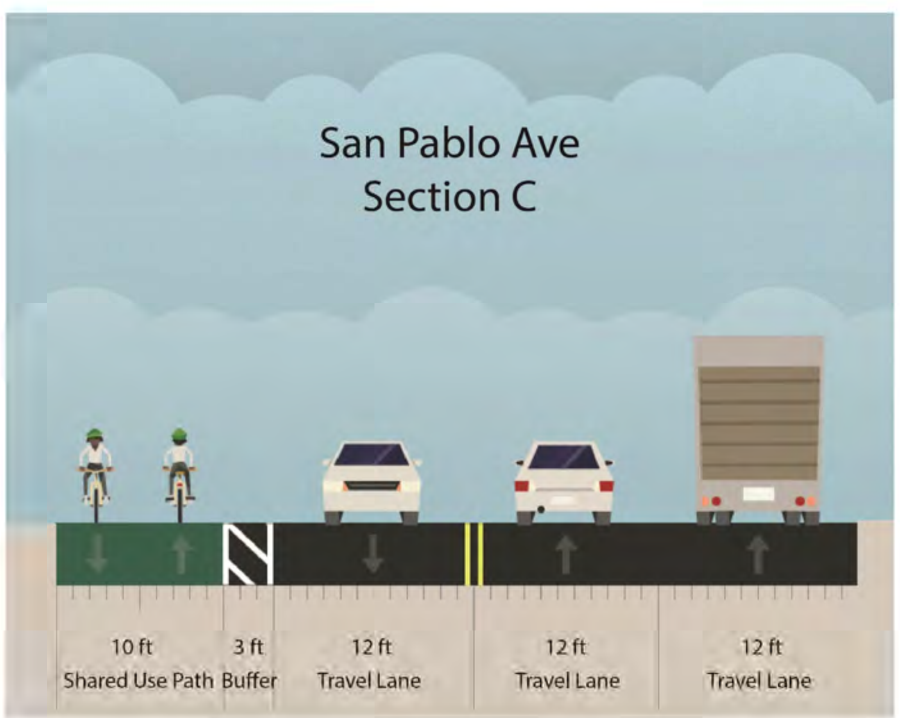
1"=40'



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Stamp

Key Plan

Drawing Title: RECOMMENDED ALTERNATIVE

STA 20+00.00 TO STA 31+00.00

SEGMENT 3 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

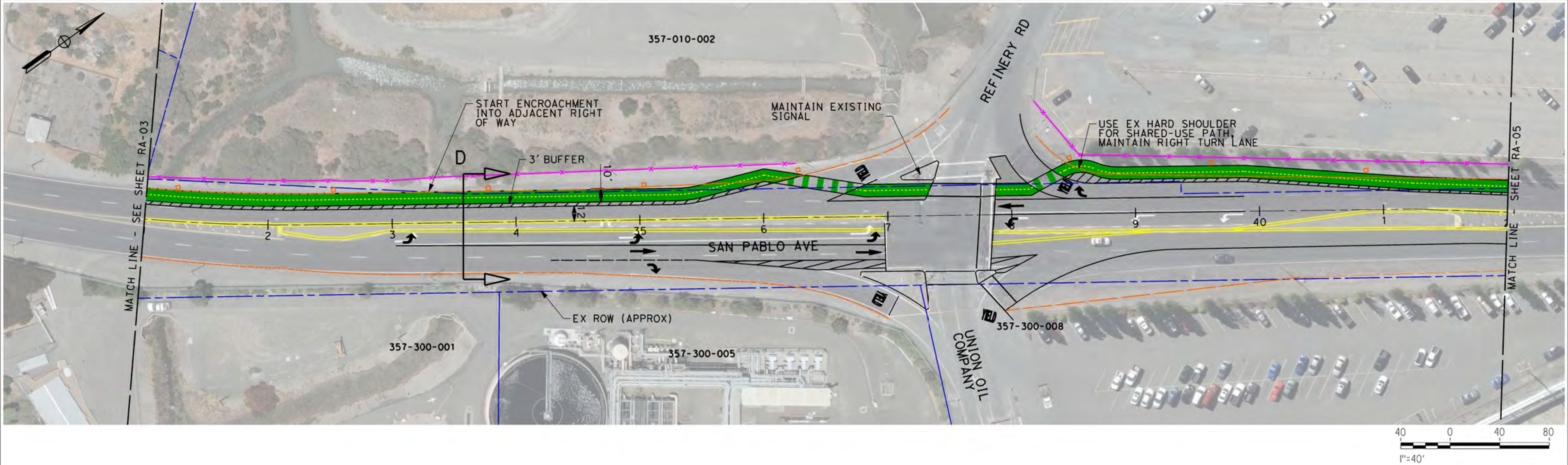
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

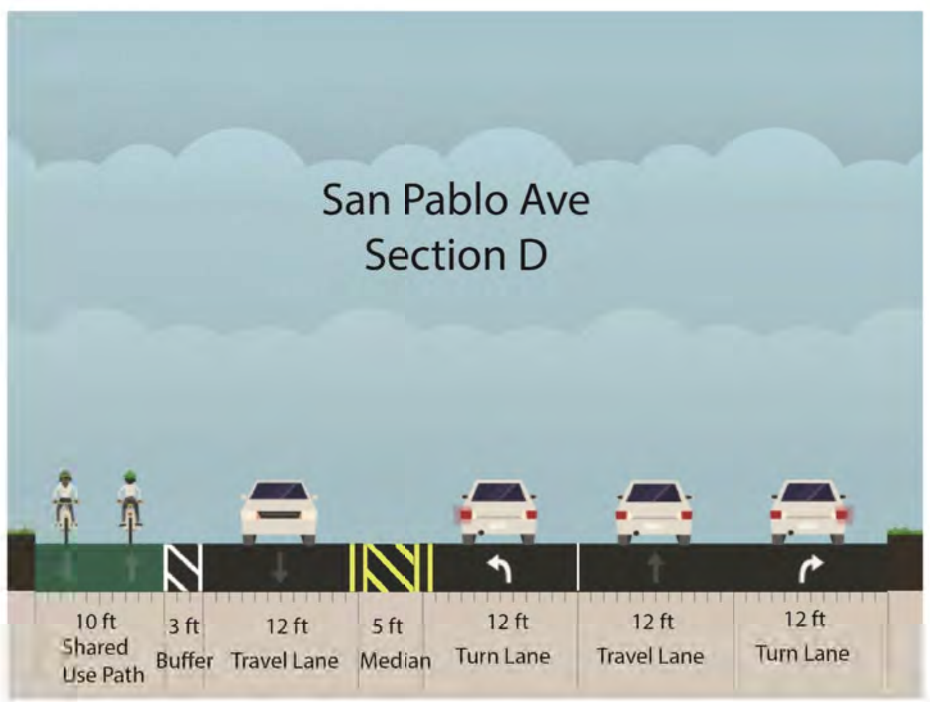
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: RA-03





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- EXISTING FENCE
- PROPOSED STREETLIGHT

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Stamp

Key Plan

Drawing Title: RECOMMENDED ALTERNATIVE

STA 31+00.00 TO STA 42+00.00

SEGMENT 4 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

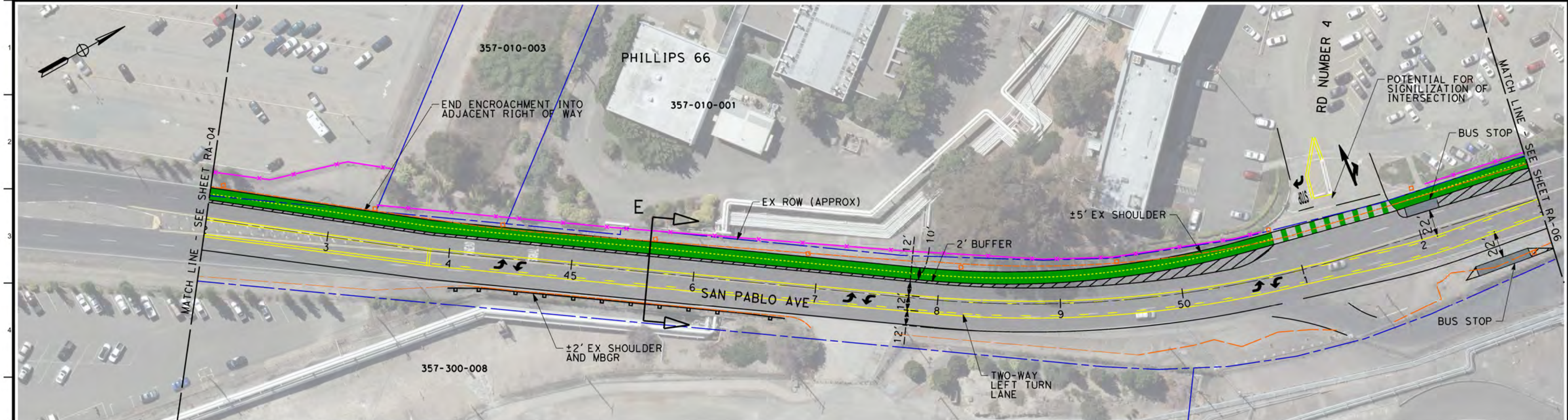
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: RA-04



40 0 40 80
1"=40'

LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- EXISTING FENCE
- PROPOSED STREETLIGHT

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Stamp

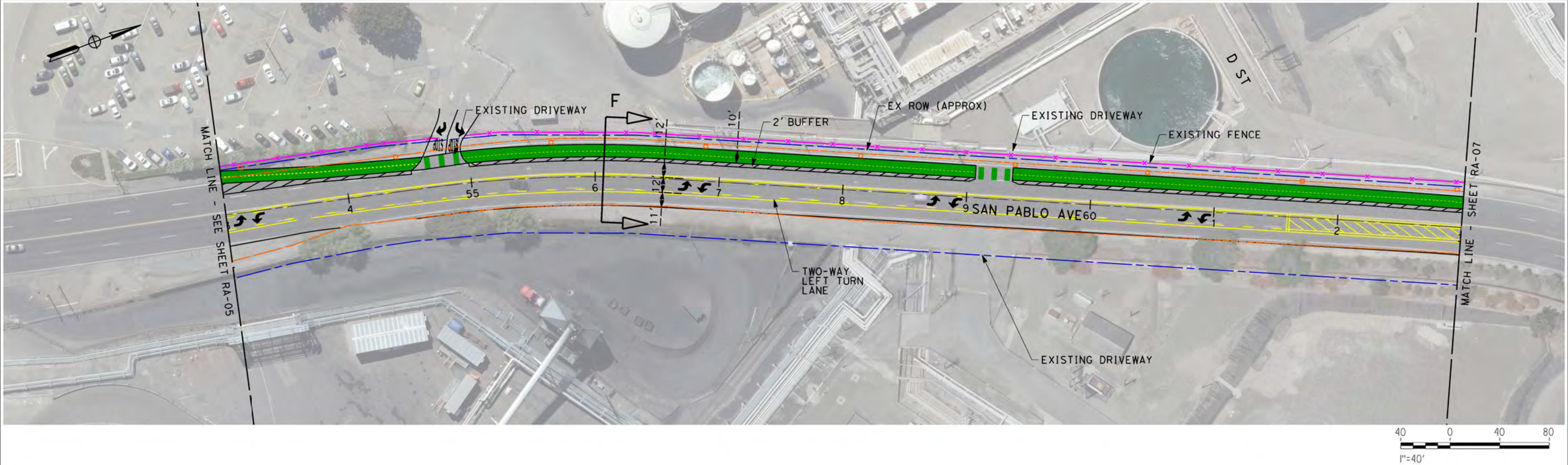
Key Plan

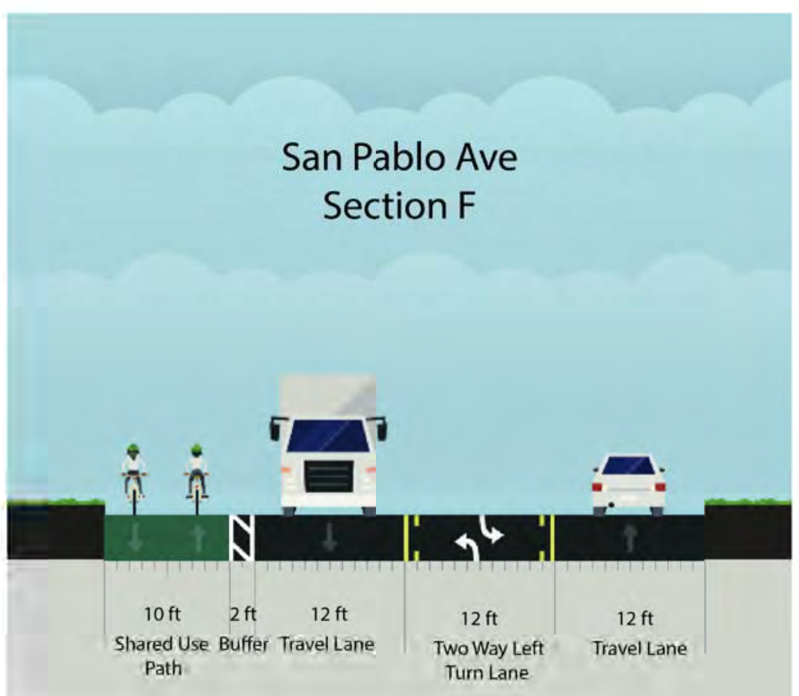
Drawing Title: RECOMMENDED ALTERNATIVE

STA 42+00.00 TO STA 53+00.00

SEGMENT 5 OF 16

Scale	1" = 40'
File Name	INFO-ARUP22X34H.DWG
Drawing Status	DRAFT - FOR DISCUSSION ONLY
Drawn By	J. STITT
Checked By	M. ISWALT
Job No	243261
Drawing No	RA-05





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- EXISTING FENCE
- PROPOSED STREETLIGHT

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Stamp

Key Plan

Drawing Title: RECOMMENDED ALTERNATIVE

STA 53+00.00 TO STA 63+00.00

SEGMENT 6 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

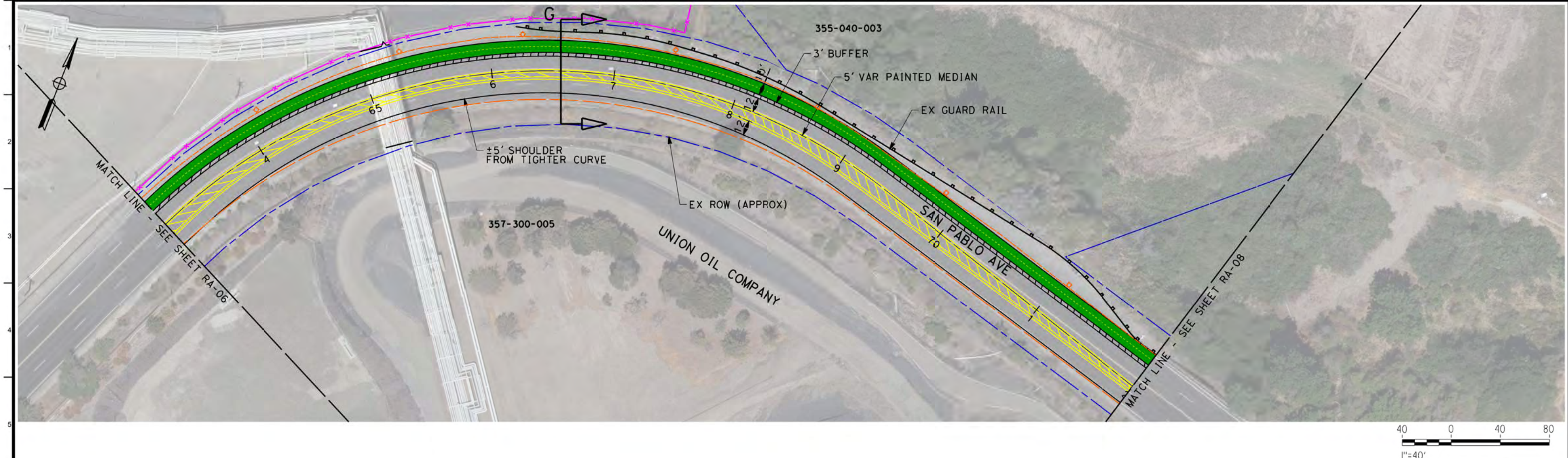
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: RA-06



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- EXISTING FENCE
- PROPOSED STREETLIGHT

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Stamp

Key Plan

Drawing Title: RECOMMENDED ALTERNATIVE

STA 63+00.00 TO STA 72+00.00

SEGMENT 7 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

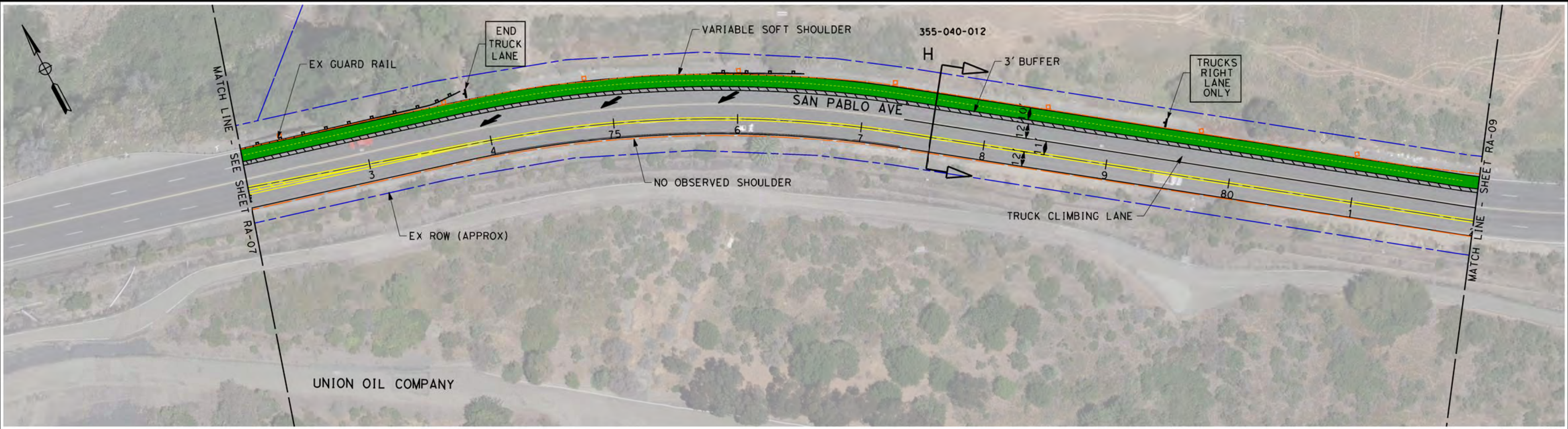
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

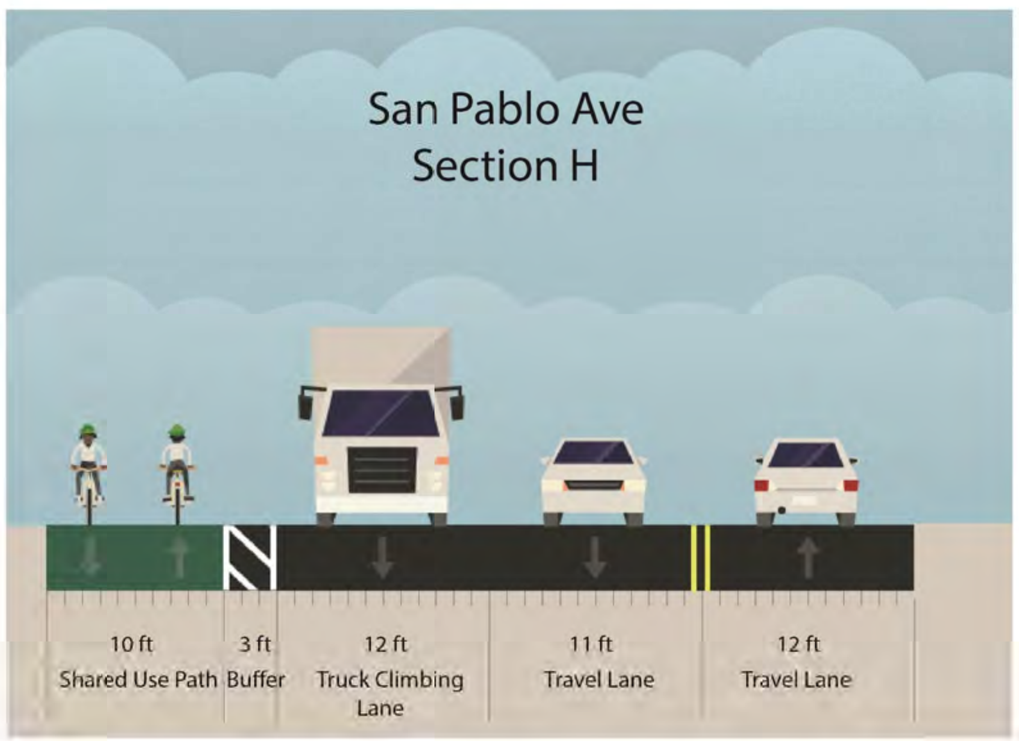
Job No: 243261

Drawing No: RA-07



40 0 40 80

1"=40'



LEGEND

EXISTING RIGHT OF WAY

BICYCLE FACILITY

EXISTING EDGE OF PAVEMENT

GUARD RAIL

CONCRETE BARRIER

PROPOSED STREETLIGHT

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Stamp

Key Plan

Drawing Title: RECOMMENDED ALTERNATIVE

STA 72+00.00 TO
STA 82+00.00

SEGMENT 8 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

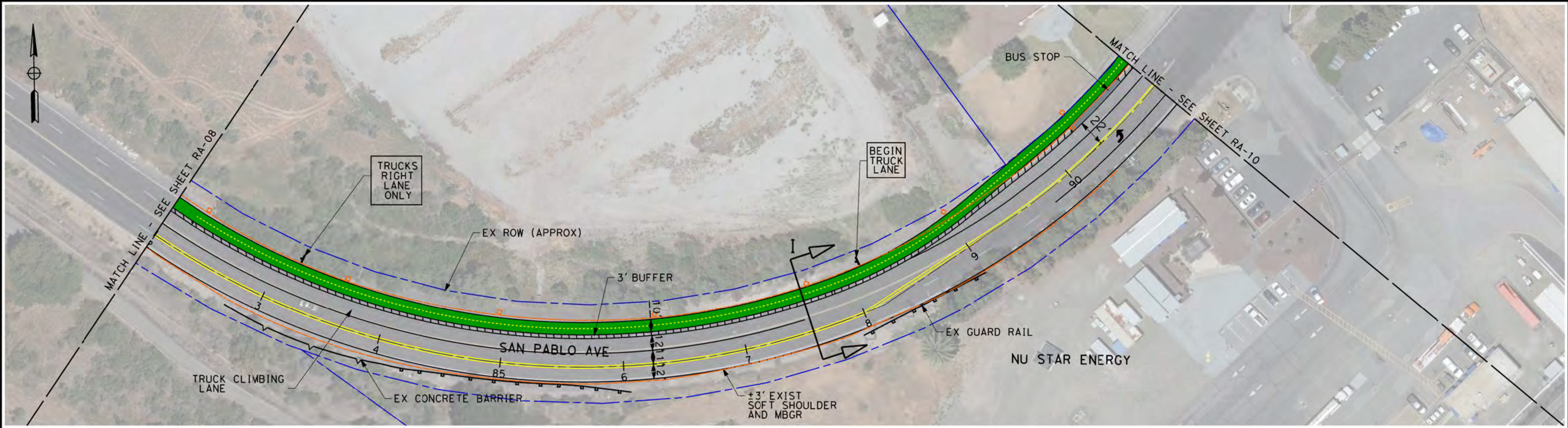
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

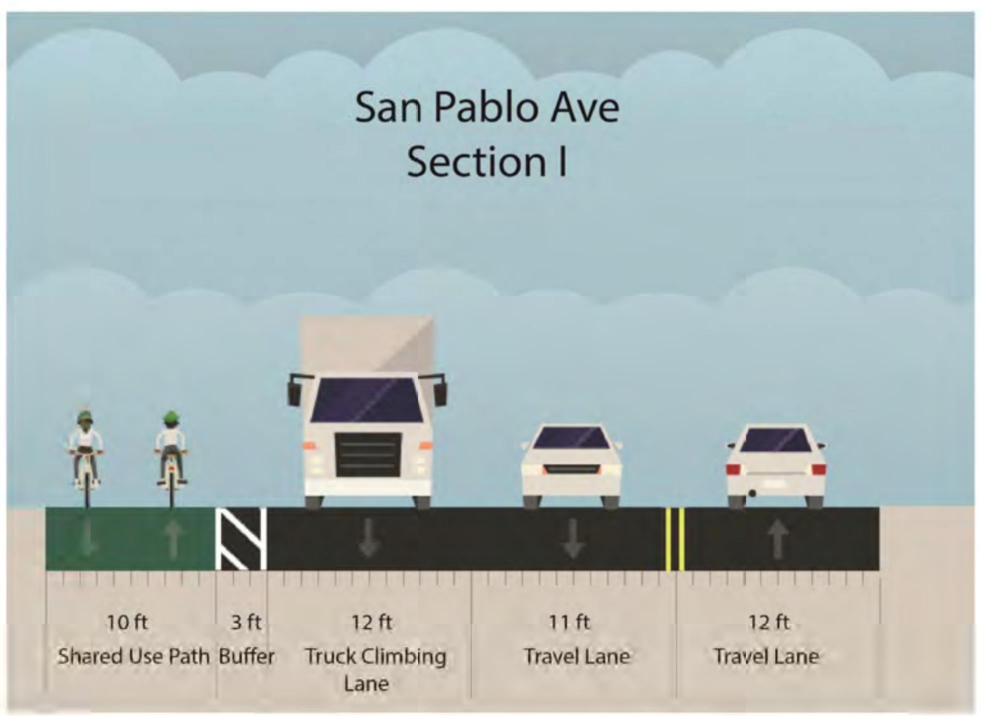
Job No: 243261

Drawing No: RA-08



40 0 40 80

1"=40'



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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COMPLETE STREETS STUDY

Stamp

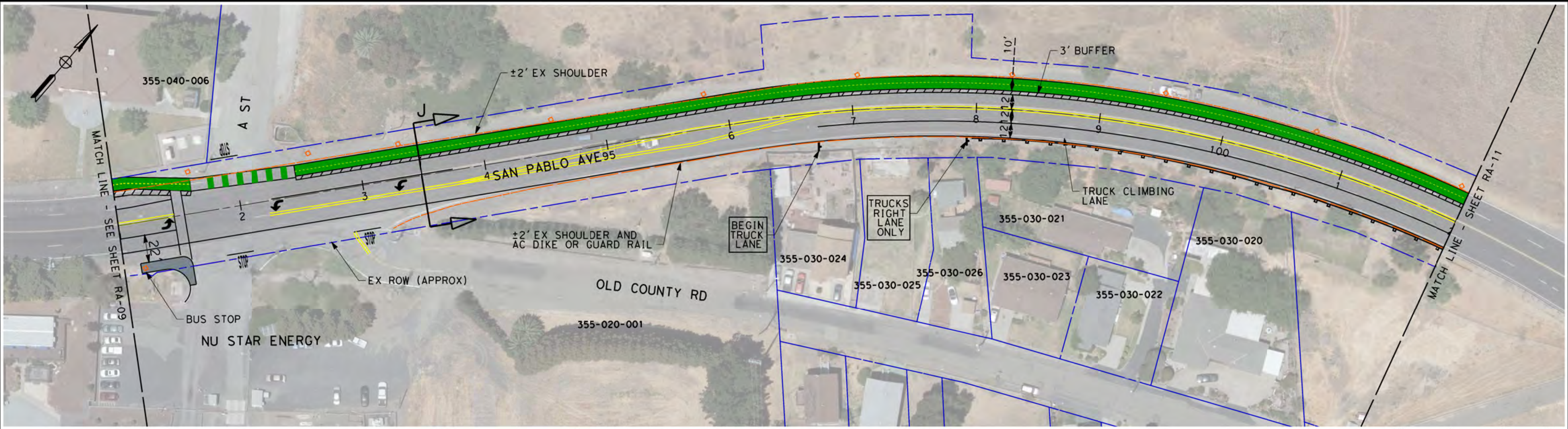
Key Plan

Drawing Title
RECOMMENDED
ALTERNATIVE

STA 82+00.00 TO
STA 91+00.00

SEGMENT 9 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status **DRAFT - FOR DISCUSSION ONLY**
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No RA-09



40 0 40 80

1"=40'

LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Job Title
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COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title
RECOMMENDED ALTERNATIVE

STA 91+00.00 TO
STA 102+00.00

SEGMENT 10 OF 16

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status DRAFT - FOR DISCUSSION ONLY
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No RA-10

LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Stamp

Key Plan

Drawing Title: RECOMMENDED ALTERNATIVE

STA 102+00.00 TO STA 113+00.00

SEGMENT 11 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

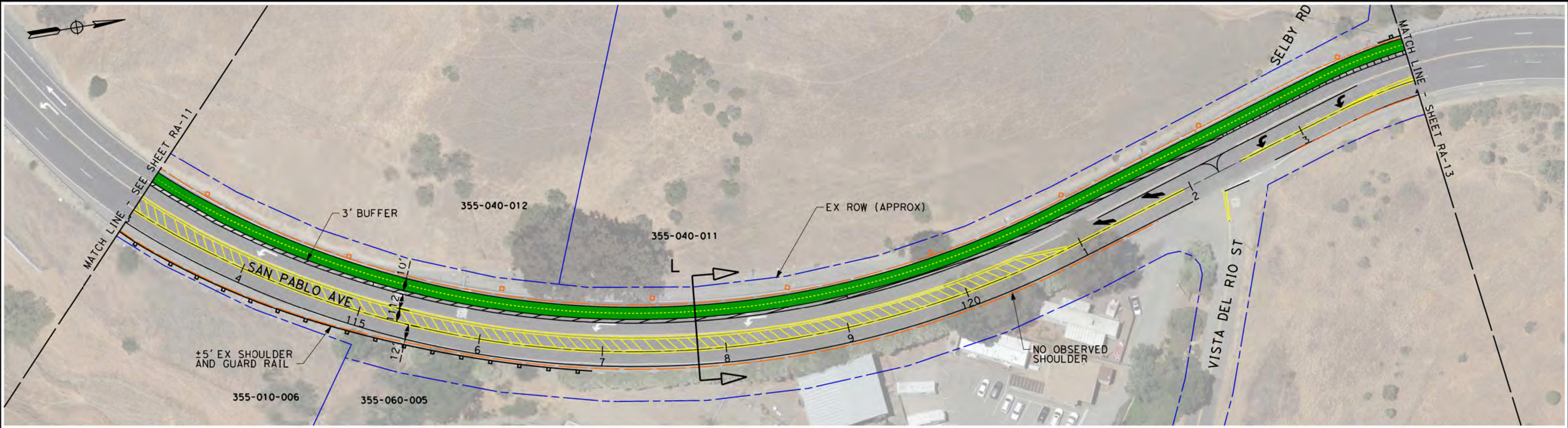
Drawing Status: DRAFT - FOR DISCUSSION ONLY

Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: RA-11



LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Stamp

Key Plan

Drawing Title: RECOMMENDED ALTERNATIVE

STA 113+00.00 TO STA 124+00.00

SEGMENT 12 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

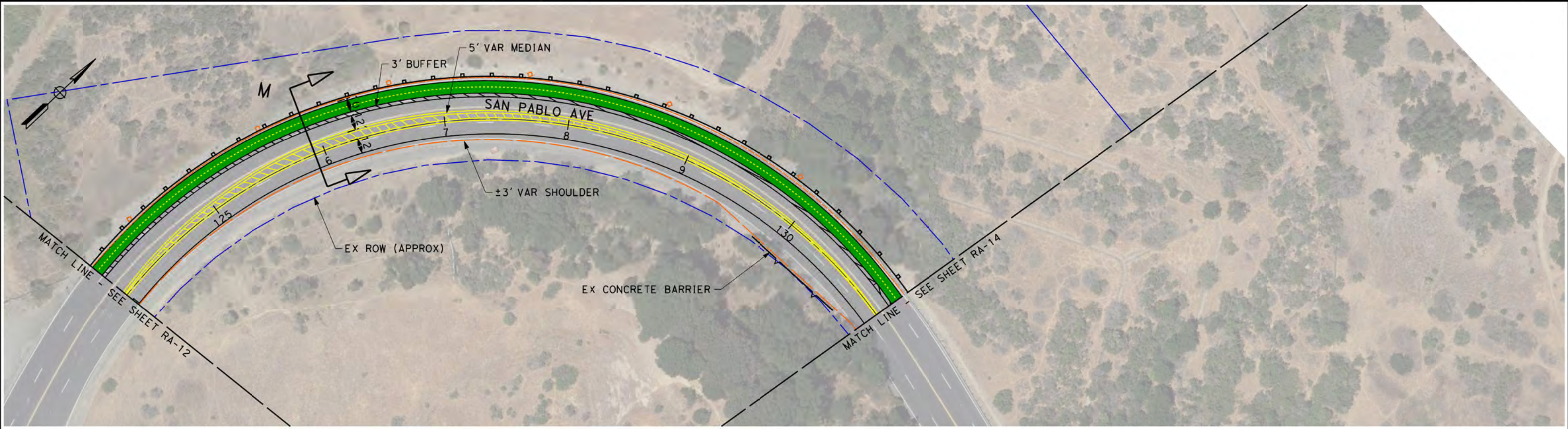
Drawing Status: DRAFT - FOR DISCUSSION ONLY

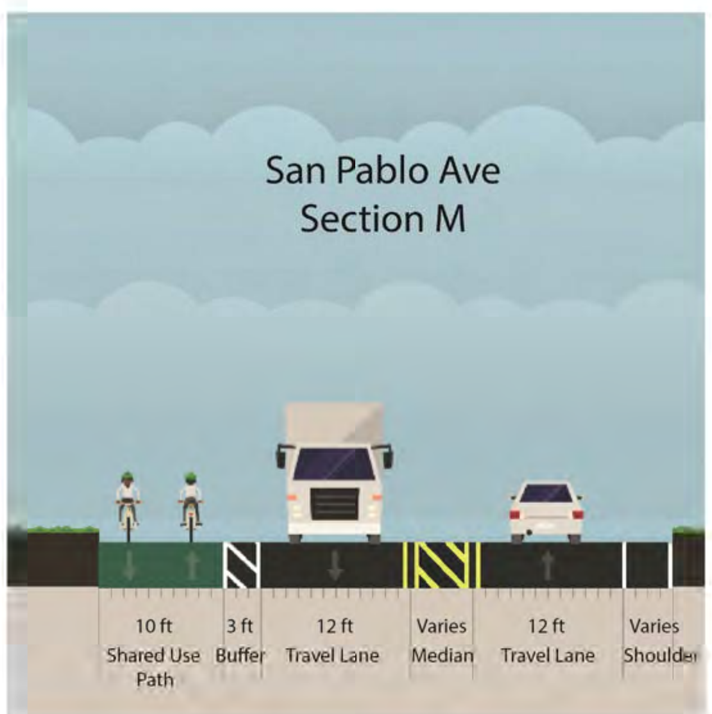
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: RA-12





LEGEND

EXISTING RIGHT OF WAY

BICYCLE FACILITY

EXISTING EDGE OF PAVEMENT

GUARD RAIL

CONCRETE BARRIER

PROPOSED STREETLIGHT

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Stamp

Key Plan

Drawing Title: RECOMMENDED ALTERNATIVE

STA 124+00.00 TO
STA 131+00.00

SEGMENT 13 OF 16

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

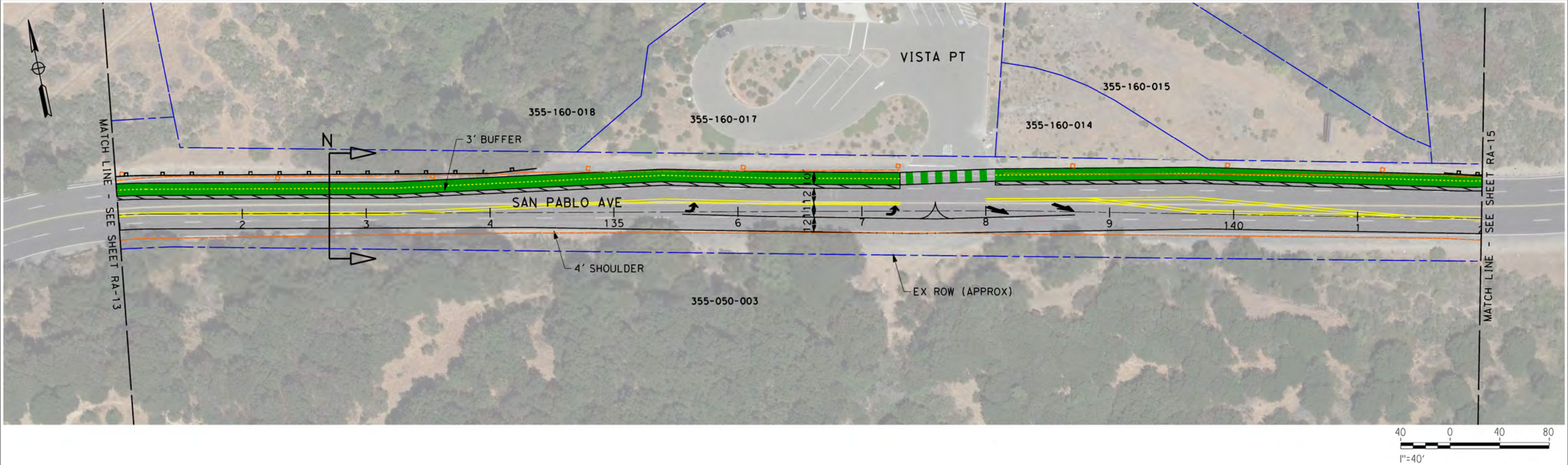
Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

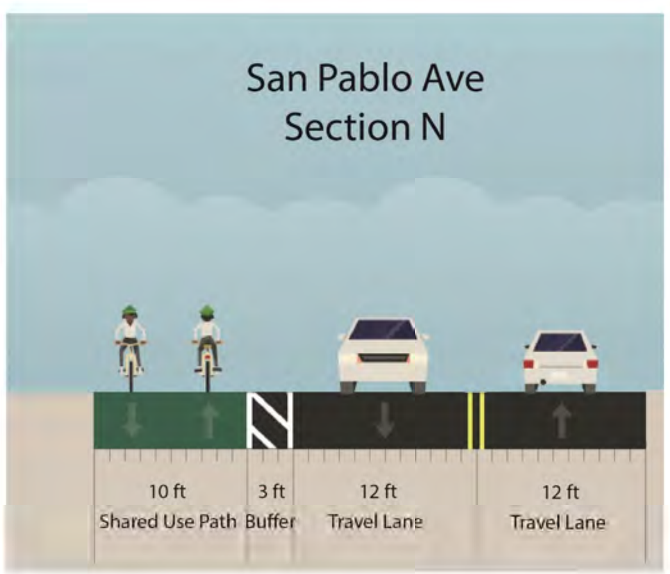
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: RA-13





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

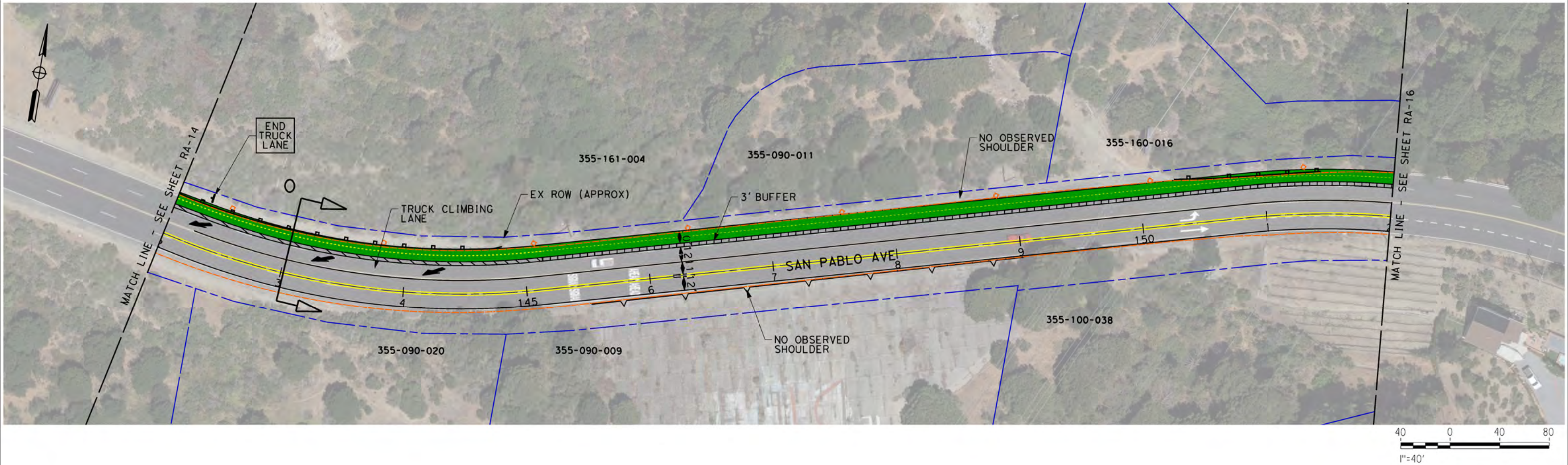
Key Plan

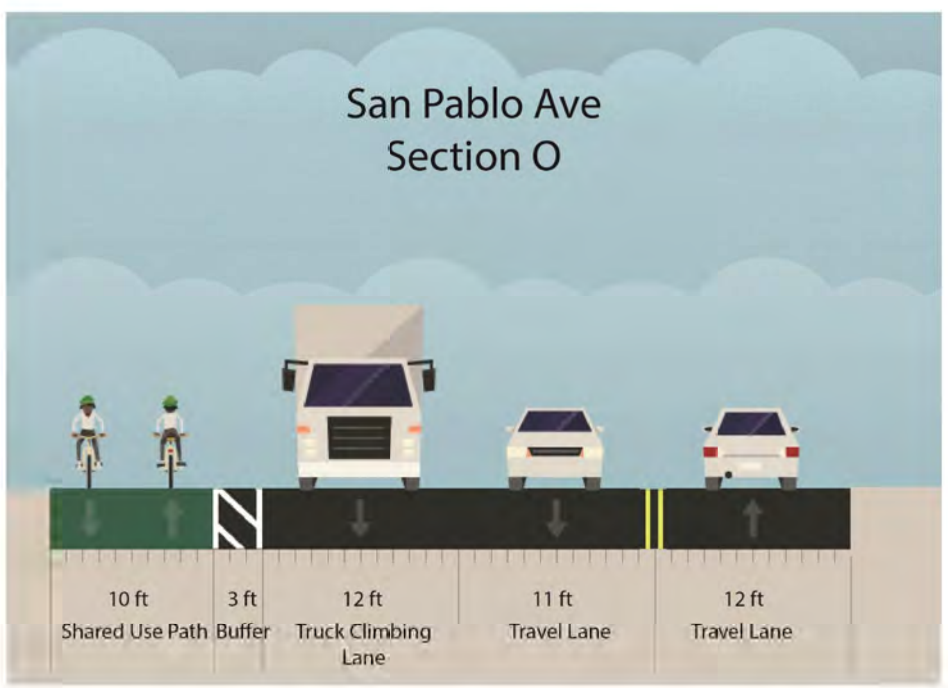
Drawing Title
RECOMMENDED
ALTERNATIVE

STA 131+00.00 TO
STA 142+00.00

SEGMENT 14 OF 16

Scale	1" = 40'
File Name	INFO-ARUP22X34H.DWG
Drawing Status	DRAFT - FOR DISCUSSION ONLY
Drawn By	J. STITT
Checked By	M. ISWALT
Job No	243261
Drawing No	RA-14





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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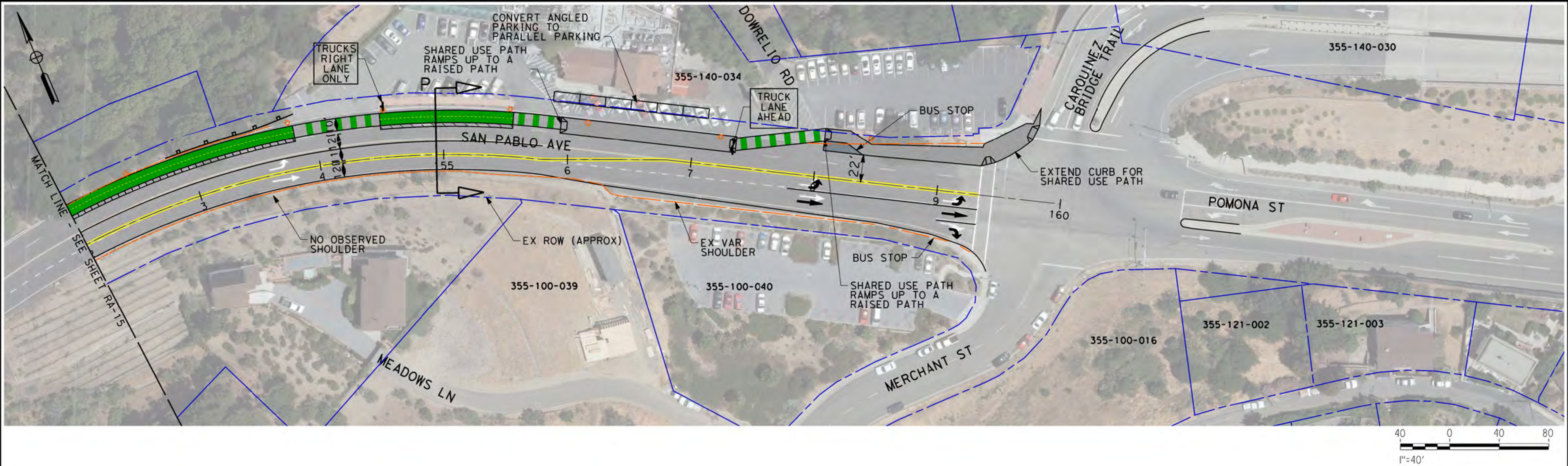
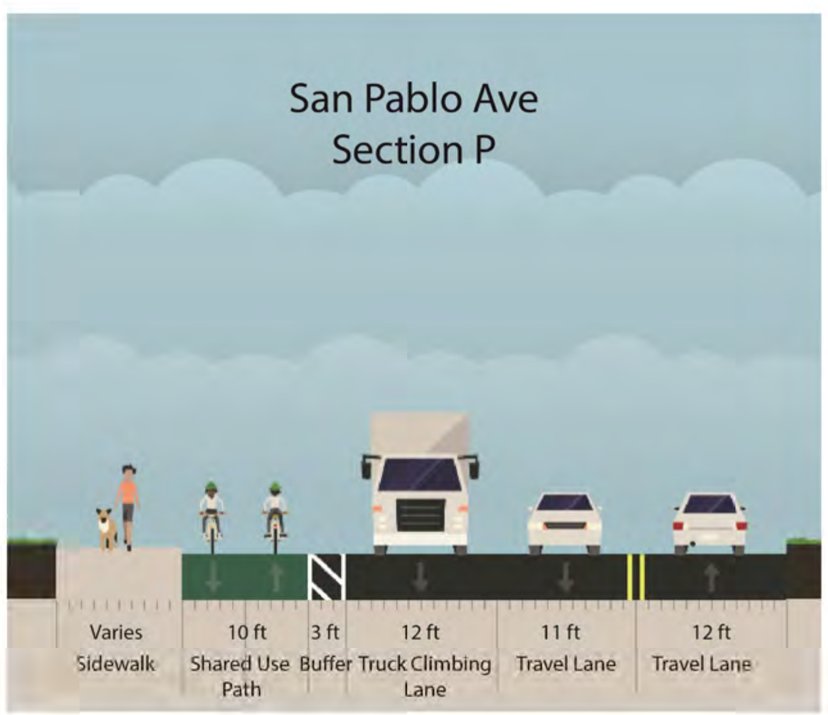
Stamp

Key Plan





LEGEND

- EXISTING RIGHT OF WAY
- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- CONCRETE BARRIER
- PROPOSED STREETLIGHT

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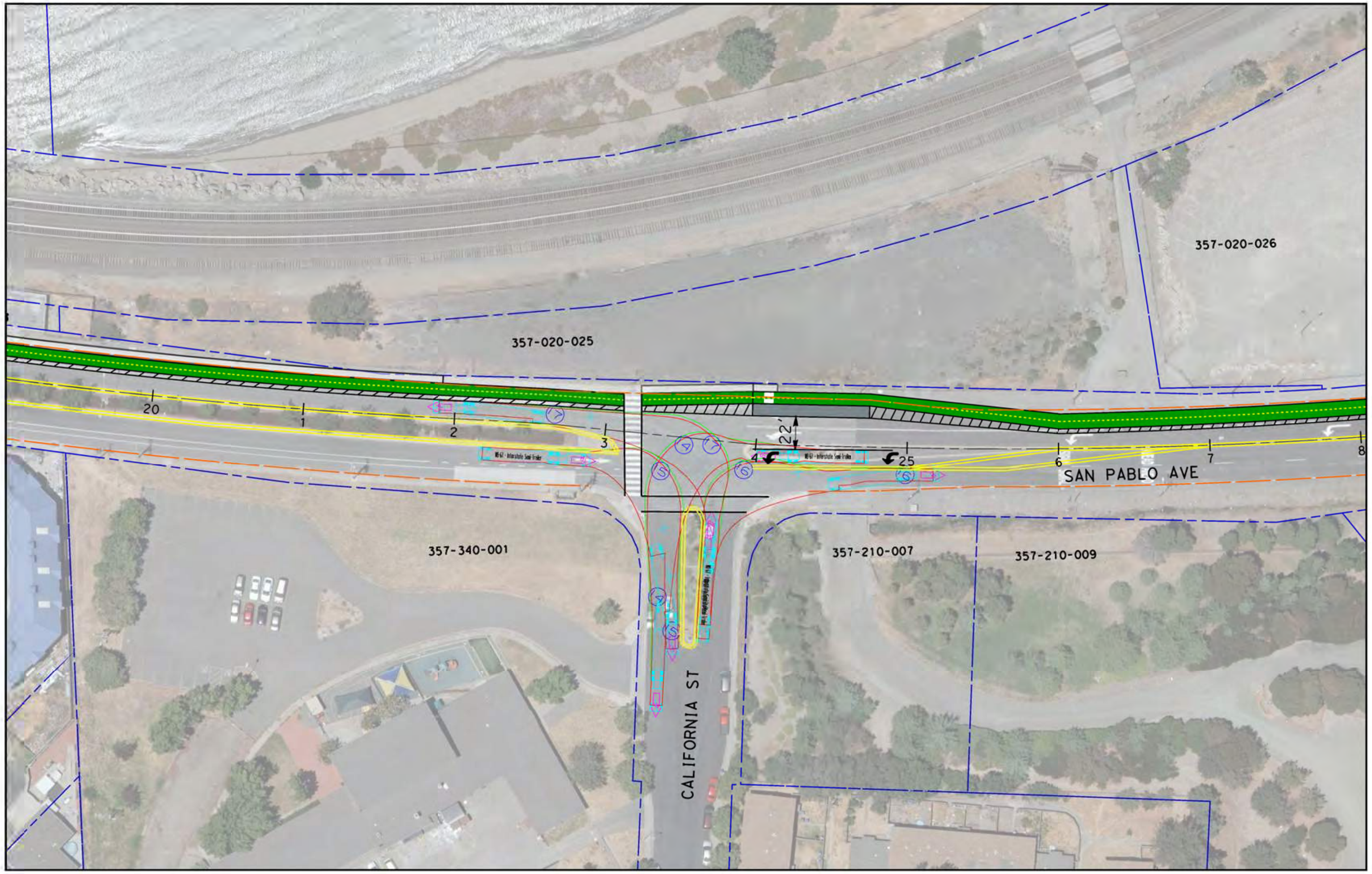
Job Title SAN PABLO AVENUE COMPLETE STREETS STUDY	Stamp	Key Plan
Drawing Title RECOMMENDED ALTERNATIVE STA 152+00.00 TO STA 160+00.00 SEGMENT 16 OF 16	Scale 1" = 40' File Name INFO-ARUP22X34H.DWG Drawing Status DRAFT - FOR DISCUSSION ONLY Drawn By J. STITT Checked By M. ISWALT	Job No 243261 Drawing No RA-16

Appendix B: Truck Turning Movements

SWEPT PATH ANALYSIS
CALIFORNIA ST AND SAN PABLO



LEGEND

BICYCLE FACILITY

EXISTING EDGE OF PAVEMENT

GUARD RAIL

EXISTING RIGHT OF WAY

DESIGN VEHICLE:
WB-67
WIDTH: 8.5 FT
LENGTH: 73.50
W/W RAD: 46.45

40 0 40 80
1"=40'

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: SHARED-USE PATH ALTERNATIVE

SWEPT PATH ANALYSIS

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

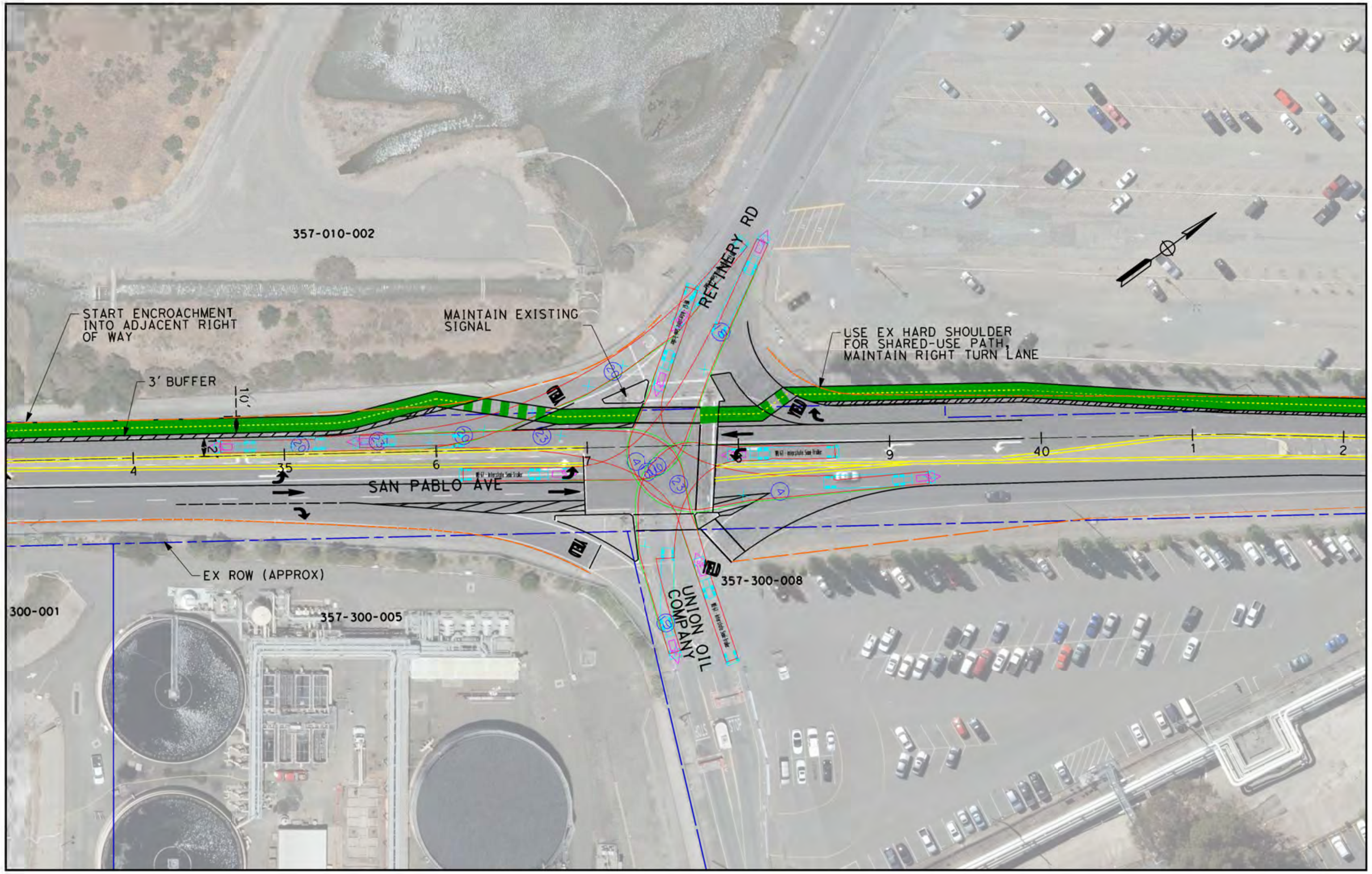
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: SU-03

SWEPT PATH ANALYSIS
REFINEREY RD AND SAN PABLO



LEGEND

BICYCLE FACILITY

EXISTING EDGE OF PAVEMENT

GUARD RAIL

EXISTING RIGHT OF WAY

DESIGN VEHICLE:
WB-67
WIDTH: 8.5 FT
LENGTH: 73.50
W/W RAD: 46.45

40 0 40 80
1"=40'

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Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: SHARED-USE PATH ALTERNATIVE

SWEPT PATH ANALYSIS

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

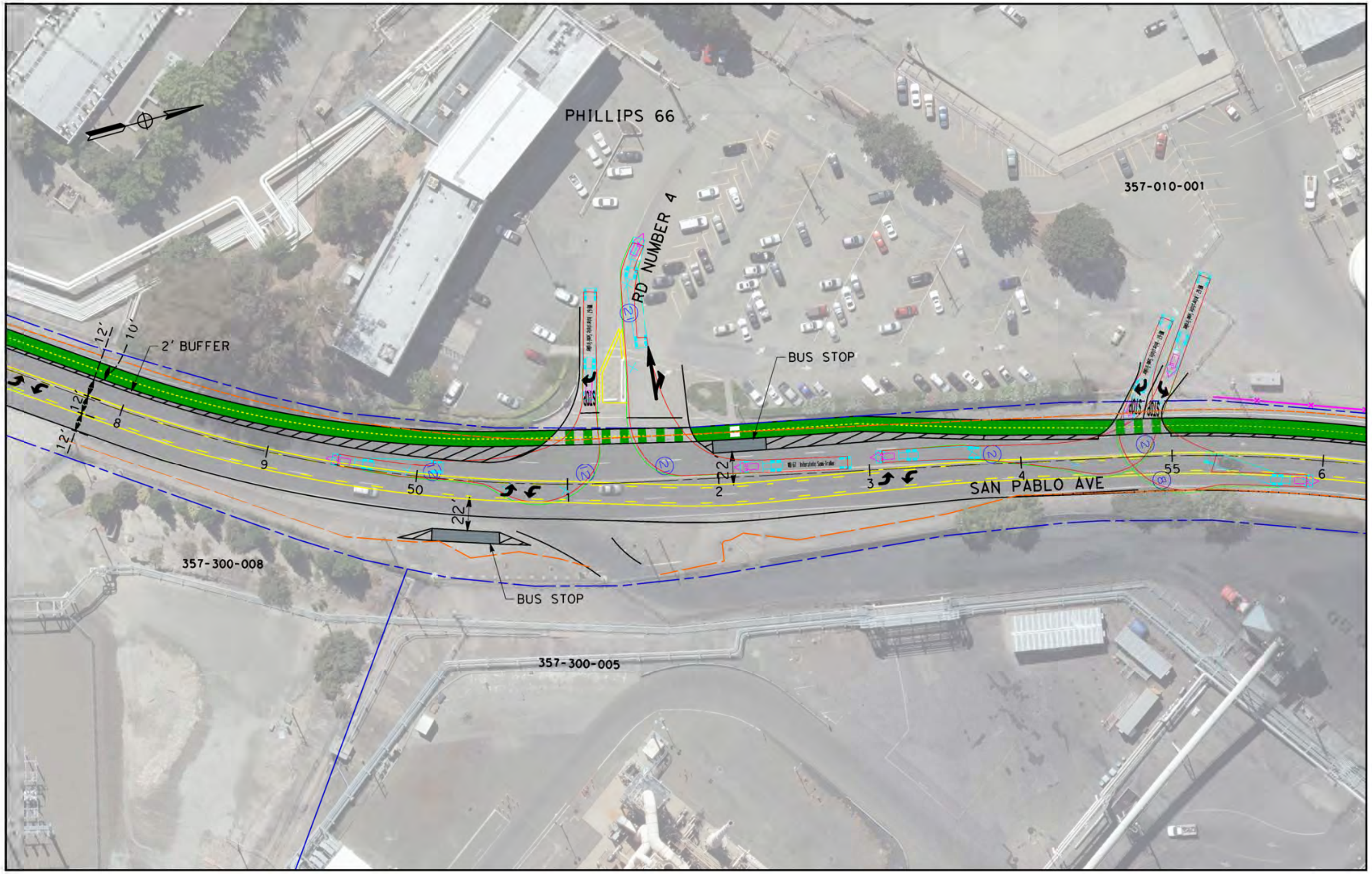
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No

SWEPT PATH ANALYSIS
ROAD NUMBER 4 AND SAN PABLO



LEGEND

BICYCLE FACILITY

EXISTING EDGE OF PAVEMENT

GUARD RAIL

EXISTING RIGHT OF WAY

DESIGN VEHICLE:
WB-67
WIDTH: 8.5 FT
LENGTH: 73.50
W/W RAD: 46.45

40 0 40 80
1"=40'

ARUP
Arup North America Ltd.
560 Mission Street, Suite 700
San Francisco, CA 94105 USA
Tel (415) 957 9445 Fax (415) 957 9096
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NO.	REVISION	DATE 9/21/2016

Client: CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT

Job Title: SAN PABLO AVENUE COMPLETE STREETS STUDY

Stamp

Key Plan

Drawing Title: SHARED-USE PATH ALTERNATIVE

SWEPT PATH ANALYSIS

Scale: 1" = 40'

File Name: INFO-ARUP22X34H.DWG

Drawing Status: **DRAFT - FOR DISCUSSION ONLY**

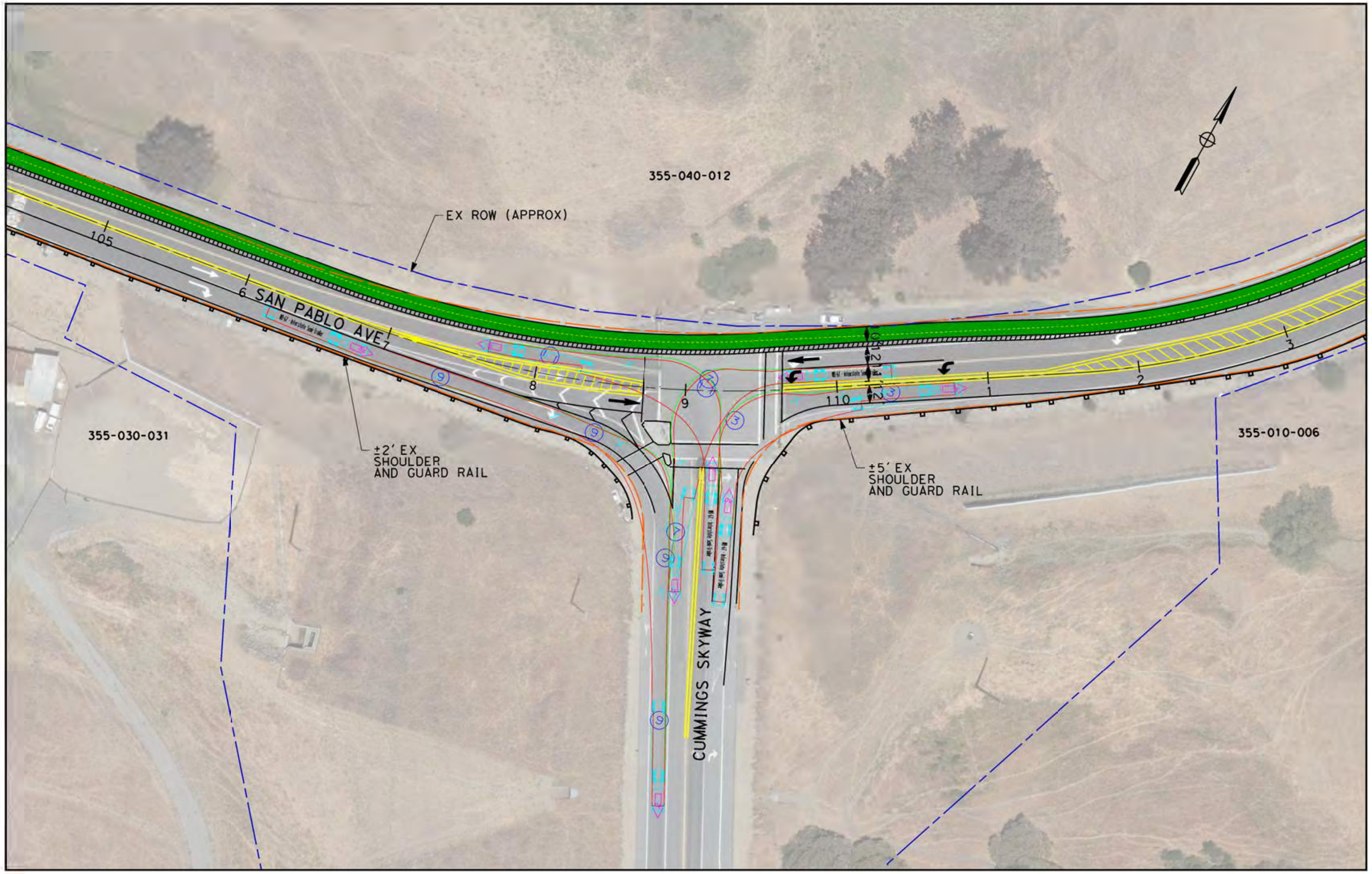
Drawn By: J. STITT

Checked By: M. ISWALT

Job No: 243261

Drawing No: SU-03

SWEPT PATH ANALYSIS
CUMMINGS SKYWAY AND SAN PABLO



LEGEND

BICYCLE FACILITY

EXISTING EDGE OF PAVEMENT

GUARD RAIL

EXISTING RIGHT OF WAY

DESIGN VEHICLE:
WB-67
WIDTH: 8.5 FT
LENGTH: 73.50
W/W RAD: 46.45

40 0 40 80
1"=40'

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NO.	REVISION	DATE 9/21/2016

Client
CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT

Job Title
SAN PABLO AVENUE
COMPLETE STREETS STUDY

Stamp

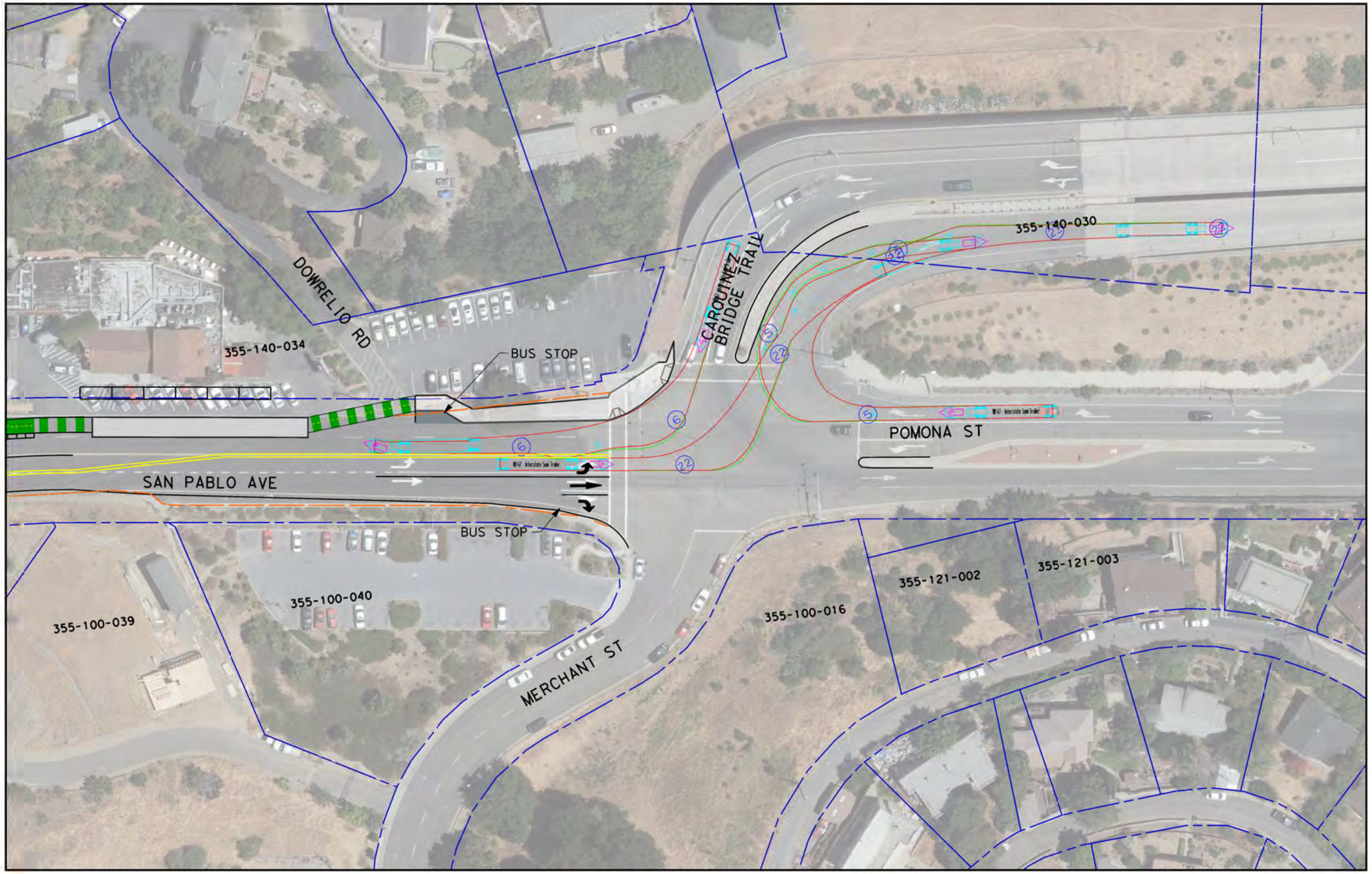
Key Plan

Drawing Title
SHARED-USE PATH
ALTERNATIVE

SWEPT PATH ANALYSIS

Scale 1" = 40'
File Name INFO-ARUP22X34H.DWG
Drawing Status
DRAFT - FOR DISCUSSION ONLY
Drawn By J. STITT
Checked By M. ISWALT
Job No 243261
Drawing No SU-03

SWEPT PATH ANALYSIS
MERCHANT ST AND SAN PABLO



LEGEND

- BICYCLE FACILITY
- EXISTING EDGE OF PAVEMENT
- GUARD RAIL
- EXISTING RIGHT OF WAY

DESIGN VEHICLE:
WB-67
WIDTH: 8.5 FT
LENGTH: 73.50
W/W RAD: 46.45

40 0 40 80
1"=40'

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COMPLETE STREETS STUDY

Stamp

Key Plan

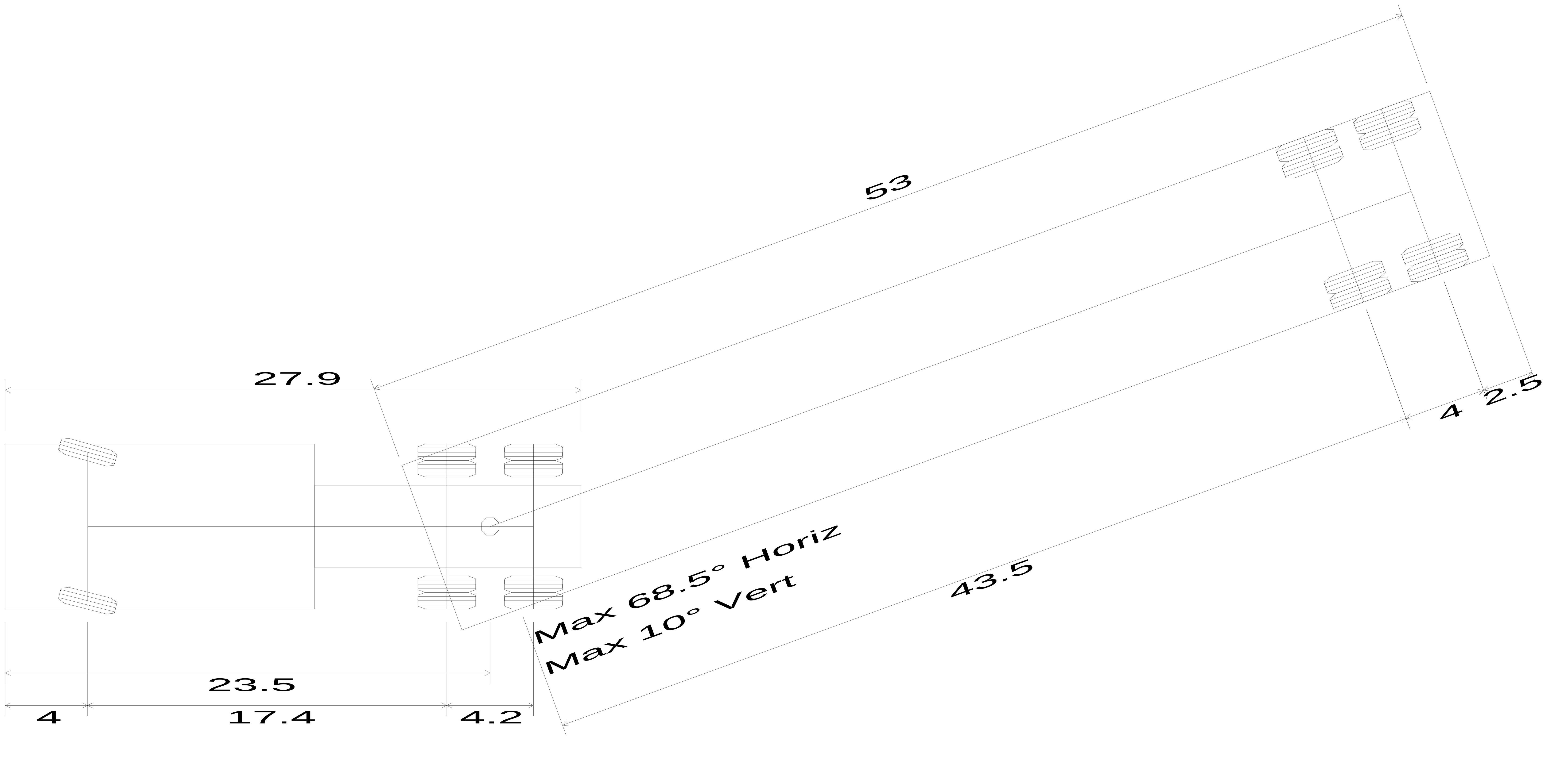
Drawing Title
SHARED-USE PATH ALTERNATIVE

SWEPT PATH ANALYSIS

Scale	1" = 40'
File Name	INFO-ARUP22X34H.DWG
Drawing Status	**DRAFT - FOR DISCUSSION ONLY**
Drawn By	J. STITT
Checked By	M. ISWALT
Job No	243261
Drawing No	

Vehicle Tracking Vehicle Details **Ref: 100033**

Vehicle Name:	**WB-67 - Interstate Semi-Trailer**
Type:	Articulated vehicle
Category	Autodesk
Classification	Autodesk
Source:	AASHTO handbook 2011
Description:	Design vehicle
Notes:	
Unit 1 Name:	WB-67 - Interstate Semi-Trailer Tractor
Unit 2 Name:	WB-67 - Interstate Semi-Trailer Trailer 1



WB-67 - Interstate Semi-Trailer	
Overall Length	73.501ft
Overall Width	8.500ft
Overall Body Height	13.500ft
Min Body Ground Clearance	1.334ft
Max Track Width	8.500ft
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	28.40°

Vehicle Tracking Vehicle Details **Ref: 100033**

Unit Name:	**WB-67 - Interstate Semi-Trailer Tractor**
Type:	Tractor (with driver controlled steering)
Body style:	Articulated Vehicle Tractor (Large Sleeper Cab)
Classification	Autodesk
Source:	AASHTO handbook 2001
Description:	Design vehicle
Notes:	
Datum:	Front Primary Axle
Front Axle(s):	1 Ackerman (axles fixed, wheels turn)
Primary Front Axle Offset:	0.000ft
Effective Front Axle Offset:	0.000ft (Auto Calculated)
Maximum Wheel Angle:	28.400deg (Any Front Wheel)
Status:	Active Non Self-Steered
Track Width:	8.000ft
Total Wheels:	2 (positioned at the ends of the axle)
Tire Width:	0.800ft (Auto Calculated - proportion of Track Width)
Tire Diameter:	2.800ft (Auto Calculated - proportion of Track Width)
Rear Axle(s):	2 Fixed (All axles identical)
Primary Rear Axle Offset:	17.400ft (Innermost Axle behind Front Primary Axle)
Effective Rear Axle Offset:	19.500ft (Auto Calculated)
Maximum Wheel Angle:	Unlimited
Rear Axle Spacing:	4.200ft
Status:	Active Non Self-Steered
Track Width:	8.000ft
Total Wheels:	4 (positioned at the ends of the axle)
Tire Width:	0.800ft (Auto Calculated - proportion of Track Width)
Tire Diameter:	2.800ft (Auto Calculated - proportion of Track Width)
Steering:	Front Axle(s):
Maximum Virtual Steering Angle:	28deg
Lock-to-Lock Time (Fwd/Rev):	6.0sec / 6.0sec
Driver / Pilot	
Driver Offset Longitudinally:	-0.921ft (in front of Front Primary Axle)
Driver / Pilot Offset Laterally:	-1.969ft (Right of Centerline)
Driver Height:	7.382ft (Above ground level)
Front Coupling:	None
Rear Coupling:	Generic
Coupling Offset:	19.500ft (behind Front Primary Axle)
Coupling Height:	2.800ft (Auto Calculated - proportion of Tire Diameter)
Capability:	Can Tow or be Towed
Max. Horizontal Articulation Angle:	68.500deg
Max. Vertical Articulation Angle:	10.000deg
Body outline (plan):	
Outline Type:	Tractor Body

Vehicle Tracking Vehicle Details **Ref: 100033**

Unit Name:	**WB-67 - Interstate Semi-Trailer Trailer 1**
Type:	Trailer (no driver-controlled steering)
Body style:	Articulated Vehicle Semi-Trailer
Classification	Autodesk
Source:	AASHTO handbook 2001
Description:	Design vehicle
Notes:	
Datum:	Front Coupling
Maximum Articulation Angle:	69deg (to previous unit)
Front Axle(s):	None
Rear Axle(s):	2 Fixed (All axles identical)
Primary Rear Axle Offset:	43.500ft (Innermost Axle behind Front Coupling)
Effective Rear Axle Offset:	45.500ft (Auto Calculated)
Maximum Wheel Angle:	Unlimited
Rear Axle Spacing:	4.000ft
Status:	Active Non Self-Steered
Track Width:	8.500ft
Total Wheels:	4 (positioned at the ends of the axle)
Tire Width:	0.850ft (Auto Calculated - proportion of Track Width)
Tire Diameter:	2.975ft (Auto Calculated - proportion of Track Width)
Front Coupling:	Generic
Coupling Offset:	0.000ft (in front of Front Coupling)
Coupling Height:	1.488ft (Auto Calculated - proportion of Tire Diameter)
Capability:	Can Tow or be Towed
Max. Horizontal Articulation Angle:	68.500deg
Max. Vertical Articulation Angle:	10.000deg
Rear Coupling:	None
Body outline (plan):	
Outline Type:	Rectangle
Offset (X,Y):	-3.000ft, 0.000ft
Length / Width:	53.000ft / 8.500ft

Vehicle Tracking Vehicle Details **Ref: 100033**

Appendix C: Cost Estimate

San Pablo Avenue

Contra Costa County

Complete Street Study

Draft 6

Thursday, March 02, 2017

ARUP

Basis of Estimate: San Pablo Avenue Complete Street Study

Prepared By: Arup

3/2/2017

1. GENERAL INTRODUCTION

1. This document has been prepared by Arup to provide an indication of Estimated Costs for Recommended alternative associated with San Pablo Avenue Complete Streets Study.

2. The estimate within this document is a Rough Order of Magnitude Estimate and is not intended to set the budget for the potential works.

3. The Recommended Alternative is divided into three segments. Segment 1: from start to California St. Segment 2: California St. to Cummings Skyway. Segment 3: Cummings Skyway to the end of the project alignment.

2. BASIS AND CONTENT OF ESTIMATE

1. This estimate is classified as a Level 5 within the Arup Cost Estimate Classification Matrix and was generated by means of widely used and accepted estimating practices. Estimate classification matrix is attached within this report.

2. This estimate is based on the requirements shown in the provided conceptual drawings.

3. The estimate has been generated considering the assumptions and exclusions noted below.

3. EXCLUSIONS

1. The costs or impacts of latent environmental issues that result in litigations or development delays.

2. Planning and enquiry costs including legal expenses and fees.

3. Financing charges.

4. Recommended Alternative estimate doesn't include any allowance for utility or pipe relocations.

5. This cost estimate does not include any storm water management and prevention plan.

6. The EBRPD "Future Off-street Shared Path" has been excluded from the scope of this estimate.

4. ASSUMPTIONS MADE IN THE PREPARATION OF THIS ESTIMATE

1. This estimate assumes normal ground conditions, and no allowances have been included for rock excavation or ground decontamination.

2. Costs are reported in Qtr.3 2016 US$

3. A construction estimate contingency of **15%** of the total Direct Costs + Indirects + OH & P has been included. Contingency is intended to cover the likely variability in construction costs related to the defined construction activities, and excludes changes in scope. It is referred to as an estimating contingency as it would cover variability in quantity take-offs, lack of details in design and assumptions made.

4. The estimate assumes a **2.5%** allowance on direct costs for traffic management during roadway works.

5. This cost estimate is a Conceptual Design Cost Estimate as defined by the Association for the Advancement of Cost Engineering International (AACEI) and is intended to be used as a complete study for all intents and purposes of the study, and not to be reproduced, interpreted, or presented in any other way.

6. For Alternative 3, Utility and Pipe relocation costs have been assumed at $250 / LF. This allowance includes all utilities in the impacted alignment, estimated as 4,000 LF.

7. Right of Way Acquisitions, a $35 / SF unit cost has been provided by the Client. In addition, a contingency of 10% has been included in the acquisitions costs and ROW Engineering Costs haven been included based on a percentage of 25% on the acquisition costs.

8. The retaining wall in Alternative 3 has been assumed to be Cast in Place concrete with an average height of 4ft.

9. The assumed barriers vary depending on the section of the alignment. For Alternatives 1 the following assumptions were made:
   i) from California to Summit 1: Plastic Pylons and striping
   ii) from Cummings Skyway to Vista Point: Plastic Pylons and striping
   For Alternatives 2 and 3, concrete Jersey barriers were assumed.
   For Recommended Alternative, concrete Jersey barriers were assumed.

10. Recommended Alternative does not include any utility relocations. Utility poles are assumed to be under franchise and will be paid by others.
    Alternative 3 includes 18 utility pole relocations. Alternatives 1 and 2 do not include any utility relocations. Utility poles are assumed to be under franchise and will be paid by others.

11. All alternatives include a total of 2 signs per intersection.

12. All alternatives include a HAWK Beacon at A Street.
    Recommended Alternative includes an additional HAWK Beacon at California Street (Segment 2).
    Other intersections include only reconfiguration of existing signals.

13. Alternatives include lighting for the path, which assumes 16' light poles with a fixture, electrical pillboxes and conduits and cables. New foundations are assumed to be reinforced concrete foundations 5' high with 2.5' diameter. Spacing between poles is assumed to be 125'.

14. A tree removal allowance has been included for Alternative 3.

15. Fence relocation has been included for Alternative 3 based on the interference of the existing fence with the proposed pathway.

16. Grading has been included for all sidewalk widening activities.

17. Signal modifications have been included as an allowance for all alternatives. It is anticipated that minimal adjustments to signal heads, relocations or reprogramming has to be made.

18. All alternatives include slurry sealing of the entire roadway area.

19. All unit costs include Direct Costs, Indirect Costs and OH & P; the latter corresponds to the Contractor's Home Office Costs and Profit.

20. Indirect costs include items such as but not limited to: Field Office; Office Furniture and Equipment; Management Staff; Field Supervision Staff; Small Tools and Supplies; Health and Safety; Sanitary; IT, Cellphones, and Technology; Engineering Supplies; Monthly Utilities.

21. Soft Costs have been applied based on the following percentages:
    Environmental Permits: **2%** of Total Construction Costs
    Design Engineering: **25%** of Total Construction Costs
    Legal & Other Fees: 1**%** of Total Construction Costs
    Construction Engineering Costs: **15%** of Total Construction Costs

Estimate Classification Matrix

Estimate Level	Estimate Description	Design Phase	Level of Design Completion	Methodology	Accuracy Range
5	Rough Order of Magnitude	Planning Schematic Design	0% to 5%	Parametric Models Capacity Factored Historical Costs	L: -20% to -50% H:+30% to +100%
4	Concept Feasibility	Planning Schematic Design	1% to 15%	Equipment Factored Parametric Models	L: -15% to -30% H:+20% to +50%
3	Budget Authorization	Planning Schematic Design Design Documents	10% to 40%	Unit Costs Assemblies	L: -10% to -20% H:+10% to +40%
2	Budget Control Estimate	Preliminary Design Engineering Design Documents Construction Documents	30% to 70%	Detailed Unit Cost with Forced Detailed Take-Off	L: -5% to -15% H:+5% to +30%
1	Bid	Detailed Design Engineering Constrution Documents	50% to 100%	Detailed Unit Costs Detailed Take-Off Production Based Estimate	L: -2% to -5% H:+3% to +15%

ARUP

San Pablo Avenue Complete Street Study
Summary of Alternative Costs

Prepared by: Arup

3/2/2017

ARUP

Description		Alternative 1 Total Cost	Alternative 2 Total Cost	Alternative 3 Total Cost	Recommended Alternative Total Cost
Striping (removal and installation)		$ 552,800	$ 588,400	$ 382,800	$ 549,900
Signs & signals		$ 218,600	$ 215,400	$ 415,400	$ 325,500
Lighting		$ -	$ 1,362,500	$ 1,362,500	$ 1,362,500
Barriers		$ 71,200	$ 1,179,400	$ 1,179,400	$ 831,100
Sidewalk		$ 427,500	$ 768,500	$ 755,200	$ 677,400
Floating Bus Island		$ 11,800	$ 38,500	$ 16,800	$ 29,300
Demolitions		$ 192,100	$ 356,100	$ 1,817,200	$ 384,000
Pavement		$ 475,000	$ 470,000	$ 903,800	$ 470,400
Landscaping		$ -	$ -	$ 37,600	$ -
Civil Works		$ -	$ -	$ 4,967,400	$ -
Miscellaneous		$ -	$ -	$ 33,500	$ -
Traffic Management		$ 48,800	$ 124,500	$ 474,900	$ 115,900
Total Contract Costs		**$ 1,997,800**	**$ 5,103,300**	**$ 12,346,500**	**$ 4,746,000**
Contingency	15%	$ 299,700	$ 765,500	$ 1,852,000	$ 711,900
Sub-Total Construction Costs		**$ 2,297,500**	**$ 5,868,800**	**$ 14,198,500**	**$ 5,457,900**
Environmental Permits	2%	$ 46,000	$ 117,400	$ 284,000	$ 109,200
Construction Engineering	15%	$ 344,700	$ 880,400	$ 2,129,800	$ 818,700
Total Construction Phase Costs		**$ 2,688,200**	**$ 6,866,600**	**$ 16,612,300**	**$ 6,385,800**
Legal & Other Fees	1%	$ 23,000	$ 58,700	$ 142,000	$ 54,600
Environmental documents		$ 25,000	$ 75,000	$ 150,000	$ 75,000
Design Engineering	25%	$ 574,400	$ 1,467,200	$ 3,549,700	$ 1,364,500
Total Preliminary Engineering Phase Costs		**$ 622,400**	**$ 1,600,900**	**$ 3,841,700**	**$ 1,494,100**
Right of Way Acquisitions			$ 252,000	$ 1,995,000	$ 252,000
Right of Way Acquisitions			**$ 252,000**	**$ 1,995,000**	**$ 252,000**
ROW Contingency	10%		$ 25,200	$ 199,500	$ 25,200
Total Right of Way Acquisitions			**$ 277,200**	**$ 2,194,500**	**$ 277,200**
Right of Way Engineering	25%		$ 69,300	$ 548,700	$ 69,400
Total Right of Way Phase Costs			**$ 346,500**	**$ 2,743,200**	**$ 346,600**
Total Project Costs		**$ 3,310,600**	**$ 8,814,000**	**$ 23,197,200**	**$ 8,227,300**

San Pablo Avenue Complete Street Study

Recommended Alternative

Prepared by: Arup

3/2/2017

ARUP

Description	Unit	Unit Cost	Segment 1 (Start-California St) Bike Path Quantity	Segment 1 Total Cost	Segment 2 (California St-Cummings Skwy) Shared Use Path Quantity	Segment 2 Total Cost	Segment 3 (Cummings Skwy-End) Shared Use Path Quantity	Segment 3 Total Cost
Striping (removal and installation)				**$ 9,100**		**$ 294,700**		**$ 246,100**
Bike Loop Detectors	ea	$ 769	-	$ -	-	$ -	-	$ -
Removing existing paint	lf	$ 4	-	$ -	23,400	$ 94,000	15,300	$ 61,500
Traffic Lanes Painting	lf	$ 3	-	$ -	10,139	$ 34,000	5,858	$ 19,600
New Pavement Markings	ea	$ 769	-	$ -	33	$ 25,400	17	$ 13,100
Bike Lane Painting (continuous) - Included in Barriers	lf	$ -	-	$ -	-	$ -	-	$ -
Buffered paint - Included in Barriers	lf	$ -	-	$ -	-	$ -	-	$ -
Bike Lane Painting (fragmented)	lf	$ 2	-	$ -	615	$ 1,300	490	$ 1,000
Yellow traffic line	lf	$ 2	4,500	$ 9,100	16,180	$ 32,500	7,304	$ 14,700
Remove Pavement Markings (arrows)	ea	$ 482	-	$ -	3	$ 1,500	10	$ 4,900
Median painting	sf	$ 5	-	$ -	19,798	$ 106,000	24,530	$ 131,300
Barriers				**$ 86,400**		**$ 585,500**		**$ 159,200**
Striping	lf	$ 7	12,250	$ 86,400	-	$ -	-	$ -
Barrier - Concrete	lf	$ 68		$ -	8,570	$ 585,500	2,330	$ 159,200
Floating Bus Island				**$ -**		**$ 29,300**		**$ -**
Floating Bus Island	sf	$ 67	-	$ -	437	$ 29,300	-	$ -
Signs & signals				**$ 1,700**		**$ 322,700**		**$ 1,100**
Signs	ea	$ 268	6	$ 1,700	10	$ 2,700	4	$ 1,100
Signal reconfiguration	LS	$100,000	-	$ -	1	$ 100,000		$ -
HAWK Beacon	ea	$110,000	-	$ -	2	$ 220,000		$ -
Lighting				**$ 412,500**		**$ 675,000**		**$ 275,000**
Street Lighting 16' with concrete foundation	ea	$ 12,500	33	$ 412,500	54	$ 675,000	22	$ 275,000
Sidewalk				**$ 480,100**		**$ 4,900**		**$ 192,400**
Grading	sf	$ 2	9,750	$ 19,600	-	$ -	4,564	$ 9,200
Sidewalk	sf	$ 33	9,750	$ 326,200	-	$ -	4,564	$ 152,700
Curb & Gutter	lf	$ 44	3,040	$ 134,300	110	$ 4,900	690	$ 30,500
Demolitions				**$ 145,200**		**$ 238,800**		**$ -**
Demo existing sidewalk / pavement	sf	$ 19	7,750	$ 145,200	2,167	$ 40,600	-	$ -
Remove Existing Median	sf	$ 19	-	$ -	10,579	$ 198,200	-	$ -
Pavement				**$ 127,000**		**$ 259,600**		**$ 83,800**
Hot mix Asphalt - median	sy	$ 45	28	$ 1,300	1,114	$ 50,200	-	$ -
Roadway Slurry Seal	sy	$ 4	28,500	$ 125,700	47,500	$ 209,400	19,000	$ 83,800
Landscaping				**$ -**		**$ -**		**$ -**
Traffic Management				**$ 31,600**		**$ 60,300**		**$ 24,000**
Traffic Management	LS	$ 1	2.5%	$ 31,600	2.5%	$ 60,300	2.5%	$ 24,000
Total Contract Costs				**$ 1,293,600**		**$ 2,470,800**		**$ 981,600**
Contingency			15.0%	$ 194,100	15.0%	$ 370,700	15.0%	$ 147,300
Sub-Total Construction Costs				**$ 1,487,700**		**$ 2,841,500**		**$ 1,128,900**
Environmental Permits			2.0%	$ 29,800	2.0%	$ 56,900	2.0%	$ 22,600
Construction Engineering			15.0%	$ 223,200	15.0%	$ 426,300	15.0%	$ 169,400
Total Construction Costs				**$ 1,740,700**		**$ 3,324,700**		**$ 1,320,900**
Preliminary Engineering			25.0%	$ 372,000	25.0%	$ 710,400	25.0%	$ 282,300
Environmental documents				$ 22,500		$ 37,500		$ 15,000
Legal & Other Fees			1.0%	$ 14,900	1.0%	$ 28,500	1.0%	$ 11,300
Total Construction Phase Costs				**$ 409,400**		**$ 776,400**		**$ 308,600**
Right of Way Acquisitions	sf	$ 35	-	$ -	3,600	$ 126,000	3,600	$ 126,000
Right of Way Acquisitions				**$ -**		**$ 126,000**		**$ 126,000**
Contingency			10%	$ -	10%	$ 12,600	10%	$ 12,600
Total Right of Way Acquisitions				**$ -**		**$ 138,600**		**$ 138,600**
Right of Way Engineering			25%	$ -	25%	$ 34,700	25%	$ 34,700
Total Right of Way Costs				**$ -**		**$ 173,300**		**$ 173,300**
Total Project Costs				**$ 2,150,100**		**$ 4,274,400**		**$ 1,802,800**

San Pablo Avenue Complete Street Study

Alternative 1: Bike Lane

Prepared by: Arup

3/2/2017

			Alternative 1: Bike Lane	
Description	**Unit**	**Unit Cost**	**Quantity**	**Total Cost**
Striping (removal and installation)				**$ 552,800**
Bike Loop Detectors	ea	$ 769	5	$ 3,900
Removing existing paint	lf	$ 4	28,750	$ 115,500
Traffic Lanes Painting	lf	$ 3	5,500	$ 18,400
New Pavement Markings	ea	$ 769	50	$ 38,500
Bike Lane Painting (continuous)	lf	$ 2	23,500	$ 47,200
Bike Lane Painting (fragmented)	lf	$ 2	2,250	$ 4,600
Yellow traffic line	lf	$ 2	20,500	$ 41,200
Median painting	sf	$ 5	50,250	$ 269,000
Remove Pavement Markings (arrows)	ea	$ 482	30	$ 14,500
Barriers				**$ 71,200**
Plastic Pylons & Striping	lf	$ 8	8,750	$ 71,200
Floating Bus Island				**$ 11,800**
Floating Bus Island	sf	$ 67	175	$ 11,800
Signs&Signals				**$ 218,600**
Signs	ea	$ 268	32	$ 8,600
Signal Reconfiguration	LS	$ 100,000	1	$ 100,000
HAWK Beacon	ea	$ 110,000	1	$ 110,000
Sidewalk				**$ 427,500**
Grading	sf	$ 2	9,250	$ 18,600
Sidewalk	sf	$ 33	9,250	$ 309,500
Curb & Gutter	lf	$ 44	2,250	$ 99,400
Demolitions				**$ 192,100**
Remove Existing Median	sf	$ 19	10,250	$ 192,100
Pavement				**$ 475,000**
Hot mix Asphalt - median	sy	$ 45	1,250	$ 56,300
Roadway Slurry Seal	sy	$ 4	95,000	$ 418,700
Landscaping				**$ -**
Traffic Management				**$ 48,800**
Traffic Management	LS	$ 1,949,000	2.5%	$ 48,800
Total Contract Costs				**$ 1,997,800**
Contingency			15.0%	$ 299,700
Sub-Total Construction Costs				**$ 2,297,500**
Environmental Permits			2.0%	$ 46,000
Construction Engineering			15.0%	$ 344,700
Total Construction Phase Costs				**$ 2,688,200**

Design Engineering	25.0%	$ 574,400
Environmental documents		$ 25,000
Legal & Other Fees	1.0%	$ 23,000
Total Preliminary Engineering Phase		**$ 622,400**

Total Project Costs		**$ 3,310,600**

San Pablo Avenue Complete Street Study

Alternative 2: Shared Use Path

Prepared by: Arup

3/2/2017

ARUP

Description	Unit	Unit Cost	Alternative 2: Shared Use Path Quantity	Total Cost
Striping (removal and installation)				**$ 588,400**
Bike Loop Detectors	ea	$ 769	-	$ -
Removing existing paint	lf	$ 4	38,750	$ 155,600
Traffic Lanes Painting	lf	$ 3	16,750	$ 56,100
New Pavement Markings	ea	$ 769	50	$ 38,500
Bike Lane Painting (continuous) - Included in Barriers	lf	$ -	-	$ -
Buffered paint - Included in Barriers	lf	$ -	-	$ -
Bike Lane Painting (fragmented)	lf	$ 2	1,250	$ 2,600
Yellow traffic line	lf	$ 2	29,500	$ 59,300
Remove Pavement Markings (arrows)	ea	$ 482	15	$ 7,300
Median painting	sf	$ 5	50,250	$ 269,000
Barriers				**$ 1,179,400**
Striping	lf	$ 7	12,250	$ 86,400
Barrier - Concrete	lf	$ 68	16,000	$ 1,093,000
Floating Bus Island				**$ 38,500**
Floating Bus Island	sf	$ 67	575	$ 38,500
Signs & signals				**$ 215,400**
Signs	ea	$ 268	20	$ 5,400
Signal reconfiguration	LS	$ 100,000	1	$ 100,000
HAWK Beacon	ea	$ 110,000	1	$ 110,000
Lighting				**$ 1,362,500**
Street Lighting 16' with concrete foundation	ea	$ 12,500	109	$ 1,362,500
Sidewalk				**$ 768,500**
Grading	sf	$ 2	16,750	$ 33,700
Sidewalk	sf	$ 33	16,750	$ 560,300
Curb & Gutter	lf	$ 44	3,950	$ 174,500
Demolitions				**$ 356,100**
Demo existing sidewalk / pavement	sf	$ 19	8,750	$ 164,000
Remove Existing Median	sf	$ 19	10,250	$ 192,100
Pavement				**$ 470,000**
Hot mix Asphalt - median	sy	$ 45	1,139	$ 51,300
Roadway Slurry Seal	sy	$ 4	95,000	$ 418,700
Landscaping				**$ -**
Traffic Management				**$ 124,500**
Traffic Management	LS	$ 4,978,800	2.5%	$ 124,500
Total Contract Costs				**$ 5,103,300**
Contingency			15.0%	$ 765,500
Sub-Total Construction Costs				**$ 5,868,800**
Environmental Permits			2.0%	$ 117,400
Construction Engineering			15.0%	$ 880,400
Total Construction Costs				**$ 6,866,600**

Preliminary Engineering			25.0%	$ 1,467,200
Environmental documents				$ 75,000
Legal & Other Fees			1.0%	$ 58,700
Total Construction Phase Costs				**$ 1,600,900**

Right of Way Acquisitions	sf	$ 35	7,200	$ 252,000
Right of Way Acquisitions				**$ 252,000**
Contingency			10%	$ 25,200
Total Right of Way Acquisitions				**$ 277,200**
Right of Way Engineering			25%	$ 69,300
Total Right of Way Costs				**$ 346,500**

Total Project Costs	**$ 8,814,000**

San Pablo Avenue Complete Street Study

Alternative 3: Widened Shared Path

Prepared by: Arup

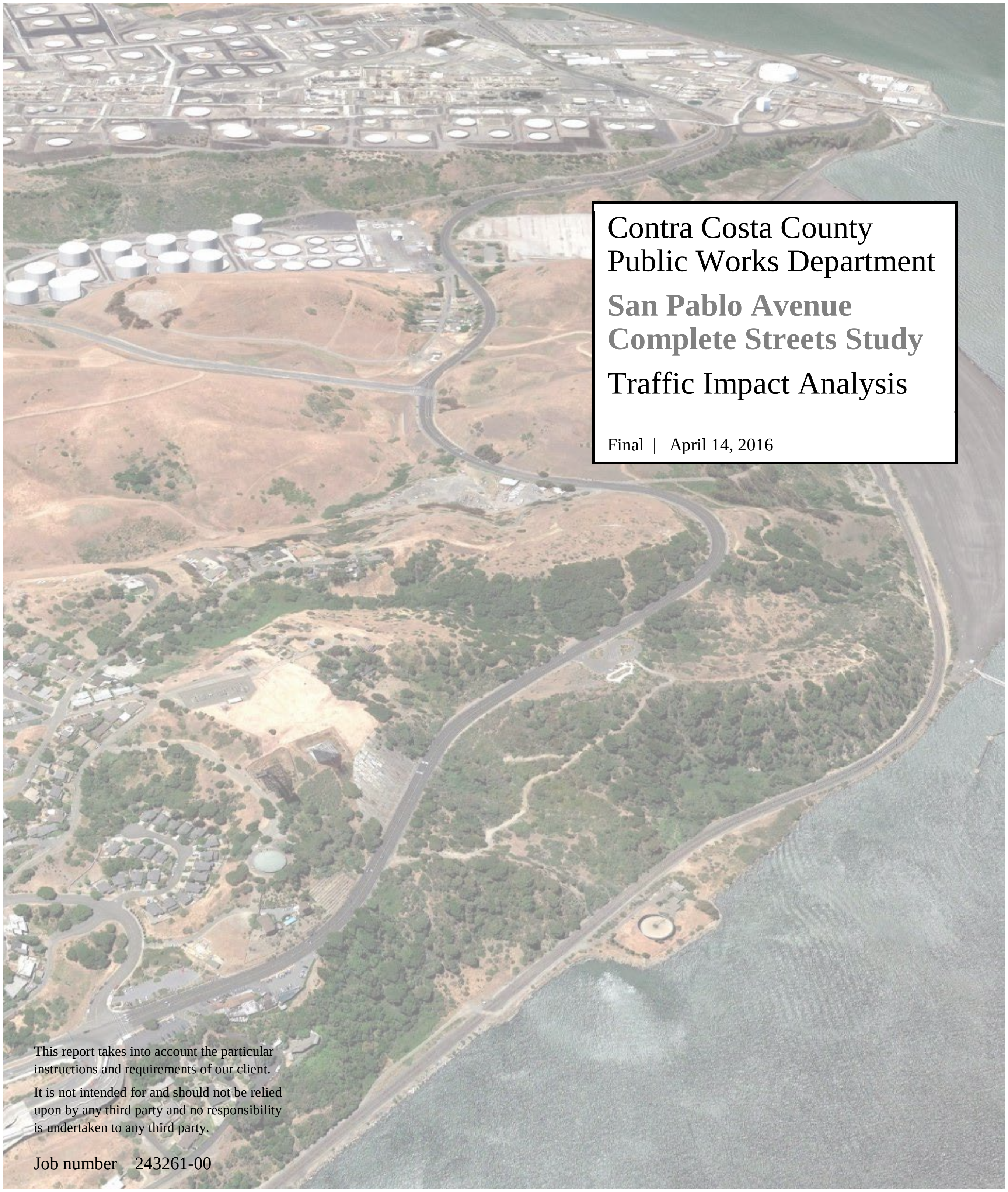
3/2/2017

ARUP

Description	Unit	Unit Costs	Alternative 3: Widened Shared Use Path Quantity	Total Cost
Striping (removal and installation)				**$ 382,800**
Bike Loop Detectors	ea	$ 769	-	$ -
Removing existing paint	lf	$ 4	-	$ -
Traffic Lanes Painting	lf	$ 3	5,250	$ 17,600
New Pavement Markings	ea	$ 769	35	$ 27,000
Bike Lane Painting (continuous) - included in Barriers	lf	$ -	-	$ -
Buffered paint - Included in Barriers	lf	$ -	-	$ -
Bike Lane Painting (fragmented)	lf	$ 2	1,250	$ 2,600
Yellow traffic line	lf	$ 2	29,500	$ 59,300
Remove Pavement Markings (arrows)	ea	$ 482	15	$ 7,300
Median painting	sf	$ 5	50,250	$ 269,000
Barriers				**$ 1,179,400**
Striping	lf	$ 7	12,250	$ 86,400
Barrier - Concrete	lf	$ 68	16,000	$ 1,093,000
Floating Bus Island				**$ 16,800**
Floating Bus Island	sf	$ 67	250	$ 16,800
Signs & Signals				**$ 415,400**
Signs	ea	$ 268	20	$ 5,400
Utility Pole relocation	ea	$ 6,690	-	$ -
Signal reconfiguration	LS	$ 300,000	1	$ 300,000
HAWK Beacon	ea	$ 110,000	1	$ 110,000
Lighting				**$ 1,362,500**
Street Lighting 16' with concrete foundation	ea	$ 12,500	109	$ 1,362,500
Sidewalk				**$ 755,200**
Grading	sf	$ 2	16,500	$ 33,200
Sidewalk	sf	$ 33	16,500	$ 552,000
Curb & Gutter	lf	$ 44	3,850	$ 170,000
Demolitions				**$ 1,817,200**
Remove Existing Median	sf	$ 19	10,250	$ 192,100
Demo existing sidewalk / pavement	sf	$ 19	86,750	$ 1,625,100
Pavement				**$ 903,800**
Hot mix Asphalt - median	sy	$ 45	1,139	$ 51,300
Hot mix Asphalt - Bike lane	sy	$ 45	9,639	$ 433,800
Roadway Slurry Seal	sy	$ 4	95,000	$ 418,700
Civil Works				**$ 4,967,400**
Retaining wall	sf	$ 234	15,500	$ 3,629,400
Utility relocation / Pipe (Allowance)	LS	$ 1,338,000	1	$ 1,338,000
Landscaping				**$ 37,600**
Tree removal	LS	$ 4,014	1	$ 4,100
Landscaping allowance	LS	$ 33,450	1	$ 33,500
Miscellaneous				**$ 33,500**
Fence relocation	lf	$ 13	2,500	$ 33,500
Traffic Management				**$ 474,900**
Traffic Management	LS	$ 11,871,600	4.0%	$ 474,900
Total Direct + Indirects + OH & P				**$ 12,346,500**
Contingency			15.0%	$ 1,852,000

San Pablo Avenue Complete Street Study					
Alternative 3: Widened Shared Path					
Sub-Total Construction Costs				**$**	**14,198,500**
Environmental Permits			2%	$	284,000
Construction Engineering			15%	$	2,129,800
Total Construction Costs				**$**	**16,612,300**
Design Engineering			25%	$	3,549,700
Environmental documents				$	150,000
Legal & Other Fees			1%	$	142,000
Total Soft Costs				**$**	**3,841,700**
Right of Way Acquisitions	sf	$ 35	57,000	$	1,995,000
Right of Way Acquisitions				**$**	**1,995,000**
Contingency			10%	$	199,500
Total Right of Way Acquisitions				**$**	**2,194,500**
Right of Way Engineering			25%	$	548,700
Total Right of Way Costs				**$**	**2,743,200**
Total Project Costs				**$**	**23,197,200**

Appendix D: Traffic Study



Contra Costa County Public Works Department

San Pablo Avenue Complete Streets Study

Traffic Impact Analysis

Final | April 14, 2016

Job number 243261-00

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Contra Costa County Public Works Department

ARUP

Contents

1 Introduction

Arup has completed a traffic impact analysis for the San Pablo Avenue Complete Streets Study. This study is evaluating the feasibility of providing improved pedestrian and bicycle facilities on San Pablo Avenue between Rodeo and Crockett in unincorporated Contra Costa County. Currently, this segment of San Pablo Avenue has no bicycle facilities and only very limited sidewalks and it has been identified as a planned Bay Trail segment by the Association of Bay Area Governments (ABAG).

The study will consider implementing a road diet on this segment of San Pablo Avenue by removing one travel lane and converting the roadway from four lanes (two travel lanes in each direction) to three (one travel lane in each direction with left turn pockets, center medians, or a truck climbing lane). The lane reduction could then be used to accommodate dedicated pedestrian and bicycle facilities.

The traffic analysis presented in this memorandum documents how this potential change to San Pablo Avenue could affect traffic operations along the corridor. The analysis methodologies presented in this memorandum are consistent with best practices and are consistent with relevant analysis guidelines published in *Technical Procedures* (Contra Costa Transportation Authority, 2013).

2 Corridor Context

The study area is a three-mile segment of San Pablo Avenue from Lone Tree Point and Parker Avenue in Rodeo to the base of the Carquinez Bridge bicycle and pedestrian shared-use path (SUP) in Crockett. Figure 1 presents the study area, the ten study intersections, and six key segments along the corridor that are described in Table 1 below. Along most of the study corridor, San Pablo Avenue is a four-lane (two lanes each direction) undivided arterial with a 45 mph speed limit, no sidewalks, and no dedicated bike facilities. However, between Lone Tree Point and California St, the speed limit was recently reduced to 35 mph.

Figure 1: Study Corridor with Key Study Segments

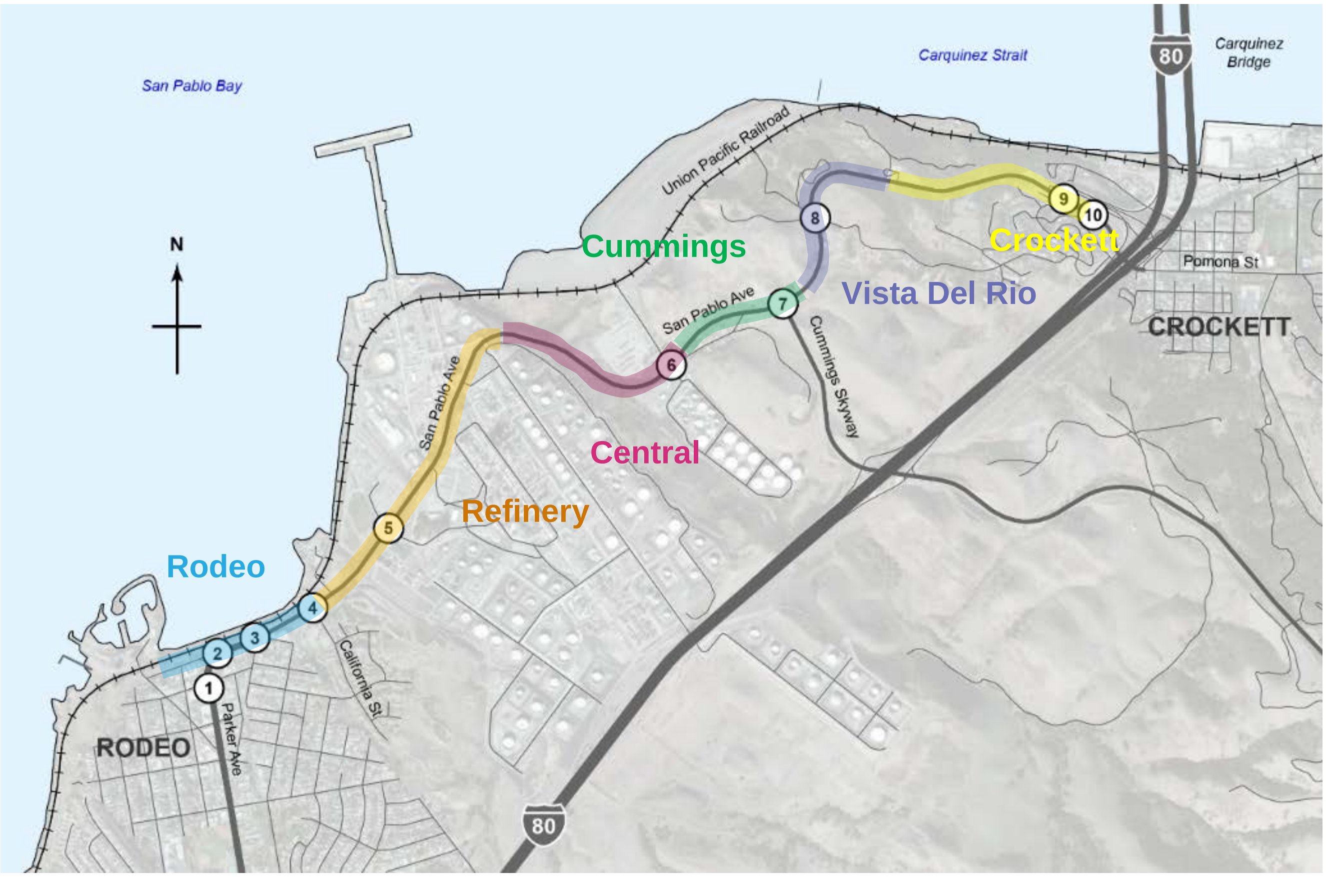


Table 1: Descriptions of Corridor Segments

Segment	Street Description/Land Use Context
Rodeo Lone Tree Point to California St	Bike lanes on Parker Avenue with sidewalks Local commercial uses with multiple driveways, on-street parking
Refinery California St to the summit east of Phillips 66	No bike lanes or sidewalks Oil refinery and heavy industrial uses Steep grades east of Refinery Rd
Central Summit to east of A St	No bike lanes or sidewalks Petroleum storage at A St; some rural residential Some moderate grades
Cummings A St to Cummings Skwy	No bike lanes or sidewalks Long steep sustained grades with moderate truck volumes
Vista Del Rio Cummings Skwy to Vista Point	No bike lanes or sidewalks Long steep sustained grades with moderate truck volumes
Crockett Vista Point to I-80 Ramps/Merchant St	No bike lanes or sidewalks Major on and off-ramps serving I-80 A large restaurant traffic generator near the ramps Some moderate grades approaching the ramps

3 Traffic Context

To identify existing traffic conditions, traffic counts were collected at multiple locations during the week of May 12, 2015. Machine "tube" counts, which record hourly volumes in each direction over a 24-hour period, were collected at three locations in the study corridor:

- Parker Ave., South of 1st St.
- San Pablo Ave., West of Cummings Skyway
- San Pablo Ave., East of Cummings Skyway

Table 2 summarizes the average daily traffic (ADT) volumes for the three count locations. Parker Avenue has the highest daily traffic, although peak hour volumes are higher on the West of Cummings Skyway segment. Traffic volumes and truck activity decrease significantly on San Pablo Avenue to the east of Cummings Skyway. Most trucks use Cummings Skyway to travel between Phillips 66 and NuStar and I-80. Overall, traffic volumes are quite low on all three segments for two and four-lane arterials, even after accounting for higher truck percentages.

Table 2: Average Daily Traffic (ADT) Volumes, by Segment

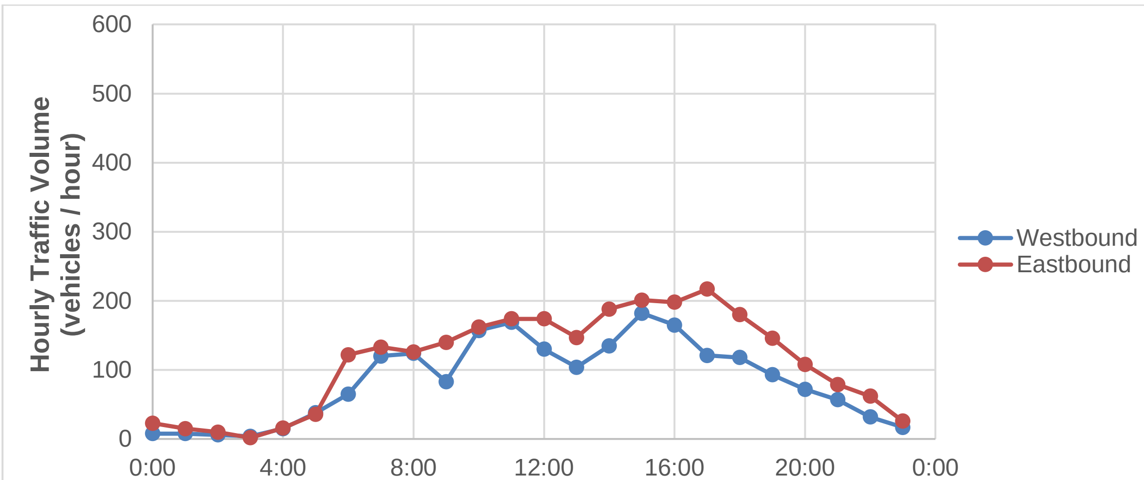
Location	**Average Daily Traffic (vehicles)**
Parker Ave, South of 1st Ave	4,700
San Pablo Ave., West of Cummings Skyway	3,900
San Pablo Ave., East of Cummings Skyway	2,200

Vehicle classification counts were also collected at the two segments east and west of Cummings Skyway. These counts identify the percentage of passenger cars, trucks, etc. Peak period intersection turning movement counts were also collected and are reported in the traffic analysis section.

3.1 Parker Ave., South of 1st St.

Figure 2 presents the hourly traffic volumes on Parker Avenue south of 1st St. Traffic volumes are relatively steady throughout the day and do not show a strong morning or afternoon peak, indicating that this segment does not serve as a major commute route. Also, hourly volumes in each direction rarely exceed 200 vehicles per hour. The capacity of a single travel lane (San Pablo Avenue has one travel lane in each direction along this segment) is approximately 800 vehicles per hour. Therefore, volumes on this segment represent only 25% of its available peak hour capacity.

Figure 2: Hourly Traffic Volumes, Parker Ave., South of 1st St.



3.2 San Pablo Ave., West of Cummings Skyway

Figure 3 presents the hourly traffic volumes on San Pablo Avenue west of Cummings Skyway. The count location was approximately 1,000’ west of the Cummings Skyway intersection. Peak traffic volumes at this location are higher than the Parker Avenue segment and do show strong peak activity between 6:00-7:00 AM in the westbound direction and 3:00-4:00 PM in the eastbound direction. This roughly coincides with work shifts at the Phillips 66 refinery and the NuStar storage facility. During the morning and afternoon peak times, hourly traffic volumes in the peak direction are approximately 400 vehicles per hour. The capacity of two travel lanes (San Pablo Avenue has two travel lanes in each direction along this segment) is approximately 1,600 vehicles per hour (800 vehicles per hour per lane * two lanes). Therefore, volumes on this segment also represent only 25% of its available peak hour capacity.

Figure 3: Hourly Traffic Volumes, San Pablo Ave., West of Cummings Skyway

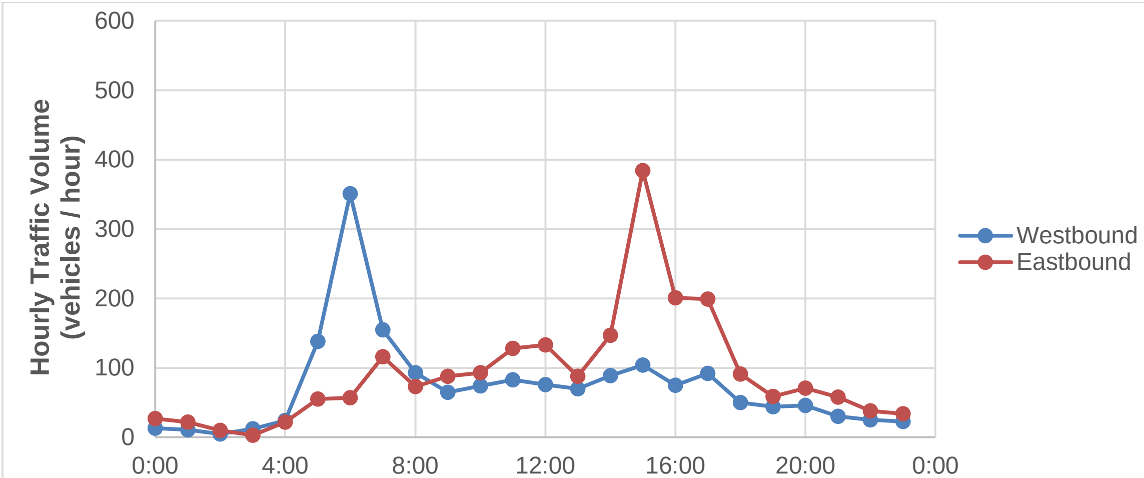


Table 3 summarizes the vehicle classification count for this segment. Trucks represent 23% of total vehicles along this segment.

Table 3: Vehicle Types, San Pablo Ave., West of Cummings Skyway

Vehicle Type	**Proportion of Total Vehicles**
Passenger Cars	61 %
Long 2-Axle	15 %
Trucks	23 %
Buses	0.4 %
Bicycles	1 %
TOTAL	100 %

3.3 San Pablo Ave., East of Cummings Skyway

Figure 4 presents the hourly traffic volumes on San Pablo Avenue East of Cummings Skyway. The count location was approximately 1,000' east of the Cummings Skyway intersection. Traffic volumes at this location are the lowest of the three segments and show only moderate peak activity in the morning and afternoon periods. During the morning and afternoon peak times, hourly traffic volumes in the peak direction are approximately 200 vehicles per hour. The capacity of two travel lanes (San Pablo Avenue has two travel lanes in each direction along this segment) is approximately 1,600 vehicles per hour (800 vehicles per hour per lane * two lanes). Therefore, volumes on this segment represent only 12% of its available peak hour capacity.

Figure 4: Hourly Traffic Volumes, San Pablo Ave., East of Cummings Skyway

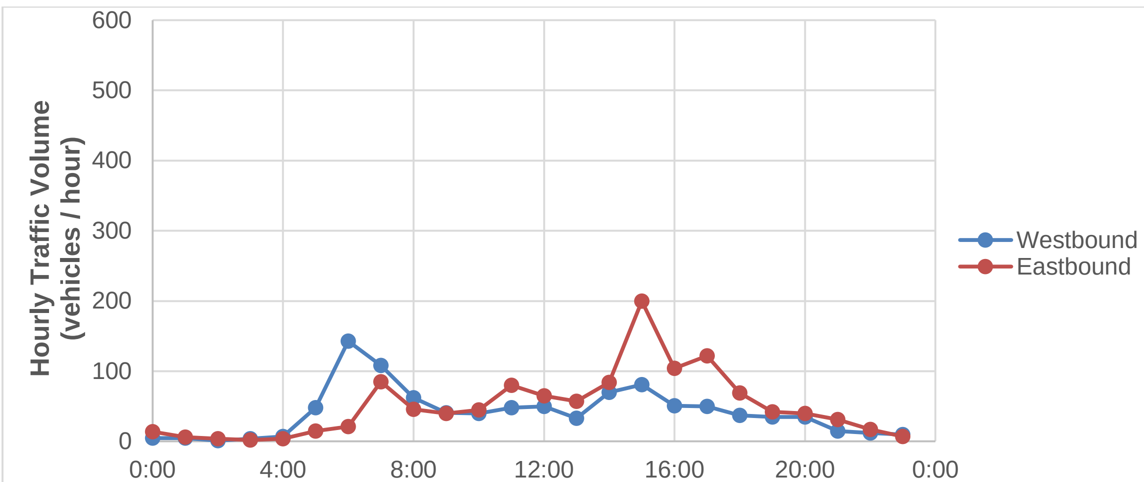


Table 4 summarizes the vehicle classification count for this segment. Trucks only represent 12% of total vehicles along this segment, lower than the segment to the west of Cummings Skyway.

Table 4: Vehicle Types, San Pablo Ave., East of Cummings Skyway

Vehicle Type	**Proportion of Total Vehicles**
Passenger Cars	71 %
Long 2-Axle	13 %
Trucks	12 %
Buses	2 %
Bicycles	1 %
TOTAL	100 %

4 Traffic Analysis

A Synchro traffic operations model was developed to analyze the ten study area intersections in greater detail and to assess the feasibility of removing a travel lane to provide space for pedestrian and bicycle improvements. For each intersection, turning movement counts were collected for the AM (7 AM – 9 AM) and PM (4 PM – 6 PM) peak periods of travel during a mid-week day in May 2015. These time periods represent the typical peak period for “regional” Bay Area travel. The study intersections in Rodeo and east of Cummings Skyway experience this “regional” peak hour.

Additional counts were collected at key intersections near the Phillips 66 refinery to capture the refinery’s peak period, which occurs earlier than the typical Bay Area peak. The additional counts were collected for an “early AM” and “early PM” peak periods (6 AM – 7 AM and 3 PM – 4 PM, respectively) to coincide with this “refinery” peak hour. Intersections at Refinery Road, the Phillips 66 administrative building, A Street, and Cummings Skyway were collected for this earlier “refinery” peak. The peak hour (60-minutes) of traffic within each of these two-hour periods is used for the traffic analysis.

4.1 Criteria and Alternatives

The analysis uses methodologies published in the *2000 Highway Capacity Manual* (Transportation Research Board, 2000) to determine the intersection level-of-service (LOS). The LOS methodologies estimate delay at the intersection and then assign a qualitative LOS rating that characterizes overall traffic operations. Table 5 summarizes the HCM intersection LOS criteria.

Table 5: Intersection LOS Criteria

LOS	Signalized Intersections
A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase and do not stop at all.
B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Three alternatives are analyzed for the “regional” peak hour and the “refinery” peak hours:

- Existing (2015) Conditions
- Cumulative No Project (2040): existing roadway lane configurations
- Cumulative + Reduced Lanes (2040): reduce from two to one travel lane in each direction at each intersection; provide dedicated left-turn lanes

The CCTA Countywide Travel Model (2010) was used to determine forecasted traffic growth in the study corridor. A small amount of growth in jobs and households is forecast for traffic analysis zones (TAZs) along the study corridor and in neighboring areas such as Hercules. However, the change is quite small relative to growth in other areas in the County. The vehicle trips associated with this growth were added to the existing counts to develop the traffic volumes for the forecast year (2040). Table 6 presents a summary of the projected traffic growth along two segments of San Pablo Avenue. The projected growth from the CCTA was assigned through the study intersections using the existing turning proportions at each location. Synchro outputs showing the lane configurations and intersection turning movement volumes are presented in the appendix.

The forecasts represent the growth in traffic corresponding to the typical “regional” Bay Area peak hour. For the refinery peak hour, this same growth increment was used for the analysis.

Table 6: Corridor Growth Forecast

Road Segment	Time Period	Observed (2015)	Baseline Year (2013)	Forecast Year (2040)	Growth (%)	Adjusted Forecast (2040)
San Pablo Ave, West of Cumming Skyway	AM Peak Hour	271	239	273	+ 34 (+ 14%)	305
	PM Peak Hour	356	122	220	+ 98 (+ 80%)	454
San Pablo Ave, East of Cumming Skyway	AM Peak Hour	190	216	244	+ 28 (+ 13%)	218
	PM Peak Hour	209	56	110	+ 54 (+ 96%)	263

4.2 Results – Regional Peak Periods

Table 7 presents the intersection LOS findings for the three scenarios during the "regional" AM and PM peak hour. The HCM technical calculation sheets from Synchro for all three scenarios are also provided in the appendix.

Table 7: "Regional" Peak Period Intersection LOS Results

Intersection	Traffic Control	Peak Hour	Intersection LOS / Average Delay (seconds per vehicle)		
			Existing	Cumulative No Project	Cumulative + Reduced Lanes
1. Parker Ave / 1st St	Traffic Signal	AM PM	A / 2.7 A / 2.4	A / 2.5 A / 2.1	A / 2.5 A / 2.1
2. San Pablo Ave / Parker Ave	Traffic Signal	AM PM	A / 0.7 A / 1.0	A / 0.6 A / 3.6	A / 0.6 A / 3.7
3. San Pablo Ave / Railroad Ave	Side Street Stop Sign	AM PM	A / 1.3 A / 0.6	A / 1.2 A / 0.5	A / 1.2 A / 0.5
4. San Pablo Ave / California St	Side Street Stop Sign	AM PM	A / 1.9 A / 2.3	A / 2.2 A / 2.9	A / 2.3 A / 2.9
5. San Pablo Ave / Refinery Rd	Traffic Signal	AM PM	B / 13.4 B / 12.8	B / 13.8 B / 13.3	B / 19.9 B / 15.7
6. San Pablo Ave / A St	Side Street Stop Sign	AM PM	A / 0.6 A / 0.4	A / 0.7 A / 0.5	A / 0.7 A / 0.5
7. San Pablo Ave / Cummings Skyway	Traffic Signal	AM PM	A / 6.8 A / 6.8	A / 7.0 A / 7.4	A / 7.5 A / 7.3
8. San Pablo Ave / Vista Del Rio St	Side Street Stop Sign	AM PM	A / 0.7 A / 0.1	A / 0.6 A / 0.1	A / 0.7 A / 0.1
9. San Pablo Ave / Pomona St / I-80 Ramps / Merchant St	Traffic Signal	AM PM	B / 17.9 B / 17.6	B / 18.1 B / 18.8	B / 19.0 B / 19.7
10. Pomona St / Wanda St	Side Street Stop Sign	AM PM	A / 0.8 A / 0.9	A / 0.8 A / 0.9	A / 0.8 A / 0.9
Source: Arup, 2015					

The traffic analysis findings for the "regional" peak hour are summarized below:

- All intersections operate at LOS A or B under Existing and Cumulative No Project conditions.
- The reduction of one travel lane in each direction does not negatively impact traffic operations.

4.3 Results – Refinery Peak Periods

Table 8 presents the intersection LOS findings for the subset of intersections near Phillips 66 for the earlier "refinery" peak hour. This analysis also includes the two driveways serving the Phillips 66 administrative building. The HCM technical calculation sheets from Synchro for all three scenarios are also provided in the appendix.

Table 8: "Refinery" Peak Period Intersection LOS Results

Intersection	Traffic Control	Peak Hour	Intersection LOS / Average Delay (seconds per vehicle)		
			Existing	Cumulative No Project	Cumulative + Reduced Lanes
5. San Pablo Ave / Refinery Rd	Traffic Signal	AM PM	B / 13.7 B / 16.7	B / 14.3 B / 18.2	B / 15.9 C / 21.5
5A. San Pablo Ave / Phillips 66 Administration Building	Side Street Stop Sign	AM PM	A / 0.6 A / 0.6	A / 0.5 A / 0.4	A / 0.5 A / 0.4
5A. San Pablo Ave / Phillips 66 Administration Building	Side Street Stop Sign	AM PM	A / 0.1 A / 0.9	A / 0.1 A / 0.9	A / 0.1 A / 0.9
6. San Pablo Ave / A St	Side Street Stop Sign	AM PM	A / 0.6 A / 1.8	A / 2.2 A / 0.7	A / 2.2 A / 1.7
7. San Pablo Ave / Cumming Skyway	Traffic Signal	AM PM	A / 6.8 A / 7.2	B / 12.1 A / 6.5	B / 12.1 A / 6.5
Source: Arup, 2016					

The traffic analysis findings for the "refinery" peak hour are summarized below:

- All intersections operate at LOS A or B under Existing and Cumulative No Project conditions.
- Under Cumulative + Reduced Lanes only one intersection, San Pablo Avenue / Refinery Road, goes to LOS C (PM peak hour only). LOS C is well within acceptable operating thresholds.
- The reduction of one travel lane in each direction does not negatively impact traffic operations.

4.4 Phillips 66 Administration Building Driveway

Currently, the Phillips 66 Administration Building is located north of San Pablo Ave and east of Refinery Road. The parking lot includes two driveways:

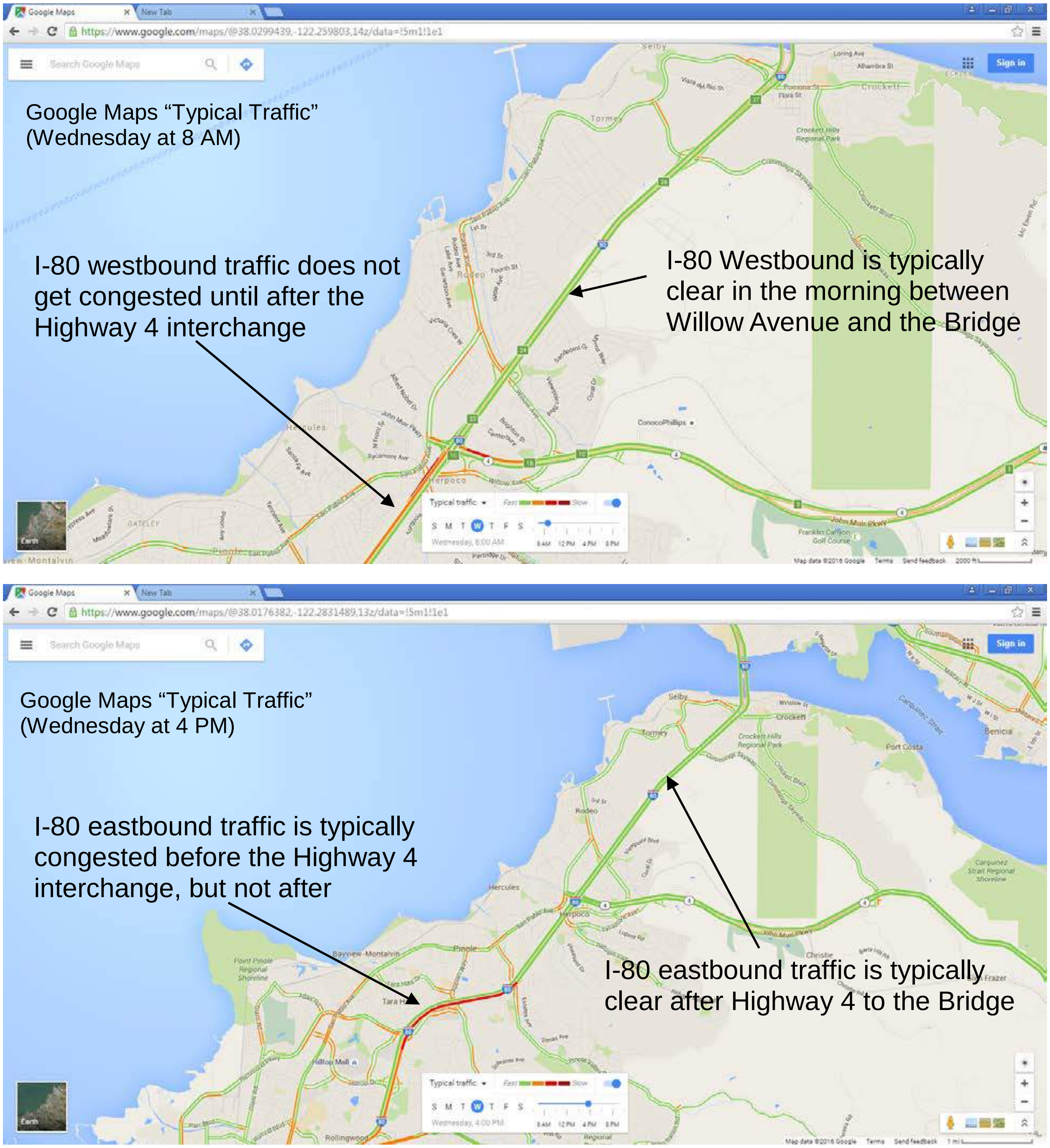
- A western driveway: serving traffic entering from San Pablo Avenue and traffic making a right-turn to exit onto westbound San Pablo Avenue
- An eastern driveway: serving traffic making a left-turn to exit onto eastbound San Pablo Avenue. No vehicles can enter via the eastern driveway.

A traffic signal warrant analysis was conducted to determine if a traffic signal at the western driveway is warranted. The California Manual on Uniform Traffic Control Devices (MUTCD) prescribes several warrants to analyze existing traffic operations and safety and the potential to improve these conditions with intersection signalization. “Warrant 3, Peak Hour” was completed to consider whether traffic at the driveway experiences excessive delay when entering San Pablo Avenue. The existing and future volumes for the “refinery” AM and PM peak hours were evaluated and shown not to exceed the warrant threshold. Therefore, the warrant is not met. Details of this warrant analysis are included in the appendix of this report.

4.5 I-80 Diversion Analysis

Additional concerns regarding the usage of San Pablo Avenue as a bypass route to avoid congestion on I-80 between the Alfred Zampa Bridge and Willow Avenue have been raised by the public. Several sources of traffic data have been utilized to understand the level of congestion on both routes and the likelihood of traffic diversion. These sources include Google Maps Traffic service, which can summarize data in real-time or for a “typical” day based on historic data collected from cell phones and other navigation system devices. Also, Caltrans Freeway Performance Management System (PeMS) also provides data collected from in-pavement road sensors. Figure 5 shows typical AM conditions on a Wednesday morning at 8 AM from Google Maps Traffic and typical PM conditions for a Wednesday afternoon at 4 PM.

Figure 5: Typical AM Conditions (8 AM) from Google Maps Traffic Application



Both figures show that I-80 operates reasonably well on the segment between Willow Avenue and the Alfred Zampa Bridge during both the AM and PM commutes. Most of the congestion is located south of the State Route 4 (SR 4) interchange in Hercules. The section of I-80 from Willow Avenue to the Alfred Zampa Bridge was recently widened in 2011 from three to four lanes to accommodate a High

Occupancy Vehicle (HOV) lane in both directions. Figure 6 shows Google Streetview images from 2008 and 2015 of I-80 eastbound north of Willow Avenue. The 2015 image shows the additional fourth HOV travel lane. This increase in capacity has reduced congestion and improved travel time reliability along this segment.

Figure 6: Google Maps Streetview Images of I-80 North of Willow Avenue

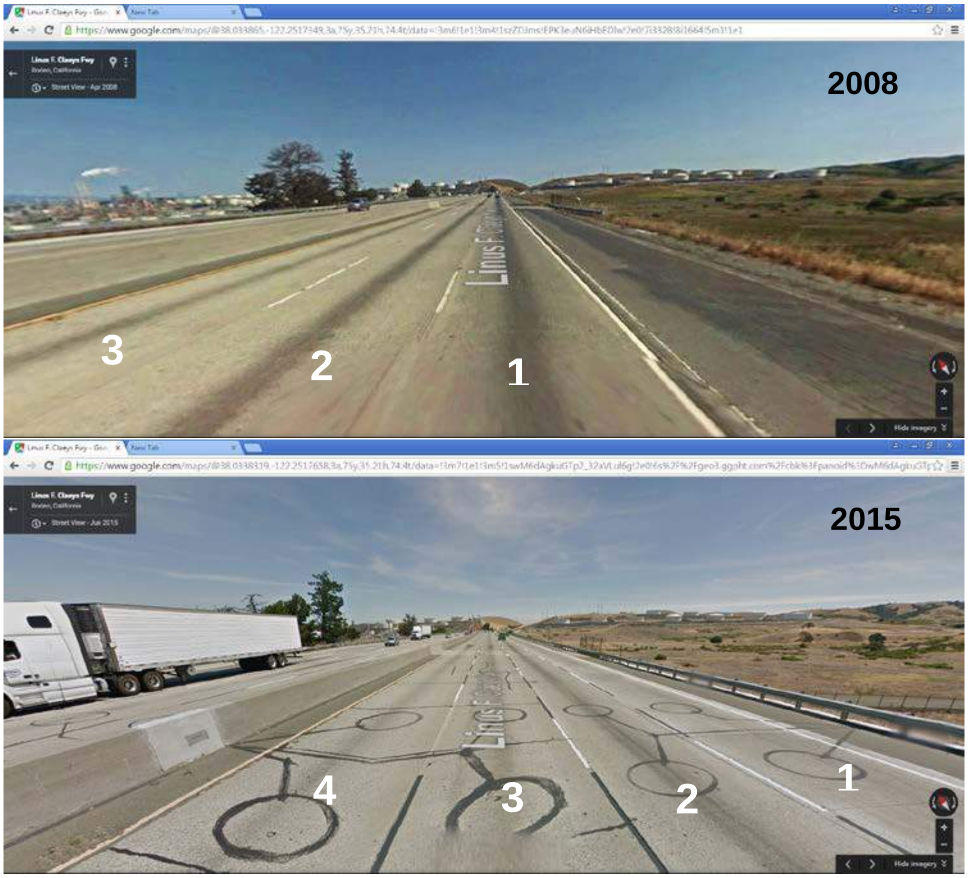


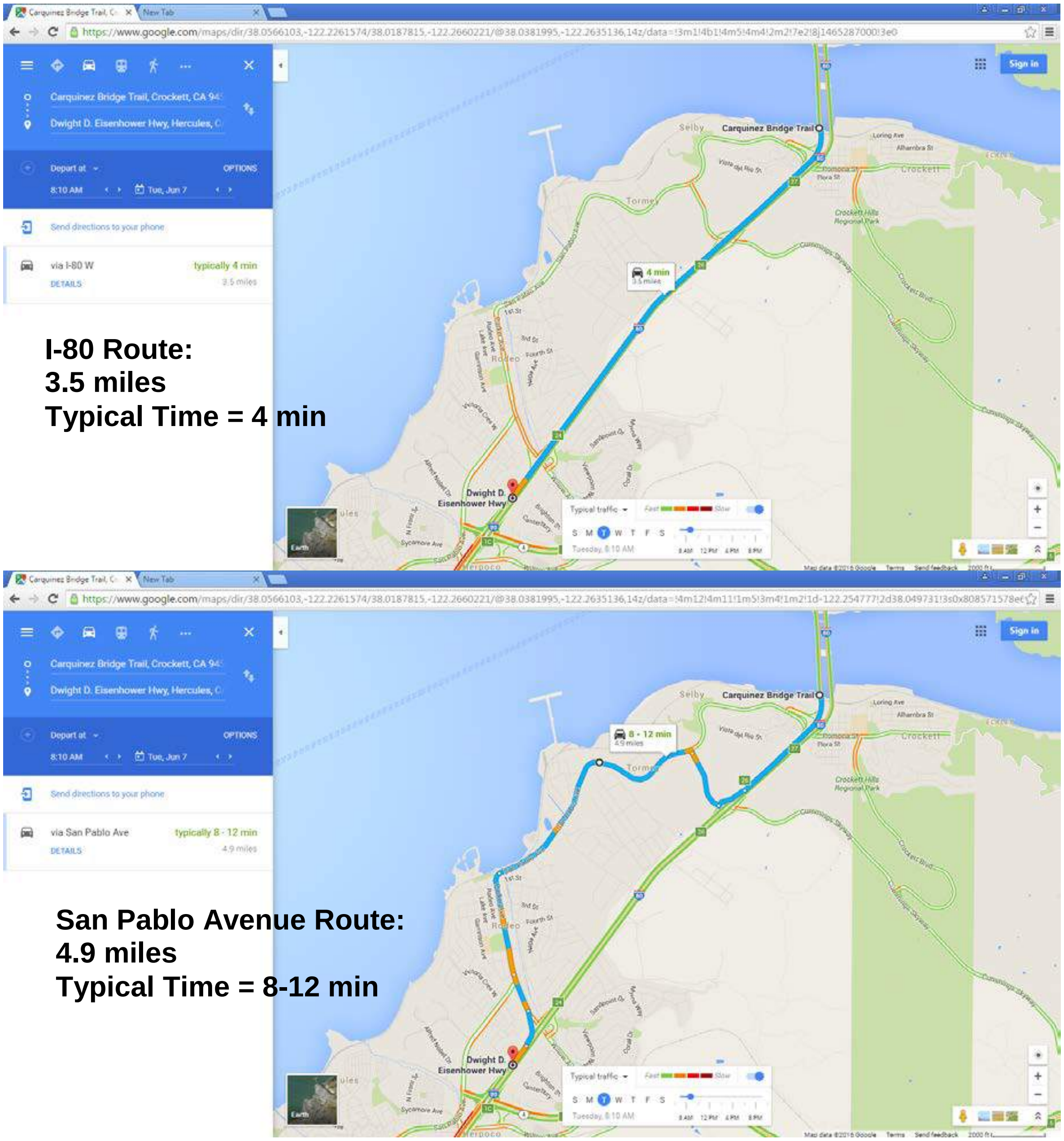
Figure 7 shows the travel distance and typical AM travel times from Google Maps Traffic between the Alfred Zampa Bridge and Willow Avenue using I-80 and San Pablo Avenue. This figure shows that I-80 is the shortest and typically the fastest route.

These data indicate the following:

- I-80 between the Bridge and Willow Avenue operates reasonably well during the AM and PM commute periods.
- The addition of the fourth HOV travel lane on I-80 has increased capacity and improved travel time reliability.
- The travel times on I-80 between the Bridge and Willow Avenue are typically two to three times faster than San Pablo Avenue.

- Therefore, these data indicate that this segment of San Pablo Avenue is not used very often as a bypass route.

Figure 7: Travel Times on I-80 and San Pablo Avenue (AM Morning Commute)



5 Collision Analysis

To assess the safety of the study corridor, the frequency of injury and fatality collisions along San Pablo Avenue were assessed. Incident data was obtained from County staff and the Statewide Integrated Traffic Records System (SWITRS). The incident results were mapped and collision rates were generated using methodologies published by Caltrans. Collision rates are normalized for traffic volumes and are reported as "incidents per million vehicle-miles". These rates were compared to other roadways with similar characteristics (e.g., lanes, grade, curvature, etc.). Figure 8 plots the injury and fatal collisions in the vicinity of the study area from 2003 through 2015 using the SWITRS data. The total number of injury and fatal collisions in this period totaled 23.

Figure 8: Study Corridor Injury and Fatality Collisions, 2003-2015

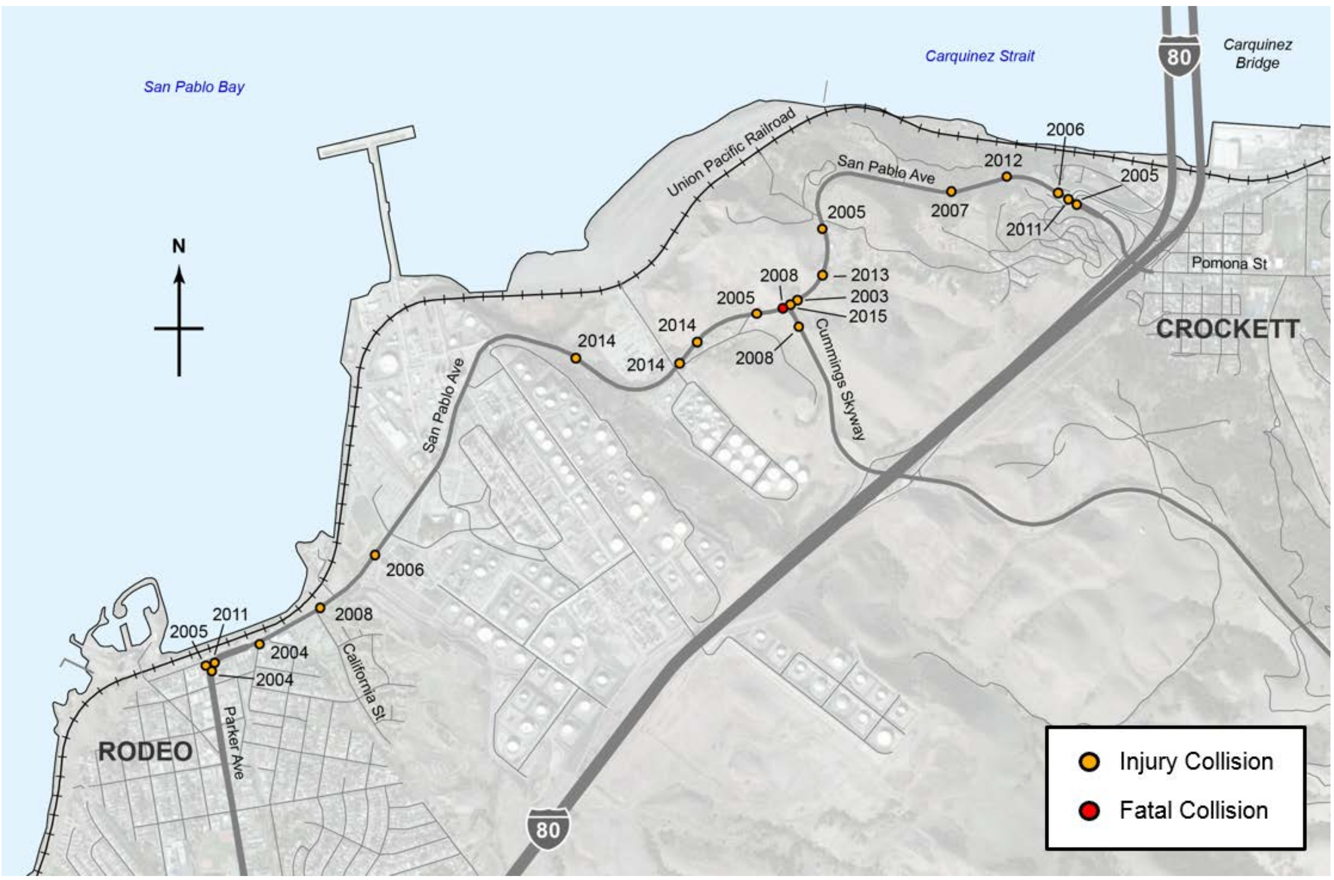


Table 9 presents the key input data and the collision rate calculations for the San Pablo Avenue corridor.

Table 9: San Pablo Collision Analysis

	West of Cummings Skyway	**East of Cummings Skyway**	**Study Corridor Total**
Segment Length (mi)	1.95	0.96	
Weekday Vehicles*	3,945	2,191	
Assumed Weekend Vehicles**	2,367	1,315	
Annual Vehicles	1,271,868	706,420	
Annual Vehicle-Miles	2,480,143	678,163	3,158,306
Vehicle-Miles, 2003 - 2015			41,057,978
Injury + Fatality Collisions, 2003 - 2015			23
Fatality Collisions, 2003 - 2015			1
Injury + Fatality Collisions per Million Vehicle-Miles			**0.56**
Fatality Collisions per Million Vehicle-Miles			**0.02**

* All trips assumed to travel entire length of segment (i.e., Rodeo – Cummings Skyway or Cummings Skyway – I-80).
** Weekend traffic counts assumed to be 40% less than weekday traffic counts.

Table 10 provides the calculated accident rates for fatal accidents and fatality + injury accidents for San Pablo Avenue, comparable roadways in the region, and California overall.

Table 10: Collision Analysis (2003-2015)

	Collision Rate (collisions per million vehicle-miles)	
Corridor	**Fatality**	**Fatality + Injury**
San Pablo Avenue (Rodeo to Crockett)	**0.020**	**0.56**
SR 12 in Solano County (4-lane, divided)	0.004	0.50
Richmond Parkway (Castro St to Giant Rd)	0.006	0.19
California Average (rural, 4-lane undivided roads)	0.018	0.35
I-80 Freeway (SR 4 to Carquinez Bridge)	0.005	0.24
Source: CHP SWITRS, Caltrans, Arup, 2016		

The accident analysis indicates that the Fatality and Fatality + Injury accident rates for the San Pablo Avenue study corridor are higher than the California average for a rural, 4-lane undivided road.

A separate dataset from Contra Costa County provides greater detail about the type of collisions (including non-injury collisions) that occurred in the study corridor but over a shorter timeframe: 2009 to 2015. The number of collisions in the County dataset is higher than the SWITRS data, even though it includes a shorter timeframe, because the County data includes non-injury accidents. Table 11 presents the collision data by severity.

Table 11: Corridor Collisions, 2009 – 2015, by Severity

Accident Type	Collisions
Fatality	0
Injury	10
Non-injury (Property Damage)	17
TOTAL	**27**
Source: Contra Costa County, 2015	

Figures 9 and 10 show the frequency by collision type and collision factor. Over two-thirds of the collisions did not involve other vehicles. These collisions included vehicles hitting objects or they overturned. Only three of the incidents involved head-on collisions. Over half of the collisions involved unsafe turning movements and unsafe speed and one-quarter of the collisions involved driving under the influence (DUI).

Figure 9: Corridor Collisions, 2009 – 2015, by Collision Type

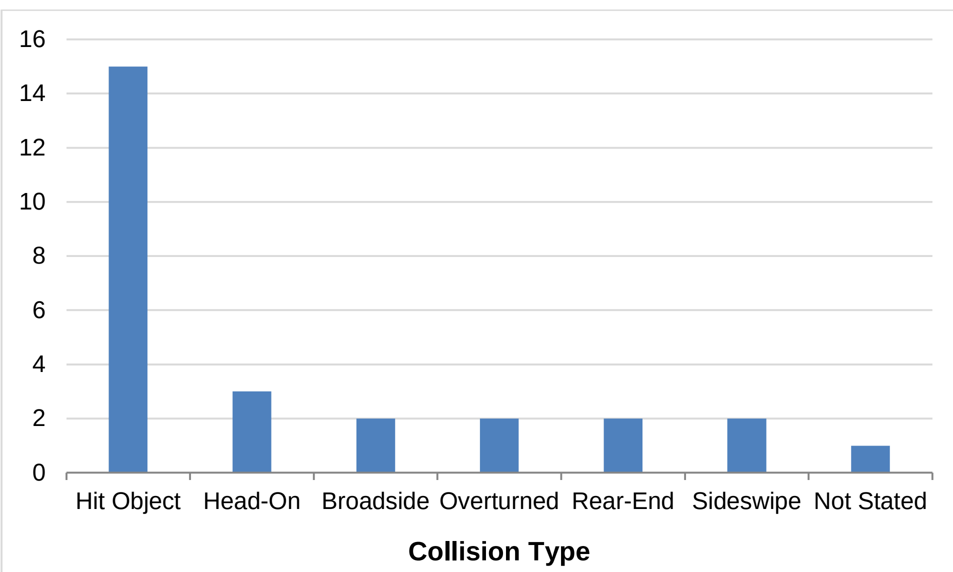
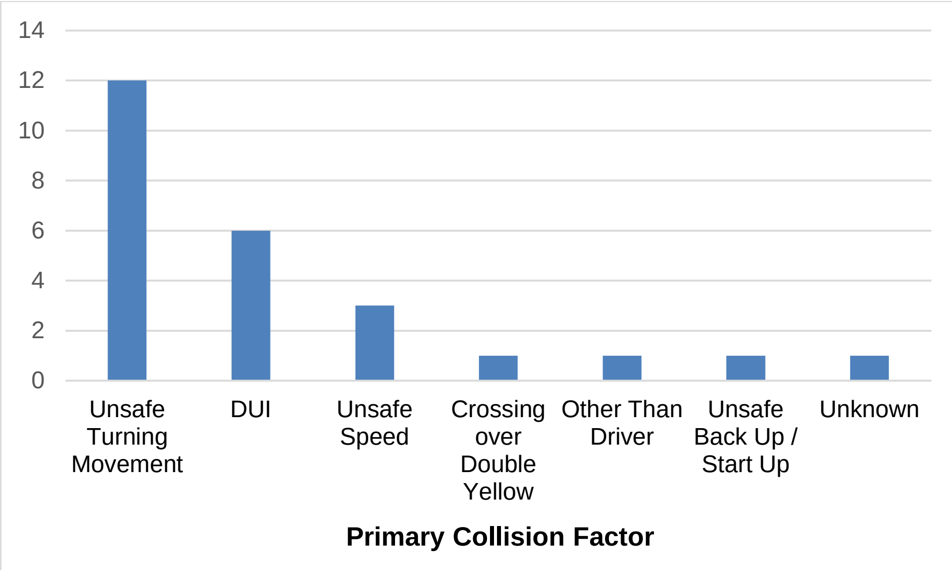


Figure 10: Corridor Collisions, 2009 – 2015, by Primary Collision Factor



Over two-thirds of the collisions did not involve other vehicles. These collisions included vehicles hitting objects or they overturned. Only three of the incidents involved head-on collisions. Over half of the collisions involved unsafe turning movements and unsafe speed and one-quarter of the collisions involved driving under the influence (DUI).

The majority of the collisions involve unsafe driver behavior and most involve hitting other objects along the road (e.g., utility poles, trees, etc.). Road diets and enhanced safety and design measures that slow travel speed should help reduce the number and severity of traffic accidents.

6 Safety with Road Diets

This section provides additional research into the safety benefits of road diets. Previous studies have shown significant safety benefits resulting from the implementation of road diets. The Federal Highway Administration's (FHWA's) "Evaluation of Lane Reduction 'Road Diet' Measures on Crashes" (2010) analyzed 45 sites in Iowa, California, and Washington to identify a "crash modification factor" (CMF), an index showing the relative change in total crashes at sites where road diets have been implemented. Table 12 provides a summary from the FHWA report.

Table 12: Observed Crash Modification Factors

Treatment Site Location	Crashes per Mile-Year		Crash Modification Factor (CMF)
	Before	After	
Iowa (rural near small towns)	23.74	12.19	0.53
California and Washington (suburban near major cities)	28.57	24.07	0.81
AVERAGE			0.71

Source: Federal Highway Administration, Evaluation of Lane Reduction "Road Diet" Measures on Crashes, 2010.

Ultimately, the researchers observed a small CMF in Iowa; crashes were reduced 47%. Crashes at the California and Washington treatment sites were only reduced 19%. The authors speculated that this observed difference could be accounted for by the rural nature of the highways studied in Iowa and the suburban nature of the highways studied in California and Washington. The rural sites generally featured moderate traffic volumes and high traffic speeds while the suburban sites featured higher traffic volumes and lower traffic speeds.

The authors recommended that for future projects, a CMF be selected based on the characteristics of the study area (rural or suburban). The San Pablo Ave study corridor has attributes of both rural and suburban areas; it is a major link in a major metropolitan area but includes relatively long segments without driveways or controlled intersections. The implementation of road diet features in the corridor can therefore be expected to reduce accidents some amount between 19% and 47%.

7 Truck Climbing Lanes

Applicable standards were consulted to determine a potential need for truck climbing lanes in the study corridor.

Caltrans Highway Design Manual (HDM, Section 204.5) offers the following broad guidance on truck climbing lanes:

> "A common criterion for all types of highways is to consider the addition of a climbing lane where the running speed of trucks falls 10 miles per hour or more below the running speed of remaining traffic. Figure 204.5 shows the speed reduction curves for a 200 lb/hp truck, which is representative of large trucks operating near maximum gross weight."

Figure 11 shows the four primary grades along the study corridor and Figure 12 plots the grades against the Caltrans criteria:

Figure 11: Study Corridor Grades

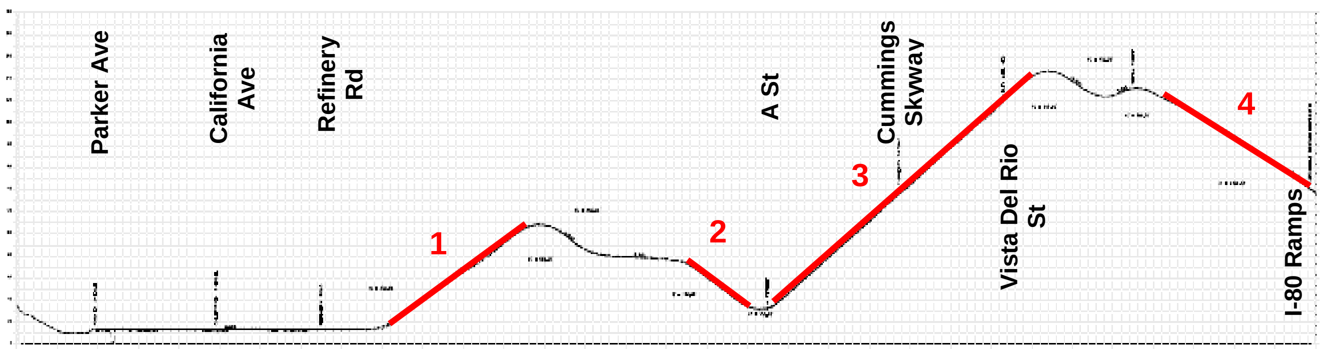
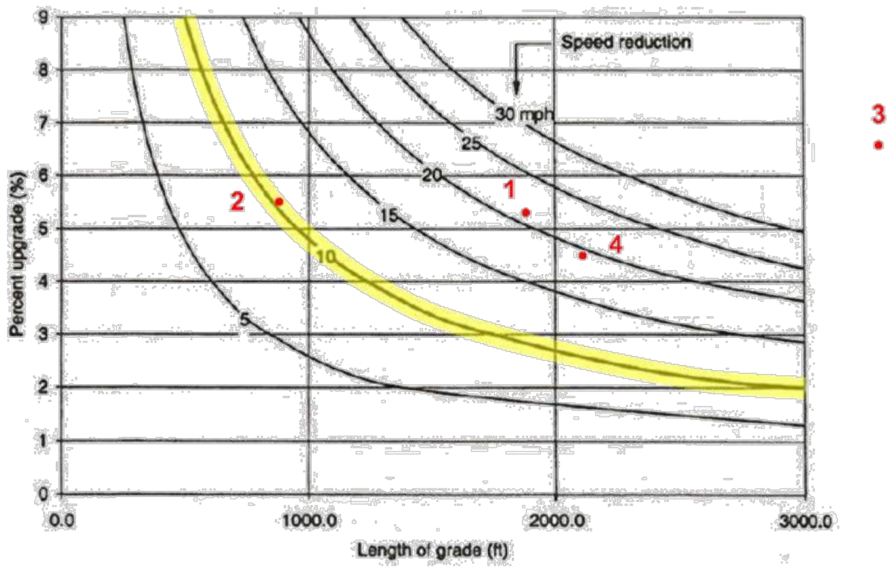


Figure 12: Critical Lengths of Grade for Design (Caltrans HDM, Figure 204.5)



As shown above, all four grades would result in the running speeds of trucks falling ten or more miles per hour below the running speed of remaining traffic. Strictly following this criterion, a climbing lane should be *considered* for each of the grades.

However, the above analysis gives no consideration to the volume of traffic in study corridor. The traffic volume (and truck volume, specifically), as discussed earlier, varies throughout the corridor. As a rough indicator for truck climbing lanes, the total traffic volume and truck traffic volumes for portions of the corridor are shown in Table 13 below.

Table 13: Peak Hour Traffic and Truck Volumes

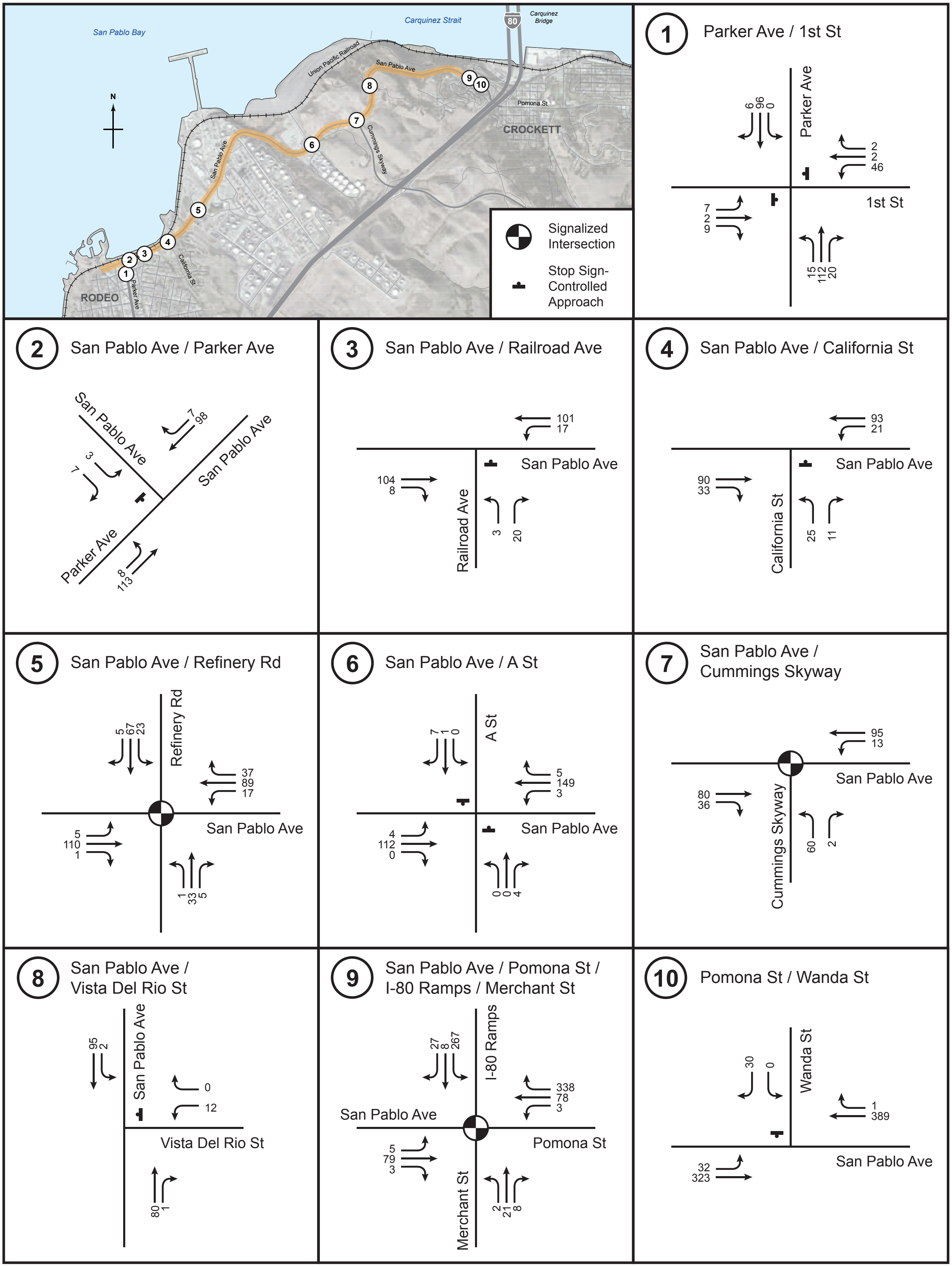
Corridor Segment	**Peak Hour Traffic Volume* (veh/hr)**	
	All Vehicles	**Trucks**
San Pablo Ave., West of Cummings Skyway	384	45
San Pablo Ave., East of Cummings Skyway	200	24

* The peak hour traffic volumes observed (in one any direction) on the corridor segment.

Given the higher overall traffic (and specifically truck) volumes observed west of Cummings Skyway compared to east of Cummings Skyway, truck climbing lanes are more likely warranted on that segment.

8 Appendix

Traffic counts and forecasts
Synchro HCM technical calculations
Phillips 66 Administration Building Driveway



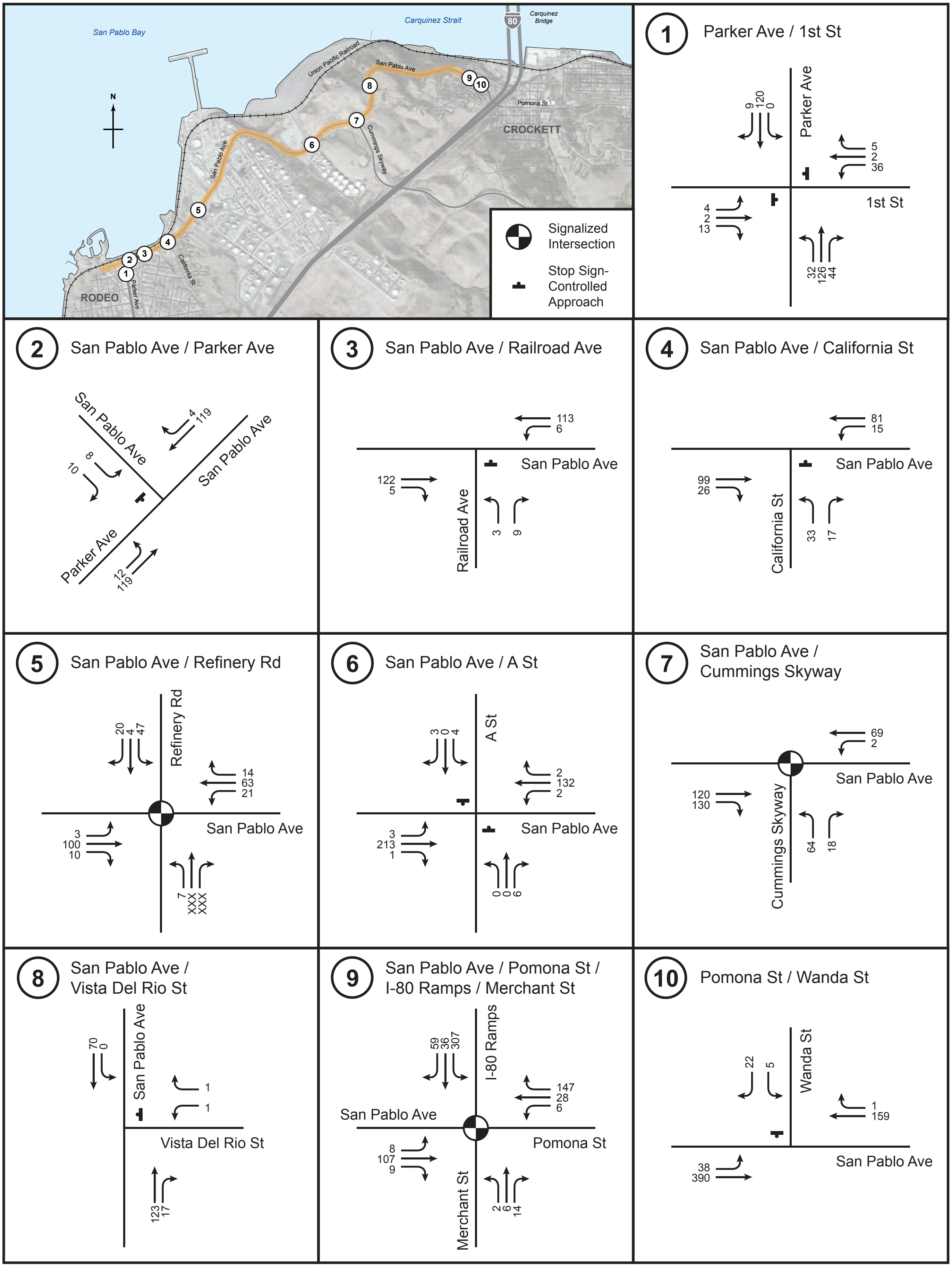
Intersection Traffic Volumes (vehicles / hour)

Existing AM
(7:30 AM - 8:30 AM)

Contra Costa County Public Works Department

ARUP

San Pablo Avenue Complete Streets Study



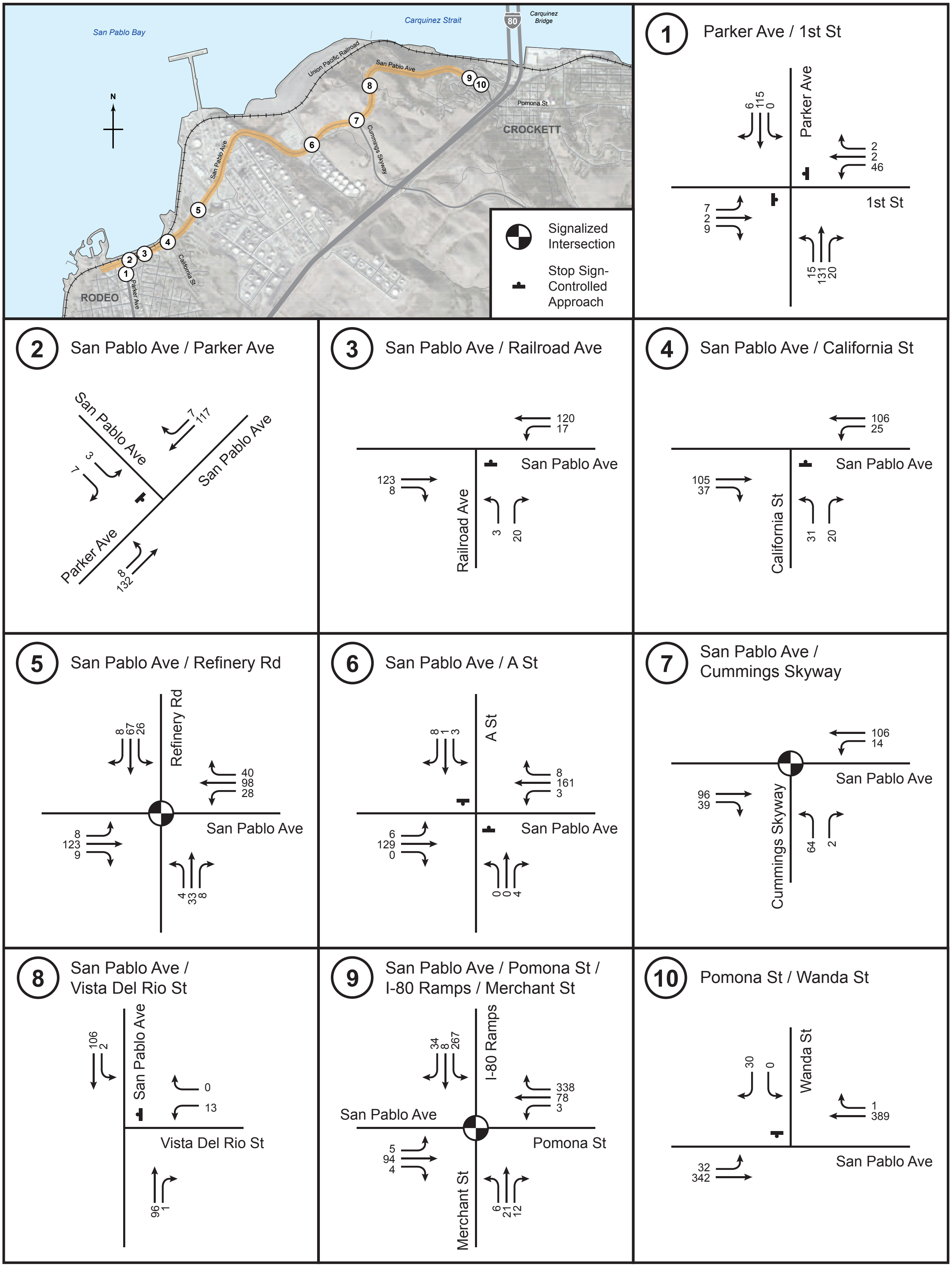
Intersection Traffic Volumes (vehicles / hour)

Existing PM
(4:15 PM - 5:15 PM)

Contra Costa County Public Works Department

ARUP

San Pablo Avenue Complete Streets Study



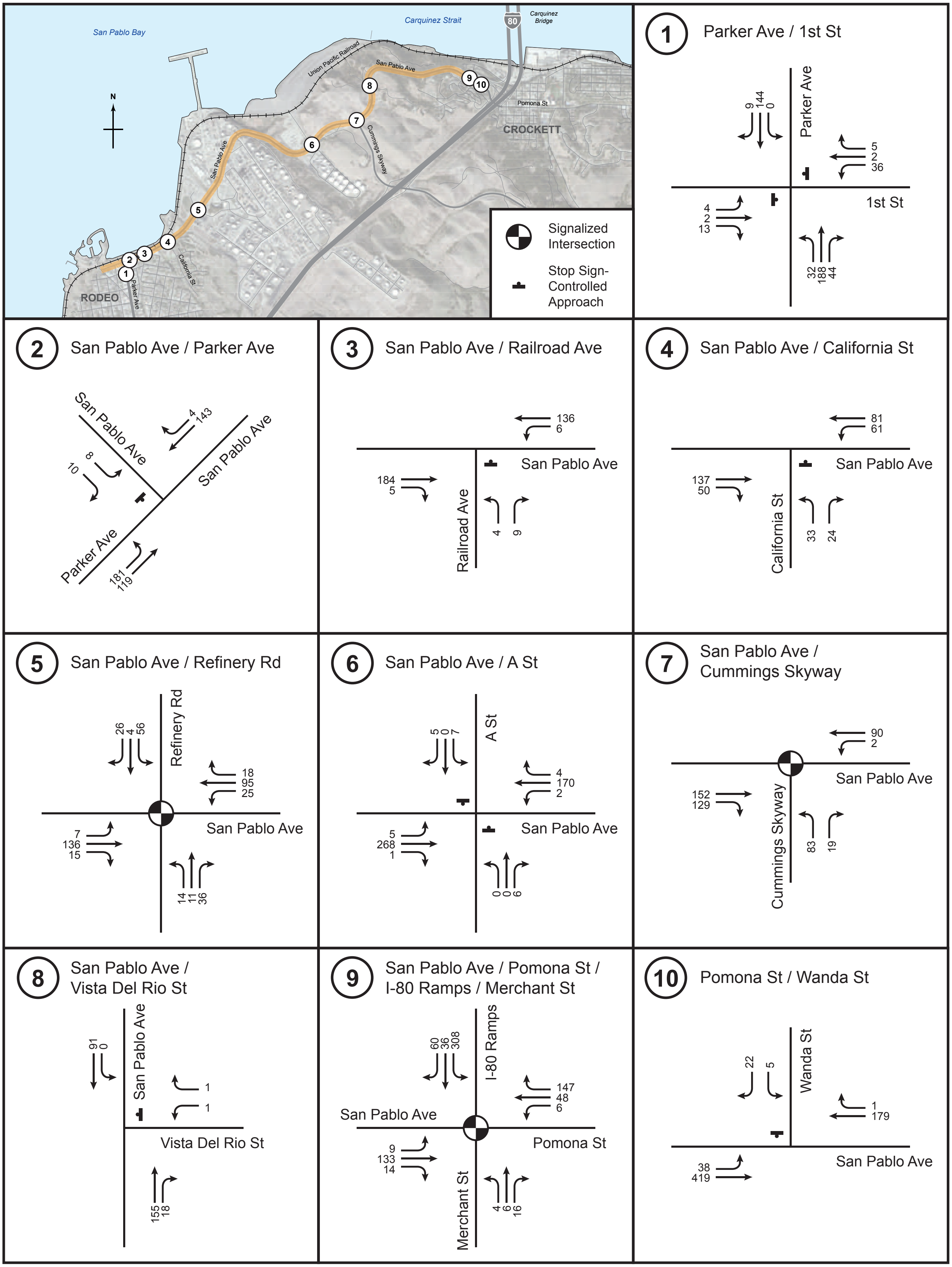
Intersection Traffic Volumes (vehicles / hour)

2040 AM
(7:30 AM - 8:30 AM)

Contra Costa County Public Works Department

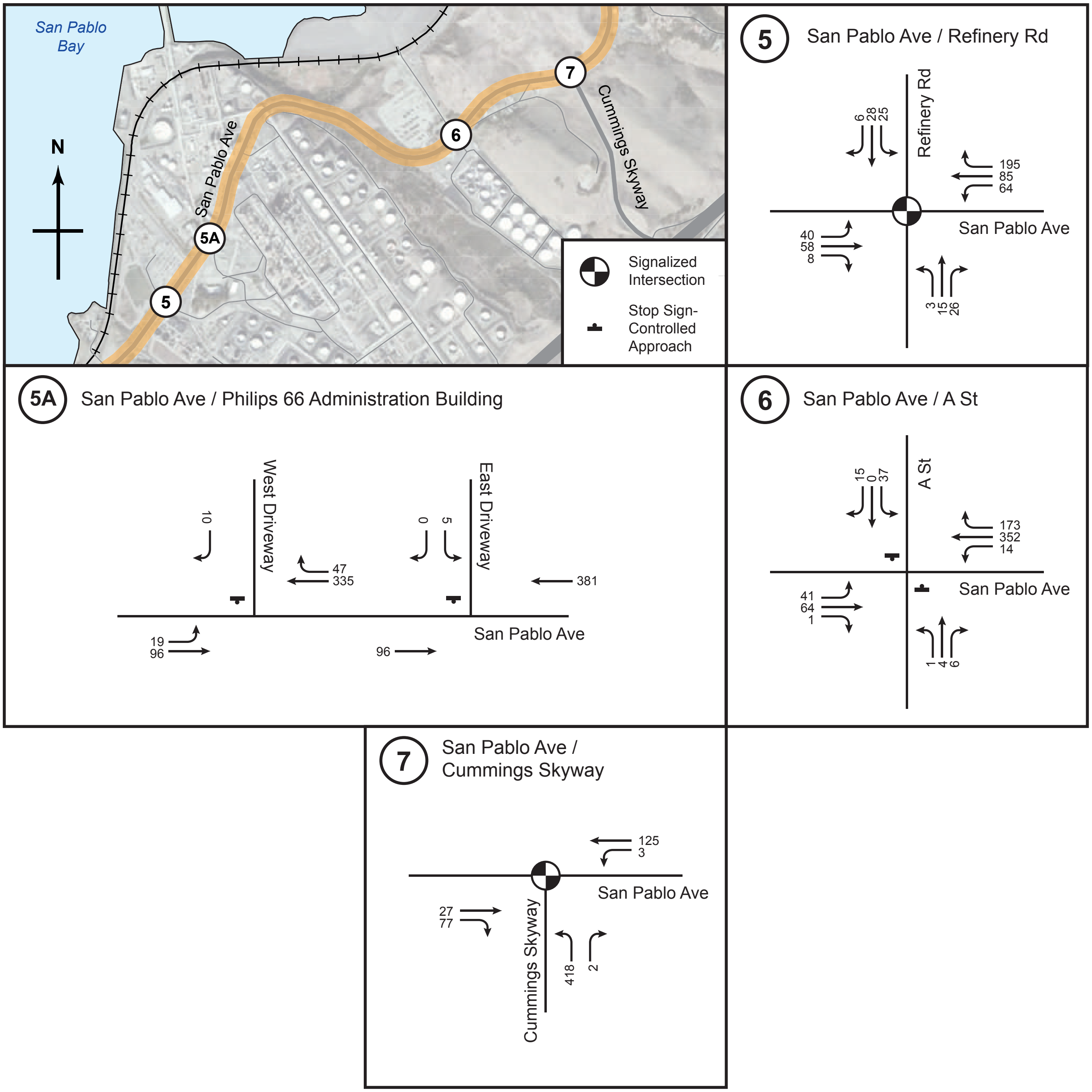
ARUP

San Pablo Avenue Complete Streets Study



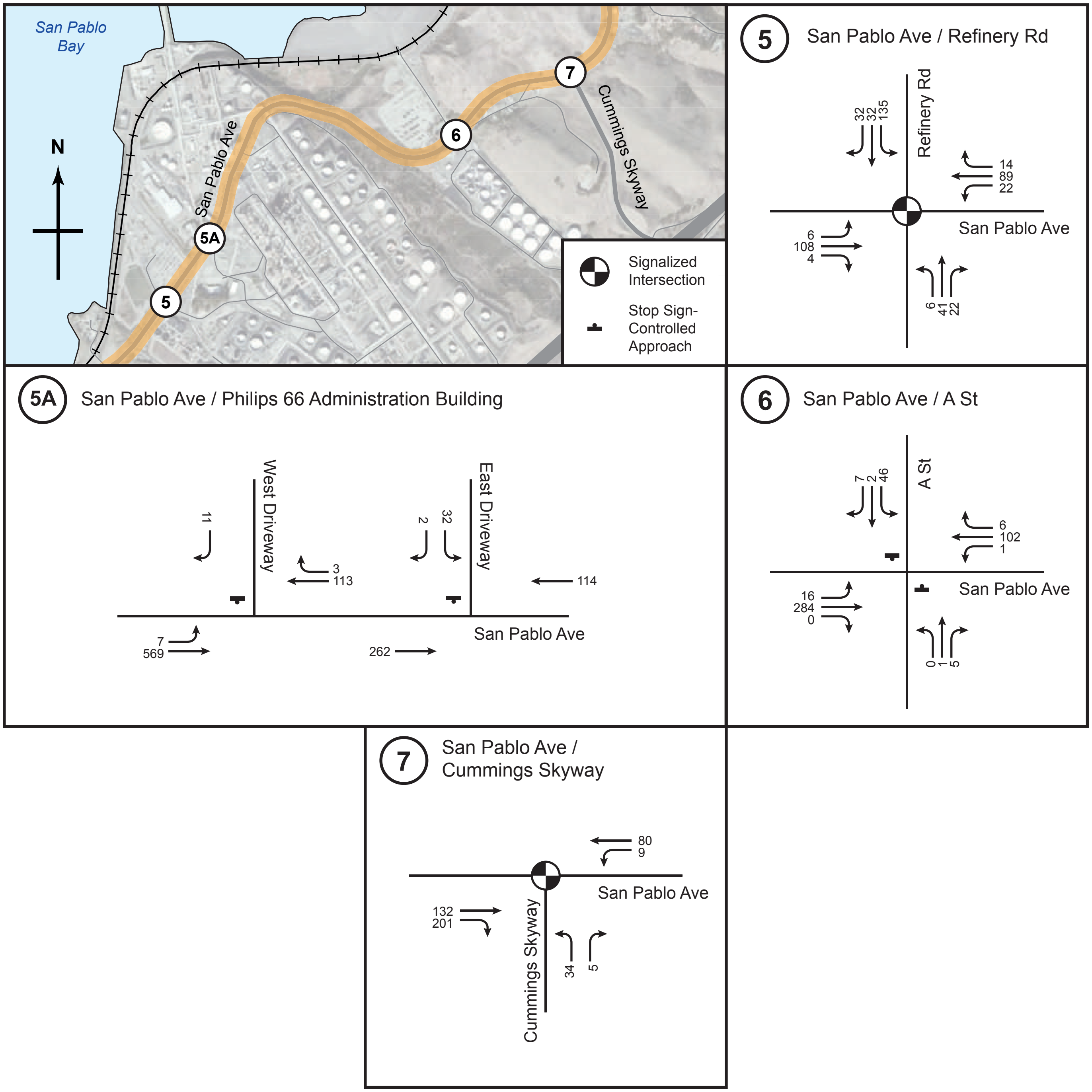
Intersection Traffic Volumes (vehicles / hour)

2040 PM
(4:15 PM - 5:15 PM)



Intersection Traffic Volumes (vehicles / hour)

Existing Early AM
(6 AM - 7 AM)



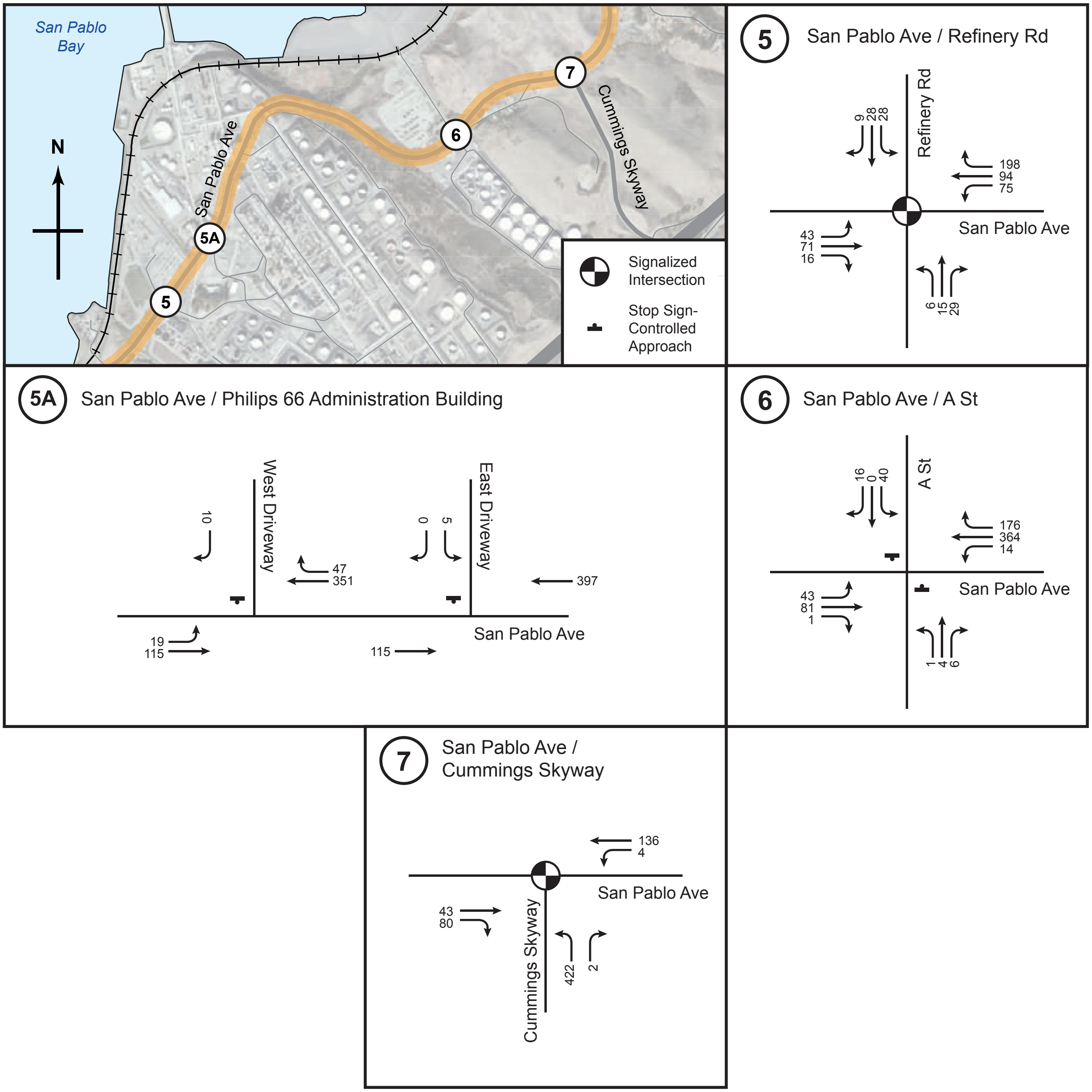
Intersection Traffic Volumes (vehicles / hour)

Existing Early PM
(3 PM - 4 PM)

Contra Costa County Public Works Department

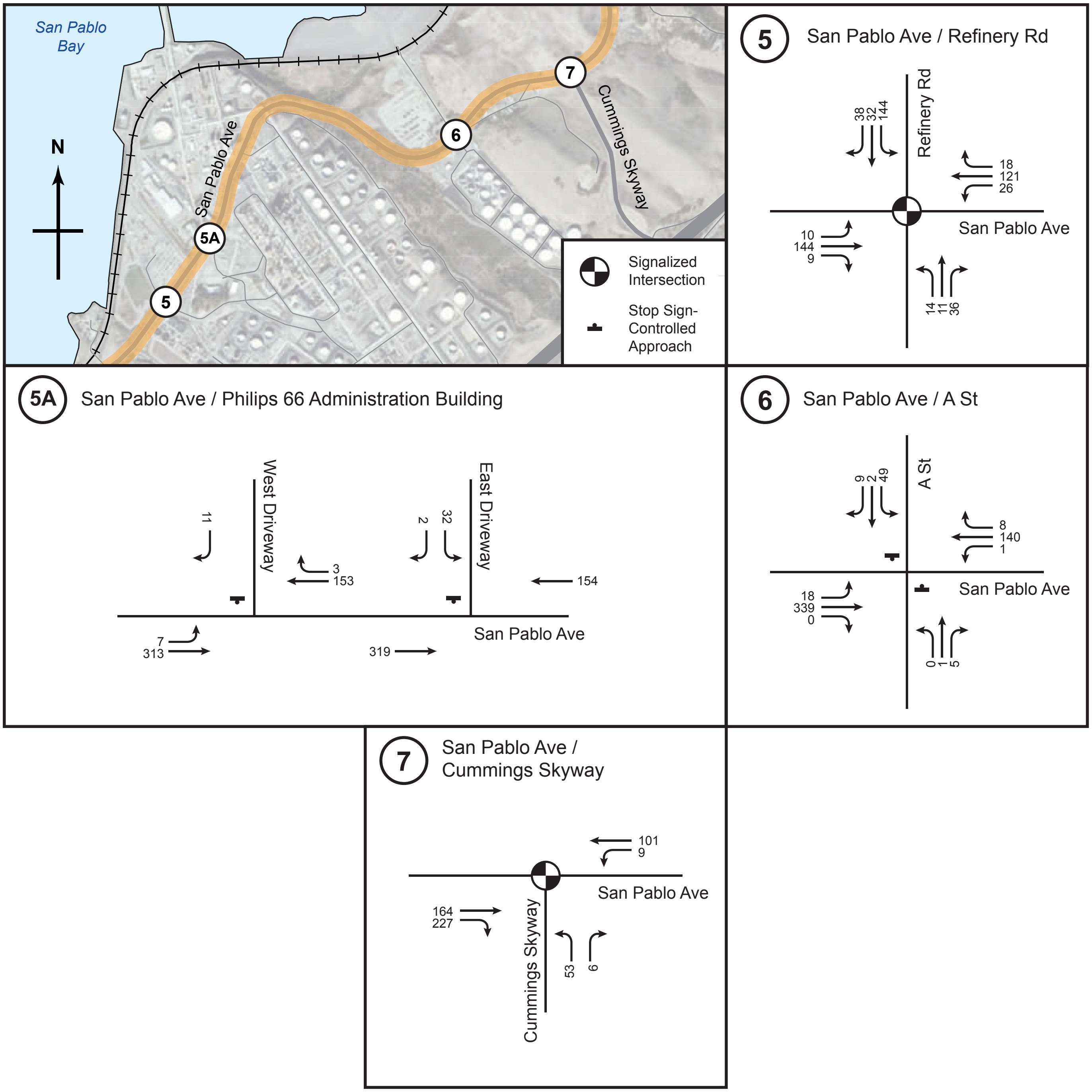
ARUP

San Pablo Avenue Complete Streets Study



Intersection Traffic Volumes (vehicles / hour)

2040 Early AM
(6 AM - 7 AM)



Intersection Traffic Volumes (vehicles / hour)

2040 Early PM
(3 PM - 4 PM)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	2	9	46	2	2	15	112	20	0	96	6
Future Volume (Veh/h)	7	2	9	46	2	2	15	112	20	0	96	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	2	10	50	2	2	16	122	22	0	104	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	264	284	108	280	276	133	111			144		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	264	284	108	280	276	133	111			144		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	99	100	99	92	100	100	99			100		
cM capacity (veh/h)	659	602	920	638	608	890	1419			1379		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	20	54	16	144	0	111
Volume Left	8	50	16	0	0	0
Volume Right	10	2	0	22	0	7
cSH	760	644	1419	1700	1700	1700
Volume to Capacity	0.03	0.08	0.01	0.08	0.00	0.07
Queue Length 95th (ft)	2	7	1	0	0	0
Control Delay (s)	9.9	11.1	7.6	0.0	0.0	0.0
Lane LOS	A	B	A			
Approach Delay (s)	9.9	11.1	0.8		0.0	
Approach LOS	A	B				

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	19.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	7	8	113	98	7
Future Volume (Veh/h)	3	7	8	113	98	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	8	9	123	107	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	252	111	107			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	252	111	107			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	100	99	99			
cM capacity (veh/h)	711	916	1424			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	11	9	123	115
Volume Left	3	9	0	0
Volume Right	8	0	0	8
cSH	849	1424	1700	1700
Volume to Capacity	0.01	0.01	0.07	0.07
Queue Length 95th (ft)	1	0	0	0
Control Delay (s)	9.3	7.5	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	9.3	0.5		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	16.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	104	8	17	101	3	20
Future Volume (Veh/h)	104	8	17	101	3	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	113	9	18	110	3	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			122		264	118
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			122		264	118
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			99		100	98
cM capacity (veh/h)			1406		695	908

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	122	18	110	25
Volume Left	0	18	0	3
Volume Right	9	0	0	22
cSH	1700	1406	1700	876
Volume to Capacity	0.07	0.01	0.06	0.03
Queue Length 95th (ft)	0	1	0	2
Control Delay (s)	0.0	7.6	0.0	9.2
Lane LOS		A		A
Approach Delay (s)	0.0	1.1		9.2
Approach LOS				A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	90	33	21	93	25	11
Future Volume (Veh/h)	90	33	21	93	25	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	36	23	101	27	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			134		263	116
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			134		263	116
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			98		96	99
cM capacity (veh/h)			1391		693	910

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	134	23	101	39
Volume Left	0	23	0	27
Volume Right	36	0	0	12
cSH	1700	1391	1700	748
Volume to Capacity	0.08	0.02	0.06	0.05
Queue Length 95th (ft)	0	1	0	4
Control Delay (s)	0.0	7.6	0.0	10.1
Lane LOS		A		B
Approach Delay (s)	0.0	1.4		10.1
Approach LOS				B

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	23.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	110	1	17	89	37	1	33	5	23	67	5
Future Volume (vph)	5	110	1	17	89	37	1	33	5	23	67	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	0.96			0.98			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1612	3219		1612	3082			1667			1665	
Flt Permitted	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (perm)	1612	3219		1612	3082			1667			1665	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	120	1	18	97	40	1	36	5	25	73	5
RTOR Reduction (vph)	0	1	0	0	30	0	0	5	0	0	3	0
Lane Group Flow (vph)	5	120	0	18	107	0	0	37	0	0	100	0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	2.3	8.8		2.3	8.8			2.4			4.2	
Effective Green, g (s)	2.3	8.8		2.3	8.8			2.4			4.2	
Actuated g/C Ratio	0.06	0.25		0.06	0.25			0.07			0.12	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	103	793		103	759			112			195	
v/s Ratio Prot	0.00	c0.04		c0.01	0.03			c0.02			c0.06	
v/s Ratio Perm												
v/c Ratio	0.05	0.15		0.17	0.14			0.33			0.51	
Uniform Delay, d1	15.7	10.5		15.8	10.5			15.9			14.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	0.1		0.8	0.1			2.4			3.0	
Delay (s)	15.9	10.6		16.6	10.6			18.3			17.8	
Level of Service	B	B		B	B			B			B	
Approach Delay (s)		10.9			11.3			18.3			17.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	35.7	Sum of lost time (s)	18.0
Intersection Capacity Utilization	27.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	112	0	3	149	5	0	0	4	0	1	7
Future Volume (Veh/h)	4	112	0	3	149	5	0	0	4	0	1	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	122	0	3	162	5	0	0	4	0	1	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	167			122			226	303	61	244	300	84
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	167			122			226	303	61	244	300	84
tC, single (s)	4.3			4.3			7.7	6.7	7.1	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			100	100	100	100	100	99
cM capacity (veh/h)	1338			1393			675	583	960	659	585	928

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	65	61	84	86	4	9
Volume Left	4	0	3	0	0	0
Volume Right	0	0	0	5	4	8
cSH	1338	1700	1393	1700	960	871
Volume to Capacity	0.00	0.04	0.00	0.05	0.00	0.01
Queue Length 95th (ft)	0	0	0	0	0	1
Control Delay (s)	0.5	0.0	0.3	0.0	8.8	9.2
Lane LOS	A		A		A	A
Approach Delay (s)	0.3		0.1		8.8	9.2
Approach LOS					A	A

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	16.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	80	36	13	95	60	2
Future Volume (vph)	80	36	13	95	60	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1696	1442	1612	1696	1612	1442
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1696	1442	1612	1696	1612	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	39	14	103	65	2
RTOR Reduction (vph)	0	26	0	0	0	2
Lane Group Flow (vph)	87	13	14	103	65	0
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	8.5	8.5	2.1	15.1	2.0	2.0
Effective Green, g (s)	8.5	8.5	2.1	15.1	2.0	2.0
Actuated g/C Ratio	0.33	0.33	0.08	0.58	0.08	0.08
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	552	469	129	981	123	110
v/s Ratio Prot	c0.05		0.01	c0.06	c0.04	
v/s Ratio Perm		0.01				0.00
v/c Ratio	0.16	0.03	0.11	0.10	0.53	0.00
Uniform Delay, d1	6.3	6.0	11.1	2.5	11.6	11.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.0	0.1	0.1	1.9	0.0
Delay (s)	6.4	6.0	11.3	2.5	13.5	11.1
Level of Service	A	A	B	A	B	B
Approach Delay (s)	6.3			3.6	13.4	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	6.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	26.1	Sum of lost time (s)	13.5
Intersection Capacity Utilization	18.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	80	1	2	95	12	0
Future Volume (Veh/h)	80	1	2	95	12	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	1	2	103	13	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1276					
pX, platoon unblocked						
vC, conflicting volume			88		143	44
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			88		143	44
tC, single (s)			4.3		7.0	7.1
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		98	100
cM capacity (veh/h)			1435		806	985

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	58	30	36	69	13
Volume Left	0	0	2	0	13
Volume Right	0	1	0	0	0
cSH	1700	1700	1435	1700	806
Volume to Capacity	0.03	0.02	0.00	0.04	0.02
Queue Length 95th (ft)	0	0	0	0	1
Control Delay (s)	0.0	0.0	0.4	0.0	9.5
Lane LOS			A		A
Approach Delay (s)	0.0		0.1		9.5
Approach LOS					A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	79	3	3	78	338	2	21	8	267	8	27
Future Volume (vph)	5	79	3	3	78	338	2	21	8	267	8	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	1612	1696	1442	1612	1696	1442		1631			1618	1442
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		1.00			0.95	1.00
Satd. Flow (perm)	1612	1696	1442	1612	1696	1442		1631			1618	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	86	3	3	85	367	2	23	9	290	9	29
RTOR Reduction (vph)	0	0	2	0	0	298	0	9	0	0	0	21
Lane Group Flow (vph)	5	86	1	3	85	69	0	25	0	0	299	8
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases			2			6						3
Actuated Green, G (s)	5.4	9.2	9.2	5.4	9.2	9.2		2.3			14.3	14.3
Effective Green, g (s)	5.4	9.2	9.2	5.4	9.2	9.2		2.3			14.3	14.3
Actuated g/C Ratio	0.11	0.19	0.19	0.11	0.19	0.19		0.05			0.29	0.29
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	176	317	269	176	317	269		76			470	419
v/s Ratio Prot	c0.00	c0.05		0.00	0.05			c0.02			c0.18	
v/s Ratio Perm			0.00			0.05						0.01
v/c Ratio	0.03	0.27	0.00	0.02	0.27	0.26		0.33			0.64	0.02
Uniform Delay, d1	19.6	17.1	16.3	19.5	17.1	17.1		22.7			15.2	12.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.1	0.5	0.0	0.0	0.5	0.5		2.6			2.8	0.0
Delay (s)	19.6	17.6	16.3	19.6	17.6	17.6		25.3			18.0	12.5
Level of Service	B	B	B	B	B	B		C			B	B
Approach Delay (s)		17.7			17.6			25.3			17.5	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	49.2	Sum of lost time (s)	18.0
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	323	0	0	389	1	0	0	0	0	0	30
Future Volume (Veh/h)	32	323	0	0	389	1	0	0	0	0	0	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	35	351	0	0	423	1	0	0	0	0	0	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		439										
pX, platoon unblocked												
vC, conflicting volume	424			351			877	845	351	844	844	424
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	424			351			877	845	351	844	844	424
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	97			100			100	100	100	100	100	95
cM capacity (veh/h)	1084			1154			238	279	670	265	280	610

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	35	351	0	424	33
Volume Left	35	0	0	0	0
Volume Right	0	0	0	1	33
cSH	1084	1700	1700	1700	610
Volume to Capacity	0.03	0.21	0.00	0.25	0.05
Queue Length 95th (ft)	3	0	0	0	4
Control Delay (s)	8.4	0.0	0.0	0.0	11.2
Lane LOS	A				B
Approach Delay (s)	0.8		0.0		11.2
Approach LOS					B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	2	13	36	2	5	32	126	44	0	120	9
Future Volume (Veh/h)	4	2	13	36	2	5	32	126	44	0	120	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	2	14	39	2	5	35	137	48	0	130	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	348	390	135	376	371	161	140			185		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	348	390	135	376	371	161	140			185		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	99	100	98	93	100	99	97			100		
cM capacity (veh/h)	572	517	888	542	530	858	1384			1332		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	20	46	35	185	0	140
Volume Left	4	39	35	0	0	0
Volume Right	14	5	0	48	0	10
cSH	751	564	1384	1700	1700	1700
Volume to Capacity	0.03	0.08	0.03	0.11	0.00	0.08
Queue Length 95th (ft)	2	7	2	0	0	0
Control Delay (s)	9.9	11.9	7.7	0.0	0.0	0.0
Lane LOS	A	B	A			
Approach Delay (s)	9.9	11.9	1.2		0.0	
Approach LOS	A	B				

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	30.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	10	12	119	119	4
Future Volume (Veh/h)	8	10	12	119	119	4
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	11	13	129	129	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	286	131	129			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	286	131	129			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	99	99	99			
cM capacity (veh/h)	677	892	1397			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	20	13	129	133
Volume Left	9	13	0	0
Volume Right	11	0	0	4
cSH	781	1397	1700	1700
Volume to Capacity	0.03	0.01	0.08	0.08
Queue Length 95th (ft)	2	1	0	0
Control Delay (s)	9.7	7.6	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	9.7	0.7		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	122	5	6	113	3	9
Future Volume (Veh/h)	122	5	6	113	3	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	133	5	7	123	3	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			138		272	136
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			138		272	136
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			99		100	99
cM capacity (veh/h)			1386		693	887

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	138	7	123	13
Volume Left	0	7	0	3
Volume Right	5	0	0	10
cSH	1700	1386	1700	833
Volume to Capacity	0.08	0.01	0.07	0.02
Queue Length 95th (ft)	0	0	0	1
Control Delay (s)	0.0	7.6	0.0	9.4
Lane LOS		A		A
Approach Delay (s)	0.0	0.4		9.4
Approach LOS				A

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	16.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	99	26	15	81	33	17
Future Volume (Veh/h)	99	26	15	81	33	17
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	108	28	16	88	36	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			136		242	122
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			136		242	122
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			99		95	98
cM capacity (veh/h)			1389		717	903

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	136	16	88	54
Volume Left	0	16	0	36
Volume Right	28	0	0	18
cSH	1700	1389	1700	769
Volume to Capacity	0.08	0.01	0.05	0.07
Queue Length 95th (ft)	0	1	0	6
Control Delay (s)	0.0	7.6	0.0	10.0
Lane LOS		A		B
Approach Delay (s)	0.0	1.2		10.0
Approach LOS				B

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	100	10	21	63	14	7	11	24	47	4	20
Future Volume (vph)	3	100	10	21	63	14	7	11	24	47	4	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	0.99		1.00	0.97			0.92			0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (prot)	1612	3179		1612	3136			1553			1579	
Flt Permitted	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (perm)	1612	3179		1612	3136			1553			1579	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	109	11	23	68	15	8	12	26	51	4	22
RTOR Reduction (vph)	0	8	0	0	11	0	0	25	0	0	18	0
Lane Group Flow (vph)	3	112	0	23	72	0	0	21	0	0	59	0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	2.1	7.6		2.1	7.6			1.2			3.1	
Effective Green, g (s)	2.1	7.6		2.1	7.6			1.2			3.1	
Actuated g/C Ratio	0.07	0.24		0.07	0.24			0.04			0.10	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	105	755		105	744			58			152	
v/s Ratio Prot	0.00	c0.04		c0.01	0.02			c0.01			c0.04	
v/s Ratio Perm												
v/c Ratio	0.03	0.15		0.22	0.10			0.36			0.39	
Uniform Delay, d1	14.0	9.6		14.2	9.5			15.0			13.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	0.1		1.1	0.1			5.2			2.2	
Delay (s)	14.1	9.8		15.2	9.6			20.2			15.8	
Level of Service	B	A		B	A			C			B	
Approach Delay (s)		9.9			10.8			20.2			15.8	
Approach LOS		A			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	32.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	213	1	2	132	2	0	0	6	4	0	3
Future Volume (Veh/h)	3	213	1	2	132	2	0	0	6	4	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	232	1	2	143	2	0	0	7	4	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	145			233			317	388	116	277	387	72
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	145			233			317	388	116	277	387	72
tC, single (s)	4.3			4.3			7.7	6.7	7.1	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			100	100	99	99	100	100
cM capacity (veh/h)	1365			1262			584	522	883	621	522	943

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	119	117	74	74	7	7
Volume Left	3	0	2	0	0	4
Volume Right	0	1	0	2	7	3
cSH	1365	1700	1262	1700	883	728
Volume to Capacity	0.00	0.07	0.00	0.04	0.01	0.01
Queue Length 95th (ft)	0	0	0	0	1	1
Control Delay (s)	0.2	0.0	0.2	0.0	9.1	10.0
Lane LOS	A		A		A	A
Approach Delay (s)	0.1		0.1		9.1	10.0
Approach LOS					A	A

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	18.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	120	103	2	69	64	18
Future Volume (vph)	120	103	2	69	64	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1696	1442	1612	1696	1612	1442
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1696	1442	1612	1696	1612	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	112	2	75	70	20
RTOR Reduction (vph)	0	52	0	0	0	18
Lane Group Flow (vph)	130	60	2	75	70	2
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	20.0	20.0	0.4	24.9	3.7	3.7
Effective Green, g (s)	20.0	20.0	0.4	24.9	3.7	3.7
Actuated g/C Ratio	0.53	0.53	0.01	0.66	0.10	0.10
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	902	767	17	1123	158	141
v/s Ratio Prot	c0.08		0.00	c0.04	c0.04	
v/s Ratio Perm		0.04				0.00
v/c Ratio	0.14	0.08	0.12	0.07	0.44	0.01
Uniform Delay, d1	4.5	4.3	18.4	2.2	16.0	15.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.1	1.1	0.0	0.7	0.0
Delay (s)	4.6	4.4	19.6	2.3	16.7	15.3
Level of Service	A	A	B	A	B	B
Approach Delay (s)	4.5			2.7	16.4	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	6.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	37.6	Sum of lost time (s)	13.5
Intersection Capacity Utilization	17.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	123	17	0	70	1	1
Future Volume (Veh/h)	123	17	0	70	1	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	134	18	0	76	1	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1276					
pX, platoon unblocked						
vC, conflicting volume			152		181	76
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			152		181	76
tC, single (s)			4.3		7.0	7.1
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		100	100
cM capacity (veh/h)			1356		763	938

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	89	63	25	51	2
Volume Left	0	0	0	0	1
Volume Right	0	18	0	0	1
cSH	1700	1700	1356	1700	842
Volume to Capacity	0.05	0.04	0.00	0.03	0.00
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	9.3
Lane LOS					A
Approach Delay (s)	0.0		0.0		9.3
Approach LOS					A

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	13.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	107	9	6	28	147	2	6	14	307	36	59
Future Volume (vph)	8	107	9	6	28	147	2	6	14	307	36	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.92			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		1.00			0.96	1.00
Satd. Flow (prot)	1612	1696	1442	1612	1696	1442		1547			1624	1442
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		1.00			0.96	1.00
Satd. Flow (perm)	1612	1696	1442	1612	1696	1442		1547			1624	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	116	10	7	30	160	2	7	15	334	39	64
RTOR Reduction (vph)	0	0	8	0	0	132	0	15	0	0	0	42
Lane Group Flow (vph)	9	116	2	7	30	28	0	9	0	0	373	22
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases			2			6						3
Actuated Green, G (s)	5.2	9.0	9.0	5.2	9.0	9.0		1.1			17.5	17.5
Effective Green, g (s)	5.2	9.0	9.0	5.2	9.0	9.0		1.1			17.5	17.5
Actuated g/C Ratio	0.10	0.18	0.18	0.10	0.18	0.18		0.02			0.34	0.34
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	165	300	255	165	300	255		33			559	496
v/s Ratio Prot	c0.01	c0.07		0.00	0.02			c0.01			c0.23	
v/s Ratio Perm			0.00			0.02						0.02
v/c Ratio	0.05	0.39	0.01	0.04	0.10	0.11		0.28			0.67	0.04
Uniform Delay, d1	20.6	18.5	17.2	20.6	17.5	17.5		24.5			14.2	11.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.1	0.8	0.0	0.1	0.1	0.2		4.7			3.0	0.0
Delay (s)	20.7	19.3	17.2	20.7	17.7	17.7		29.1			17.2	11.1
Level of Service	C	B	B	C	B	B		C			B	B
Approach Delay (s)		19.2			17.8			29.1			16.3	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	50.8	Sum of lost time (s)	18.0
Intersection Capacity Utilization	39.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	390	0	0	159	1	0	0	0	5	0	22
Future Volume (Veh/h)	38	390	0	0	159	1	0	0	0	5	0	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	424	0	0	173	1	0	0	0	5	0	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		439										
pX, platoon unblocked												
vC, conflicting volume	174			424			703	680	424	680	680	174
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	174			424			703	680	424	680	680	174
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	97			100			100	100	100	99	100	97
cM capacity (veh/h)	1344			1084			322	350	609	344	350	845

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	41	424	0	174	29
Volume Left	41	0	0	0	5
Volume Right	0	0	0	1	24
cSH	1344	1700	1700	1700	675
Volume to Capacity	0.03	0.25	0.00	0.10	0.04
Queue Length 95th (ft)	2	0	0	0	3
Control Delay (s)	7.8	0.0	0.0	0.0	10.6
Lane LOS	A				B
Approach Delay (s)	0.7		0.0		10.6
Approach LOS					B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	37.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	2	9	46	2	2	15	131	20	0	115	6
Future Volume (Veh/h)	7	2	9	46	2	2	15	131	20	0	115	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	2	10	50	2	2	16	142	22	0	125	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	306	324	128	321	317	153	132			164		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	306	324	128	321	317	153	132			164		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	99	100	99	92	100	100	99			100		
cM capacity (veh/h)	619	571	895	599	576	867	1394			1356		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	20	54	16	164	0	132
Volume Left	8	50	16	0	0	0
Volume Right	10	2	0	22	0	7
cSH	725	605	1394	1700	1700	1700
Volume to Capacity	0.03	0.09	0.01	0.10	0.00	0.08
Queue Length 95th (ft)	2	7	1	0	0	0
Control Delay (s)	10.1	11.5	7.6	0.0	0.0	0.0
Lane LOS	B	B	A			
Approach Delay (s)	10.1	11.5	0.7		0.0	
Approach LOS	B	B				

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	24.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	7	8	132	117	7
Future Volume (Veh/h)	3	7	8	132	117	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	8	9	143	127	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	292	131	127			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	292	131	127			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	100	99	99			
cM capacity (veh/h)	674	892	1399			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	11	9	143	135
Volume Left	3	9	0	0
Volume Right	8	0	0	8
cSH	820	1399	1700	1700
Volume to Capacity	0.01	0.01	0.08	0.08
Queue Length 95th (ft)	1	0	0	0
Control Delay (s)	9.5	7.6	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	9.5	0.4		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	16.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	123	8	17	120	3	20
Future Volume (Veh/h)	123	8	17	120	3	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	134	9	18	130	3	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			143		304	138
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			143		304	138
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			99		100	98
cM capacity (veh/h)			1380		658	884

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	143	18	130	25
Volume Left	0	18	0	3
Volume Right	9	0	0	22
cSH	1700	1380	1700	849
Volume to Capacity	0.08	0.01	0.08	0.03
Queue Length 95th (ft)	0	1	0	2
Control Delay (s)	0.0	7.6	0.0	9.4
Lane LOS		A		A
Approach Delay (s)	0.0	0.9		9.4
Approach LOS				A

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	23.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	105	37	25	106	31	20
Future Volume (Veh/h)	105	37	25	106	31	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	40	27	115	34	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			154		303	134
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			154		303	134
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			98		95	98
cM capacity (veh/h)			1368		655	889

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	154	27	115	56
Volume Left	0	27	0	34
Volume Right	40	0	0	22
cSH	1700	1368	1700	731
Volume to Capacity	0.09	0.02	0.07	0.08
Queue Length 95th (ft)	0	2	0	6
Control Delay (s)	0.0	7.7	0.0	10.3
Lane LOS		A		B
Approach Delay (s)	0.0	1.5		10.3
Approach LOS				B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	24.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	123	9	28	98	40	4	33	8	26	67	8
Future Volume (vph)	8	123	9	28	98	40	4	33	8	26	67	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	0.99		1.00	0.96			0.98			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1612	3190		1612	3085			1648			1657	
Flt Permitted	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (perm)	1612	3190		1612	3085			1648			1657	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	134	10	30	107	43	4	36	9	28	73	9
RTOR Reduction (vph)	0	7	0	0	32	0	0	8	0	0	4	0
Lane Group Flow (vph)	9	137	0	30	118	0	0	41	0	0	106	0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	2.4	9.1		2.4	9.1			2.5			4.3	
Effective Green, g (s)	2.4	9.1		2.4	9.1			2.5			4.3	
Actuated g/C Ratio	0.07	0.25		0.07	0.25			0.07			0.12	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	106	799		106	773			113			196	
v/s Ratio Prot	0.01	c0.04		c0.02	0.04			c0.02			c0.06	
v/s Ratio Perm												
v/c Ratio	0.08	0.17		0.28	0.15			0.36			0.54	
Uniform Delay, d1	15.9	10.6		16.1	10.6			16.1			15.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.3	0.1		1.5	0.1			2.7			3.6	
Delay (s)	16.3	10.8		17.6	10.7			18.8			18.7	
Level of Service	B	B		B	B			B			B	
Approach Delay (s)		11.1			11.9			18.8			18.7	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	36.3	Sum of lost time (s)	18.0
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	129	0	3	161	8	0	0	4	3	1	8
Future Volume (Veh/h)	6	129	0	3	161	8	0	0	4	3	1	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	140	0	3	175	9	0	0	4	3	1	9
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	184			140			257	344	70	274	340	92
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	184			140			257	344	70	274	340	92
tC, single (s)	4.3			4.3			7.7	6.7	7.1	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	99			100			100	100	100	100	100	99
cM capacity (veh/h)	1318			1371			638	551	947	626	554	916

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	77	70	90	96	4	13
Volume Left	7	0	3	0	0	3
Volume Right	0	0	0	9	4	9
cSH	1318	1700	1371	1700	947	791
Volume to Capacity	0.01	0.04	0.00	0.06	0.00	0.02
Queue Length 95th (ft)	0	0	0	0	0	1
Control Delay (s)	0.7	0.0	0.3	0.0	8.8	9.6
Lane LOS	A		A		A	A
Approach Delay (s)	0.4		0.1		8.8	9.6
Approach LOS					A	A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	18.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	96	39	14	106	64	2
Future Volume (vph)	96	39	14	106	64	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1696	1442	1612	1696	1612	1442
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1696	1442	1612	1696	1612	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	104	42	15	115	70	2
RTOR Reduction (vph)	0	28	0	0	0	2
Lane Group Flow (vph)	104	14	15	115	70	0
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	8.7	8.7	2.1	15.3	2.1	2.1
Effective Green, g (s)	8.7	8.7	2.1	15.3	2.1	2.1
Actuated g/C Ratio	0.33	0.33	0.08	0.58	0.08	0.08
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	558	475	128	982	128	114
v/s Ratio Prot	c0.06		0.01	c0.07	c0.04	
v/s Ratio Perm		0.01				0.00
v/c Ratio	0.19	0.03	0.12	0.12	0.55	0.00
Uniform Delay, d1	6.3	6.0	11.3	2.5	11.7	11.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.0	0.1	0.1	2.5	0.0
Delay (s)	6.5	6.0	11.4	2.6	14.2	11.2
Level of Service	A	A	B	A	B	B
Approach Delay (s)	6.4			3.6	14.2	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	7.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	26.4	Sum of lost time (s)	13.5
Intersection Capacity Utilization	18.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	96	1	2	106	13	0
Future Volume (Veh/h)	96	1	2	106	13	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	104	1	2	115	14	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1276					
pX, platoon unblocked						
vC, conflicting volume			105		166	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			105		166	52
tC, single (s)			4.3		7.0	7.1
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		98	100
cM capacity (veh/h)			1414		779	972

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	69	36	40	77	14
Volume Left	0	0	2	0	14
Volume Right	0	1	0	0	0
cSH	1700	1700	1414	1700	779
Volume to Capacity	0.04	0.02	0.00	0.05	0.02
Queue Length 95th (ft)	0	0	0	0	1
Control Delay (s)	0.0	0.0	0.4	0.0	9.7
Lane LOS			A		A
Approach Delay (s)	0.0		0.1		9.7
Approach LOS					A

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	14.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	94	4	3	78	338	6	21	12	267	8	34
Future Volume (vph)	5	94	4	3	78	338	6	21	12	267	8	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.99			0.95	1.00
Satd. Flow (prot)	1612	1696	1442	1612	1696	1442		1614			1618	1442
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.99			0.95	1.00
Satd. Flow (perm)	1612	1696	1442	1612	1696	1442		1614			1618	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	102	4	3	85	367	7	23	13	290	9	37
RTOR Reduction (vph)	0	0	3	0	0	297	0	12	0	0	0	26
Lane Group Flow (vph)	5	102	1	3	85	70	0	31	0	0	299	11
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases			2			6						3
Actuated Green, G (s)	5.4	9.6	9.6	5.4	9.6	9.6		2.5			14.9	14.9
Effective Green, g (s)	5.4	9.6	9.6	5.4	9.6	9.6		2.5			14.9	14.9
Actuated g/C Ratio	0.11	0.19	0.19	0.11	0.19	0.19		0.05			0.30	0.30
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	172	323	274	172	323	274		80			478	426
v/s Ratio Prot	c0.00	c0.06		0.00	0.05			c0.02			c0.18	
v/s Ratio Perm			0.00			0.05						0.01
v/c Ratio	0.03	0.32	0.00	0.02	0.26	0.26		0.38			0.63	0.03
Uniform Delay, d1	20.2	17.6	16.5	20.1	17.4	17.4		23.2			15.3	12.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.1	0.6	0.0	0.0	0.4	0.5		3.0			2.6	0.0
Delay (s)	20.2	18.1	16.5	20.2	17.8	17.9		26.2			17.9	12.6
Level of Service	C	B	B	C	B	B		C			B	B
Approach Delay (s)		18.2			17.9			26.2			17.3	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	50.4	Sum of lost time (s)	18.0
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	342	0	0	389	1	0	0	0	0	0	30
Future Volume (Veh/h)	32	342	0	0	389	1	0	0	0	0	0	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	35	372	0	0	423	1	0	0	0	0	0	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		439										
pX, platoon unblocked												
vC, conflicting volume	424			372			898	866	372	866	866	424
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	424			372			898	866	372	866	866	424
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	97			100			100	100	100	100	100	95
cM capacity (veh/h)	1084			1134			231	272	652	257	272	610

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	35	372	0	424	33
Volume Left	35	0	0	0	0
Volume Right	0	0	0	1	33
cSH	1084	1700	1700	1700	610
Volume to Capacity	0.03	0.22	0.00	0.25	0.05
Queue Length 95th (ft)	3	0	0	0	4
Control Delay (s)	8.4	0.0	0.0	0.0	11.2
Lane LOS	A				B
Approach Delay (s)	0.7		0.0		11.2
Approach LOS					B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	2	13	36	2	5	32	188	44	0	144	9
Future Volume (Veh/h)	4	2	13	36	2	5	32	188	44	0	144	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	2	14	39	2	5	35	204	48	0	157	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	442	484	162	470	465	228	167			252		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	442	484	162	470	465	228	167			252		
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.3	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	99	100	98	92	100	99	97			100		
cM capacity (veh/h)	494	456	857	468	468	787	1352			1257		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	20	46	35	252	0	167
Volume Left	4	39	35	0	0	0
Volume Right	14	5	0	48	0	10
cSH	694	490	1352	1700	1700	1700
Volume to Capacity	0.03	0.09	0.03	0.15	0.00	0.10
Queue Length 95th (ft)	2	8	2	0	0	0
Control Delay (s)	10.3	13.1	7.7	0.0	0.0	0.0
Lane LOS	B	B	A			
Approach Delay (s)	10.3	13.1	0.9		0.0	
Approach LOS	B	B				

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	10	181	119	143	4
Future Volume (Veh/h)	8	10	181	119	143	4
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	11	197	129	155	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	680	157	155			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	680	157	155			
tC, single (s)	6.5	6.3	4.2			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.3			
p0 queue free %	97	99	86			
cM capacity (veh/h)	344	863	1366			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	20	197	129	159
Volume Left	9	197	0	0
Volume Right	11	0	0	4
cSH	514	1366	1700	1700
Volume to Capacity	0.04	0.14	0.08	0.09
Queue Length 95th (ft)	3	13	0	0
Control Delay (s)	12.3	8.1	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	12.3	4.9		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	184	5	6	136	4	9
Future Volume (Veh/h)	184	5	6	136	4	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	200	5	7	148	4	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			205		364	202
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			205		364	202
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			99		99	99
cM capacity (veh/h)			1309		612	814

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	205	7	148	14
Volume Left	0	7	0	4
Volume Right	5	0	0	10
cSH	1700	1309	1700	744
Volume to Capacity	0.12	0.01	0.09	0.02
Queue Length 95th (ft)	0	0	0	1
Control Delay (s)	0.0	7.8	0.0	9.9
Lane LOS		A		A
Approach Delay (s)	0.0	0.4		9.9
Approach LOS				A

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	137	50	61	81	33	24
Future Volume (Veh/h)	137	50	61	81	33	24
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	149	54	66	88	36	26
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			203		396	176
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			203		396	176
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			95		94	97
cM capacity (veh/h)			1311		560	842

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	203	66	88	62
Volume Left	0	66	0	36
Volume Right	54	0	0	26
cSH	1700	1311	1700	652
Volume to Capacity	0.12	0.05	0.05	0.10
Queue Length 95th (ft)	0	4	0	8
Control Delay (s)	0.0	7.9	0.0	11.1
Lane LOS		A		B
Approach Delay (s)	0.0	3.4		11.1
Approach LOS				B

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	27.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	136	15	25	95	18	14	11	36	56	4	26
Future Volume (vph)	7	136	15	25	95	18	14	11	36	56	4	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.92			0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (prot)	1612	3176		1612	3145			1544			1576	
Flt Permitted	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (perm)	1612	3176		1612	3145			1544			1576	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	148	16	27	103	20	15	12	39	61	4	28
RTOR Reduction (vph)	0	12	0	0	15	0	0	36	0	0	20	0
Lane Group Flow (vph)	8	152	0	27	108	0	0	30	0	0	73	0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	2.1	8.2		2.1	8.2			2.6			3.1	
Effective Green, g (s)	2.1	8.2		2.1	8.2			2.6			3.1	
Actuated g/C Ratio	0.06	0.24		0.06	0.24			0.08			0.09	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	99	765		99	758			118			143	
v/s Ratio Prot	0.00	c0.05		c0.02	0.03			c0.02			c0.05	
v/s Ratio Perm												
v/c Ratio	0.08	0.20		0.27	0.14			0.25			0.51	
Uniform Delay, d1	15.0	10.3		15.2	10.1			14.8			14.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.4	0.2		1.5	0.1			1.6			4.0	
Delay (s)	15.4	10.5		16.7	10.3			16.3			18.8	
Level of Service	B	B		B	B			B			B	
Approach Delay (s)		10.7			11.4			16.3			18.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	34.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	268	1	2	170	4	0	0	6	7	0	5
Future Volume (Veh/h)	5	268	1	2	170	4	0	0	6	7	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	291	1	2	185	4	0	0	7	8	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	189			292			403	494	146	354	493	94
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	189			292			403	494	146	354	493	94
tC, single (s)	4.3			4.3			7.7	6.7	7.1	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			100	100	99	99	100	99
cM capacity (veh/h)	1312			1197			504	451	844	546	452	912

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	150	146	94	96	7	13
Volume Left	5	0	2	0	0	8
Volume Right	0	1	0	4	7	5
cSH	1312	1700	1197	1700	844	646
Volume to Capacity	0.00	0.09	0.00	0.06	0.01	0.02
Queue Length 95th (ft)	0	0	0	0	1	2
Control Delay (s)	0.3	0.0	0.2	0.0	9.3	10.7
Lane LOS	A		A		A	B
Approach Delay (s)	0.1		0.1		9.3	10.7
Approach LOS					A	B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	152	129	2	90	83	19
Future Volume (vph)	152	129	2	90	83	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1696	1442	1612	1696	1612	1442
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1696	1442	1612	1696	1612	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	165	140	2	98	90	21
RTOR Reduction (vph)	0	91	0	0	0	18
Lane Group Flow (vph)	165	49	2	98	90	3
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	10.3	10.3	2.2	17.0	3.6	3.6
Effective Green, g (s)	10.3	10.3	2.2	17.0	3.6	3.6
Actuated g/C Ratio	0.35	0.35	0.07	0.57	0.12	0.12
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	590	501	119	974	196	175
v/s Ratio Prot	c0.10		0.00	c0.06	c0.06	
v/s Ratio Perm		0.03				0.00
v/c Ratio	0.28	0.10	0.02	0.10	0.46	0.01
Uniform Delay, d1	7.0	6.5	12.7	2.8	12.1	11.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.0	0.1	0.6	0.0
Delay (s)	7.3	6.6	12.7	2.9	12.7	11.5
Level of Service	A	A	B	A	B	B
Approach Delay (s)	7.0			3.1	12.5	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	29.6	Sum of lost time (s)	13.5
Intersection Capacity Utilization	20.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	155	18	0	91	1	1
Future Volume (Veh/h)	155	18	0	91	1	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	168	20	0	99	1	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1276					
pX, platoon unblocked						
vC, conflicting volume			188		228	94
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			188		228	94
tC, single (s)			4.3		7.0	7.1
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		100	100
cM capacity (veh/h)			1313		713	913

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	112	76	33	66	2
Volume Left	0	0	0	0	1
Volume Right	0	20	0	0	1
cSH	1700	1700	1313	1700	801
Volume to Capacity	0.07	0.04	0.00	0.04	0.00
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	9.5
Lane LOS					A
Approach Delay (s)	0.0		0.0		9.5
Approach LOS					A

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	14.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	133	14	6	48	147	4	6	16	308	36	60
Future Volume (vph)	9	133	14	6	48	147	4	6	16	308	36	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.92			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.99			0.96	1.00
Satd. Flow (prot)	1612	1696	1442	1612	1696	1442		1546			1624	1442
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.99			0.96	1.00
Satd. Flow (perm)	1612	1696	1442	1612	1696	1442		1546			1624	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	145	15	7	52	160	4	7	17	335	39	65
RTOR Reduction (vph)	0	0	12	0	0	130	0	16	0	0	0	43
Lane Group Flow (vph)	10	145	3	7	52	30	0	12	0	0	374	22
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases			2			6						3
Actuated Green, G (s)	5.2	10.0	10.0	5.2	10.0	10.0		2.3			17.8	17.8
Effective Green, g (s)	5.2	10.0	10.0	5.2	10.0	10.0		2.3			17.8	17.8
Actuated g/C Ratio	0.10	0.19	0.19	0.10	0.19	0.19		0.04			0.33	0.33
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	157	318	270	157	318	270		66			542	481
v/s Ratio Prot	c0.01	c0.09		0.00	0.03			c0.01			c0.23	
v/s Ratio Perm			0.00			0.02						0.02
v/c Ratio	0.06	0.46	0.01	0.04	0.16	0.11		0.18			0.69	0.05
Uniform Delay, d1	21.8	19.2	17.6	21.8	18.1	18.0		24.6			15.4	12.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.2	1.0	0.0	0.1	0.2	0.2		1.3			3.8	0.0
Delay (s)	22.0	20.3	17.6	21.9	18.4	18.1		25.9			19.1	12.0
Level of Service	C	C	B	C	B	B		C			B	B
Approach Delay (s)		20.1			18.3			25.9			18.1	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	53.3	Sum of lost time (s)	18.0
Intersection Capacity Utilization	40.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	419	0	0	179	1	0	0	0	5	0	22
Future Volume (Veh/h)	38	419	0	0	179	1	0	0	0	5	0	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	455	0	0	195	1	0	0	0	5	0	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		439										
pX, platoon unblocked				0.98			0.98	0.98	0.98	0.98	0.98	
vC, conflicting volume	196			455			756	733	455	732	732	196
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	196			436			743	719	436	719	719	196
tC, single (s)	4.2			4.2			7.2	6.6	6.3	7.2	6.6	6.3
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	97			100			100	100	100	98	100	97
cM capacity (veh/h)	1319			1053			297	326	589	318	326	821

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	41	455	0	196	29
Volume Left	41	0	0	0	5
Volume Right	0	0	0	1	24
cSH	1319	1700	1700	1700	645
Volume to Capacity	0.03	0.27	0.00	0.12	0.04
Queue Length 95th (ft)	2	0	0	0	4
Control Delay (s)	7.8	0.0	0.0	0.0	10.8
Lane LOS	A				B
Approach Delay (s)	0.6		0.0		10.8
Approach LOS					B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	2	9	46	2	2	15	131	20	0	115	6
Future Volume (Veh/h)	7	2	9	46	2	2	15	131	20	0	115	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	2	10	50	2	2	16	142	22	0	125	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	306	324	128	321	317	153	132			164		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	306	324	128	321	317	153	132			164		
tC, single (s)	7.3	6.7	6.4	7.3	6.7	6.4	4.3			4.3		
tC, 2 stage (s)												
tF (s)	3.7	4.2	3.5	3.7	4.2	3.5	2.4			2.4		
p0 queue free %	99	100	99	91	100	100	99			100		
cM capacity (veh/h)	597	552	866	578	558	838	1328			1291		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	20	54	16	164	0	132
Volume Left	8	50	16	0	0	0
Volume Right	10	2	0	22	0	7
cSH	700	584	1328	1700	1700	1700
Volume to Capacity	0.03	0.09	0.01	0.10	0.00	0.08
Queue Length 95th (ft)	2	8	1	0	0	0
Control Delay (s)	10.3	11.8	7.7	0.0	0.0	0.0
Lane LOS	B	B	A			
Approach Delay (s)	10.3	11.8	0.7		0.0	
Approach LOS	B	B				

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	24.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	7	8	132	117	7
Future Volume (Veh/h)	3	7	8	132	117	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	8	9	143	127	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	292	131	127			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	292	131	127			
tC, single (s)	6.6	6.4	4.3			
tC, 2 stage (s)						
tF (s)	3.7	3.5	2.4			
p0 queue free %	100	99	99			
cM capacity (veh/h)	650	863	1334			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	11	9	143	135
Volume Left	3	9	0	0
Volume Right	8	0	0	8
cSH	792	1334	1700	1700
Volume to Capacity	0.01	0.01	0.08	0.08
Queue Length 95th (ft)	1	1	0	0
Control Delay (s)	9.6	7.7	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	9.6	0.5		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	16.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	123	8	17	120	3	20
Future Volume (Veh/h)	123	8	17	120	3	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	134	9	18	130	3	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			143		304	138
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			143		304	138
tC, single (s)			4.3		6.6	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.7	3.5
p0 queue free %			99		100	97
cM capacity (veh/h)			1315		635	854

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	143	18	130	25
Volume Left	0	18	0	3
Volume Right	9	0	0	22
cSH	1700	1315	1700	820
Volume to Capacity	0.08	0.01	0.08	0.03
Queue Length 95th (ft)	0	1	0	2
Control Delay (s)	0.0	7.8	0.0	9.5
Lane LOS		A		A
Approach Delay (s)	0.0	0.9		9.5
Approach LOS				A

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	23.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	105	37	25	106	31	20
Future Volume (Veh/h)	105	37	25	106	31	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	114	40	27	115	34	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			154		303	134
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			154		303	134
tC, single (s)			4.3		6.6	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.7	3.5
p0 queue free %			98		95	97
cM capacity (veh/h)			1303		632	860

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	154	27	115	56
Volume Left	0	27	0	34
Volume Right	40	0	0	22
cSH	1700	1303	1700	705
Volume to Capacity	0.09	0.02	0.07	0.08
Queue Length 95th (ft)	0	2	0	6
Control Delay (s)	0.0	7.8	0.0	10.5
Lane LOS		A		B
Approach Delay (s)	0.0	1.5		10.5
Approach LOS				B

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	24.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	123	9	28	98	40	4	33	8	26	67	8
Future Volume (vph)	8	123	9	28	98	40	4	33	8	26	67	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.96			0.98			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1456	1516		1456	1466			1488			1496	
Flt Permitted	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (perm)	1456	1516		1456	1466			1488			1496	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	134	10	30	107	43	4	36	9	28	73	9
RTOR Reduction (vph)	0	4	0	0	22	0	0	8	0	0	4	0
Lane Group Flow (vph)	9	140	0	30	128	0	0	41	0	0	106	0
Heavy Vehicles (%)	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	2.1	9.9		2.1	9.9			2.7			3.2	
Effective Green, g (s)	2.1	9.9		2.1	9.9			2.7			3.2	
Actuated g/C Ratio	0.06	0.28		0.06	0.28			0.08			0.09	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	85	418		85	404			111			133	
v/s Ratio Prot	0.01	c0.09		c0.02	0.09			c0.03			c0.07	
v/s Ratio Perm												
v/c Ratio	0.11	0.34		0.35	0.32			0.37			0.80	
Uniform Delay, d1	16.0	10.4		16.2	10.3			15.8			16.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.6	0.7		2.5	0.6			2.8			28.9	
Delay (s)	16.6	11.0		18.8	10.9			18.6			44.9	
Level of Service	B	B		B	B			B			D	
Approach Delay (s)		11.4			12.2			18.6			44.9	
Approach LOS		B			B			B			D	

Intersection Summary			
HCM 2000 Control Delay	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	35.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	129	0	3	161	8	0	0	4	3	1	8
Future Volume (Veh/h)	6	129	0	3	161	8	0	0	4	3	1	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	140	0	3	175	9	0	0	4	3	1	9
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	184			140			257	344	70	274	340	92
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	184			140			257	344	70	274	340	92
tC, single (s)	4.6			4.6			8.0	7.0	7.4	8.0	7.0	7.4
tC, 2 stage (s)												
tF (s)	2.4			2.4			3.7	4.2	3.5	3.7	4.2	3.5
p0 queue free %	99			100			100	100	100	99	100	99
cM capacity (veh/h)	1242			1294			610	526	912	597	529	881

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	77	70	90	96	4	13
Volume Left	7	0	3	0	0	3
Volume Right	0	0	0	9	4	9
cSH	1242	1700	1294	1700	912	759
Volume to Capacity	0.01	0.04	0.00	0.06	0.00	0.02
Queue Length 95th (ft)	0	0	0	0	0	1
Control Delay (s)	0.8	0.0	0.3	0.0	9.0	9.8
Lane LOS	A		A		A	A
Approach Delay (s)	0.4		0.1		9.0	9.8
Approach LOS					A	A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	18.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	96	39	14	106	64	2
Future Volume (vph)	96	39	14	106	64	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1532	1302	1456	1532	1456	1302
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1532	1302	1456	1532	1456	1302
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	104	42	15	115	70	2
RTOR Reduction (vph)	0	28	0	0	0	2
Lane Group Flow (vph)	104	14	15	115	70	0
Heavy Vehicles (%)	24%	24%	24%	24%	24%	24%
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	8.9	8.9	2.2	15.6	2.2	2.2
Effective Green, g (s)	8.9	8.9	2.2	15.6	2.2	2.2
Actuated g/C Ratio	0.33	0.33	0.08	0.58	0.08	0.08
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	508	432	119	891	119	106
v/s Ratio Prot	c0.07		0.01	c0.08	c0.05	
v/s Ratio Perm		0.01				0.00
v/c Ratio	0.20	0.03	0.13	0.13	0.59	0.00
Uniform Delay, d1	6.4	6.0	11.4	2.5	11.9	11.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.0	0.2	0.1	4.7	0.0
Delay (s)	6.7	6.1	11.6	2.6	16.6	11.3
Level of Service	A	A	B	A	B	B
Approach Delay (s)	6.5			3.7	16.4	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	7.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	26.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	18.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	96	1	2	106	13	0
Future Volume (Veh/h)	96	1	2	106	13	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	104	1	2	115	14	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1276					
pX, platoon unblocked						
vC, conflicting volume			105		224	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			105		224	52
tC, single (s)			4.6		7.3	7.4
tC, 2 stage (s)						
tF (s)			2.4		3.7	3.5
p0 queue free %			100		98	100
cM capacity (veh/h)			1337		685	937

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	69	36	117	14
Volume Left	0	0	2	14
Volume Right	0	1	0	0
cSH	1700	1700	1337	685
Volume to Capacity	0.04	0.02	0.00	0.02
Queue Length 95th (ft)	0	0	0	2
Control Delay (s)	0.0	0.0	0.1	10.4
Lane LOS			A	B
Approach Delay (s)	0.0		0.1	10.4
Approach LOS				B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	17.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	94	4	3	78	338	6	21	12	267	8	34
Future Volume (vph)	5	94	4	3	78	338	6	21	12	267	8	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.99			0.95	1.00
Satd. Flow (prot)	1456	1532	1302	1456	1532	1302		1458			1461	1302
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.99			0.95	1.00
Satd. Flow (perm)	1456	1532	1302	1456	1532	1302		1458			1461	1302
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	102	4	3	85	367	7	23	13	290	9	37
RTOR Reduction (vph)	0	0	3	0	0	297	0	12	0	0	0	25
Lane Group Flow (vph)	5	102	1	3	85	70	0	31	0	0	299	12
Heavy Vehicles (%)	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases			2			6						3
Actuated Green, G (s)	5.4	10.0	10.0	5.4	10.0	10.0		2.6			16.3	16.3
Effective Green, g (s)	5.4	10.0	10.0	5.4	10.0	10.0		2.6			16.3	16.3
Actuated g/C Ratio	0.10	0.19	0.19	0.10	0.19	0.19		0.05			0.31	0.31
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	150	292	248	150	292	248		72			455	405
v/s Ratio Prot	c0.00	c0.07		0.00	0.06			c0.02			c0.20	
v/s Ratio Perm			0.00			0.05						0.01
v/c Ratio	0.03	0.35	0.00	0.02	0.29	0.28		0.43			0.66	0.03
Uniform Delay, d1	21.1	18.3	17.1	21.1	18.1	18.1		24.1			15.6	12.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.1	0.7	0.0	0.1	0.6	0.6		4.0			3.4	0.0
Delay (s)	21.2	19.1	17.1	21.1	18.7	18.7		28.1			19.0	12.5
Level of Service	C	B	B	C	B	B		C			B	B
Approach Delay (s)		19.1			18.7			28.1			18.3	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	52.3	Sum of lost time (s)	18.0
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	342	0	0	389	1	0	0	0	0	0	30
Future Volume (Veh/h)	32	342	0	0	389	1	0	0	0	0	0	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	35	372	0	0	423	1	0	0	0	0	0	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		439										
pX, platoon unblocked												
vC, conflicting volume	424			372			898	866	372	866	866	424
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	424			372			898	866	372	866	866	424
tC, single (s)	4.3			4.3			7.3	6.7	6.4	7.3	6.7	6.4
tC, 2 stage (s)												
tF (s)	2.4			2.4			3.7	4.2	3.5	3.7	4.2	3.5
p0 queue free %	97			100			100	100	100	100	100	94
cM capacity (veh/h)	1027			1075			219	259	628	244	260	586

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	35	372	0	424	33
Volume Left	35	0	0	0	0
Volume Right	0	0	0	1	33
cSH	1027	1700	1700	1700	586
Volume to Capacity	0.03	0.22	0.00	0.25	0.06
Queue Length 95th (ft)	3	0	0	0	4
Control Delay (s)	8.6	0.0	0.0	0.0	11.5
Lane LOS	A				B
Approach Delay (s)	0.7		0.0		11.5
Approach LOS					B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	2	13	36	2	5	32	188	44	0	144	9
Future Volume (Veh/h)	4	2	13	36	2	5	32	188	44	0	144	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	2	14	39	2	5	35	204	48	0	157	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	442	484	162	470	465	228	167			252		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	442	484	162	470	465	228	167			252		
tC, single (s)	7.3	6.7	6.4	7.3	6.7	6.4	4.3			4.3		
tC, 2 stage (s)												
tF (s)	3.7	4.2	3.5	3.7	4.2	3.5	2.4			2.4		
p0 queue free %	99	100	98	91	100	99	97			100		
cM capacity (veh/h)	475	440	829	450	451	760	1288			1195		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	20	46	35	252	0	167
Volume Left	4	39	35	0	0	0
Volume Right	14	5	0	48	0	10
cSH	670	471	1288	1700	1700	1700
Volume to Capacity	0.03	0.10	0.03	0.15	0.00	0.10
Queue Length 95th (ft)	2	8	2	0	0	0
Control Delay (s)	10.5	13.5	7.9	0.0	0.0	0.0
Lane LOS	B	B	A			
Approach Delay (s)	10.5	13.5	1.0		0.0	
Approach LOS	B	B				

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	10	181	119	143	4
Future Volume (Veh/h)	8	10	181	119	143	4
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	11	197	129	155	4
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	680	157	155			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	680	157	155			
tC, single (s)	6.6	6.4	4.3			
tC, 2 stage (s)						
tF (s)	3.7	3.5	2.4			
p0 queue free %	97	99	85			
cM capacity (veh/h)	326	834	1302			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	20	197	129	159
Volume Left	9	197	0	0
Volume Right	11	0	0	4
cSH	491	1302	1700	1700
Volume to Capacity	0.04	0.15	0.08	0.09
Queue Length 95th (ft)	3	13	0	0
Control Delay (s)	12.6	8.3	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	12.6	5.0		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	184	5	6	136	4	9
Future Volume (Veh/h)	184	5	6	136	4	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	200	5	7	148	4	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			205		364	202
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			205		364	202
tC, single (s)			4.3		6.6	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.7	3.5
p0 queue free %			99		99	99
cM capacity (veh/h)			1246		590	786

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	205	7	148	14
Volume Left	0	7	0	4
Volume Right	5	0	0	10
cSH	1700	1246	1700	718
Volume to Capacity	0.12	0.01	0.09	0.02
Queue Length 95th (ft)	0	0	0	1
Control Delay (s)	0.0	7.9	0.0	10.1
Lane LOS		A		B
Approach Delay (s)	0.0	0.4		10.1
Approach LOS				B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	137	50	61	81	33	24
Future Volume (Veh/h)	137	50	61	81	33	24
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	149	54	66	88	36	26
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			203		396	176
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			203		396	176
tC, single (s)			4.3		6.6	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.7	3.5
p0 queue free %			95		93	97
cM capacity (veh/h)			1248		538	813

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	203	66	88	62
Volume Left	0	66	0	36
Volume Right	54	0	0	26
cSH	1700	1248	1700	627
Volume to Capacity	0.12	0.05	0.05	0.10
Queue Length 95th (ft)	0	4	0	8
Control Delay (s)	0.0	8.0	0.0	11.4
Lane LOS		A		B
Approach Delay (s)	0.0	3.4		11.4
Approach LOS				B

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	27.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	136	15	25	95	18	14	11	36	56	4	26
Future Volume (vph)	7	136	15	25	95	18	14	11	36	56	4	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.92			0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (prot)	1456	1510		1456	1495			1394			1423	
Flt Permitted	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (perm)	1456	1510		1456	1495			1394			1423	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	148	16	27	103	20	15	12	39	61	4	28
RTOR Reduction (vph)	0	6	0	0	10	0	0	35	0	0	20	0
Lane Group Flow (vph)	8	158	0	27	113	0	0	31	0	0	73	0
Heavy Vehicles (%)	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	2.1	10.3		2.1	10.3			4.3			3.2	
Effective Green, g (s)	2.1	10.3		2.1	10.3			4.3			3.2	
Actuated g/C Ratio	0.06	0.27		0.06	0.27			0.11			0.08	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	80	410		80	406			158			120	
v/s Ratio Prot	0.01	c0.10		c0.02	0.08			c0.02			c0.05	
v/s Ratio Perm												
v/c Ratio	0.10	0.39		0.34	0.28			0.20			0.61	
Uniform Delay, d1	17.0	11.2		17.2	10.9			15.2			16.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.5	0.8		2.5	0.5			0.8			9.7	
Delay (s)	17.6	12.1		19.7	11.4			16.1			26.4	
Level of Service	B	B		B	B			B			C	
Approach Delay (s)		12.3			12.9			16.1			26.4	
Approach LOS		B			B			B			C	

Intersection Summary				
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.38			
Actuated Cycle Length (s)	37.9	Sum of lost time (s)	18.0	
Intersection Capacity Utilization	34.6%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	268	1	2	170	4	0	0	6	7	0	5
Future Volume (Veh/h)	5	268	1	2	170	4	0	0	6	7	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	291	1	2	185	4	0	0	7	8	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	189			292			403	494	146	354	493	94
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	189			292			403	494	146	354	493	94
tC, single (s)	4.6			4.6			8.0	7.0	7.4	8.0	7.0	7.4
tC, 2 stage (s)												
tF (s)	2.4			2.4			3.7	4.2	3.5	3.7	4.2	3.5
p0 queue free %	100			100			100	100	99	98	100	99
cM capacity (veh/h)	1236			1122			477	427	809	518	428	877

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	150	146	94	96	7	13
Volume Left	5	0	2	0	0	8
Volume Right	0	1	0	4	7	5
cSH	1236	1700	1122	1700	809	615
Volume to Capacity	0.00	0.09	0.00	0.06	0.01	0.02
Queue Length 95th (ft)	0	0	0	0	1	2
Control Delay (s)	0.3	0.0	0.2	0.0	9.5	11.0
Lane LOS	A		A		A	B
Approach Delay (s)	0.2		0.1		9.5	11.0
Approach LOS					A	B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	152	129	2	90	83	19
Future Volume (vph)	152	129	2	90	83	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1532	1302	1456	1532	1456	1302
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1532	1302	1456	1532	1456	1302
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	165	140	2	98	90	21
RTOR Reduction (vph)	0	65	0	0	0	19
Lane Group Flow (vph)	165	75	2	98	90	2
Heavy Vehicles (%)	24%	24%	24%	24%	24%	24%
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	21.1	21.1	0.3	25.9	4.3	4.3
Effective Green, g (s)	21.1	21.1	0.3	25.9	4.3	4.3
Actuated g/C Ratio	0.54	0.54	0.01	0.66	0.11	0.11
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	824	700	11	1012	159	142
v/s Ratio Prot	c0.11		0.00	c0.06	c0.06	
v/s Ratio Perm		0.06				0.00
v/c Ratio	0.20	0.11	0.18	0.10	0.57	0.02
Uniform Delay, d1	4.7	4.4	19.3	2.4	16.6	15.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	2.9	0.1	2.7	0.0
Delay (s)	4.8	4.5	22.2	2.5	19.3	15.6
Level of Service	A	A	C	A	B	B
Approach Delay (s)	4.7			2.9	18.6	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	7.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	39.2	Sum of lost time (s)	13.5
Intersection Capacity Utilization	20.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	155	18	0	91	1	1
Future Volume (Veh/h)	155	18	0	91	1	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	168	20	0	99	1	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1276					
pX, platoon unblocked						
vC, conflicting volume			188		277	94
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			188		277	94
tC, single (s)			4.6		7.3	7.4
tC, 2 stage (s)						
tF (s)			2.4		3.7	3.5
p0 queue free %			100		100	100
cM capacity (veh/h)			1237		633	878

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	112	76	99	2
Volume Left	0	0	0	1
Volume Right	0	20	0	1
cSH	1700	1700	1237	735
Volume to Capacity	0.07	0.04	0.00	0.00
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	9.9
Lane LOS				A
Approach Delay (s)	0.0		0.0	9.9
Approach LOS				A

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	14.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	133	14	6	48	147	4	6	16	308	36	60
Future Volume (vph)	9	133	14	6	48	147	4	6	16	308	36	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		0.92			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.99			0.96	1.00
Satd. Flow (prot)	1456	1532	1302	1456	1532	1302		1397			1467	1302
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00		0.99			0.96	1.00
Satd. Flow (perm)	1456	1532	1302	1456	1532	1302		1397			1467	1302
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	145	15	7	52	160	4	7	17	335	39	65
RTOR Reduction (vph)	0	0	12	0	0	131	0	16	0	0	0	41
Lane Group Flow (vph)	10	145	3	7	52	29	0	12	0	0	374	24
Heavy Vehicles (%)	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%	24%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases			2			6						3
Actuated Green, G (s)	5.1	10.5	10.5	5.1	10.5	10.5		2.5			21.0	21.0
Effective Green, g (s)	5.1	10.5	10.5	5.1	10.5	10.5		2.5			21.0	21.0
Actuated g/C Ratio	0.09	0.18	0.18	0.09	0.18	0.18		0.04			0.37	0.37
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)	130	281	239	130	281	239		61			539	478
v/s Ratio Prot	c0.01	c0.09		0.00	0.03			c0.01			c0.26	
v/s Ratio Perm			0.00			0.02						0.02
v/c Ratio	0.08	0.52	0.01	0.05	0.19	0.12		0.19			0.69	0.05
Uniform Delay, d1	23.8	21.0	19.1	23.8	19.7	19.5		26.3			15.3	11.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.3	1.6	0.0	0.2	0.3	0.2		1.5			3.9	0.0
Delay (s)	24.1	22.6	19.1	24.0	20.0	19.7		27.9			19.2	11.7
Level of Service	C	C	B	C	C	B		C			B	B
Approach Delay (s)		22.4			19.9			27.9			18.1	
Approach LOS		C			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	57.1	Sum of lost time (s)	18.0
Intersection Capacity Utilization	40.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	419	0	0	179	1	0	0	0	5	0	22
Future Volume (Veh/h)	38	419	0	0	179	1	0	0	0	5	0	22
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	455	0	0	195	1	0	0	0	5	0	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		439										
pX, platoon unblocked				0.98			0.98	0.98	0.98	0.98	0.98	
vC, conflicting volume	196			455			756	733	455	732	732	196
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	196			436			743	719	436	719	719	196
tC, single (s)	4.3			4.3			7.3	6.7	6.4	7.3	6.7	6.4
tC, 2 stage (s)												
tF (s)	2.4			2.4			3.7	4.2	3.5	3.7	4.2	3.5
p0 queue free %	97			100			100	100	100	98	100	97
cM capacity (veh/h)	1256			998			283	312	566	304	313	793

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	41	455	0	196	29
Volume Left	41	0	0	0	5
Volume Right	0	0	0	1	24
cSH	1256	1700	1700	1700	620
Volume to Capacity	0.03	0.27	0.00	0.12	0.05
Queue Length 95th (ft)	3	0	0	0	4
Control Delay (s)	8.0	0.0	0.0	0.0	11.1
Lane LOS	A				B
Approach Delay (s)	0.7		0.0		11.1
Approach LOS					B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	58	8	64	85	195	3	15	26	25	28	6
Future Volume (vph)	40	58	8	64	85	195	3	15	26	25	28	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	0.98		1.00	0.90			0.92			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (prot)	1612	3163		1612	2886			1555			1637	
Flt Permitted	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (perm)	1612	3163		1612	2886			1555			1637	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	63	9	70	92	212	3	16	28	27	30	7
RTOR Reduction (vph)	0	7	0	0	155	0	0	26	0	0	7	0
Lane Group Flow (vph)	43	65	0	70	149	0	0	21	0	0	57	0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	2.4	9.2		2.4	9.2			2.1			2.3	
Effective Green, g (s)	2.4	9.2		2.4	9.2			2.1			2.3	
Actuated g/C Ratio	0.07	0.27		0.07	0.27			0.06			0.07	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	113	855		113	780			96			110	
v/s Ratio Prot	0.03	0.02		c0.04	c0.05			c0.01			c0.04	
v/s Ratio Perm												
v/c Ratio	0.38	0.08		0.62	0.19			0.22			0.52	
Uniform Delay, d1	15.1	9.2		15.4	9.5			15.2			15.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	2.1	0.1		9.7	0.2			1.5			5.7	
Delay (s)	17.2	9.3		25.1	9.7			16.7			21.0	
Level of Service	B	A		C	A			B			C	
Approach Delay (s)		12.3			12.6			16.7			21.0	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	34.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	33.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	19	96	335	47	10	0
Future Volume (Veh/h)	19	96	335	47	10	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	104	364	51	11	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	415				484	208
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	415				484	208
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	98				98	100
cM capacity (veh/h)	1072				478	769

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	56	69	243	172	11
Volume Left	21	0	0	0	11
Volume Right	0	0	0	51	0
cSH	1072	1700	1700	1700	478
Volume to Capacity	0.02	0.04	0.14	0.10	0.02
Queue Length 95th (ft)	1	0	0	0	2
Control Delay (s)	3.3	0.0	0.0	0.0	12.7
Lane LOS	A				B
Approach Delay (s)	1.5		0.0		12.7
Approach LOS					B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	96	381	0	5	0
Future Volume (Veh/h)	0	96	381	0	5	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	104	414	0	5	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	414				466	207
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	414				466	207
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				99	100
cM capacity (veh/h)	1073				501	769

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	52	52	207	207	5
Volume Left	0	0	0	0	5
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	501
Volume to Capacity	0.03	0.03	0.12	0.12	0.01
Queue Length 95th (ft)	0	0	0	0	1
Control Delay (s)	0.0	0.0	0.0	0.0	12.3
Lane LOS					B
Approach Delay (s)	0.0		0.0		12.3
Approach LOS					B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	20.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	112	0	3	149	5	0	0	4	0	1	7
Future Volume (Veh/h)	4	112	0	3	149	5	0	0	4	0	1	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	122	0	3	162	5	0	0	4	0	1	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	167			122			226	303	61	244	300	84
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	167			122			226	303	61	244	300	84
tC, single (s)	4.3			4.3			7.7	6.7	7.1	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	100			100			100	100	100	100	100	99
cM capacity (veh/h)	1338			1393			675	583	960	659	585	928

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	65	61	84	86	4	9
Volume Left	4	0	3	0	0	0
Volume Right	0	0	0	5	4	8
cSH	1338	1700	1393	1700	960	871
Volume to Capacity	0.00	0.04	0.00	0.05	0.00	0.01
Queue Length 95th (ft)	0	0	0	0	0	1
Control Delay (s)	0.5	0.0	0.3	0.0	8.8	9.2
Lane LOS	A		A		A	A
Approach Delay (s)	0.3		0.1		8.8	9.2
Approach LOS					A	A

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	16.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	80	36	13	95	60	2
Future Volume (vph)	80	36	13	95	60	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1696	1442	1612	1696	1612	1442
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1696	1442	1612	1696	1612	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	39	14	103	65	2
RTOR Reduction (vph)	0	26	0	0	0	2
Lane Group Flow (vph)	87	13	14	103	65	0
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	8.5	8.5	2.1	15.1	2.0	2.0
Effective Green, g (s)	8.5	8.5	2.1	15.1	2.0	2.0
Actuated g/C Ratio	0.33	0.33	0.08	0.58	0.08	0.08
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	552	469	129	981	123	110
v/s Ratio Prot	c0.05		0.01	c0.06	c0.04	
v/s Ratio Perm		0.01				0.00
v/c Ratio	0.16	0.03	0.11	0.10	0.53	0.00
Uniform Delay, d1	6.3	6.0	11.1	2.5	11.6	11.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.0	0.1	0.1	1.9	0.0
Delay (s)	6.4	6.0	11.3	2.5	13.5	11.1
Level of Service	A	A	B	A	B	B
Approach Delay (s)	6.3			3.6	13.4	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	6.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	26.1	Sum of lost time (s)	13.5
Intersection Capacity Utilization	18.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	6	108	4	22	89	14	6	41	22	135	32	32
Future Volume (vph)	6	108	4	22	89	14	6	41	22	135	32	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	1.00		1.00	0.98			0.96			0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.97	
Satd. Flow (prot)	1612	3207		1612	3158			1617			1605	
Flt Permitted	0.95	1.00		0.95	1.00			1.00			0.97	
Satd. Flow (perm)	1612	3207		1612	3158			1617			1605	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	117	4	24	97	15	7	45	24	147	35	35
RTOR Reduction (vph)	0	3	0	0	12	0	0	21	0	0	8	0
Lane Group Flow (vph)	7	118	0	24	100	0	0	55	0	0	209	0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	2.1	8.1		2.1	8.1			4.7			9.3	
Effective Green, g (s)	2.1	8.1		2.1	8.1			4.7			9.3	
Actuated g/C Ratio	0.05	0.19		0.05	0.19			0.11			0.22	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	80	615		80	606			180			353	
v/s Ratio Prot	0.00	c0.04		c0.01	0.03			c0.03			c0.13	
v/s Ratio Perm												
v/c Ratio	0.09	0.19		0.30	0.16			0.30			0.59	
Uniform Delay, d1	19.1	14.3		19.3	14.2			17.2			14.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.5	0.2		2.1	0.2			1.3			3.1	
Delay (s)	19.6	14.5		21.4	14.4			18.5			17.9	
Level of Service	B	B		C	B			B			B	
Approach Delay (s)		14.8			15.6			18.5			17.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	42.2	Sum of lost time (s)	18.0
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	19	256	113	47	2	11
Future Volume (Veh/h)	19	256	113	47	2	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	278	123	51	2	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	174				330	87
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	174				330	87
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	98				100	99
cM capacity (veh/h)	1330				604	923

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	114	185	82	92	14
Volume Left	21	0	0	0	2
Volume Right	0	0	0	51	12
cSH	1330	1700	1700	1700	858
Volume to Capacity	0.02	0.11	0.05	0.05	0.02
Queue Length 95th (ft)	1	0	0	0	1
Control Delay (s)	1.5	0.0	0.0	0.0	9.3
Lane LOS	A				A
Approach Delay (s)	0.6		0.0		9.3
Approach LOS					A

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	262	114	0	32	2
Future Volume (Veh/h)	0	262	114	0	32	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	285	124	0	35	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	124				266	62
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	124				266	62
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				95	100
cM capacity (veh/h)	1390				673	959

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	142	142	62	62	37
Volume Left	0	0	0	0	35
Volume Right	0	0	0	0	2
cSH	1700	1700	1700	1700	684
Volume to Capacity	0.08	0.08	0.04	0.04	0.05
Queue Length 95th (ft)	0	0	0	0	4
Control Delay (s)	0.0	0.0	0.0	0.0	10.6
Lane LOS					B
Approach Delay (s)	0.0		0.0		10.6
Approach LOS					B

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	17.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	284	0	1	102	6	0	1	5	46	2	7
Future Volume (Veh/h)	16	284	0	1	102	6	0	1	5	46	2	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	309	0	1	111	7	0	1	5	50	2	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	118			309			410	463	154	310	460	59
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	118			309			410	463	154	310	460	59
tC, single (s)	4.3			4.3			7.7	6.7	7.1	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	99			100			100	100	99	91	100	99
cM capacity (veh/h)	1398			1179			492	467	833	584	469	963

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	172	154	56	62	6	60
Volume Left	17	0	1	0	0	50
Volume Right	0	0	0	7	5	8
cSH	1398	1700	1179	1700	737	611
Volume to Capacity	0.01	0.09	0.00	0.04	0.01	0.10
Queue Length 95th (ft)	1	0	0	0	1	8
Control Delay (s)	0.8	0.0	0.1	0.0	9.9	11.5
Lane LOS	A		A		A	B
Approach Delay (s)	0.4		0.1		9.9	11.5
Approach LOS					A	B

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	28.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	132	201	9	80	64	5
Future Volume (vph)	132	201	9	80	64	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1696	1442	1612	1696	1612	1442
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1696	1442	1612	1696	1612	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	143	218	10	87	70	5
RTOR Reduction (vph)	0	140	0	0	0	5
Lane Group Flow (vph)	143	78	10	87	70	0
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	9.9	9.9	2.2	16.6	2.1	2.1
Effective Green, g (s)	9.9	9.9	2.2	16.6	2.1	2.1
Actuated g/C Ratio	0.36	0.36	0.08	0.60	0.08	0.08
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	606	515	128	1016	122	109
v/s Ratio Prot	c0.08		0.01	c0.05	c0.04	
v/s Ratio Perm		0.05				0.00
v/c Ratio	0.24	0.15	0.08	0.09	0.57	0.00
Uniform Delay, d1	6.2	6.0	11.8	2.3	12.4	11.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.2	0.1	0.0	4.0	0.0
Delay (s)	6.5	6.2	11.9	2.4	16.4	11.8
Level of Service	A	A	B	A	B	B
Approach Delay (s)	6.3			3.4	16.1	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	7.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	27.7	Sum of lost time (s)	13.5
Intersection Capacity Utilization	23.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	71	16	75	94	198	6	15	29	28	28	9
Future Volume (vph)	43	71	16	75	94	198	6	15	29	28	28	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	0.97		1.00	0.90			0.92			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1612	3136		1612	2895			1553			1629	
Flt Permitted	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (perm)	1612	3136		1612	2895			1553			1629	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	77	17	82	102	215	7	16	32	30	30	10
RTOR Reduction (vph)	0	13	0	0	163	0	0	30	0	0	8	0
Lane Group Flow (vph)	47	81	0	82	154	0	0	25	0	0	62	0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	3.2	8.3		3.2	8.3			2.6			2.1	
Effective Green, g (s)	3.2	8.3		3.2	8.3			2.6			2.1	
Actuated g/C Ratio	0.09	0.24		0.09	0.24			0.08			0.06	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	150	761		150	702			118			100	
v/s Ratio Prot	0.03	0.03		c0.05	c0.05			c0.02			c0.04	
v/s Ratio Perm												
v/c Ratio	0.31	0.11		0.55	0.22			0.22			0.62	
Uniform Delay, d1	14.5	10.1		14.8	10.4			14.8			15.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.2	0.1		4.0	0.2			1.3			13.0	
Delay (s)	15.7	10.2		18.8	10.6			16.1			28.7	
Level of Service	B	B		B	B			B			C	
Approach Delay (s)		12.0			12.3			16.1			28.7	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	34.2	Sum of lost time (s)	18.0
Intersection Capacity Utilization	33.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	19	115	351	47	1	10
Future Volume (Veh/h)	19	115	351	47	1	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	125	382	51	1	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	433				512	216
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	433				512	216
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	98				100	99
cM capacity (veh/h)	1055				458	758

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	63	83	255	178	12
Volume Left	21	0	0	0	1
Volume Right	0	0	0	51	11
cSH	1055	1700	1700	1700	719
Volume to Capacity	0.02	0.05	0.15	0.10	0.02
Queue Length 95th (ft)	2	0	0	0	1
Control Delay (s)	3.0	0.0	0.0	0.0	10.1
Lane LOS	A				B
Approach Delay (s)	1.3		0.0		10.1
Approach LOS					B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	115	397	0	5	0
Future Volume (Veh/h)	0	115	397	0	5	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	125	432	0	5	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	432				494	216
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	432				494	216
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				99	100
cM capacity (veh/h)	1056				480	759

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	62	62	216	216	5
Volume Left	0	0	0	0	5
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	480
Volume to Capacity	0.04	0.04	0.13	0.13	0.01
Queue Length 95th (ft)	0	0	0	0	1
Control Delay (s)	0.0	0.0	0.0	0.0	12.6
Lane LOS					B
Approach Delay (s)	0.0		0.0		12.6
Approach LOS					B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	21.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	81	1	14	364	176	1	4	6	40	0	16
Future Volume (Veh/h)	43	81	1	14	364	176	1	4	6	40	0	16
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	47	88	1	15	396	191	1	4	7	43	0	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	587			89			428	800	44	668	704	294
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	587			89			428	800	44	668	704	294
tC, single (s)	4.3			4.3			7.7	6.7	7.1	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	95			99			100	99	99	86	100	97
cM capacity (veh/h)	918			1434			453	280	984	304	320	674

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	91	45	213	389	12	60
Volume Left	47	0	15	0	1	43
Volume Right	0	1	0	191	7	17
cSH	918	1700	1434	1700	509	360
Volume to Capacity	0.05	0.03	0.01	0.23	0.02	0.17
Queue Length 95th (ft)	4	0	1	0	2	15
Control Delay (s)	4.9	0.0	0.6	0.0	12.2	17.0
Lane LOS	A		A		B	C
Approach Delay (s)	3.3		0.2		12.2	17.0
Approach LOS					B	C

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	43	80	4	136	422	2
Future Volume (vph)	43	80	4	136	422	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1696	1442	1612	1696	1612	1442
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1696	1442	1612	1696	1612	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	87	4	148	459	2
RTOR Reduction (vph)	0	69	0	0	0	1
Lane Group Flow (vph)	47	18	4	148	459	1
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	7.9	7.9	2.0	14.4	15.6	15.6
Effective Green, g (s)	7.9	7.9	2.0	14.4	15.6	15.6
Actuated g/C Ratio	0.20	0.20	0.05	0.37	0.40	0.40
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	343	292	82	626	644	576
v/s Ratio Prot	0.03		0.00	c0.09	c0.28	
v/s Ratio Perm		0.01				0.00
v/c Ratio	0.14	0.06	0.05	0.24	0.71	0.00
Uniform Delay, d1	12.8	12.6	17.6	8.5	9.8	7.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	0.1	0.3	3.1	0.0
Delay (s)	13.0	12.7	17.7	8.8	12.9	7.0
Level of Service	B	B	B	A	B	A
Approach Delay (s)	12.8			9.0	12.9	
Approach LOS	B			A	B	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	39.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	38.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	144	9	26	121	18	13	41	34	144	32	38
Future Volume (vph)	10	144	9	26	121	18	13	41	34	144	32	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.95			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (prot)	1612	3194		1612	3160			1597			1602	
Flt Permitted	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (perm)	1612	3194		1612	3160			1597			1602	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	157	10	28	132	20	14	45	37	157	35	41
RTOR Reduction (vph)	0	7	0	0	16	0	0	33	0	0	9	0
Lane Group Flow (vph)	11	160	0	28	136	0	0	63	0	0	224	0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	2.1	8.6		2.1	8.6			4.8			8.3	
Effective Green, g (s)	2.1	8.6		2.1	8.6			4.8			8.3	
Actuated g/C Ratio	0.05	0.21		0.05	0.21			0.11			0.20	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	80	657		80	650			183			318	
v/s Ratio Prot	0.01	c0.05		c0.02	0.04			c0.04			c0.14	
v/s Ratio Perm												
v/c Ratio	0.14	0.24		0.35	0.21			0.35			0.70	
Uniform Delay, d1	19.0	13.9		19.2	13.8			17.1			15.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.8	0.3		2.6	0.2			1.6			7.4	
Delay (s)	19.8	14.1		21.8	14.0			18.6			23.0	
Level of Service	B	B		C	B			B			C	
Approach Delay (s)		14.5			15.2			18.6			23.0	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	41.8	Sum of lost time (s)	18.0
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	313	153	3	2	11
Future Volume (Veh/h)	7	313	153	3	2	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	340	166	3	2	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	169				354	84
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	169				354	84
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				100	99
cM capacity (veh/h)	1336				588	926

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	121	227	111	58	14
Volume Left	8	0	0	0	2
Volume Right	0	0	0	3	12
cSH	1336	1700	1700	1700	856
Volume to Capacity	0.01	0.13	0.07	0.03	0.02
Queue Length 95th (ft)	0	0	0	0	1
Control Delay (s)	0.6	0.0	0.0	0.0	9.3
Lane LOS	A				A
Approach Delay (s)	0.2		0.0		9.3
Approach LOS					A

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	319	154	0	32	2
Future Volume (Veh/h)	0	319	154	0	32	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	347	167	0	35	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	167				340	84
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	167				340	84
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				94	100
cM capacity (veh/h)	1338				603	928

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	174	174	84	84	37
Volume Left	0	0	0	0	35
Volume Right	0	0	0	0	2
cSH	1700	1700	1700	1700	615
Volume to Capacity	0.10	0.10	0.05	0.05	0.06
Queue Length 95th (ft)	0	0	0	0	5
Control Delay (s)	0.0	0.0	0.0	0.0	11.2
Lane LOS					B
Approach Delay (s)	0.0		0.0		11.2
Approach LOS					B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	18.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	339	0	1	140	8	0	1	5	49	2	9
Future Volume (Veh/h)	18	339	0	1	140	8	0	1	5	49	2	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	368	0	1	152	9	0	1	5	53	2	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	161			368			497	571	184	388	566	80
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	161			368			497	571	184	388	566	80
tC, single (s)	4.3			4.3			7.7	6.7	7.1	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	99			100			100	100	99	90	100	99
cM capacity (veh/h)	1345			1118			423	402	797	511	405	932

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	204	184	77	85	6	65
Volume Left	20	0	1	0	0	53
Volume Right	0	0	0	9	5	10
cSH	1345	1700	1118	1700	685	544
Volume to Capacity	0.01	0.11	0.00	0.05	0.01	0.12
Queue Length 95th (ft)	1	0	0	0	1	10
Control Delay (s)	0.9	0.0	0.1	0.0	10.3	12.5
Lane LOS	A		A		B	B
Approach Delay (s)	0.5		0.1		10.3	12.5
Approach LOS					B	B

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	164	227	9	101	53	6
Future Volume (vph)	164	227	9	101	53	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1696	1442	1612	1696	1612	1442
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1696	1442	1612	1696	1612	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	178	247	10	110	58	7
RTOR Reduction (vph)	0	153	0	0	0	6
Lane Group Flow (vph)	178	94	10	110	58	1
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	11.0	11.0	2.2	17.7	2.1	2.1
Effective Green, g (s)	11.0	11.0	2.2	17.7	2.1	2.1
Actuated g/C Ratio	0.38	0.38	0.08	0.61	0.07	0.07
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	647	550	123	1042	117	105
v/s Ratio Prot	c0.10		0.01	c0.06	c0.04	
v/s Ratio Perm		0.07				0.00
v/c Ratio	0.28	0.17	0.08	0.11	0.50	0.00
Uniform Delay, d1	6.1	5.9	12.4	2.3	12.8	12.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.2	0.1	0.1	1.2	0.0
Delay (s)	6.5	6.1	12.5	2.3	14.0	12.4
Level of Service	A	A	B	A	B	B
Approach Delay (s)	6.2			3.2	13.9	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	28.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	25.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	43	71	16	75	94	198	6	15	29	28	28	9
Future Volume (vph)	43	71	16	75	94	198	6	15	29	28	28	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.90			0.92			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1612	1650		1612	1524			1553			1629	
Flt Permitted	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (perm)	1612	1650		1612	1524			1553			1629	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	77	17	82	102	215	7	16	32	30	30	10
RTOR Reduction (vph)	0	11	0	0	108	0	0	30	0	0	8	0
Lane Group Flow (vph)	47	83	0	82	209	0	0	25	0	0	62	0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	3.2	11.2		3.2	11.2			2.6			2.2	
Effective Green, g (s)	3.2	11.2		3.2	11.2			2.6			2.2	
Actuated g/C Ratio	0.09	0.30		0.09	0.30			0.07			0.06	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	138	496		138	458			108			96	
v/s Ratio Prot	0.03	0.05		c0.05	c0.14			c0.02			c0.04	
v/s Ratio Perm												
v/c Ratio	0.34	0.17		0.59	0.46			0.23			0.65	
Uniform Delay, d1	16.0	9.6		16.4	10.5			16.4			17.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.5	0.2		6.7	1.0			1.5			16.2	
Delay (s)	17.5	9.8		23.1	11.5			17.9			33.3	
Level of Service	B	A		C	B			B			C	
Approach Delay (s)		12.4			13.9			17.9			33.3	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	15.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	37.2	Sum of lost time (s)	18.0
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	19	115	351	47	1	10
Future Volume (Veh/h)	19	115	351	47	1	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	125	382	51	1	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	433				512	408
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	433				512	408
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	98				100	98
cM capacity (veh/h)	1055				458	566

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	63	83	433	12
Volume Left	21	0	0	1
Volume Right	0	0	51	11
cSH	1055	1700	1700	555
Volume to Capacity	0.02	0.05	0.25	0.02
Queue Length 95th (ft)	2	0	0	2
Control Delay (s)	3.0	0.0	0.0	11.6
Lane LOS	A			B
Approach Delay (s)	1.3		0.0	11.6
Approach LOS				B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	115	397	0	5	0
Future Volume (Veh/h)	0	115	397	0	5	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	125	432	0	5	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	432				494	432
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	432				494	432
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				99	100
cM capacity (veh/h)	1056				480	545

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	62	62	432	5
Volume Left	0	0	0	5
Volume Right	0	0	0	0
cSH	1700	1700	1700	480
Volume to Capacity	0.04	0.04	0.25	0.01
Queue Length 95th (ft)	0	0	0	1
Control Delay (s)	0.0	0.0	0.0	12.6
Lane LOS				B
Approach Delay (s)	0.0		0.0	12.6
Approach LOS				B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	30.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	81	1	14	364	176	1	4	6	40	0	16
Future Volume (Veh/h)	43	81	1	14	364	176	1	4	6	40	0	16
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	47	88	1	15	396	191	1	4	7	43	0	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	587			89			428	800	44	668	704	294
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	587			89			428	800	44	668	704	294
tC, single (s)	4.3			4.3			7.7	6.7	7.1	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	95			99			100	99	99	86	100	97
cM capacity (veh/h)	918			1434			453	280	984	304	320	674

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	91	45	213	389	12	60
Volume Left	47	0	15	0	1	43
Volume Right	0	1	0	191	7	17
cSH	918	1700	1434	1700	509	360
Volume to Capacity	0.05	0.03	0.01	0.23	0.02	0.17
Queue Length 95th (ft)	4	0	1	0	2	15
Control Delay (s)	4.9	0.0	0.6	0.0	12.2	17.0
Lane LOS	A		A		B	C
Approach Delay (s)	3.3		0.2		12.2	17.0
Approach LOS					B	C

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	43	80	4	136	422	2
Future Volume (vph)	43	80	4	136	422	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1696	1442	1612	1696	1612	1442
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1696	1442	1612	1696	1612	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	47	87	4	148	459	2
RTOR Reduction (vph)	0	69	0	0	0	1
Lane Group Flow (vph)	47	18	4	148	459	1
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	7.9	7.9	2.0	14.4	15.6	15.6
Effective Green, g (s)	7.9	7.9	2.0	14.4	15.6	15.6
Actuated g/C Ratio	0.20	0.20	0.05	0.37	0.40	0.40
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	343	292	82	626	644	576
v/s Ratio Prot	0.03		0.00	c0.09	c0.28	
v/s Ratio Perm		0.01				0.00
v/c Ratio	0.14	0.06	0.05	0.24	0.71	0.00
Uniform Delay, d1	12.8	12.6	17.6	8.5	9.8	7.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	0.1	0.3	3.1	0.0
Delay (s)	13.0	12.7	17.7	8.8	12.9	7.0
Level of Service	B	B	B	A	B	A
Approach Delay (s)	12.8			9.0	12.9	
Approach LOS	B			A	B	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	39.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	38.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	144	9	26	121	18	13	41	34	144	32	38
Future Volume (vph)	10	144	9	26	121	18	13	41	34	144	32	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.95			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (prot)	1612	1681		1612	1663			1597			1602	
Flt Permitted	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (perm)	1612	1681		1612	1663			1597			1602	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	157	10	28	132	20	14	45	37	157	35	41
RTOR Reduction (vph)	0	3	0	0	8	0	0	32	0	0	9	0
Lane Group Flow (vph)	11	164	0	28	144	0	0	64	0	0	224	0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	2.1	10.8		2.1	10.8			6.6			8.3	
Effective Green, g (s)	2.1	10.8		2.1	10.8			6.6			8.3	
Actuated g/C Ratio	0.05	0.24		0.05	0.24			0.14			0.18	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	73	396		73	392			230			290	
v/s Ratio Prot	0.01	c0.10		c0.02	0.09			c0.04			c0.14	
v/s Ratio Perm												
v/c Ratio	0.15	0.41		0.38	0.37			0.28			0.77	
Uniform Delay, d1	21.0	14.8		21.2	14.6			17.5			17.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.0	1.0		3.3	0.8			0.9			12.7	
Delay (s)	22.0	15.8		24.6	15.4			18.4			30.6	
Level of Service	C	B		C	B			B			C	
Approach Delay (s)		16.2			16.9			18.4			30.6	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	45.8	Sum of lost time (s)	18.0
Intersection Capacity Utilization	41.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	313	153	3	2	11
Future Volume (Veh/h)	7	313	153	3	2	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	340	166	3	2	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	169				354	168
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	169				354	168
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				100	99
cM capacity (veh/h)	1336				588	817

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	121	227	169	14
Volume Left	8	0	0	2
Volume Right	0	0	3	12
cSH	1336	1700	1700	774
Volume to Capacity	0.01	0.13	0.10	0.02
Queue Length 95th (ft)	0	0	0	1
Control Delay (s)	0.6	0.0	0.0	9.7
Lane LOS	A			A
Approach Delay (s)	0.2		0.0	9.7
Approach LOS				A

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	Err%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	319	154	0	32	2
Future Volume (Veh/h)	0	319	154	0	32	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	347	167	0	35	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	167				340	167
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	167				340	167
tC, single (s)	4.3				7.0	7.1
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				94	100
cM capacity (veh/h)	1338				603	817

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	174	174	167	37
Volume Left	0	0	0	35
Volume Right	0	0	0	2
cSH	1700	1700	1700	612
Volume to Capacity	0.10	0.10	0.10	0.06
Queue Length 95th (ft)	0	0	0	5
Control Delay (s)	0.0	0.0	0.0	11.3
Lane LOS				B
Approach Delay (s)	0.0		0.0	11.3
Approach LOS				B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	18.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	339	0	1	140	8	0	1	5	49	2	9
Future Volume (Veh/h)	18	339	0	1	140	8	0	1	5	49	2	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	368	0	1	152	9	0	1	5	53	2	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	161			368			497	571	184	388	566	80
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	161			368			497	571	184	388	566	80
tC, single (s)	4.3			4.3			7.7	6.7	7.1	7.7	6.7	7.1
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.1	3.4	3.6	4.1	3.4
p0 queue free %	99			100			100	100	99	90	100	99
cM capacity (veh/h)	1345			1118			423	402	797	511	405	932

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	204	184	77	85	6	65
Volume Left	20	0	1	0	0	53
Volume Right	0	0	0	9	5	10
cSH	1345	1700	1118	1700	685	544
Volume to Capacity	0.01	0.11	0.00	0.05	0.01	0.12
Queue Length 95th (ft)	1	0	0	0	1	10
Control Delay (s)	0.9	0.0	0.1	0.0	10.3	12.5
Lane LOS	A		A		B	B
Approach Delay (s)	0.5		0.1		10.3	12.5
Approach LOS					B	B

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

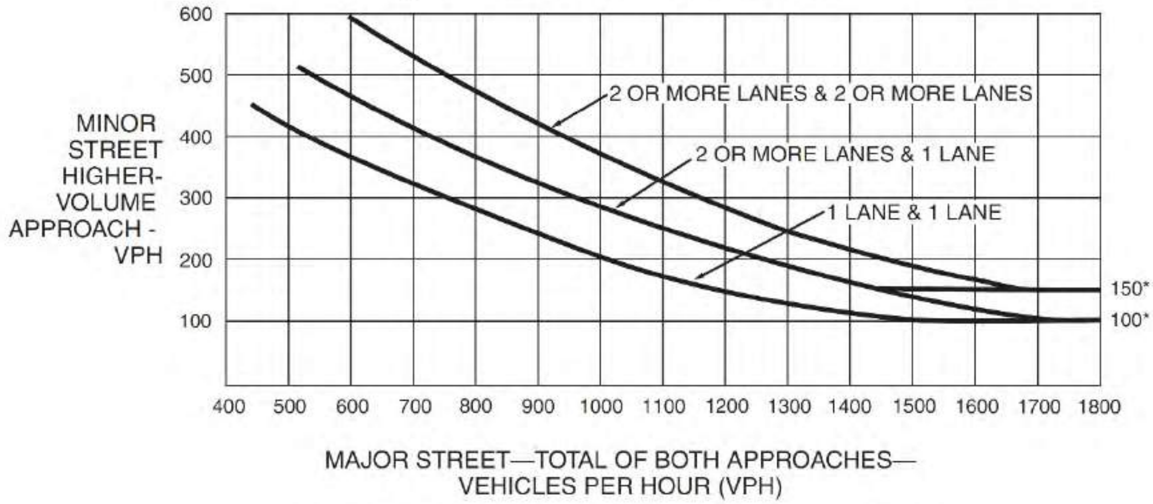
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	164	227	9	101	53	6
Future Volume (vph)	164	227	9	101	53	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1696	1442	1612	1696	1612	1442
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1696	1442	1612	1696	1612	1442
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	178	247	10	110	58	7
RTOR Reduction (vph)	0	153	0	0	0	6
Lane Group Flow (vph)	178	94	10	110	58	1
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6				4
Actuated Green, G (s)	11.0	11.0	2.2	17.7	2.1	2.1
Effective Green, g (s)	11.0	11.0	2.2	17.7	2.1	2.1
Actuated g/C Ratio	0.38	0.38	0.08	0.61	0.07	0.07
Clearance Time (s)	5.5	5.5	4.0	5.0	4.0	4.0
Vehicle Extension (s)	4.0	4.0	2.0	4.0	2.0	2.0
Lane Grp Cap (vph)	647	550	123	1042	117	105
v/s Ratio Prot	c0.10		0.01	c0.06	c0.04	
v/s Ratio Perm		0.07				0.00
v/c Ratio	0.28	0.17	0.08	0.11	0.50	0.00
Uniform Delay, d1	6.1	5.9	12.4	2.3	12.8	12.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.2	0.1	0.1	1.2	0.0
Delay (s)	6.5	6.1	12.5	2.3	14.0	12.4
Level of Service	A	A	B	A	B	B
Approach Delay (s)	6.2			3.2	13.9	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	28.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	25.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Traffic Signal Warrant Analysis- Phillips 66 Administration Building Driveway

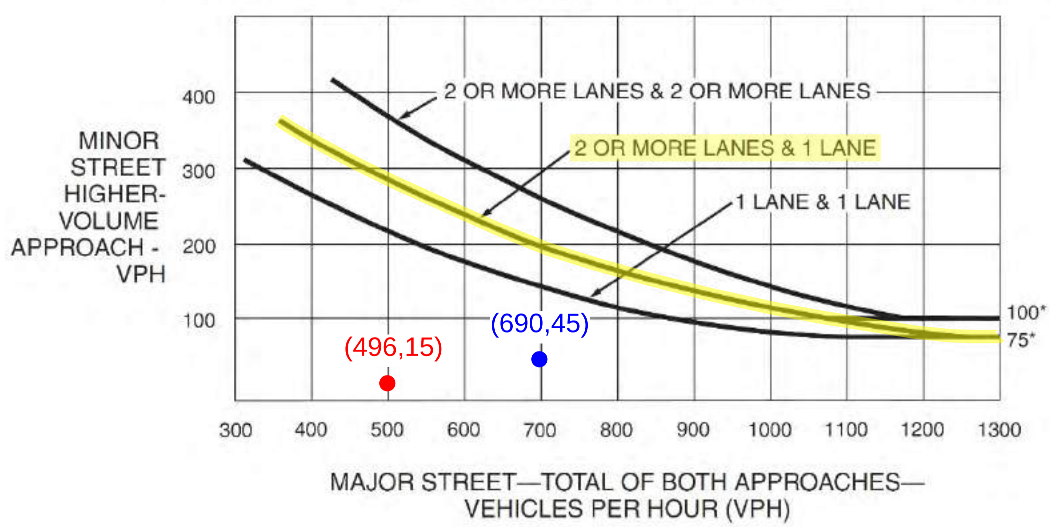
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More	Hour	Hour	Hour	Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**
(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☒ No ☐

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	Hour
Both Approaches - Major Street		X	AM: 496 PM: 690
Higher Approach - Minor Street	X		AM: 15 PM: 45

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☐
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☒

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Appendix E: Environmental Screening

URBAN PLANNING PARTNERS INC.
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APPENDIX E

MEMORANDUM

DATE: November 4, 2016

TO:	**FROM:**
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560 Mission Street, Suite 700	P. 510.251.8210
San Francisco, CA 94105	E. bbohonok@up-partners.com
P. 415.957.9445	CC: ldias@up-partners.com

RE: Environmental Screening: *San Pablo Avenue Complete Streets Feasibility Study*

This memo contains an initial screening-level analysis of selected CEQA topics and potential environmental issues related to the San Pablo Avenue Complete Streets Feasibility Study project. This screening is a first step in understanding whether project alternatives are likely to result in environmental impacts under the California Environmental Quality Act (CEQA) and provides preliminary guidance on what level of CEQA review may be required for the project, dependent on the alternative selected. The environmental topic analysis is provided in matrix format, organized by topic and project alternative.

The following information was used in the evaluation of project alternatives: project information provided by Arup, the 2016 CEQA Guidelines Environmental Checklist, and applicable sections of the Code of Federal Regulations. Additionally, a selection of prior CEQA documents were reviewed to provide background information on existing environmental issues in the project area and environmental issues encountered under similar Bay Area complete streets projects. The prior documents reviewed include:

- Alhambra Avenue Improvements CEQA Initial Study, City of Martinez (May 2005)
- ConocoPhillips Rodeo Refinery Clean Fuels Expansion Project EIR (November 2006)
- The Phillips 66 Propane Recovery Project EIR (June 2013)
- Contra Costa Countywide Comprehensive Transportation Plan Draft Supplemental EIR (September 2014)

1. Project Understanding

The San Pablo Avenue Complete Streets Study is examining a portion of San Pablo Avenue between Rodeo and Crockett in Contra Costa County. The study will 1) evaluate alternatives for bicycle and pedestrian improvements and 2) identify a preferred alternative to aid in future funding requests for project implementation.

The study segment is approximately three miles in length, extending from Lone Tree Point in Rodeo to the base of the Alfred Zampa Memorial Bridge in Crockett. The study area passes through the Conoco Philips Rodeo Refinery, an active refinery that uses San Pablo Avenue for transportation of materials between areas of its campus, and through undeveloped, unincorporated land. The corridor has been identified as a future segment of the Bay Trail and implementation of the project would provide a connection to existing bicycle and pedestrian facilities.

For most of the study corridor, San Pablo Avenue is a four-lane undivided arterial with two travel lanes in each direction. The segment has and a 45 mph speed limit, no bicycle facilities and very limited sidewalks. Existing traffic volumes along the corridor are approximately 25 percent of the total capacity and volumes are not expected to increase significantly in the future.[1]

Four project alternatives are under evaluation including a no build alternative. Each alternative and its key components are outlined below, and additional details are provided in Table 1.

- **No Build Alternative:** Existing (4 travel lanes)
  - Four 12’ travel lanes
  - No bike lanes and very limited sidewalks
  - No truck climbing lanes
- **Alternative 1:** Bike Lanes (3 vehicle lanes with bike lanes)
  - Road diet converting the roadway to one travel lane in each direction with left turn pockets, center left turn lanes, medians, or truck climbing lanes
  - Class 2 on-street bike lanes; some areas would include a separation barrier
- **Alternative 2:** Shared Use Path (3 vehicle lanes with path)
  - Road diet, converting the roadway to one travel lane in each direction with left turn pockets, center left turn lanes, medians, or truck climbing lanes
  - Dedicated, barrier-separated path for bikes and pedestrians
- **Alternative 3:** Widened Shared Use Path (4 vehicle lanes with path)
  - Widened roadway to maintain four-lane arterial
  - Dedicated, barrier separated path for bikes and pedestrians

2. Environmental Issues

For the purposes of this screening analysis, Urban Planning Partners evaluated the project alternatives against the 2016 CEQA Guidelines Environmental Checklist which includes the following topics: air quality, aesthetics, agriculture, biological resources, cultural resources, geology and soils, greenhouse gases, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation and utilities. Table 1 presents each of these topics by project alternative, discusses whether significant impacts are considered likely to occur, and outlines analysis and/or studies that would need to be completed at a later date as a part of CEQA analyses for the project.

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[1] Arup, San Pablo Complete Streets Study Traffic Impact Analysis, 2016.

Summary

Through the screening analysis, Urban Planning Partners has made a preliminary determination that the following CEQA topics are not likely to be impacted by the project under any alternative:

- Agricultural Resources
- Land Use
- Mineral Resources
- Population and Housing
- Public Services
- Recreation
- Transit and Transportation
- Utilities

Alternative 1 is not anticipated to result in any significant impacts to the environment or require mitigation and is not discussed further in this summary. **Alternative 2** is anticipated to have less-than-significant impacts (not requiring mitigation) under the following CEQA topics:

- Aesthetics
- Greenhouse Gas Emissions
- Land Use and Planning
- Recreation
- Traffic and Transportation

Alternative 2 may result in significant impacts to the environment; however it is likely that these impacts could be mitigated to a less-than-significant level. CEQA topic areas that may require mitigation measures to avoid a significant impact under Alternative 2 include:

- Air Quality
- Biological Resources
- Cultural Resources
- Geology and Soils
- Hazards and Hazardous Materials
- Hydrology and Water
- Noise

Under **Alternative 3**, less-than-significant impacts (not requiring mitigation) are anticipated under the following CEQA topics:

- Land Use and Planning
- Recreation
- Traffic and Transportation

Alternative 3 may result in significant impacts to the environment, some of which are anticipated to be reduced to less-than-significant levels through mitigation. It is possible that some impacts may remain significant after mitigation. CEQA topic areas that are anticipated to require mitigation measures and could potentially remain significant under **Alternative 3** include:

- Air Quality
- Aesthetics
- Biological Resources

- Cultural Resources
- Geology and Soils
- Greenhouse Gases
- Hazards and Hazardous Materials
- Hydrology and Water
- Noise

3. Anticipated Level of CEQA Review

For each alternative, Urban Planning Partners has identified a CEQA approach that is likely to be the most appropriate, efficient, and defensible. The no build alternative would not require CEQA analysis and therefore is not included below. These recommendations are based on a review of the 2016 CEQA Guidelines, project information, prior EIRs, and our knowledge of CEQA analysis.

- **Alternative 1:** Bike Lanes. This alternative would likely qualify for a Categorical Exemption under 15304(h), creation of bicycle lanes on existing rights-of-way and/or a Statutory Exemption under 15282(j), restriping streets. Significant environmental impacts are not anticipated, since improvements would be within the existing roadway and many impacts would be considered beneficial. An Initial Study could be conducted to confirm these findings and support the use of a categorical exemption.
- **Alternative 2:** Shared Use Path. An Initial Study could be completed to assess environmental impacts and determine if significant impacts would occur under this alternative. It is anticipated that significant environmental impacts could be mitigated to less-than-significant levels since improvements would be largely within the existing roadway and many impacts would be considered beneficial. If such a determination is made a Mitigated Negative Declaration would be prepared.
- **Alternative 3:** Widened Shared Use Path. Given the extensive grading work and retaining wall construction required to widen the roadway under this alternative, including grading and new construction in natural, vegetated areas, significant impacts are considered to be possible. At this point it is uncertain whether mitigation measures would reduce significant impacts to less-than-significant. Additionally, given the known level of controversy around the proposed project, it may be prudent to take a conservative approach and prepare an EIR. An EIR would provide a better standard of review than an Initial Study, lowering risk, and could be a more efficient and legally defensible method of fulfilling the requirements of CEQA compared to first completing an Initial Study.

  Alternatively, An Initial Study could first be prepared to evaluate the potential impacts of the proposed project and determine if a Mitigated Negative Declaration can be completed or if an EIR will be necessary.

Attachment A: Environmental Topics Alternatives Matrix

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Appendix E - Attachment A: Environmental Topics Alternatives Matrix

Metric	Existing (4 vehicle lanes)	Alternative 1 Bike Lanes (3 vehicle lanes with bike lanes)	Alternative 2 Shared Use Path (3 vehicle lanes with path)	Alternative 3 Widened Shared Use Path (4 vehicle lanes with path)
Project Components	• 48' existing pavement • Four 12' travel lanes • Minimal shoulders • No bike lanes and very limited sidewalks • No truck climbing lanes	• 48' existing pavement • Two 12' travel lanes (one each direction) • 12' center lane for left turns, median, or truck climbing lane • Two 6' bike lanes • Potential for buffers if travel lanes narrowed to 11' and bike lanes to 5' • Road diet • Most improvements within existing 48' paved area Paved area increases from an average width of 32' to 42' between Pacific Ave and Parker Ave	• 48' existing pavement • Two 12' travel lanes (one each direction) • 11' center lane for left turns, median, or truck climbing lane • 10' (minimum) shared use path (north or south side) • 3' barrier or curb separating shared use path from vehicles • Road diet • Most improvements within existing 48' paved area Paved area increases from an average width of 32' to 42' between Pacific Ave and Parker Ave, some widening at the approaches to intersections and bus stops, average 12' of added pavement; motor vehicle roadway width to be reduced to 36'	• Four 12' travel lanes (two each direction) • 10' (minimum) shared use path (north or south side) • 3' barrier or curb separating shared use path from vehicles • Road diet: reduce to three lanes east of Cummings Skyway (same as Shared Use Path alternative) • Improved area to increase from 48' to 74'; motor vehicle roadway width to be maintained at 48' west of Cummings Skyway and would be reduced to 36' east of Cummings Skyway
Environmental Analysis	N/A	SIGNIFICANT IMPACTS UNLIKELY Significant environmental impacts are not anticipated, since improvements would be within the existing roadway and many impacts would be considered beneficial. This alternative would likely qualify for a Categorical Exemption under 15304(h), creation of bicycle lanes on existing rights-of-way, a Statutory Exemption under 21080.20.5, restriping of streets for bicycle lanes consistent with a bicycle transportation plan, and a Statutory Exemption under 15282(j), restriping streets.	SIGNIFICANT IMPACTS UNLIKELY Significant environmental impacts are not anticipated, since improvements would be largely within the existing roadway and many impacts would be considered beneficial. An Initial Study could be completed to assess environmental impacts and determine if significant impacts would occur as a result of this alternative.	SIGNIFICANT IMPACTS POSSIBLE Significant environmental impacts could result from this alternative to extensive grading work and retaining wall construction required to widen the roadway, including grading in natural, vegetated areas. Additionally, this alternative would add new impervious surface. An EIR could be prepared to determine if significant impacts would occur as a result of the project under this alternative. An EIR would provide a better standard of review than an Initial Study, lowering risk.

Air Quality	N/A	SIGNIFICANT IMPACTS UNLIKELY • This alternative would include minor work such as restriping, and is not anticipated to include heavy construction equipment, such as diesel-engine excavators, backhoes, or a high number of truck trips. • Successful improvements would result in more pedestrians and cyclists traveling along the alignment. Users may be exposed to poor air quality in excess of Bay Area Air Quality Management District (BAAQMD) significance thresholds. It is unlikely that users would be considered sensitive receptors for the purposes of CEQA. **Potential Impact**: • Exposure of sensitive receptors to air quality that does not meet BAAQMD thresholds. It is unlikely that users would be considered sensitive receptors (generally defined as children, the elderly, etc.); therefore, impacts to sensitive receptors are not anticipated. Additionally, the duration of exposure and frequency of exposure would be limited, therefore impacts are not anticipated. • Some air quality impacts would potentially be beneficial since all project alternatives would encourage the use of active transportation thereby reducing automobile use. • Temporary increase in air pollutants near project site during construction period. This is anticipated to be minor and less than significant. **Recommendation**: • A screening-level analysis of potential air quality impacts should be completed by a qualified professional, in support of using CEQA provisions for an exemption.	SIGNIFICANT IMPACTS POSSIBLE • Construction of this alternative would require the use of heavy construction equipment, resulting in a short-term increase of air pollutant emissions. • Successful improvements would result in more pedestrians and cyclists traveling along the alignment. Users may be exposed to poor air quality in excess of Bay Area Air Quality Management District (BAAQMD) significance thresholds. It is unlikely that users would be considered sensitive receptors for the purposes of CEQA. **Potential Impact:** • Temporary increase in air pollutant emissions during construction period. This impact is anticipated to be less than significant or mitigated to less than significant with typical mitigation measures. • Exposure of sensitive receptors to air quality that does not meet BAAQMD thresholds. It is unlikely that users would be considered sensitive receptors (generally defined as children, the elderly, etc.); therefore, impacts to sensitive receptors are not anticipated. Additionally, the duration of exposure and frequency of exposure would be limited, therefore impacts are not anticipated. • Some air quality impacts would potentially be beneficial since all project alternatives would encourage the use of active transportation thereby reducing automobile use. **Recommendation:** • Further analysis would need to be conducted by a qualified technical specialist to determine potential impacts and to develop mitigation measures if needed.	SIGNIFICANT IMPACTS POSSIBLE • Construction of this alternative would require the extensive use of heavy construction equipment and would likely require a large number of truck trips due to the high volume of cut and fill material. This would result in a short-term increase of air pollutant emissions. • Successful improvements would result in more pedestrians and cyclists traveling along the alignment. Users may be exposed to poor air quality in excess of Bay Area Air Quality Management District (BAAQMD) significance thresholds. It is unlikely that users would be considered sensitive receptors for the purposes of CEQA. **Potential Impact:** • Temporary increase in air pollutant emissions during construction period. Due to the large amount of construction required for this alternative, project-specific mitigation measures may be required to reduce impacts to less-than-significant levels. • Exposure of sensitive receptors to air quality that does not meet BAAQMD thresholds. It is unlikely that users would be considered sensitive receptors (generally defined as children, the elderly, etc.); therefore, impacts to sensitive receptors are not anticipated. Additionally, the duration of exposure and frequency of exposure would be limited, therefore impacts are not anticipated. • Some air quality impacts would potentially be beneficial since all project alternatives would encourage the use of active transportation thereby reducing emissions.

Air Quality	**N/A**	**SIGNIFICANT IMPACTS UNLIKELY**	**SIGNIFICANT IMPACTS POSSIBLE**	**SIGNIFICANT IMPACTS POSSIBLE** **Recommendation:** • Further analysis would need to be completed by a qualified technical specialist to determine potential impacts and to develop mitigation measures

Aesthetics	**N/A**	**SIGNIFICANT IMPACTS UNLIKELY** • This alternative would be limited to restriping of the existing, paved travel lanes. Visual changes to the project site would be very minor. • During construction, equipment such as a road striping machine would be located on the project site and would be visible to drivers and visible from the surrounding area. • The project site is not within or near a known scenic route, vista, or scenic resource. • It is not anticipated that the alternative would introduce new lighting to the project site or surrounding area. **Potential Impacts:** • Impacts are expected to be less than significant without mitigation. Visual changes to the project area would be limited to the placement of roadway striping and would not be distinguishably different in character from the existing paved roadway. • Visual impacts from construction equipment would be less than significant as the impact would be temporary by nature. **Recommendations:** • A qualitative discussion of visual impacts should be included in the CEQA document.	**SIGNIFICANT IMPACTS UNLIKELY** • The alternative would include minor construction to create a separated pedestrian and bicycle path. • During construction, equipment such as a road striping machine would be located on the project site and would be visible to drivers and visible from the surrounding area. • The project site is not within or near a known scenic route, vista, or scenic resource. • It is not anticipated that the alternative would introduce new lighting to the project site and surrounding area. **Potential Impacts:** • Impacts are generally expected to be less than significant. Visual changes to the project area would be limited to the placement of a separation barrier, restriping, installation of bus stops and other minor construction. The project site would maintain its overall character as a paved travel way. Visual impacts from construction equipment would be less than significant as the impact would be temporary by nature. **Recommendations:** • A qualified technical specialist should evaluate the project site and alternative to determine impacts.	**SIGNIFICANT IMPACTS POSSIBLE** • This alternative would require the construction of an additional travel lane, widening the existing roadway. This work would include large amounts of grading (excavation and addition of fill) and construction of retaining walls. • The project site is not within or near a known scenic route, vista, or resource. • It is not anticipated that the alternative would introduce new lighting to the project site and surrounding area. **Potential Impacts:** • Potentially significant impacts could result from this alternative, particularly in the undeveloped, natural areas of the alignment, where the character and visual quality of the site would be arguably altered and potentially degraded. Mitigation measures may be required, such as aesthetic treatments for retaining walls. **Recommendations:** • A qualified technical specialist should evaluate the project site and alternative to determine impacts and mitigation measures if needed.

Agriculture	**N/A**	**NO IMPACTS ANTICIPATED** • No impacts are anticipated as the project site is not known to include agriculture or forest resources.2	**NO IMPACTS ANTICIPATED** • No impacts are anticipated as the project site is not known to include agriculture or forest resources.3	**NO IMPACTS ANTICIPATED** • No impacts are anticipated as the project site is not known to include agriculture or forest resources.4
Biological Resources	**N/A**	**SIGNIFICANT IMPACTS UNLIKELY** • This alternative would not increase the existing roadway footprint or the amount of impervious surface in the project area. • The project footprint under this alternative consists of developed areas that are primarily paved, therefore biological resources including habitat for listed species is unlikely to exist on the project site. **Exemption:** • To qualify for an exemption under CEQA, the analysis must demonstrate that the project would not occur in a "particularly sensitive environment" which would make an ordinarily insignificant impact significant. Given that the project site is comprised of paved roadway, it is very unlikely that the project site has value for biological resources or is otherwise a sensitive site for biological resources. **Recommendation**: • A qualified biologist should perform a screening-level assessment of the project site and vicinity, including a search of relevant databases, to characterize the project site from a biological resources perspective.	**SIGNIFICANT IMPACTS POSSIBLE** • This alternative would not increase the existing roadway footprint or the amount of impervious surface in the project area. • The project footprint under this alternative consists of developed areas that are primarily paved, therefore biological resources including habitat for listed species is unlikely to exist on the project site. **Potential Impacts**: • If biological resources are found to exist in the project area, impacts to biological resources could occur. • Impacts would most likely be limited to the construction period of the project. • Impacts to biological resources could likely be reduced to less-than-significant levels through implementation of typical mitigation measures such as work windows, designated work areas, or possibly a biological monitor. **Recommendation**: • A qualified biologist would need to perform an assessment of the project site and vicinity, including a search of relevant databases and field survey, to determine what biological resources exist in the study area and to develop mitigation measures if needed.	**SIGNIFICANT IMPACTS POSSIBLE** • This alternative would require a large amount of grading and construction of new roadway and retaining walls. • Construction would occur in developed and undeveloped, natural areas. Therefore, impacts to biological resources could occur. **Potential Impacts**: • If biological resources are found to exist in the project area, impacts to biological resources are likely to occur. • Impacts to biological resources could occur during construction, including permanent impacts if the project would alter or degrade habitat for listed species. • If sensitive biological resources or habitat for listed species would be permanently altered or degraded, off-site mitigation may be needed. • Other impacts to biological resources could likely be reduced to less-than-significant levels through implementation of project-specific mitigation measures such as work windows, designated work areas, or possibly a biological monitor. **Recommendation:** • A qualified biologist would need to perform an assessment of the proposed work, including a search of relevant databases and field survey, to determine what biological resources exist in the study area and to develop mitigation measures if needed.

2 Contra Costa County Agricultural Preserves Map, 2012. Accessed October 31, 2016. http://www.co.contra-costa.ca.us/DocumentCenter/View/882
3 Ibid.
4 Ibid.

Cultural Resources	N/A	SIGNIFICANT IMPACTS UNLIKELY • This alternative would not include excavation, demolition or construction and therefore would not have the potential to impact existing historic resources (should they exist) or have the potential to result in an accidental discovery of archeological, paleontological or cultural resources.	SIGNIFICANT IMPACTS POSSIBLE • This alternative would require some excavation and construction of bus stops and other minor improvements. **Potential Impacts:** • Discovery of archeological resources, human remains, or paleontological resources during construction. Typical mitigation measures are anticipated to be adequate to reduce this impact to a less-than-significant level. • Impacts to historic resources. It is unknown at this time if historic resources exist in the project site or vicinity. If resources exist, mitigation measures may be required to reduce impacts to a less-than-significant level. • Impacts to tribal resources. Consultation with the Native American Heritage Commission may be required. **Recommendation:** • A qualified cultural resources specialist should complete an analysis of the project site and alternative to assess impacts, develop mitigation measures if needed, and to complete Native American consultation.	SIGNIFICANT IMPACTS POSSIBLE • This alternative would require large amounts of excavation to expand the road footprint. It is not known whether demolition or partial demolition of existing structures would be required to complete this alternative. **Potential Impacts:** • Discovery of archeological resources, human remains, or paleontological resources during construction. Typical mitigation measures are anticipated to be adequate to reduce this impact to a less-than-significant level. • Impacts to historic resources. It is unknown at this time if historic resources exist in the project site or vicinity. If resources exist, mitigation measures may be required to reduce impacts to a less-than-significant level. • Impacts to tribal resources. Consultation with the Native American Heritage Commission may be required. **Recommendation:** • A qualified cultural resources specialist should complete an analysis of the project site and alternative to assess impacts, develop mitigation measures if needed, and to complete Native American consultation.

Geology & Soils	**N/A**	**SIGNIFICANT IMPACTS UNLIKELY** • This alternative would not expand the existing roadway footprint and would not require soil-disturbing activities, and therefore would not increase the likelihood of erosion, ground shaking, or landslides. • The geologic character of the project site is not known at this time. • The alternative is likely to encourage a higher frequency of users in an area that may be at risk for potential ground shaking, liquefaction, and expansive soils. **Potential Impacts:** • Exposure of users to seismic risk including ground shaking and liquefaction. However, it is unlikely that this impact would be considered significant under CEQA as the alternative would not construct any new structures on the project alignment or alter the existing roadway prism. **Recommendation:** • A qualified geologist should conduct a screening-level analysis of the project site and alternative, in support of using CEQA provisions for an exemption.	**SIGNIFICANT IMPACTS POSSIBLE** • This alternative would include minor construction, which could temporarily increase erosion. • The geologic character of the project alignment is not known at this time. • This alternative would encourage a higher frequency of users in an area at risk for potential ground shaking, liquefaction, and expansive soils. **Potential Impacts:** • Exposure of users to seismic risk including ground shaking and liquefaction. The alternative would construct minor structures (bus stops) built to the current California Building Code. Additionally, under this alternative the project would not alter the existing roadway prism. Typical mitigation measures are anticipated to be sufficient to reduce impacts to less-than-significant levels. • Increase in the likelihood of erosion and landslides due to hillside construction and soil disturbance. Typical mitigation measures are anticipated to be sufficient to reduce impacts to less-than-significant levels. **Recommendation:** • A qualified geologist should examine the specific geologic conditions that underlay the project site to determine potential impacts and to develop mitigation measures as needed.	**SIGNIFICANT IMPACTS POSSIBLE** • This alternative would require substantial alteration to existing hillsides, including the creation of new, steep slopes and the construction of retaining walls. • The geologic character of the project alignment is not known at this time. • This alternative would encourage a higher frequency of users in an area at risk for potential ground shaking, liquefaction, and expansive soils. **Potential Impacts:** • Exposure of users to seismic risk including ground shaking and liquefaction. The alternative would construct minor structures (bus stops) built to the current California Building Code. The alternative would also require alterations to the existing roadway prism to widen the travel way. It is possible that mitigation measures would be required to reduce impacts. • Increase in the likelihood of erosion and landslides due to hillside cuts and soil disturbance. Project-specific mitigation measures are anticipated to be required to reduce potential impacts. • A site-specific geotechnical investigation would likely be required. **Recommendation:** • A qualified geologist should examine the specific geologic conditions that underlay the project site to determine potential impacts and to develop mitigation measures.

Green House Gases	N/A	SIGNIFICANT IMPACTS UNLIKELY • This alternative is not anticipated to permanently increase greenhouse gas emissions or create new sources of greenhouse gas emissions. **Potential Impacts:** • Construction equipment used to implement this alternative would likely cause a temporary increase in greenhouse gas emissions, however, these emissions are not anticipated to exceed established thresholds due to the minor amount of construction required. This impact is anticipated to be less than significant. • Some impacts are anticipated to be beneficial, as all project alternatives would encourage active transportation rather than automobile use. **Recommendation:** • A qualitative analysis of greenhouse gas emissions should be included in the CEQA document in support of using CEQA provisions for an exemption.	SIGNIFICANT IMPACTS UNLIKELY • This alternative is not anticipated to permanently increase greenhouse gas emissions or create new sources of greenhouse gas emissions. **Potential Impacts:** • Construction equipment used to implement this alternative would likely cause a temporary increase in greenhouse gas emissions, however, these emissions are not anticipated to exceed established thresholds due to the minor amount of construction required. This impact is anticipated to be less than significant. • Some impacts are anticipated to be beneficial, as all project alternatives would encourage active transportation rather than automobile use. **Recommendation:** • A qualified technical specialist should analyze the alternative to characterize potential greenhouse gas emissions during construction and determine potential impacts.	SIGNIFICANT IMPACTS POSSIBLE • This alternative is not anticipated to permanently increase greenhouse gas emissions or create new sources of greenhouse gas emissions. • Construction would require a large amount of grading, involving the use of heavy construction equipment. **Potential Impacts:** • Construction equipment used to implement this alternative would likely cause a temporary increase in greenhouse gas emissions which may exceed established thresholds. Mitigation measures may be required. • Some impacts are anticipated to be beneficial, as all project alternatives would encourage active transportation rather than automobile use. **Recommendation:** • A qualified technical specialist should analyze the alternative to characterize potential greenhouse gas emissions during construction, determine potential impacts, and develop mitigation measures if needed.

Hazards and Hazardous Materials	N/A	SIGNIFICANT IMPACTS UNLIKELY • Given that the project alignment includes areas surrounded by industrial land, including a refinery, it is possible that the project site or immediate vicinity include a site which is included on a Cortese list. • All project alternatives would encourage more bicyclists and pedestrians to travel along the project alignment, introducing new users to an area with potential hazards associated with the refinery, such as explosions or leaks. **Exemption**: • A categorical exemption cannot be used for a project that includes a Cortese list site. If the project area is determined to include a Cortese list site, a statutory exemption could perhaps still be used, or a different type of environmental document would be prepared. **Recommendation**: • A search of Cortese list sites and a desktop survey would be needed to identify and evaluate potential hazards in the project area.	SIGNIFICANT IMPACTS POSSIBLE • Under this alternative, construction of the shared use path would require soil-disturbing activities and may include soil excavation. • Given that the project alignment includes areas surrounded by industrial land, including a refinery, it is possible that the project site or immediate vicinity include a site which is included on a Cortese list. • All project alternatives would encourage more bicyclists and pedestrians to travel along the project alignment, introducing new users to an area with potential hazards associated with the refinery, such as explosions or leaks. **Potential Impacts**: • If contaminated soil or other underground hazards exist on the project site, construction could expose workers to hazardous materials. There is also a risk of accidental release of hazardous materials during construction. Potentially significant impacts could likely be mitigated to less than significant levels using typical mitigation measures. • During operation, users of the pedestrian and bike facilities would be in close proximity to the refinery, where the potential for release of hazardous materials exists. **Recommendations**: • A qualified technical specialist should complete an analysis of potential hazards and hazardous materials in the project site and vicinity. • A search of Cortese list sites would be needed to identify and evaluate known hazardous materials sites.	SIGNIFICANT IMPACTS POSSIBLE •This alternative would require a large amount of grading and construction of new roadway and retaining walls, requiring a large amount of soil to be excavated. • Given that the project alignment includes areas surrounded by industrial land, including a refinery, it is possible that the project site or immediate vicinity include a site which is included on a Cortese list. • All project alternatives would encourage more bicyclists and pedestrians to travel along the project alignment, introducing new users to an area with potential hazards associated with the refinery, such as explosions or leaks. **Potential Impacts**: • If contaminated soil or other underground hazards exist on the project site, construction could expose workers to hazardous materials. There is also a risk of accidental release of hazardous materials during construction. Potentially significant impacts could likely be mitigated to less than significant levels using typical mitigation measures. • Construction of the project would include major soil excavation and grading. If soils are found to be contaminated, excavated soil may need to be off-hauled from the site and/or disposed of at an appropriate hazardous materials facility. • During operation, users of the pedestrian and bike facilities would be in close proximity to the refinery, where the potential for release of hazardous materials exists. **Recommendations:** • A qualified technical specialist should complete an analysis of potential hazards and hazardous materials in the project site and vicinity. • A Phase I/II environmental site assessment may need to be prepared to characterize soil conditions at the project site. • A search of Cortese list sites would be needed to identify and evaluate known hazardous materials sites.

Hydrology and Water Quality	**N/A**	**SIGNIFICANT IMPACTS UNLIKELY** This alternative would not alter the amount of impervious surface or change the drainage of the project area. The alternative would not contribute to additional runoff water and is unlikely to degrade water quality. **Exemption**: • The alternative's minor changes to the project site would not result in significant or potentially significant impacts to the environment, and therefore it is unlikely that hydrology and water quality issues would prevent the project from qualifying for an exemption. **Recommendation**: • A screening-level analysis of the project's potential to impact hydrology and water quality should be completed and included in the exemption or other CEQA document.	**SIGNIFICANT IMPACTS POSSIBLE** This alternative would result in minor increases to the existing roadway footprint, thereby increasing the amount of impervious surface in the project area. **Potential Impacts**: • The alternative could slightly increase stormwater runoff or alter the drainage pattern of the site in minor ways. •Construction activities could have the potential to temporarily degrade water quality through accidental spills or leaks and through increased sediment in stormwater runoff. • All impacts could likely be mitigated to less-than-significant levels using typical mitigation measures and BMPs. **Recommendation**: • A qualified technical specialist should analyze the alternative's potential to impact hydrology and water quality to determine impacts and develop mitigation measures if needed.	**SIGNIFICANT IMPACTS POSSIBLE** This alternative would increase impervious surfaces, alter existing drainage patterns, and increase stormwater runoff. **Potential Impacts**: • This alternative would alter the existing drainage pattern of the site area and would increase impervious surfaces, contributing to stormwater runoff. • Under this alternative, the project would be required to prepare a SWPPP and would be subject to local and state permitting requirements. • Preparation of a SWPPP, standard conditions of approval and/or BMPs would likely be sufficient to reduce potential impacts to a less-than-significant level. **Recommendation**: • A qualified hydrologist would need to analyze the alternative for potential hydrology and water quality impacts, and develop mitigation measures as needed. • Mitigation strategies developed under previous CEQA documents should be reviewed to identify opportunities for cooperative mitigation measures. • The hydrologist should also conduct a cumulative analysis to accurately characterizing potential flood-related impacts. Design and engineering solutions may reduce this potential impact.
Land Use & Planning	**N/A**	**SIGNIFICANT IMPACTS UNLIKELY** • This alternative would be limited to restriping of the existing roadway and would not alter land use or divide an established community; therefore no impacts to land use are anticipated.	**SIGNIFICANT IMPACTS UNLIKELY** • This alternative would be limited to restriping of the existing roadway and construction of a separation barrier in the paved travel way and other minor, transportation-affiliated structures. This alternative would not alter land use or divide an established community; therefore no impacts to land use are anticipated.	**SIGNIFICANT IMPACTS UNLIKELY** • This alternative would include some right of way acquisition and conversion of some land areas to transportation uses. However, this change in land use is not anticipated to conflict with applicable plans or policies. This alternative would not divide an established community. It is anticipated that land use impacts would be less than significant without the use of mitigation measures.

Mineral Resources	**N/A**	**NO IMPACTS ANTICIPATED** • This alternative would not have the potential to impact mineral resources, should they exist in the project area.[5]	**NO IMPACTS ANTICIPATED** • This alternative would not have the potential to impact mineral resources, should they exist in the project area.[6]	**NO IMPACTS ANTICIPATED** • This alternative would not have the potential to impact mineral resources, should they exist in the project area.[7]
Noise	**N/A**	**SIGNIFICANT IMPACTS UNLIKELY** • Construction would likely result in a temporary increase over ambient noise levels in the project area. This noise is expected to be relatively minimal, as extensive use of heavy construction equipment is not anticipated. • During operation, the project would not result in increased noise in the project area. **Potential Impacts:** • Temporary construction-related noise. Construction noise is not anticipated to be in excess of standard construction noise, and the project is not located in a noise-sensitive area. **Recommendation:** • A qualitative noise analysis should be included in the CEQA document in support of using CEQA provisions for an exemption.	**SIGNIFICANT IMPACTS POSSIBLE** • Construction would result in a temporary increase in noise levels in the project area. Construction noise would be generated by heavy construction equipment needed to perform minor excavation and construct project components such as bus stop shelters and a new shared use path with barrier. • During operation, the project would not result in increased noise in the project area. **Potential Impacts:** • Temporary construction-related noise impacts. Construction noise may result in a potentially significant impact, which can likely be reduced to less-than-significant levels through typical mitigation measures. **Recommendation:** • A qualified technical specialist should analyze the alternative to calculate baseline noise conditions, anticipated noise during construction, evaluate potential impacts, and develop mitigation measures.	**SIGNIFICANT IMPACTS POSSIBLE** • Construction would result in a temporary increase in noise levels in the project area. Construction noise would be generated by heavy construction equipment needed to perform extensive excavation, grading, and construction of retaining walls. • Depending on the type of retaining wall needed, pile driving may be required. • During operation, the project would not result in increased noise in the project area. **Potential Impacts:** • Temporary construction-related noise impacts. Construction noise may result in a potentially significant impact, which can likely be reduced to less-than-significant levels through typical mitigation measures. **Recommendation:** • A qualified technical specialist should analyze the alternative to calculate baseline noise conditions, anticipated noise during construction, evaluate potential impacts, and develop mitigation measures.

[5] Public Resources Code, Division 2, Chapter 9, Section 2714
[6] Ibid.
[7] Ibid.

Population & Housing	**N/A**	**NO IMPACTS ANTICIPATED** • This alternative would not induce substantial population growth or result in displacement. Therefore, impacts to population and housing are not anticipated.	**NO IMPACTS ANTICIPATED** • This alternative would not induce substantial population growth or result in displacement. Therefore, impacts to population and housing are not anticipated.	**NO IMPACTS ANTICIPATED** • This alternative would not induce substantial population growth or result in displacement. Therefore, impacts to population and housing are not anticipated.
Public Services	**N/A**	**NO IMPACTS ANTICIPATED** • This alternative would not increase demand for public services including fire protection, police protection, schools, parks, or other public facilities. Therefore, impacts to public services are not anticipated.	**NO IMPACTS ANTICIPATED** • This alternative would not increase demand for public services including fire protection, police protection, schools, parks, or other public facilities. Therefore, impacts to public services are not anticipated.	**NO IMPACTS ANTICIPATED** • This alternative would not increase demand for public services including fire protection, police protection, schools, parks, or other public facilities. Therefore, impacts to public services are not anticipated.
Recreation	**N/A**	**SIGNIFICANT IMPACTS UNLIKELY** • The proposed alternative would not increase the use of existing neighborhood and regional parks or other recreational facilities. • This alternative would provide new recreation facilities for cyclists and pedestrians, connecting two segments of the Bay Trail. This connection of the Bay Trail is not anticipated to have an adverse physical effect on the environment.	**SIGNIFICANT IMPACTS UNLIKELY** • The proposed alternative would not increase the use of existing neighborhood and regional parks or other recreational facilities. • This alternative would provide new recreation facilities for cyclists and pedestrians, connecting two segments of the Bay Trail. This connection of the Bay Trail is not anticipated to have an adverse physical effect on the environment. Impacts resulting from the construction of new recreational facilities would be evaluated through the project CEQA analysis and organized by CEQA topic (e.g., air quality, noise).	**SIGNIFICANT IMPACTS UNLIKELY** • The proposed alternative would not increase the use of existing neighborhood and regional parks or other recreational facilities. • This alternative would provide new recreation facilities for cyclists and pedestrians, connecting two segments of the Bay Trail. Impacts resulting from the construction of new recreational facilities would be evaluated through the project CEQA analysis and organized by CEQA topic (e.g., air quality, noise).
Transportation & Traffic	**N/A**	**SIGNIFICANT IMPACTS UNLIKELY** • Arup conducted a traffic impact analysis for this scenario which found all impacts to be less than significant.	**SIGNIFICANT IMPACTS UNLIKELY** • Arup conducted a traffic impact analysis for this scenario which found all impacts to be less than significant.	**SIGNIFICANT IMPACTS UNLIKELY** • Arup conducted a traffic impact analysis for this scenario which found all impacts to be less than significant.

Utilities	**N/A**	**NO IMPACTS ANTICIPATED** • This alternative would not increase demand for utilities, therefore no impacts are anticipated.	**NO IMPACTS ANTICIPATED** • This alternative would not increase demand for utilities, therefore no impacts are anticipated.	**NO IMPACTS ANTICIPATED** • This alternative would not increase demand for utilities, therefore no impacts are anticipated.

Appendix F: Community Outreach Summary

Memorandum

ARUP

To	Paul Fassinger, CCTA Angela Villar, Contra Costa County Public Works	Date	November 3, 2016
Copies		Reference number	243261/MVI
From	Mike Iswalt	File reference	4-05
Subject	San Pablo Avenue Complete Streets Study - Public Outreach Strategy		

This memorandum summarizes Arup's public outreach strategy for the San Pablo Avenue Complete Streets study. This study is evaluating the feasibility of providing improved pedestrian and bicycle facilities on San Pablo Avenue between Rodeo and Crockett in unincorporated Contra Costa County. Currently, this segment of San Pablo Avenue has no bicycle facilities and only very limited sidewalks and it has been identified as a planned Bay Trail segment by the Association of Bay Area Governments (ABAG).

1 Study Introduction

The study will consider implementing a road diet on this segment of San Pablo Avenue by removing one travel lane and converting the roadway from four lanes (two travel lanes in each direction) to three (one travel lane in each direction with left turn pockets, center medians, or a truck climbing lane). The lane reduction could then be used to accommodate dedicated pedestrian and bicycle facilities.

The study area is a three-mile segment of San Pablo Avenue from Lone Tree Point and Parker Avenue in Rodeo to the base of the Carquinez Bridge bicycle and pedestrian shared-use path (SUP) in Crockett. Figure 1 presents the study area, the ten study intersections, and six key segments along the corridor that are described in Table 1 below. Along most of the study corridor, San Pablo Avenue is a four-lane (two lanes each direction) undivided arterial with a 45 mph speed limit, no sidewalks, and no dedicated bike facilities. However, between Lone Tree Point and California St, the speed limit was recently reduced to 35 mph.

This memorandum describes the various elements of the public outreach strategy for the study. The study is still ongoing, so several meetings have not been scheduled.

Memorandum

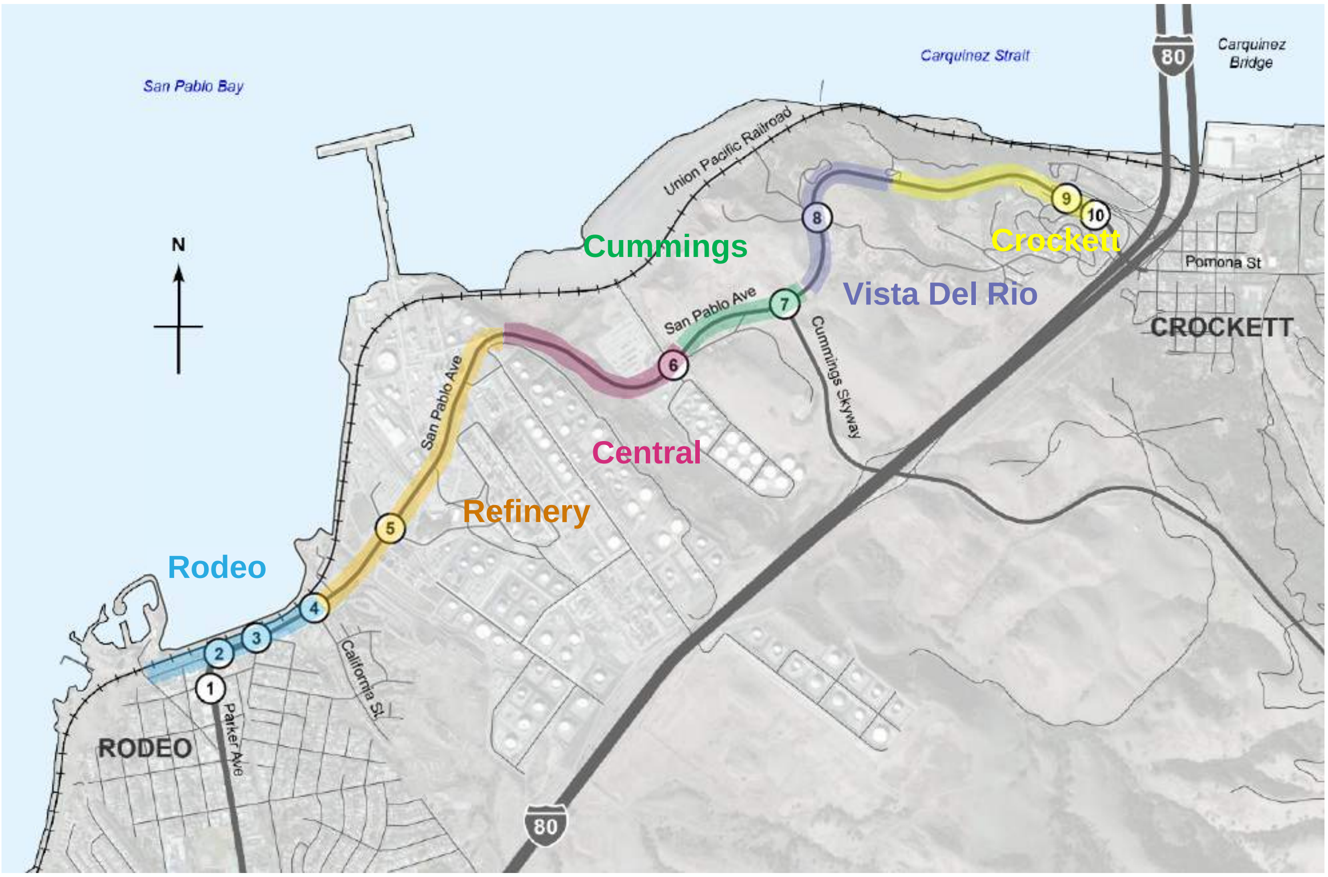


Figure 1: Study Area

Table 1: Study Area Description

Segment	Street Description/Land Use Context
Rodeo Lone Tree Point to California St	Bike lanes on Parker Avenue with sidewalks Local commercial uses with multiple driveways, on-street parking
Refinery California St to the summit east of Phillips 66	No bike lanes or sidewalks Oil refinery and heavy industrial uses Steep grades east of Refinery Rd
Central Summit to east of A St	No bike lanes or sidewalks Petroleum storage at A St; some rural residential Some moderate grades
Cummings A St to Cummings Skwy	No bike lanes or sidewalks Long steep sustained grades with moderate truck volumes
Vista Del Rio Cummings Skwy to Vista Point	No bike lanes or sidewalks Long steep sustained grades with moderate truck volumes
Crockett Vista Point to I-80 Ramps/Merchant St	No bike lanes or sidewalks Major on and off-ramps serving I-80 A large restaurant traffic generator near the ramps Some moderate grades approaching the ramps

2 Public Outreach Strategy

The public outreach strategy contains the following elements:

- Arup and County staff established a Technical Advisory Committee (TAC). The committee consists of many stakeholders, including: County staff, , representatives from staff of the Contra Costa County District V Supervisor Federal Glover, Contra Costa Health Services, Contra Costa County Employment and Human Services, Western Contra Costa Transit Authority (WestCAT), Caltrans, the West Contra Costa County Transportation Advisory Committee (WCCTAC), the Metropolitan Transportation Commission (MTC), Caltrans, the East Bay Regional Parks District, ABAG, Phillips 66, NuStar, Bike East Bay, and local residents from Rodeo and Crockett. (See attachments for a complete list of TAC members.)

1.

    - The first TAC meeting was held on October 27, 2016 at Contra Costa County Public Works. At this meeting, Arup and County staff provided an overview of the study, presented initial concepts for the alternatives, presented initial findings from the traffic study, and received comments and answered questions from the TAC.
    - The second TAC meeting was held on June 13, 2016 at Contra Costa County Public Works. At this meeting, the study alternatives were presented and the preliminary layout drawings were reviewed by the TAC. Comments were received by the TAC and incorporated into the alternative drawings.
    - Arup and County staff anticipate at least one additional TAC meetings before the end of the study.

2. Community Workshops: Two public meetings were held to inform residents and users on the study. Public meetings were advertised by posting meeting announcements on the County project website, posting at the Rodeo Senior Center and Crockett Community Center, and mailing to all site addresses and property owners within 300 feet of the study corridor.

    - The first community workshop was held on February 8, 2016 at the Rodeo Senior Center. The meeting was attended by approximately 25 people from the local community. At this meeting, Arup and County staff provided an overview of the project, presented initial concepts for two alternatives (bike lanes and shared-use path), presented the traffic study findings, received public comments, and responded to questions from the public. Comment cards were handed out at the meeting and web surveys and the collaborative map were launched (more details below).
    - The second community workshop was held on September 29, 2016 at the Crockett Community Center. The meeting was attended by approximately 35 people. The project team presented the alternatives and received input and feedback on the preliminary layouts. Comment cards were handed out at the meeting to obtain feedback on preferred alternatives.

3. Stakeholder meetings:

   - Arup and County staff attended a stakeholder meeting with Phillips 66 and NuStar Energy on November 10, 2015 at the Phillips 66 refinery in Rodeo. This meeting was an informational session to better understand the refinery operations and security concerns.

   - Arup and County staff attended a stakeholder meeting on May 16, 2016 with Phillips 66 and the office of Federal Glover, Supervisor for Contra Costa County. At this meeting, Arup and County staff presented the latest conceptual designs for two alternatives (bike lanes and shared-use path), discussed the traffic study, and answered questions.

   - Additional stakeholder outreach was conducted to obtain information and feedback from the Crockett-Carquinez Fire Department, Rodeo-Hercules Fire District, John Swett Unified School District, WestCAT, and the Dead Fish restaurant.

4. Website: County staff established a website for the project at the following URL: http://www.co.contra-costa.ca.us/6006/San-Pablo-Avenue-Complete-Streets-Projec. All documents, presentations, meeting information, surveys (more details below) and designs are being posted to this website for the public.

5. Comment Cards: County staff developed comment cards for each public meeting. The cards were printed on postcards and distributed at the public meetings to obtain feedback and allow attendees to provide written comments.

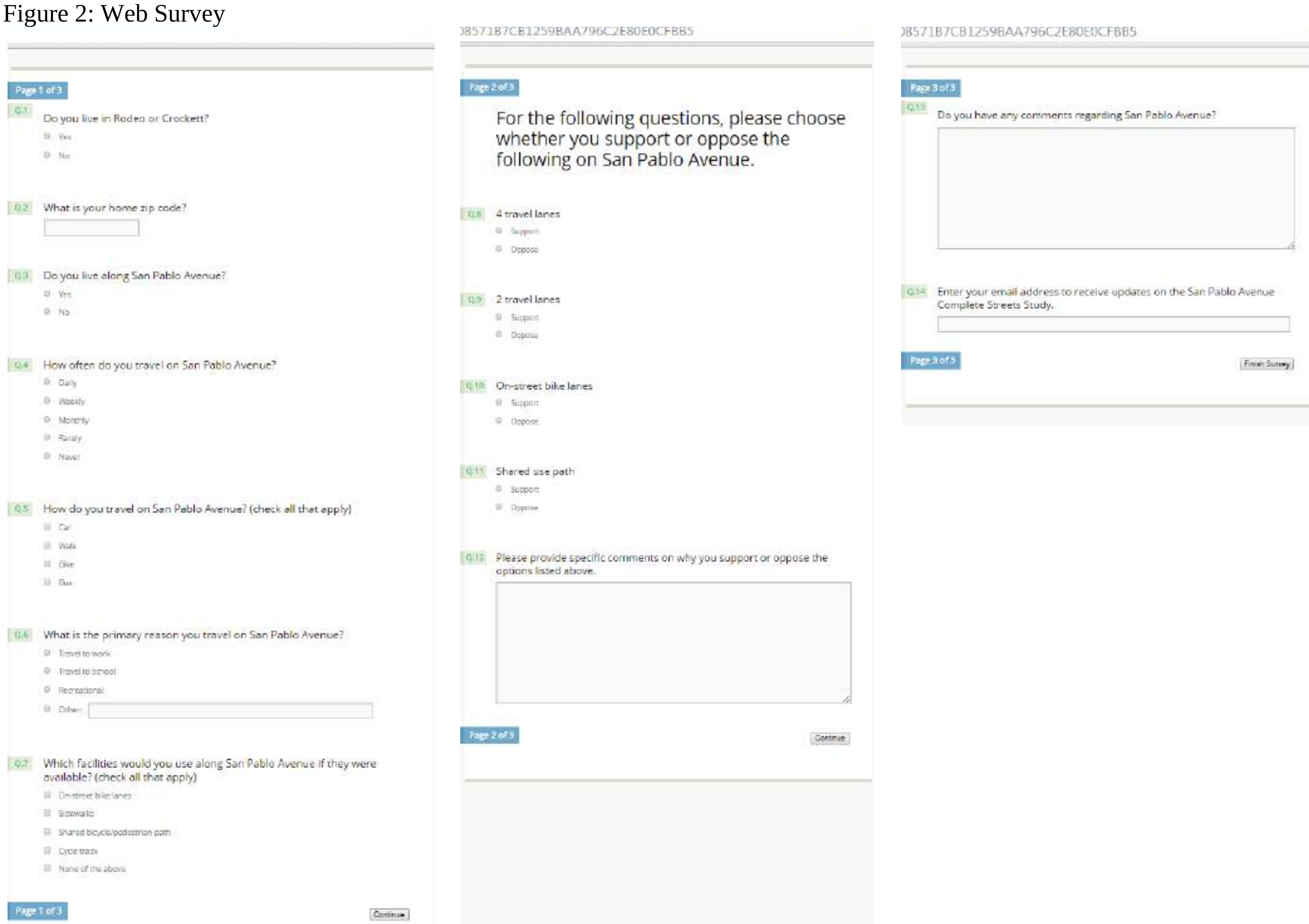
6. Web surveys: Arup developed a web survey for the study that was launched at the February 8th public meeting. The County has a link to the website at this URL: http://arup.polldaddy.com/s/san-pablo-avenue-complete-streets-project-survey. The survey results are summarized in the next section.

7. Collaborative Map. Arup also set up a "Collaborative Map" for the corridor that allows users to drop pins on problem areas and provide comments. The Collaborative Map URL is https://www.collaborativemap.com/SanPabloAve/. The collaborative map was launched at the February 8th public meeting.

3 Survey Results

The web survey is presented in Figure 2 below.

Figure 2: Web Survey



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Page 1 of 3

Q.1 Do you live in Rodeo or Crockett?
- Yes
- No

Q.2 What is your home zip code?

Q.3 Do you live along San Pablo Avenue?
- Yes
- No

Q.4 How often do you travel on San Pablo Avenue?
- Daily
- Weekly
- Monthly
- Rarely
- Never

Q.5 How do you travel on San Pablo Avenue? (check all that apply)
- Car
- Walk
- Bike
- Bus

Q.6 What is the primary reason you travel on San Pablo Avenue?
- Travel to work
- Travel to school
- Recreational
- Other:

Q.7 Which facilities would you use along San Pablo Avenue if they were available? (check all that apply)
- On-street bike lanes
- Sidewalks
- Shared bicycle/pedestrian path
- Cycle track
- None of the above

Page 1 of 3 Continue

Page 2 of 3

For the following questions, please choose whether you support or oppose the following on San Pablo Avenue.

Q.8 4 travel lanes
- Support
- Oppose

Q.9 2 travel lanes
- Support
- Oppose

Q.10 On-street bike lanes
- Support
- Oppose

Q.11 Shared use path
- Support
- Oppose

Q.12 Please provide specific comments on why you support or oppose the options listed above.

Page 2 of 3 Continue

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Page 3 of 3

Q.13 Do you have any comments regarding San Pablo Avenue?

Q.14 Enter your email address to receive updates on the San Pablo Avenue Complete Streets Study.

Page 3 of 3 Finish Survey

This survey is one tool of many in the outreach process. It is not considered a statistically significant sample because the survey was open to the general public and anyone with the web address could complete the survey. We also did not activate any validation processes to ensure that people did not vote multiple times (i.e., “stuff the ballot box”).

However, some data were useful to help group responses and try to identify the potential for multiple votes. These include email addresses, which were submitted by some respondents, and Internet Protocol (IP) addresses, which were collected from all responses. The IP address is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol for communication.

Memorandum

There were 204 survey responses submitted through the website. Not every respondent answered every question. In investigating the responses, a large number came from the same IP address. A large number of these addresses came from Phillips 66 emails. Many corporate IT networks will route their emails through the same email server with the same IP address. To better ensure that people were not voting multiple times, we decided to remove responses from the same IP address that did not provide an email address or a unique email address. This will better help show the range of results.

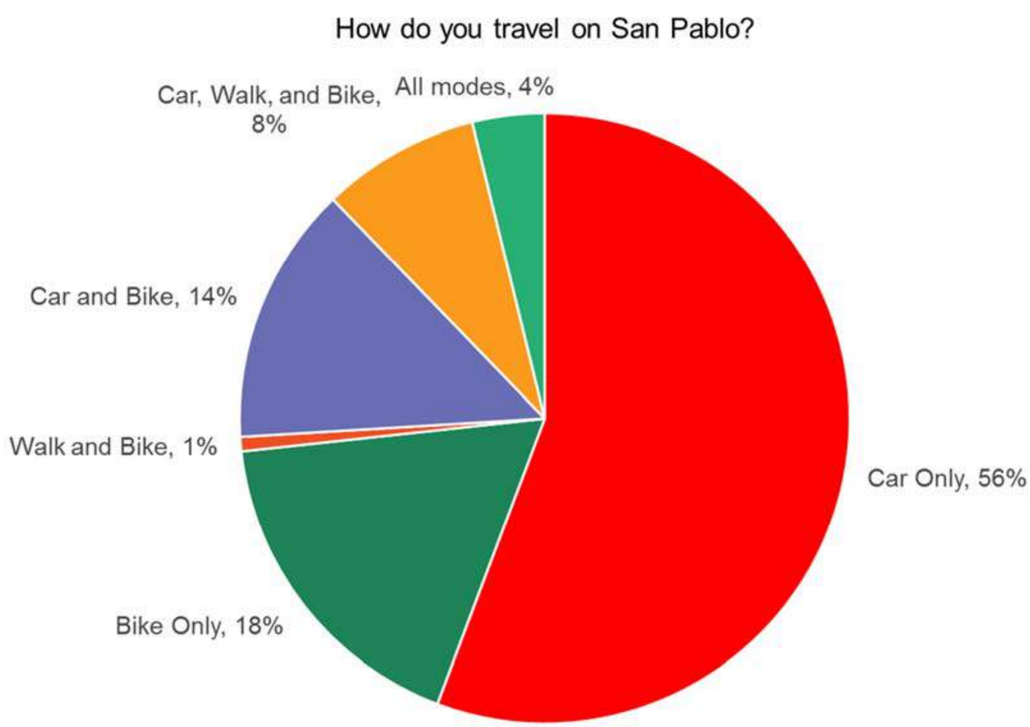
Using this process, 122 responses were identified as originating from Phillips 66 refinery. These were identified through the email and IP address. Of these 122 responses, half were removed because an email was not provided or it was a duplicate email address.

This resulted in 143 “valid” responses for reporting purposes. Of these, 61 responses were from Phillips 66 and 82 responses were from the rest of the general public. The following summarizes the results of the 143 valid responses for some of the key questions.

Do you live in Rodeo or Crockett?

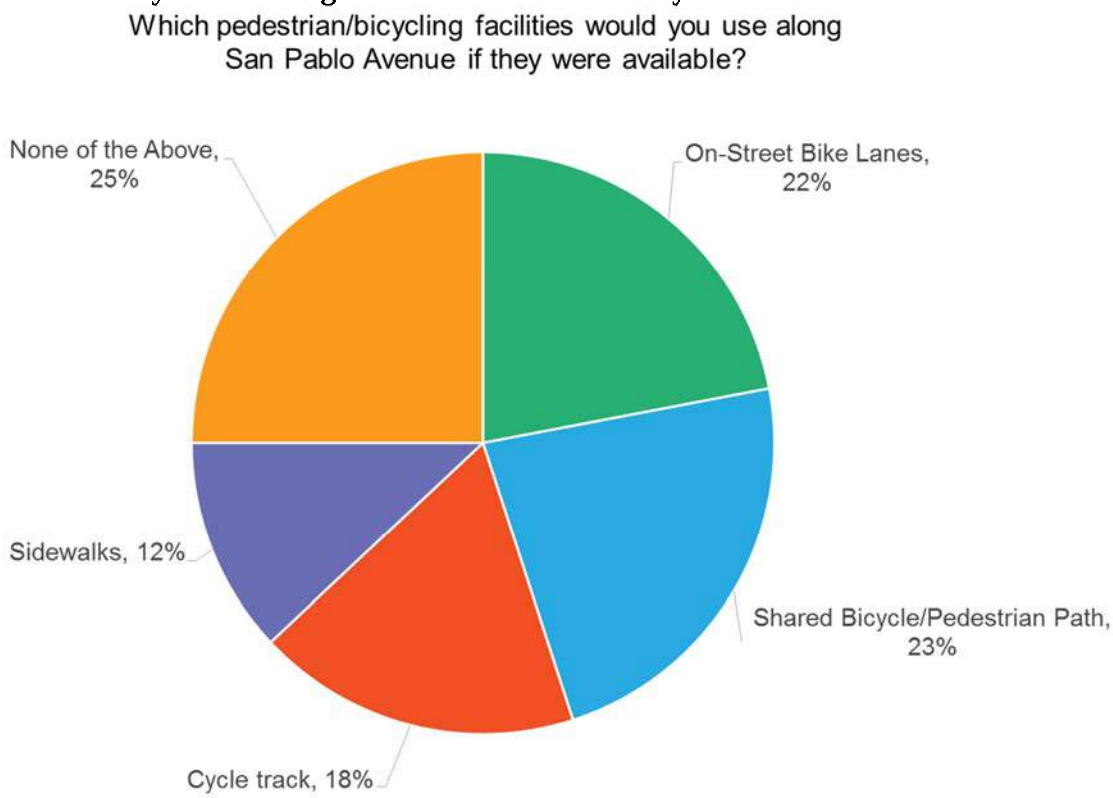
17% live in Rodeo or Crockett / 83% live outside of Rodeo and Crockett.

How do you travel on San Pablo Avenue?



Memorandum

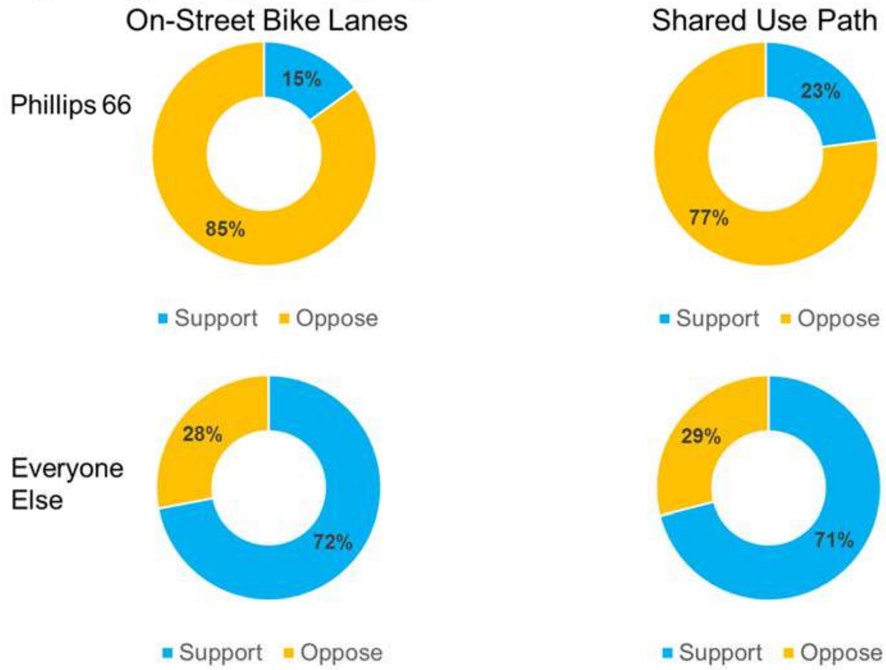
Which facilities would you use along San Pablo Avenue if they were available?



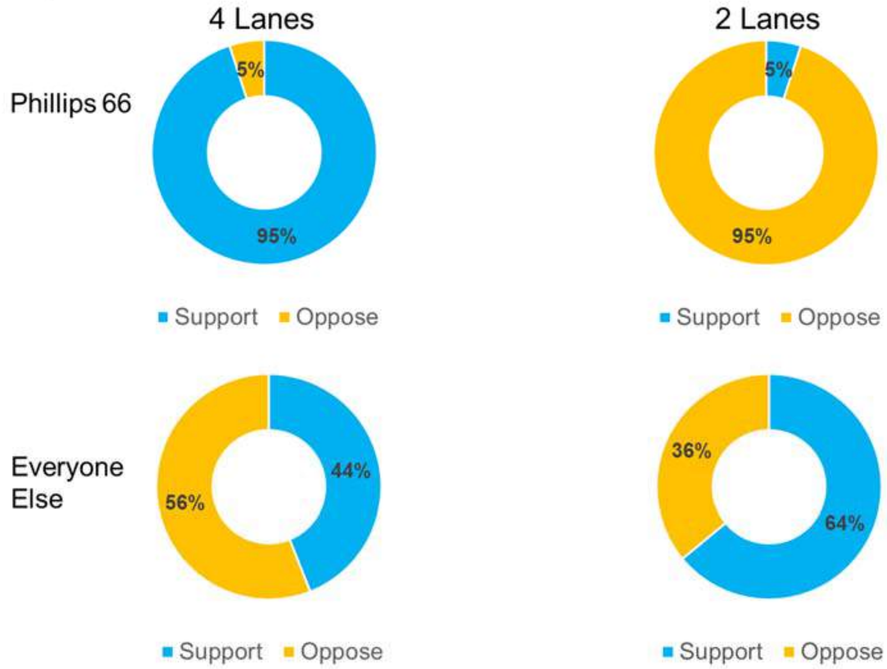
Memorandum

Since there was significant distinction between the responses, the following series of charts break up the responses into Phillips 66 and “Everyone Else”.

Do you support/oppose bicycle/pedestrian facilities on San Pablo Avenue?



Do you support/oppose narrowing San Pablo Avenue from 4 lanes (existing) to 2 lanes (road diet)?



The following summarizes the survey results:

- There are a range of uses along the corridor: 56% report using a car only, while 44% use at least one other modes (walk, bike, transit).
  - Of the car only respondents (56%), 77% travel the corridor daily.
  - Of the respondents that use at least one other mode (44%), only 44% travel the corridor daily.
- For the question regarding potential improvements along the corridor, 75% were in support of at least one of the improvements (sidewalks, bike lanes, cycle tracks, shared-use path), while 25% wanted "none of the above". Presumably this last group would like to maintain the existing four-lane cross-section on San Pablo Avenue.
- For the questions related to the type of facility (on-street bike lanes or a shared use path) and the number of travel lanes, the responses were clearly split between the Phillips 66 respondents and the Everyone Else group. The Phillips 66 employees strongly opposed changing the number of lanes and implementing any pedestrian and bicycle improvements, while the Everyone Else group largely supported reducing the number of travel lanes and implementing bike lanes or a shared use path.

4 Community Meeting Comments/Responses

The Community Meeting comments and responses are attached to this memo.

San Pablo Avenue Complete Streets Study Community Comments

#	Date	Source	Comment	Draft Response
1	2/8/2016	Community Workshop	will a left turn lane be provided at Vista Del Rio St?	We are considering providing a left-turn pocket at Vista Del Rio St.
2	2/8/2016	Community Workshop	San Pablo Avenue isn't 4 lanes the entire length	San Pablo Avenue is primarily 4 lanes (two lanes each direction) from California Street to Merchant St / I-80 Westbound Ramps. It's two lanes in Rodeo (Parker Ave) and two lanes in Crockett (Pomona St). Only a very short section near the Cummings Skyway San Pablo has three lanes.
3	2/8/2016	Community Workshop	Nustar trucks sometimes get backed up on SPA heading west. PW should not reduce lanes	We have completed a detailed traffic analysis that has evaluated delay and queuing conditions across a four-hour AM and PM period. Our alternatives that include lane reductions on San Pablo are taking into account left-turn truck queues at all intersections. The intersections will be designed with enough storage capacity to serve existing and future projected volumes.
4	2/8/2016	Community Workshop	There is heavy traffic on SPA near A Street	Our traffic study indicates that volumes on A Street are similar to other locations along San Pablo Avenue within the study area. Overall, traffic volumes along the corridor are low relative to other areas of the County.
5	2/8/2016	Community Workshop	If San Pablo Avenue is reduced to 3 lanes how will that affect potential evacuation needs for Rodeo and Crockett?	Our traffic study indicates that there is considerable excess capacity even with reducing the number of travel lanes from 4 (2 in each direction) to 3 (1 in each direction plus a center turn lane). This indicates that we expect relatively free-flow travel conditions under most circumstances. While this study is not evaluating an emergency evacuation scenario, the traffic analysis indicates that there is sufficient capacity to handle much higher traffic volumes, such as during an emergency evacuation.
6	2/8/2016	Community Workshop	Request construction to also rehab the roadway and ensure the subgrade is stable in clearly faulting areas.	This project is primarily a striping project with some barriers and will involve little pavement rehabilitation work. The County will consider the existing pavement condition of the roadway during the implementation phase of the project.
7	2/8/2016	Community Workshop	Concern for bike collisions on shared use path. Prefers Class 2 bike lanes	The project has developed alternatives to consider options for a shared use path and also on-street bike lanes. The shared-use path is planned to be 10 ft wide. The minimum width from Caltrans and NACTO is 8 ft with 10 ft "preferred" (source: NACTO Urban Bikeway Design Guide and the Caltrans Highway Design Manual). A 10 ft path should provide adequate safety for cyclists and pedestrians traveling in both directions.
8	2/8/2016	Community Workshop	What would the striping and delineation for a shared use path look like?	Various options are being studied for striping and delineation, including simple paint striping, plastic pylons, parking blocks, curb-and-gutter, and solid barriers. Different means of separation can be employed throughout the corridor in response to specific corridor conditions.
9	2/8/2016	Community Workshop	How was the alignment of the Bay Trail along San Pablo Avenue chosen?	The San Pablo Avenue alignment between Rodeo and Hercules was identifed in the *San Francisco Bay Trail Project Gap Analysis Study* (ABAG, September 2005). A shoreline alignment is constrained by the refinery, the Union Pacific (UP) railroad tracks, and topography. An alignment along I-80 would be much more expensive, would have topography constraints, impact private property and the refineries, would be even further from the Bay, and would be more difficult to connect to other Bay Trail segments.
10	2/8/2016	Community Workshop	Are there concerns from Homeland Security having bicycles and pedestrians so close to these large refineries?	We understand that there are restrictions and we will need to work with the refinery's security group to understand the specifics along San Pablo Avenue. There are existing signs that prohibit stopping, standing, and parking at any time along the refinery frontage. These existing signs would remain in place to discourage pedestrians and cyclists from standing and stopping along the path through the refinery segment.
11	2/8/2016	Community Workshop	Since traffic on San Pablo Avenue is 99% vehicles and 1% bikes is a facility for this 1% really necessary?	The current limited bicycle usage on the corridor reflects the relatively unfriendly cycling conditions along San Pablo Avenue. ABAG has identified this corridor as a key link in the Bay Trail system. We anticipate usage to increase substantially if a facility is provided.
12	2/8/2016	Community Workshop	When there is an accident on I-80 many people use Rodeo and San Pablo Avenue to reach the Carquinez Bridge. Would 3 lanes handle that capacity?	In the peak period, traffic on San Pablo Ave only uses approximately 25 percent of the roadway's capacity. The capacity of the roadway could be reduced from 4 to 3 lanes and the road would still have excess capacity for exceptional events (such as a severe accident on I-80). Also, San Pablo Avenue (Parker Avenue) only has 3 lanes in Rodeo (1 lane in each direction with dedicated left-turn pockets). Therefore, the precedent and evidence that this cross-section is adequate, already exists.
13	2/8/2016	Community Workshop	A shared use path would need a hard barrier like a curb or K-rail to protect pedestrians and cyclists; especially around the difficult corners.	If a shared use path alternative is chosen, the design will need to consider various types of barriers between pedestrians/cyclists and vehicles. These could include curb-and-gutter, plastic pylons, parking blocks, and other solid barriers. Different means of separation can be employed throughout the corridor in response to specific corridor conditions.
14	2/8/2016	Community Workshop	Is there enough space (length) for a left turn pocket into Nustar while still incorporating a truck climbing lane?	Left-turn pockets with sufficient length to store large trucks will be provided at the intersection serving A Street and the NuStar entrance. There is sufficient space to design a left-turn pocket at A St and still accomodate a truck climbing lane traveling from A St to Cummings Skyway.
15	2/8/2016	Community Workshop	Is it realistic for the Bay Trail to accommodate users in industrial areas all over the bay such as in Rodeo and in the delta?	The Bay Trail is a regional trail system that is intended to provide a connection between communities. This segment will provide a safe pedestrian and bicycle connection from Hercules and Rodeo to Crockett and Vallejo (via the shared use path on the Alfred Zampa Bridge). There are numerous examples of the Bay Trail and other dedicated bicycle and pedestrian facilities traveling through industrial areas to link regional destinations.
16	2/8/2016	Community Workshop	The refineries have turnaround periods once or twice a year which create significant traffic. Has this been accounted for?	We have spoken with the refinery and we understand that these turnaround activities occur. The traffic analysis indicates that there would be excess capacity with the proposed road diet to accommodate infrequent events such as turnarounds.
17	2/8/2016	Community Workshop	Has public works considered Cap and Trade grants?	Yes, Cap and Trade grants are typically tied to adjacent affordable housing projects. Once project improvements have been identified, the County's Public Works Department will seek additional grant opportunities for the implementation phase.
18	2/8/2016	Community Workshop	Will PW look at other alternatives or just the 2 presented	The study is intended to look at a range of alternatives to incorporate bicycle and pedestrian facilities along the corridor. Two concepts are being developed - 1) bike lanes and 2) the shared-use path. However, each concept will consider a range of design options to address site specific concerns.
19	2/8/2016	Community Workshop	Concern that many fatalities have not been included (4 high school students in 1990).	The traffic analysis considered a comprehensive database of traffic accidents dating back to 2003. We did not consider traffic accidents earlier than 2003.

San Pablo Avenue Complete Streets Study Community Comments

#	Date	Source	Comment	Draft Response
20	2/8/2016	comment card	shared path will work best for users with protection from traffic using curbs and k-rails	Noted. If a shared use path alternative is chosen, the design will need to consider various types of barriers between pedestrians/cyclists and vehicles. These could include curb-and-gutter, plastic pylons, parking blocks, and other solid barriers. Different means of separation can be employed throughout the corridor in response to specific corridor conditions.
21	2/8/2016	comment card	as a firefighter in Rodeo we see this section of SPA as an alternative route during heavy traffic on I-80 while on scene. Narrowing this access would also further endanger motorists traveling during commute and non-commute hours. Being an east bay resident this trail should not affect or impact traffic as it is elsewhere along the trail. I do see a benefit in a "face-lift" tho this section, just feel that narrowing the roadway isn't the safest way to do this	The traffic analysis indicates that the road diet would not impact traffic conditions along San Pablo Avenue. The road diet could result in a lower speed limit, which will cause an increase in travel time. However, we expect this increase to be minimal. We will work with the Fire District to understand any potential effects to response times.
22	2/8/2016	comment card	emergency response capabilities and traffic flow along with increased vehicle collision on a two lane roadway	Federal Highway Administration (FHWA) research indicates that converting an existing four-lane, undivided roadway to a three-lane roadway with one lane in each direction and center left-turn lanes reduces crashes by 19 to 47 percent.
23	2/8/2016	comment card	wouldn't use bike lane or pedestrian path	Noted.
24	2/8/2016	comment card	not safe	Empirical evidence indicates that well designed shared use paths increase safety for pedestrians and cyclists.

San Pablo Avenue Complete Streets Study
Community Workshop
September 29, 2016

	Name	Phone #	Email Draft Study	Email	Alternative 1 BIKE LANES	Alternative 2 SHARED-USE PATH	Alternative 3 WIDENED SHARED-USE PATH	Alternative 4 "DO NOTHING" (Write-in)	Comments	Response
1					3	2	1	X	Alternative 4 - Leave it as it is! No Change!!	Comment noted
2					3	2	1	X	Alternate 1st choice - Leave it alone! I will be sending an email.	Comment noted
3					–	–	X		–	-
4					3	1	2		Complete trail for walking and biking. Make safer for everyone.	Comment noted
5					1		3		All alternatives will seriously affect the parking in front of 3 blocks of businesses on San Pablo between Parker and California. • The businesses park and use road to unload trucks, etc. • Having to Park across from shops would be impractical and dangerous. • In the last year traffic has doubled on San Pablo Ave and seems to be getting busier. • Pedestrian traffic on north side is non-existant; i.e., people walk on the south side of San Pablo Ave.	The recommended design is planning to maintain the on-street parking between Parker and California.
6						X			• Drop Alternative 1. It does not meet your objectives and accomplishes very little. • The workshop format is bogus. We all need to hear all the questions and answers. You must allow questions during the sit-down portion. It is impossible to hear all the discussion around thoase large tables. It was difficult to get a question answered because of interruptions and hard to get close to one of the persons with a name tag.	Comment noted and responded to in a separate email.
7						X			• Alternative 3 at $20M will be very difficlt to fund as it's too expensive to complete in a variety of great categories. • Alternative 2 provides a beneift to a wide range of users; i.e., bikers, pedestrians, hikers, etc. It would be a big improvement over the status quo.	Comment noted.
8					1	1	2		–	-
9					–	–	X		–	-

San Pablo Avenue Complete Streets Study
Community Workshop
September 29, 2016

	Name	Phone #	Email Draft Study	Email	Alternative 1 BIKE LANES	Alternative 2 SHARED-USE PATH	Alternative 3 WIDENED SHARED-USE PATH	Alternative 4 "DO NOTHING" (Write-in)	Comments	Response
10					–	–	–		• Where is #4? • Have you checked C&H using SP for more trucks going to Cummings?	We are consulting with Caltrans about a freeway trail alignment. There are many constraints to doing this. The feasibilty report provides more detail. Our understanding is increase with the C&H trucks will be quite small.
11					–	–	X		Why? You won't listen to us anyway!	-
12					–	–	X	X	Reality? No, I do not want any. Do we really have to choose?	-
13					–	–	X		–	-
14					–	–	X	X	• Alternative 4) Leave it as-is! • The only reasonable option is #3! This pie chart of 143 is not people of our community. You need to take a chart of people in Rodeo & Crockett. • The other option is leave it alone!	The intent of the survey was to reach a broad range of users. We are limited in how we can summarize the results. We do not have accurate geographic data on all respondents.
15					–	–	X		I do not like the idea of creating the bike/multi-use lane on San Pablo Ave. at all because of the danger factor. • The only reasonable alternative is #3. • The residents I know in Rodeo do not like the finished product that they already have on Parker Ave. • I think the people of Rodeo would prefer that you find a way to acquire land from the refineries and move the path somewhere else. Even consider putting it in adjacent to the freeway. If they can do it in Marin county, why can't they do it here?	We are consulting with Caltrans about a freeway trail alignment. There are many constraints to doing this. The feasibilty report provides more detail. It is our understanding that the refineries do not want a trail through their facilities.
16					–	X	–		• Alternative # 1 - No. • Alternative # 2 - Only Logical Option. • Alternative # 3 - High $$ and Environmental Destruction. • Very good presentation. • Maybe a group q and a could have helped a bit? • Keep me posted.	-
17					–	–	X		–	-
18					–	–	X		The other options, # 1 and # 2, are not safe.	-
19					2	1	3		• Alternative # 2 qualifies for Bay Trail (Peds) & is more cost effective than # 3. • Soley as a cyclist, I prefer # 1 but # 1 does not address pedestrians.	-

	Name	Phone #	Email Draft Study	Email	Alternative 1 BIKE LANES	Alternative 2 SHARED-USE PATH	Alternative 3 WIDENED SHARED-USE PATH	Alternative 4 "DO NOTHING" (Write-in)	Comments	Response
20					–	1	2		• Road Diet is ok. • We need "K" rails to protect peds/bikes from cars passing on right or distracted drivers.	The recommended design includes concrete K-rail to separate the path from the travel lanes.
21					1	2	3		• Parking on street & Rodeo near 650 San Pablo Ave. should be kept & also near inductrial buildings. • Parking -- look at it now.	The recommended design is planning to maintain the on-street parking between Parker and California.
22					–	X	–		Only concerns are lack of flashing beacon at Old County Road. East bound traffic has less visibility.	The recommended design includes a "HAWK" signal (High-Intensity Activated crssWalK beacon)
23					1	2	3		• Least impact and least cost is a priority for us. • Minimizing loss of parking roads side near Parker Ave.	The recommended design is planning to maintain the on-street parking between Parker and California.
24					–	–	–		None of these take into consideration the increased truck traffic planned by C & H. The low # of surveys shows not enough work done.	The proposed rerouting of C&H STAA trucks is not expected to impact traffic along San Pablo Ave.
25					3	2	1		• Need slow down devices on blind curve at Vista del Rio interchange. • Single lane has no turnout for flat tire or other failures.	
26					2	1	3		• Pedestrians will be safer with shared-use path and this qualifies for Bay Trail designation. • Still I have a bad feeling about safety between Stations 125 & 130.	The recommended design includes a wide (painted) median buffer zone, which could include rumble strips. K-rail can also be considered for a physical barrier in the median.
27					3	2	1	X	• My vote is Alternative 4: NOTHING! • Who will monitor school kids walking on the path from Crockett to Rodeo and vice versa? • 340 miles - leave our 3 alone! • Destroys alt. route. • Who is paying for this "stuff"? Better be cycles. • The pedestrians are kids or drug addicts. • When there's bad traffic, where Parker and San Pablo meet, it's a "parking lot".	The feasibility report and traffic appendix provide a detailed response to the freeway bypass/diversion issue.

San Pablo Avenue Complete Streets Study
Community Workshop
September 29, 2016

	Name	Phone #	Email Draft Study	Email	Alternative 1 BIKE LANES	Alternative 2 SHARED-USE PATH	Alternative 3 WIDENED SHARED-USE PATH	Alternative 4 "DO NOTHING" (Write-in)	Comments	Response
28					3	1	2		The bike/ped. lanes together are ideal for safety & usage. As a runner I could turn around easily. As a cyclist, being able to safely reach another without crossing traffic is ideal. I would ride my bike & public transportation to SF instead of driving. I couldn't be more excited to see the possibility of opening this section of road to bicycles and pedestrians. I drive daily to San Francisco. I would ride my bike & use public transit instead if this project succeeds. Also, I am an ultra runner and a cyclist. This section of the road has been so dangerous, I stopped using it. Please don't get down with the negative comments you might receive from these communities. They don't like change, and many just like to argue. I think this project is exciting. A barrier would be ideal because of the wind & gravel from the trucks. Keeping bike lanes together is a plus for runners & in case of accessing another cyclist with an emergency/flat.	Comment noted. In the recommended design, we have incorporated a concrete K-rail barrier between the path and the travel lanes.
29					1	1	3	X	• Alternative # 4: Leave as-is. • I do not appreciated strangers dictating how my life should be made more difficult for their convenience. Parents have to commute their children between Rodeo and Crockett for 13 years. When traffic is bad on Hwy 80, Hwy 49 is the better route. There are industrial trucks using it also. If a change has to be made, then Alternative # 3 is the most beneficial to all concerned. If the area is going to be on maps as the Bay Trail, then it will encourage more foot and bike traffic. It will be best if the highway remains as four lanes with a safe area for bikers and pedestrians.	Comment noted. The feasibility report and traffic appendix provide a detailed response to the freeway bypass/diversion issue.
30					–	–	1		When San Pablo was 2 & 3 lanes, people died - they will die again. If you don't do Alternative #3, you need a truck climbing lane on the Dead Fish segment. Just wishing that it's safter won't make it so.	Truck climbing lanes have been provided from the refinery to the Dead Fish.

San Pablo Avenue Complete Streets Study
Community Workshop
September 29, 2016

	Name	Phone #	Email Draft Study	Email	Alternative 1 BIKE LANES	Alternative 2 SHARED-USE PATH	Alternative 3 WIDENED SHARED-USE PATH	Alternative 4 "DO NOTHING" (Write-in)	Comments	Response
31					–	–	–		Safety First. Travel from Crockett to Rodeo, go left on Cumming Skyway to Hwy 80 West to Rodeo, using a "K" rail barrier along Hwy 80.	We are consulting Caltrans regarding the trail alignment along the freeway.
32					2	1	3		Personally, I think the County has better things to spend $3.1 milliion for a bike lane. That being said, since I think this change is going to happen anyway, I think alternative # 2, the "shared-use path", would be the safest for the cyclists and the pedestrians. They would be safer all on one lane. Please put a cement barrier. I know the yellow pylons would not last.	In the recommended design, we have incorporated a concrete K-rail barrier between the path and the travel lanes.
33							X		Requested drawings in front of Nu Star. Preference submitted by email on 9/29/16.	Comment noted.
34									Verbal comments: • DTSC proposing to develop Selby site at 'A' Street near waterfront. • Consider grading hillside in Segment 4 on curve. • Consider adding signing/striping on existing curve in Segment 4 to increase safety.	DTSC is in the process of preparing a remediation plan and an EIR for the remedial action for the Selby Site. The EIR will include traffic impacts during remediation. DTSC doesn't own the property, therefore they do not know what plans the owners have for the property after it is remediated. The current schedule is remediation in 2022.
35									Verbal comment: Add a longer left turn pocket for NuStar Energy. Trucks often queue up waiting to turn into facility.	The traffic analysis considered intersection LOS and queuing at all of the locations. We have lengthened the turn pockets to accommodate up to 3 trucks at a given time.
36									Verbal comment: Consider a safe pedestrian crossing for pedestrians at "A" Street.	The recommended design includes a "HAWK" signal (High-Intensity Activated crssWalK beacon)
					4	11	10	6		

San Pablo Avenue Complete Streets Study
Technical Advisory Committee

- Paul Adler, Phillips 66 Refinery
- Cynthia Armour, Bike East Bay
- Brad Beck, Contra Costa Transportation Authority (CCTA)
- Ana Bertolucci, NuStar Energy
- Gregory Currey, Caltrans District 4, Office of Transit and Community Planning/Pedestrian and Bicycle Coordination Branch
- Sean Dougan, East Bay Regional Park District (EBRPD)
- Deborah Drake, Bayo Vista resident
- Paul Fassinger, CTP Planning & Economics
- Lee Huong, Association of Bay Area Governments (ABAG)
- Clover Mahn, Rodeo Municipal Advisory Council (MAC)
- Vincent Manuel, Contra Costa County Supervisor Federal Glover's Office, District 5
- John Nemeth, West Contra Costa Transportation Advisory Committee (WCCTAC)
- Kent Peterson, Crockett Improvement Association (CIA)
- Coire Reilly, Contra Costa Health Services
- Robert Sarmiento, Contra Costa County Department of Conservation and Development
- Drennen Shelton, Metropolitan Transportation Commission (MTC)
- Robert Thompson, Western Contra Costa Transit Authority (WestCAT)
- Angela Villar, Contra Costa County Public Works Department
- Richard Zampa, Tormey resident

San Pablo Avenue Complete Streets Study

TAC
October 27, 2015

Contra Costa County Public Works Department

ARUP

Agenda

1. Introductions
2. Project Overview
3. Traffic Analysis Findings
4. Alternatives – Early Concepts
5. Issues/Opportunities
6. Next Steps

San Pablo Avenue Complete Streets Study

TAC Meeting #2
June 13, 2016

Contra Costa County Public Works Department

ARUP

Agenda

1. Project Overview
2. Survey Results
3. Traffic Concerns
4. Safety Concerns
5. Alternative Concepts
6. Separation Options
7. Constraints
8. Alternative Evaluation Matrix
9. Review Preliminary Alternative Layouts

Contra Costa County
Public Works
Department

Julia R. Bueren, Director
Deputy Directors
Brian M. Balbas
Stephen Kowalewski
Stephen Silveira
Joe Yee

San Pablo Avenue
Complete Streets Project
Rodeo to Crockett

Monday, May 16, 2016

Supervisor Glover's Office

Refinery Coordination Meeting

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1. Introductions

2. Background (Angela)

3. Study Overview (Angela)
   a. Purpose and need
   b. Study overview
   c. Ultimate goal – identify preferred alternative for implementation
   d. Schedule
      i. Follow up TAC meeting and Community workshop in June
      ii. Upcoming grant opportunities this summer/fall

4. Presentation (Arup) – approx. 30 minutes
   a. Bay Trail alignment options
   b. Outreach summary
   c. Survey results
   d. Address widening/Show constraint areas
   e. Alternative concepts
   f. Alternative layouts
   g. Areas of interest

5. Discussion

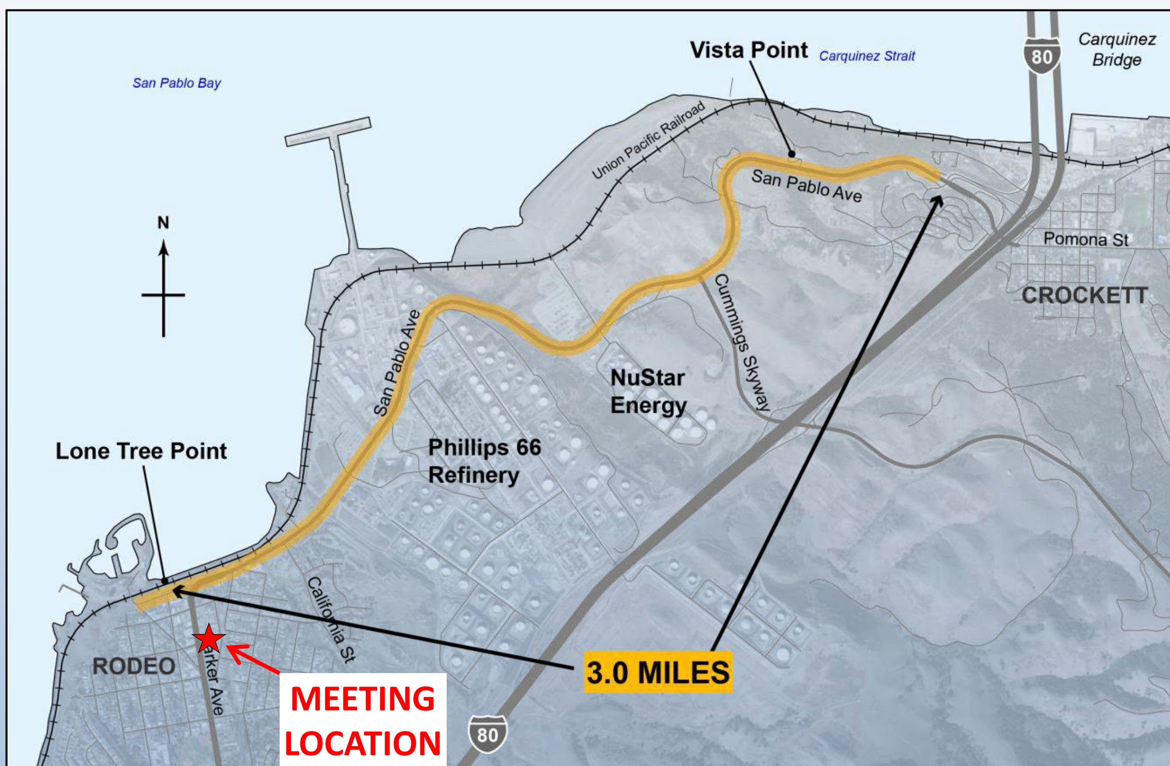
San Pablo Avenue Complete Streets Study Community Workshop

Supervisor Glover and the Contra Costa County Public Works Department invite you to help **plan roadway improvements** along San Pablo Avenue.

You should consider attending the community workshop:

- If you travel along **San Pablo Avenue**,
- If you walk or bike in **Rodeo** and **Crockett**,
- If you are a **Bay Trail** user,
- If you want to **see** initial concepts, **share** ideas, and **ask** questions!

When: Monday, February 8th, 2016, 7:00-8:30 pm
Where: Rodeo Senior Center, 189 Parker Avenue, Rodeo



Project Website: http://www.cccounty.us/sanpabloavenuecompletestreets

Contra Costa County Public Works Department

For more information, contact
Angela Villar at 925-313-2016
angela.villar@pw.cccounty.us

San Pablo Avenue Complete Streets Study
Community Workshop

The Contra Costa County Public Works Department invites you to help **plan roadway improvements** along San Pablo Avenue between Rodeo and Crockett.

<u>When:</u> Thursday, September 29, 2016, 6:00-7:30 pm

<u>Where:</u> Crockett Community Center, 850 Pomona Street, Crockett

Come and see the alternative layouts, provide feedback, and ask questions!

Project Website: http://www.cccounty.us/sanpabloavenuecompletestreets

Contra Costa County Public Works Department

For more information, contact
Angela Villar at 925-313-2016
angela.villar@pw.cccounty.us

Reasonable accommodations can be made for persons with special accessibility needs planning to attend this meeting by contacting us at least 72 hours prior to the meeting.

San Pablo Ave Complete Streets Study
Community Workshop
Date: September 29, 2016

Contra Costa County Public Works Department

Information (optional):
Name: ________________________________
Phone: ________________________________
Email: ________________________________

☐ Notify me by email when draft study is available for review.

Priority: Indicate 1, 2 or 3 for your highest (1) to lowest (3) priority.

______ Alternative 1: Bike Lanes

______ Alternative 2: Shared-Use Path

______ Alternative 3: Widened Shared-Use Path

Please comment on your priorities (additional space on back):

____
____
____
____

San Pablo Ave Complete Streets Study
Community Workshop
Date: September 29, 2016

Contra Costa County Public Works Department

Information (optional):
Name: ________________________________
Phone: ________________________________
Email: ________________________________

Notify me by email when draft study is available for review.

Priority: Indicate 1, 2 or 3 for your highest (1) to lowest (3) priority.

______ Alternative 1: Bike Lanes

______ Alternative 2: Shared-Use Path

______ Alternative 3: Widened Shared-Use Path

Please comment on your priorities (additional space on back):

____
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San Pablo Ave Complete Streets Study
Community Workshop
Comment Card

Name
Comment

San Pablo Ave Complete Streets Study
Community Workshop
Comment Card

Name
Comment

San Pablo Avenue Complete Streets Study
Response to Common Questions

1. How was the alignment of the Bay Trail along San Pablo Avenue chosen?

   The San Pablo Avenue alignment between Rodeo and Crockett was identified in the San Francisco Bay Trail Project Gap Analysis Study (ABAG, September 2005). http://www.baytrail.org/gap-analysis.html

   The County is working with the Association of Bay Area Governments (ABAG) who manages the San Francisco Bay Trail project. The San Francisco Bay Trail is intended to run along the waterfront and encircle the entire San Francisco Bay. However, a shoreline alignment in this area is constrained by the refinery, the Union Pacific (UP) railroad tracks, and topography. An alignment along I-80 is not desirable. It pushes the Bay Trail further away from the Bay and would be more difficult to connect to other Bay Trail segments.

2. Is it realistic for the Bay Trail to accommodate users in industrial areas?

   The Bay Trail is a regional trail system that is intended to provide a connection between communities. This segment will provide a safe pedestrian and bicycle connection from Hercules and Rodeo to Crockett and Vallejo (via the shared use path on the Alfred Zampa Bridge). There are other examples of the Bay Trail and other dedicated bicycle and pedestrian facilities traveling through industrial areas to link regional destinations. Some examples include along Marina Vista in Martinez through the Shell Refinery and near the Port of Oakland. Caltrans is also currently working on implementation of a segment in Richmond between the San Rafael Bridge and Point Molate that is planned between the I-580 corridor and Chevron Refinery.

3. If the number of lanes is reduced, how will this affect the roadway’s ability to handle potential evacuation needs for Rodeo and Crockett? What about when there is an accident on I-80?

   Traffic on San Pablo Ave only uses approximately 25% of the roadway's existing capacity and this is during peak periods. The capacity of the roadway could be reduced from 4 to 2 lanes and the road would still have excess capacity for exceptional events. This indicates that relatively free-flow travel conditions should be expected under most circumstances. San Pablo Avenue only has 2 lanes in Rodeo as it turns into Parker Avenue on the west end and 2 lanes in Crockett as it turns into Pomona Street on the east end. Therefore, the through capacity of the roadway is already limited to 2 lanes by the connecting segments on either end of the study corridor.

4. Will the lane reduction impact emergency response capabilities?

   The traffic impact analysis indicates that the road diet would not impact traffic conditions along San Pablo Avenue. In general, road diets encourage lower speed limits which could result in increased travel time. However, this increase is expected to be minimal. The County will work with the Fire District to maintain clear roadway widths and to understand any potential effects to response times.

5. Will the lane reduction increase vehicle collisions?

   Federal Highway Administration (FHWA) research indicates that converting an existing four-lane, undivided roadway to a three-lane roadway with one lane in each direction and center left-turn lanes reduces crashes by 19% to 47%.

6. What would a segment of the Bay Trail look like?

   In general, the Bay Trail is intended to be a multi-use path around the entire San Francisco Bay. The Bay Trail design guidelines meet the Caltrans bikeway standards. The Bay Trail is intended to be a Class I separated bike path; however, Class II on-street bike lanes exist in segments of the Bay Trail where constraints have limited the design of the trail. Within the County right-of-way, the Bay Trail would be a paved trail that complies with the Americans with Disabilities Act (ADA). You can find out more information about the Bay Trail on their website: http://baytrail.org/

7. Will left-turns be provided along the roadway?

   Left-turn pockets at intersections and key driveways will be provided where space is available, such as at Phillips 66 entrance, A Street, and Vista Del Rio Street. The left-turn pockets will be of sufficient length to store vehicles based on the traffic data collected.

8. Will truck climbing lanes be provided along the roadway?

   Truck climbing lanes are typically provided in areas where the running speed of trucks is expected to fall 10mph or more below regular traffic. They provide an additional lane in order to allow other vehicles to pass slow-moving trucks. The study segment has a number of sustained grades at various locations. The project aims at incorporating truck climbing lanes in specific areas where space is available.

9. What would the striping and delineation for a shared use path look like?

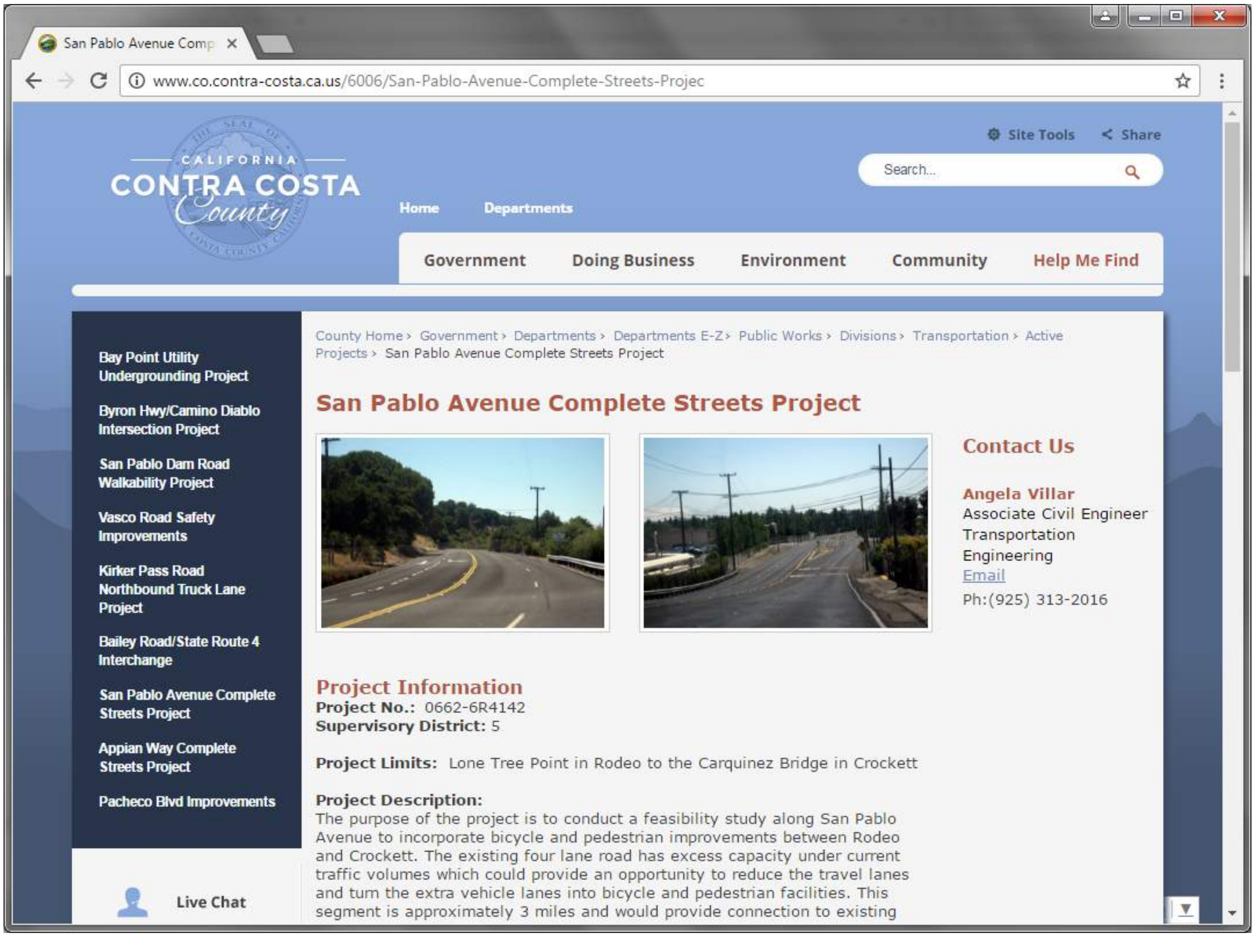
   If a shared use path alternative is chosen, the design will need to consider various types of barriers between pedestrians/cyclists and vehicles. These could include curb-and-gutter, plastic pylons, parking blocks, and other solid barriers. Different means of separation can be employed throughout the corridor in response to specific corridor conditions.

10. Are there security concerns having bicycles and pedestrians so close to the refineries?

    The County understands that the refineries have existing security restrictions and will work with the refinery's security group to understand the specifics along San Pablo Avenue. San Pablo Avenue is a public roadway and “No Stopping” signs currently existing along the refinery frontage. These existing signs prohibit stopping, standing, and parking at any time along this portion of the roadway. These existing signs would remain in place to discourage pedestrians and cyclists from standing and stopping along the path through the refinery segment.

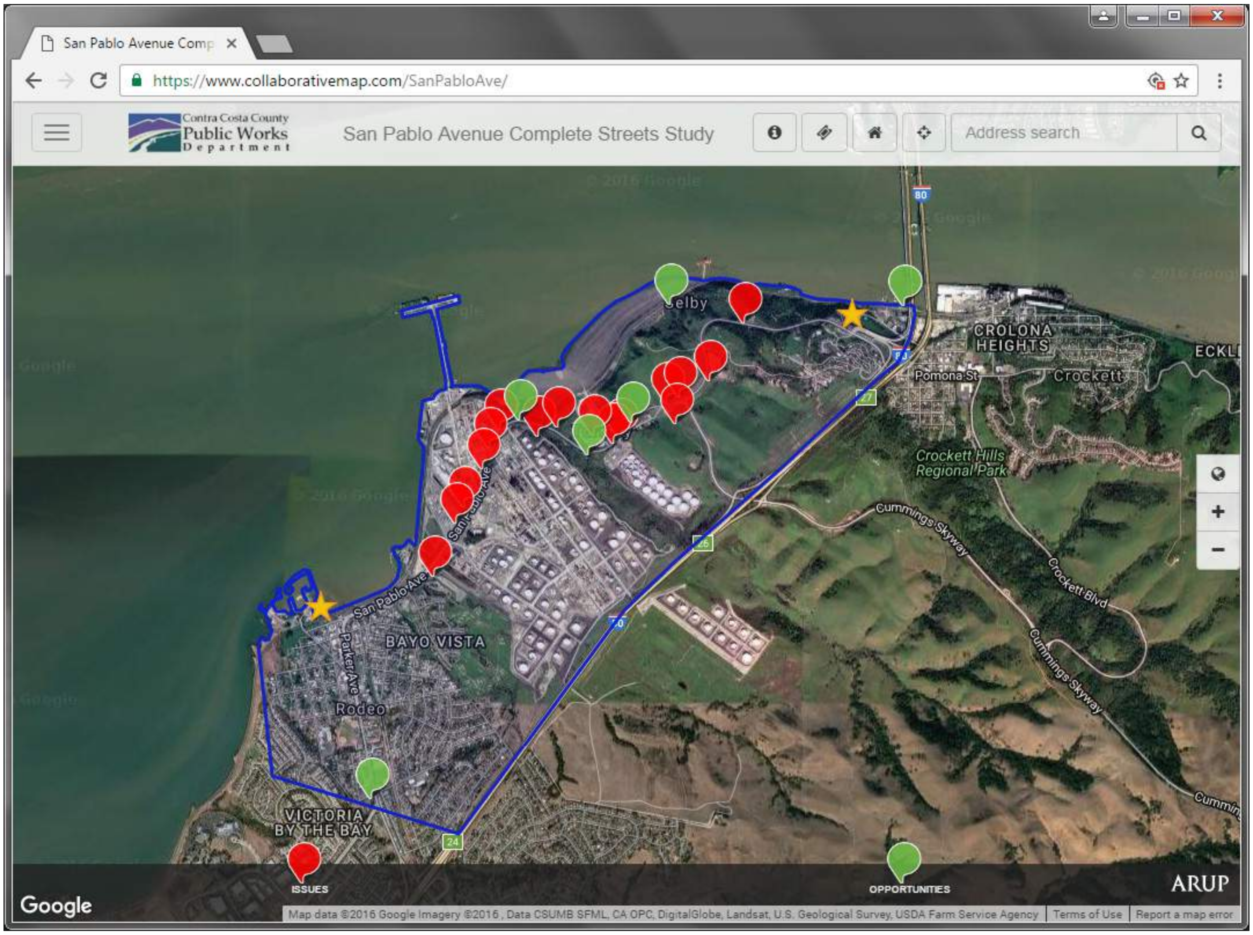
San Pablo Avenue Complete Streets Study

Project Website



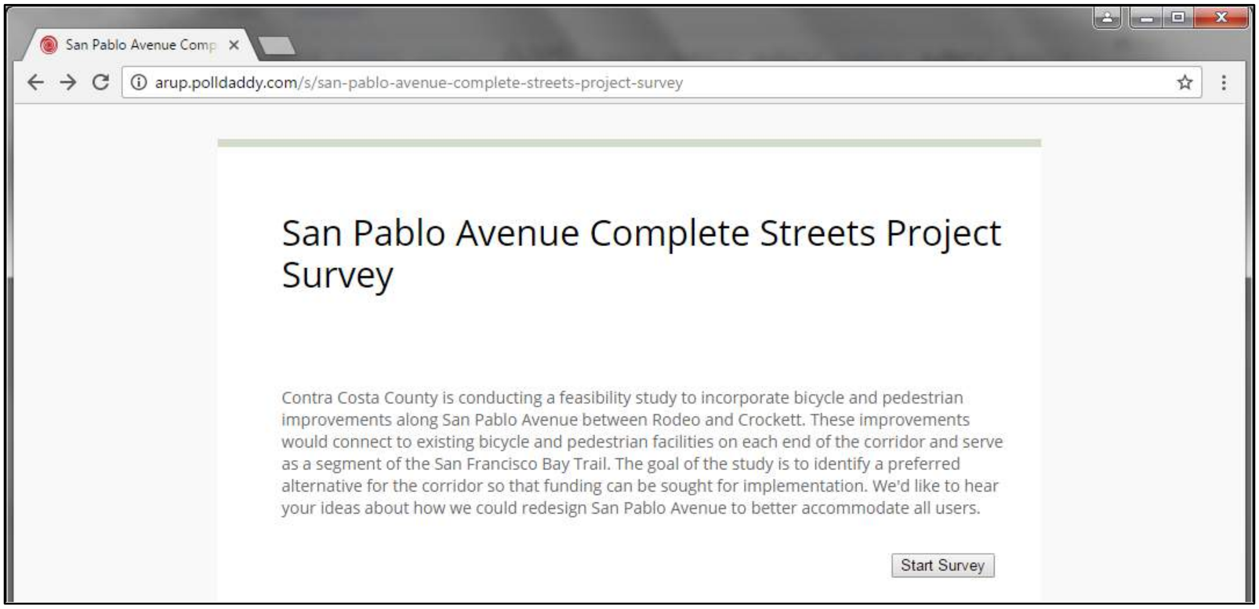
San Pablo Avenue Complete Streets Study

Collaborative Map Website



San Pablo Avenue Complete Streets Study

Web Survey Sample

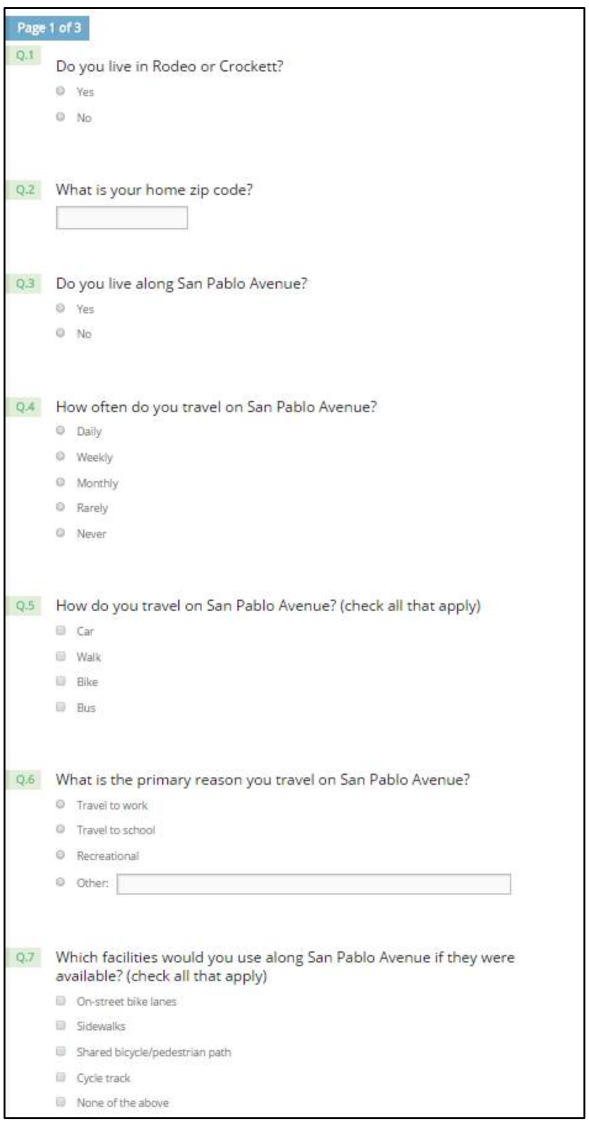

San Pablo Avenue Comp

arup.polldaddy.com/s/san-pablo-avenue-complete-streets-project-survey

San Pablo Avenue Complete Streets Project Survey

Contra Costa County is conducting a feasibility study to incorporate bicycle and pedestrian improvements along San Pablo Avenue between Rodeo and Crockett. These improvements would connect to existing bicycle and pedestrian facilities on each end of the corridor and serve as a segment of the San Francisco Bay Trail. The goal of the study is to identify a preferred alternative for the corridor so that funding can be sought for implementation. We'd like to hear your ideas about how we could redesign San Pablo Avenue to better accommodate all users.

Start Survey


Page 1 of 3

Q.1 Do you live in Rodeo or Crockett?
- Yes
- No

Q.2 What is your home zip code?

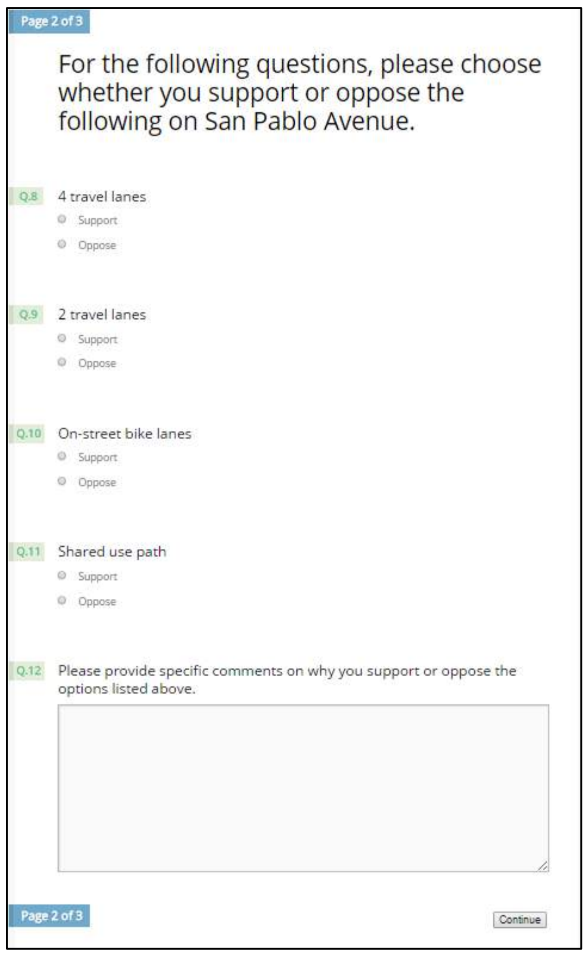
Q.3 Do you live along San Pablo Avenue?
- Yes
- No

Q.4 How often do you travel on San Pablo Avenue?
- Daily
- Weekly
- Monthly
- Rarely
- Never

Q.5 How do you travel on San Pablo Avenue? (check all that apply)
- Car
- Walk
- Bike
- Bus

Q.6 What is the primary reason you travel on San Pablo Avenue?
- Travel to work
- Travel to school
- Recreational
- Other:

Q.7 Which facilities would you use along San Pablo Avenue if they were available? (check all that apply)
- On-street bike lanes
- Sidewalks
- Shared bicycle/pedestrian path
- Cycle track
- None of the above


Page 2 of 3

For the following questions, please choose whether you support or oppose the following on San Pablo Avenue.

Q.8 4 travel lanes
- Support
- Oppose

Q.9 2 travel lanes
- Support
- Oppose

Q.10 On-street bike lanes
- Support
- Oppose

Q.11 Shared use path
- Support
- Oppose

Q.12 Please provide specific comments on why you support or oppose the options listed above.

Page 2 of 3

Continue

San Pablo Avenue Complete Streets Study: Fact Sheet

STUDY PURPOSE

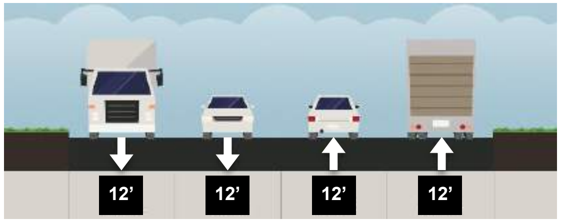
The San Pablo Avenue Complete Streets Study will evaluate the feasibility of providing a “Complete Street” connection with improved pedestrian and bicycle facilities on San Pablo Avenue between Rodeo and Crockett in unincorporated Contra Costa County. Currently, this segment of San Pablo Avenue has no bicycle facilities and only very limited sidewalks. This segment has also been identified as a planned Bay Trail segment by the Association of Bay Area Governments (ABAG).

CORRIDOR CONTEXT

The study area is a three-mile segment of San Pablo Avenue from Lone Tree Point in Rodeo to the base of the Carquinez Bridge in Crockett. Along most of the study corridor, San Pablo Avenue is a four-lane (two lanes in each direction) undivided arterial with a 45 mph speed limit. Existing traffic volumes along the corridor are approximately 25% of the total capacity and are not expected to increase significantly in the future.

EXISTING

- 4-lane road
- 48’ pavement width
- No bike lanes or sidewalk
- Minimal shoulders

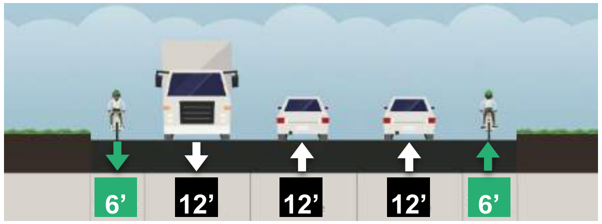


POTENTIAL BENEFITS

- Provide a safe and convenient pedestrian and bicycle connection between Rodeo and Crockett
- Construct a three-mile segment of the San Francisco Bay Trail
- Improve traffic safety by providing median treatments and other traffic calming measures that slow travel speeds

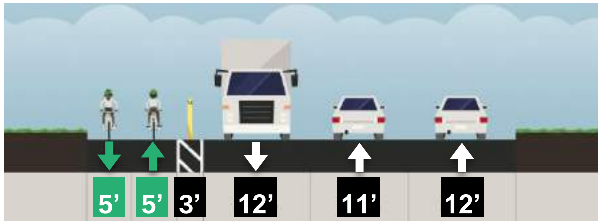
ALTERNATIVE 1: BIKE LANES

- Class 2 on-street bike lanes
- Portions with barrier to separate vehicles from bikes
- Road diet, converting the roadway to one travel lane in each direction with left turn pockets, center left-turn lanes, medians, or truck climbing lanes.



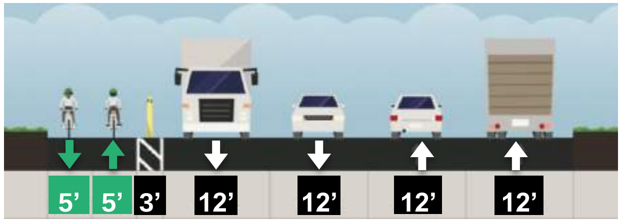
ALTERNATIVE 2: SHARED-USE PATH

- Dedicated path for pedestrians and cyclists
- Barrier separating vehicles from bikes and pedestrians
- Road diet, converting the roadway to one travel lane in each direction with left turn pockets, center left-turn lanes, medians, or truck climbing lanes.



ALTERNATIVE 3: WIDENED SHARED-USE PATH

- Dedicated path for pedestrians and cyclists
- Barrier separating vehicles from bikes and pedestrians
- Widened roadway to maintain four-lane arterial



Project Contact: Angela Villar, Associate Civil Engineer, Contra Costa County Public Works Department
angela.villar@pw.cccounty.us or (925) 313-2016

Contra Costa County Public Works Department

ARUP

To: Angela Villar
Contra Costa County Public Works Department
Transportation Engineering Division
255 Glacier Drive
Martinez, CA 94553

Re: San Pablo Avenue Complete Streets Study

Dear Angela,

Thank you for your work on the San Pablo Avenue Complete Streets Study. We appreciate the County's Public Works Department taking the initiative in extending the Bay Trail and designing complete streets.

The East Bay Regional Park District, the San Francisco Bay Trail, and Bike East Bay urge the County to consider a separated Class 1 trail facility that meets the expectations of the public and conforms to other well designed Class 1 segments of the Bay Trail in use today. On sections for which this is unfeasible, we support the Shared Use Path Alternative. We do not support the Bike Lane Alternative nor do we deem the additional cost of a road widening appropriate.

There are several elements discussed at the previous TAC meeting that we would like to highlight, specifically:

- Recent traffic studies show that traffic conditions on this entire route of San Pablo Avenue can be halved and still be operating under capacity.
- Between 2009 and 2015, there have been 25 collisions. 10 of those involved an injury, and one of those involved a fatality. The majority of collisions were caused by unsafe turning movements and unsafe speeds.
- Road diets reduce the rate of collisions by 29%

These points illustrate how straightforward this project should be. In addition, the added value provided to this project by the San Francisco Bay Trail and its vision merits a note. The Bay Trail is a planned 500-mile walking and bicycling path around the entire San Francisco Bay running through all nine Bay Area counties, 47 cities, and across seven toll bridges. With over 350 miles in place, the Bay Trail connects communities to parks, open spaces, schools, transit and to each other, and also provides a great alternative commute corridor.

The ultimate goal of the Bay Trail is to build a continuous shoreline bicycle and pedestrian path for all to enjoy, and this project is a rare opportunity to build 3 additional miles of this ambitious and visionary network.

To do the Bay Trail vision justice, these 3 miles of on-street facilities should reflect the need for wide paths that are protected from traffic and accommodate all comfort levels. As such, and in order to create a well connected and designed facility from end to end, we would like to suggest the following:

- First and foremost, the designs must include a physical barrier between the shared use path and the roadway.
- In regards to the segment near the Dead Fish restaurant; the design currently features angled parking spaces pulling through the proposed trail. This creates potential safety issues especially when drivers are backing out of the spaces. Consider redesigning the section to move the trail between the curb and the parking
- In addition, we would like the plans to include a connection within the city of Crockett to connect the shared use path with existing Class II facilities.
- Finally, some members of the TAC have requested that a road widening alternative be considered. Although we understand their perspective, such an alternative disregards the traffic study findings and jeopardizes the overall project by making it financially unfeasible.

Thank you again for your dedicated work on this project. You have our organizations' combined support and encouragement to design a continuous, separated and protected bicycle and pedestrian facility as part of the San Pablo Complete Streets Study.

Sincerely,

Cynthia Armour
Advocacy Manager
Bike East Bay

Sean Dougan
Trails Development Program Manager
East Bay Regional Parks District

Lee Chien Huo
Bay Trail Planner
San Francisco Bay Trail Project

PO Box 1736, Oakland, CA 94604
510 845 RIDE (7433) • info@bikeeastbay.org

Contra Costa County
Public Works
Department

Julia R. Bueren, Director
Deputy Directors
Brian M. Balbas
Stephen Kowalewski
Joe Yee

September 21, 2016

Ms. Cynthia Armour, Advocacy Manager
Bike East Bay
P.O. Box 1736
Oakland, CA 94604

Mr. Sean Dougan, Trails Development Program Manager
East Bay Regional Parks District
2950 Peralta Oaks Court
Oakland, CA 94605

Mr. Lee Chien Huo, Bay Trail Planner
Association of Bay Area Governments
375 Beale Street, Suite 700
San Francisco, CA 94105

RE: San Pablo Avenue Complete Streets Study
Project No.: 0662-6R4142

Dear Ms. Armour, Mr. Dougan, and Mr. Huo:

Thank you for submitting your comment letter dated July 15, 2016, expressing your support for the San Pablo Avenue Complete Streets Study. The purpose of the planning study is to analyze the configuration of the existing roadway and evaluate the feasibility of incorporating bicycle and pedestrian facilities along this segment of San Pablo Avenue.

This segment of San Pablo Avenue is designated as part of the San Francisco Bay Trail. We understand that to qualify as a Bay Trail segment, the study corridor would need to provide on-street bikes lanes with sidewalks, at a minimum or separated bicycle and pedestrian facilities as a preferred option. This segment of the roadway could potentially fill an existing 3 mile gap of the Bay Trail between Rodeo and Crockett.

The study is considering a number of alternatives, including a bike lane, shared use path, and widened shared use path alternative. It will need to evaluate the feasibility of implementing these alternatives from a number of different criteria that include financial feasibility and safety to ensure that the roadway meets the needs of all users to the extent practicable.

Your letter highlighted a number of issues along the roadway, such as physical barriers from vehicles, conflicts with parking at the Dead Fish, and connections within Crockett. We are currently looking into these elements and how to address them. We appreciate your suggestions and will consider incorporating them into our study. Thank you for your support as we work to balance the need of all users along San Pablo Avenue.

Should you have any questions about the study, you may contact me at (925) 313-2016 or angela.villar@pw.cccounty.us.

Sincerely,

Angela Villar
Associate Civil Engineer
Transportation Engineering Division

AV:nn
\\pw-data\grpdata\transeng\Projects\San Pablo Ave Complete Streets (Rodeo to Crockett)\Coordination\Community\response letter - 2016-09 - Bike East Bay-EBRPD-Bay Trail.docx

Attachment: Comment letter received July 15, 2016

c: Steve Kowalewski, Admin, CCCPWD
Jerry Fahy, TE, CCCPWD
Nancy Wein, TE, CCCPWD
Vincent Manuel, Sr. Dist. Rep., Dist. V
Michael Iswalt, Arup

July 28, 2016

To: Angela Villar, P. E.

CCC Public Works

255 Glacier Dr., Martinez, 94553.

RE: San Pablo Avenue Complete Streets Study between Rodeo and Crockett.

Dear Ms.Villar,

The Crockett Carquinez Fire Commission has a number of concerns in regards to the study fact sheet along with general concerns regarding a bike and pedestrian trail. Our primary concern as First Responders is to avoid an increase in call outs for accidents and to help ensure that the project increases safety for the bicycle riders, pedestrians and vehicle drivers who would be sharing the use of the roadway.

Our concerns and comments are as follows:

1. The design of a three lane vehicle roadway could potentially create dangerous and confusing conditions for vehicle drivers, for example frustrated drivers stuck behind trucks trying to pass in left turn pockets or turn lanes not dedicated to climbing trucks. Additional lanes should be considered at the Nu Star Entrance, the Cummings Skyway entrance and the Vista Del Rio Entrance. Consideration should also be given to grading the Southern hillside just East of Vista Del Rio to create a better and safer sightline.
2. The design at constrained areas where the roadway will be difficult to widen for example the pipe crossing overpass at the refinery.
3. Crossings at areas where there is significant commercial vehicle traffic entering and exiting the roadway.
4. The proposed improvements will attract and cause a larger number of riders to use the unmarked and unimproved surface streets between this and other sections of the Bay Trail. This raises the question of why current studies and funding aren't being directed towards increasing contiguous sections of the bike trail used by more riders. For example the 27 mile loop trail that includes the Al Zampa Memorial and Martinez bridges which has large sections without marked or protected bike lanes and limited signage. We have also observed that other unimproved roadways including Cummings Skyway and Franklin Canyon have significantly more bicycle traffic than the roadway between Rodeo and Crockett.
5. Traffic on this roadway increases dramatically anytime there is an accident or congestion on Hwy 80 filling the roadway with frustrated drivers who will try to pass other vehicles wherever they can.

In closing we feel that the safety of all involved and the impact to emergency services requires further consideration in regards to the design of the roadway and in regard to where existing funding is applied to construct improvements and provide safe passage for the largest number of bicycle riders and pedestrians possible.

Sincerely

Ridge Greene
Commissioner-Secretary
Crockett-Carquinez Fire Department

Julia R. Bueren, Director
Deputy Directors
Brian M. Balbas
Stephen Kowalewski
Joe Yee

September 13, 2016

Mr. Ridge Greene, Commissioner-Secretary
Crockett-Carquinez Fire Department
746 Loring Avenue
Crockett, CA 94525

RE: San Pablo Avenue Complete Streets Study
Project No.: 0662-6R4142

Dear Mr. Greene:

Thank you for submitting your letter dated July 28, 2016, expressing your concerns for the planning study being conducted along San Pablo Avenue between Rodeo and Crockett. The purpose of the planning study is to analyze the configuration of the existing roadway and evaluate the feasibility of incorporating bicycle and pedestrian facilities along this segment of San Pablo Avenue. The County's Public Works Department has received a Priority Development Area (PDA) Planning Grant through the Contra Costa Transportation Authority (CCTA) to conduct the complete streets planning study. The County is working with a consultant selected by CCTA, Arup, on the study currently underway.

This segment of San Pablo Avenue is designated as part of the San Francisco Bay Trail alignment adopted in 1990. The 3-mile study corridor would fill an existing gap in the regional Bay Trail between the Lone Tree Point improvements planned by the East Bay Regional Park District (EBRPD) on the west end and the existing Carquinez Bridge trail on the east end. The Bay Trail currently has a number of active projects at various stages that would provide a continuous trail stretching from Vallejo to the Oakland waterfront. This project would fill a critical gap to provide 77 miles of continuous Bay Trail.

To qualify as a Bay Trail segment, the study corridor would need to provide on-street bikes lanes with sidewalks, at a minimum, or separated bicycle and pedestrian facilities as a preferred option. This study is considering the feasibility of removing one travel lane along this segment of San Pablo Avenue to provide these pedestrian and bicycle facilities in a cost effective manner.

In 2008, the state passed the California Complete Streets Act of 2008 that required local jurisdictions to integrate specific transportation policies that accommodate the needs of all users. In April 2008, the Contra Costa County Board of Supervisors adopted a General Plan Amendment that added language to the Transportation and Circulation Element for the purpose of "promoting the development of bicycle and pedestrian facilities", in lines with "complete streets" principles. This identified the need for roadway projects to balance the needs of all users. Promoting alternative modes of transportation not only promotes a more active lifestyle, but has benefits to public health and the environment. Just recently in July 2016, the County adopted a specific Complete Streets Policy expressing its commitment to providing roadways that serve all users. This policy is attached for your reference.

The safety of all users along the roadway is of utmost importance to the County. The traffic analysis indicates that the existing four-lane roadway is underutilized and future volumes are not expected to increase significantly. This creates opportunities to reconfigure the roadway to repurpose one travel lane to provide dedicated facilities for bicyclists and pedestrians with additional separation between travel lanes, dedicated turn pockets for key driveways and intersections, dedicated truck climbing lanes, and refuge areas for traffic entering/existing the roadway. All of these facilities will help to improve safety along the roadway for all users.

The current layouts consider truck climbing lanes on two of the three segments with the steepest grades and highest truck traffic between the Phillips 66 refinery and Cummings Skyway. These lanes will allow vehicles to safely pass slower moving trucks. Climbing lanes are not required east of Cummings Skyway near Vista Del Rio because truck volumes are very low on the segment between Cummings Skyway and the Carquinez Bridge.

There are a number of constrained areas along this segment of San Pablo Avenue, such as overhead and underground pipeline crossings and steep grades on either side of the roadway, which make improvements challenging. The County designs its roadways to meet County standards, as well as Caltrans Highway Design Manual standards. Any improvements to the roadway will be designed to both these standards during the design phase of the project. We are currently conducting the feasibility study as part of the planning phase and expect to present the study to our Board of Supervisors for consideration this winter.

We appreciate your concerns and will consider incorporating them into our study. Thank you for your consideration as we work to balance the need of all users, including emergency vehicles, along San Pablo Avenue.

Should you have any questions about the study, you may contact me at (925) 313-2016 or angela.villar@pw.cccounty.us.

Sincerely,

Angela Villar
Associate Civil Engineer
Transportation Engineering Division

AV:nn
grpdata\transeng\Projects\San Pablo Ave Complete Streets (Rodeo to Crockett)\Coordination\Community

Attachment: Complete Streets Policy of Contra Costa County

c: Steve Kowalewski, Admin, CCCPWD
Jerry Fahy, TE, CCCPWD
Nancy Wein, TE, CCCPWD
Vincent Manuel, Supervisor District V
Michael Iswalt, Arup

Appendix G: Unocal Agreement Letter

76 PRODUCTS COMPANY

NEP-96-77
LOC #10, #137

NANCY POLOSKE
Manager, External Affairs
San Francisco Refinery

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

August 6, 1996

Ms. Julie Bueren
Contra Costa County
Department of Public Works
655 Glacier Drive
Martinez, CA 94553

Dear Ms. Bueren:

LAND USE PERMIT
REFORMULATED GASOLINE PROJECT
CONDITION #72 - BIKE PATH

Attached is a check issued to Contra Costa County in the amount of $100,000. As discussed and agreed in our July 10, 1996, meeting, these funds are to be deposited in a trust fund administered by the County for use in constructing a bike trail and walking path on San Pablo Avenue along the frontage of Unocal's San Francisco Refinery as required by the Land Use Permit. The interest shall accrue to this account and shall also be used for construction of these facilities.

These funds have been submitted to demonstrate Unocal's commitment to complying with Condition of Approval 72 of the permit and represent Unocal's funding obligation for construction of the bike path.

1380 San Pablo Avenue
Rodeo, California 94572-1299
PH (510) 245-4588
FAX (510) 245-4476
A Unocal Company

Unocal is also required by the permit condition to dedicate a portion of an existing security road at the northeastern portion of the refinery property for use in completing this bike trail and walking path. Once a final layout has been adopted by the County, Unocal will submit a detailed dedication for a County easement to use the needed section of road. The provision concerning the easement will allow Unocal to retain access for use as a security road as necessary.

Unocal will continue to work with the Public Works Department and the other agencies on this matter. If you need additional information, please do not hesitate to contact me.

Sincerely,

Tammy C. Poloska

NEP/rab

Attachment

cc: J. C. Wilkes
M. A. Smith
R. A. Belcher
P. K. Gaither
J. W. Cutler
C. O. Kutsuris
D. R. Sanderson
S. Fiala
B. Wiese

Appendix H: Responses to Public Comment

H.1 Notice of Availability of Draft Report for the San Pablo Avenue Complete Streets Study

H.2 Responses to Public Comment:

1. Technical Advisory Committee (TAC) Meeting held March 30, 2017
2. Response to comment letter from Phillips 66 Community Advisory Panel dated March 27, 2017
3. Response to comment letter from Paula Edmonds dated March 8, 2017
4. Response to email received from Ariana Hirsh on April 3, 2017
5. Response to email received from Eileen Housteau on April 4, 2017
6. Response to email received from Erin Sanders on April 4, 2017
7. Response to email received from Paul Adler on April 4, 2017
8. Response to email received from Michael Kellogg on April 4, 2017
9. Response to comment letter from Bike East Bay, East Bay Regional Park District (EBRPD), and Association of Bay Area Governments (ABAG) dated April 4, 2017
10. Response to email received from Wendy Malone and Jerry Hirst on April 7, 2017

H.3 Supplemental analysis to support comment responses

Appendix H.1: Notice of Availability of Draft Report for the San Pablo Avenue Complete Streets Study

NOTICE OF AVAILABILITY OF DRAFT REPORT FOR THE
SAN PABLO AVENUE COMPLETE STREETS STUDY

DESCRIPTION

The purpose of the study is to conduct a feasibility study along San Pablo Avenue to incorporate bicycle and pedestrian improvements between Rodeo and Crockett. This segment is approximately 3 miles long and could provide connection to bicycle and pedestrian facilities on either end as part of the planned San Francisco Bay Trail alignment.

A copy of the draft report may be reviewed at the Contra Costa County Public Works Department, 255 Glacier Drive, Martinez, CA, during normal business hours. You may also view the document on the project webpage at:

http://www.co.contra-costa.ca.us/6006/San-Pablo-Avenue-Complete-Streets-Projec

All documents referenced in the appendix are available upon request.

The public comment period for accepting comments on the draft report is from **March 6, 2017 to April 4, 2017.**

Any comments should be submitted in writing to the following address and/or email address:

Angela Villar, Associate Civil Engineer
Contra Costa County Public Works Department
255 Glacier Drive
Martinez, CA 94553
Angela.villar@pw.cccounty.us

Appendix H.2: Responses to Public Comment

San Pablo Avenue Complete Streets Study
Technical Advisory Committee Meeting #3
March 30, 2017

Comment #1

#	TAC Comment	Response
0	Tom Stewart presented the comment letter from the Phillips 66 Community Advisory Panel (CAP)	Please see the response letter to the Phillips 66 CAP for the detailed comments and responses.
1	Have projected bike volumes been estimated for the recommended alternative?	No, bicycle and pedestrian usage is difficult to project for future improvements. The methodology for estimating bike/ped use is not well established, unlike vehicular traffic. Studies have shown that if a new facility is constructed, users are drawn to it. The Benicia/Martinez bridge connection to Carquinez Scenic Drive is a great local example of this.
2	Suggestion to install automated bicycle/pedestrian counters along the trail if it is constructed.	Noted. The County will take this into consideration if it constructs the trail improvements.
3	This project is a gap closure project for the Bay Trail and provides the biggest bang for your buck.	Yes, the proposed segment would close a 3-mile gap in the Bay Trail, connecting users to the west to future Lone Tree Point trail improvements by EBRPD and users to the east to the Carquinez Bridge trail.
4	What is being done to reduce the high speed of traffic along the roadway (particularly from Crockett) and reduce traffic collisions?	Studies conducted by the Federal Highway Administration (FHWA) have shown that road diets can reduce collisions, increase mobility and access, and improve a community's quality of life. Section 6.4 of the study indicates that FHWA studies have shown that road diets can reduce crashes by 29% and vehicles traveling over the speed limit are reduced by 30%. The Contra Costa Health Services Department has found that if you add bicycle lanes and construct gap closure projects, the safety for that section of roadway is increased by 80 to 90%. With a shared use path, those percentages are expected to increase even higher.
5	There is a high school in Crockett, but most students live in Rodeo. I have observed high speed traffic back to Rodeo after school. There is also an active "bar life" in Crockett. I worry about a one-lane road.	A road diet can create a traffic calming effect, reduce speeds and reduce injuries. With 4-lanes, you have no separation, with 3-lanes, there will be a separation.
6	It is currently difficult for residents to make left turns into/out of Vista del Rio.	The recommended alternative proposes to create a left turn pocket and acceleration lane at the Vista del Rio Street intersection. This will create a refuge space for vehicles making left turns into/out of Vista del Rio St that does not impede through moving traffic.
7	Consider paving the existing turnout across from Vista del Rio St. This provides existing trail access and is often used by vehicles.	Noted. This is something that the County will need to consider during the design phase of the project.
8	Desire expressed to help create stops along the route to help benefit the local community's economy. This is an opportunity to create enhancements.	Noted. The purpose of the Bay Trail is to provide community access to recreation in the scenery of the Bay. The trail is intended to provide amenities such as gathering areas, vista points, and seating. In addition, the owner of the Dead Fish restaurant has indicated a desire to to create a public space in that vicinity. If the study is approved and the project moves forward into the design phase, the County will work with interested parties to look at the feasibility of incorporating enhancements into the project.

9	County should work with community to provide enhancements along the route and provide more education about the gaps between communities.	Noted. The purpose of this study is to close a significant gap in the Bay Trail route. If the study is approved and the project moves forward into the design phase, the County will work with interested parties to look at the feasibility of incorporating enhancements along the corridor.
10	Rodeo is a community of concern.	The project will attract people to Rodeo and provide residents with access to the future Hercules Transit Center. EBRPD plans to make Bay Trail improvements at Lone Tree Point and is currently in the process of cleaning up the Lone Tree Point staging area.
11	EBRPD noted that they intend to design the Lone Tree Point trail through the staging area to the end of their property.	Noted. If the study is approved and the project moves forward into the design phase, the County will need to coordinate the design at Lone Tree Point with EBRPD.
12	EBRPD's Lone Tree Point project is beginning design. The trail will provide access from Rodeo to the Hercules Intermodal Station. This will create connections to transit and businesses, and has the potential to increase property values and attract people to live in Rodeo.	Noted. Completion of this gap in the Bay Trail along San Pablo Avenue has the potential to positively impact the economy of the local communities by creating new connections and attracting new business.
13	Discussion on the idea of "Field of Dreams"/"Build it and they will come".	This project is attractive because it fills a critical gap in the Bay Trail and provides continuous bicycle/pedestrian facilities that are not currently available. Studies have shown that bicycle/pedestrian usage/ridership will increase with the installation of dedicated facilities. If you build this facility, they will come. It will bring people to your community - consider it as a community enhancement. It brings up and adds to the character of the community.
14	Past examples of bicycle improvements have been good for local business.	Increasing bicycle and pedestrian traffic can bring positive economic impacts to a community. Businesses such as retail shops and restaurants in particular can benefit from this type of traffic.
15	Phillips 66 raised security concerns about Homeland security requirements that prohibits loitering in front of the refinery.	The County currently has signs along the roadway prohibiting stopping, standing, and parking at any time along the refinery frontage. These existing signs would remain in place to discourage pedestrians and bicyclists from standing and stopping along the path through the refinery segment.
16	Clarification needed in report on the type of barrier proposed. The need for a physical barrier should be emphasized in the report.	A concrete physical barrier is described in the recommendations of Section 9 in the study. Details on the type of barrier will need to be determined during the design phase of the project. The report discusses physical barriers in section 7.1 and has been updated to emphasize the need for a physical barrier between vehicles and the shared use path.
17	The map on page 16 should be updated. Many of the Bay Trail gaps shown are already being closed.	Noted. An updated map based on feedback from ABAG has been incorporated in to the study report.

18	Alternative 3 is extremely expensive, suggest considering hybrid (with "spot widenings") to maintain existing travel lanes in some areas if feasible.	The County did look into taking the hybrid approach. In fact, Alternative 3 is actually a hybrid between a 3-lane and 4-lane roadway configuration. Alternative 3 proposes to maintain 4-lanes from Rodeo to Cummings Skyway with widening for the shared use path and reconfigure the roadway to 3-lanes from Cummings Skyway to Crockett.
19	Have other Bay Trail alignments been addressed, such as Willow Avenue?	The purpose of this study is to assess the feasibility along San Pablo Avenue. The Bay Trail alignment through this area is defined along San Pablo Avenue and was identified through a separate planning process that occurred when the Bay Trail was established in 1989. However, since this question has been raised during the course of this study, other alignments are briefly discussed in Section 2.5 of the study.
20	Transitions between on-street bike lanes and the shared use path are challenging for bikes/peds and may need more attention. Suggest considering a cycle track adjacent to on street parking instead of on street bike lanes. A good example of this is on Shoreline Drive in Alameda.	The recommended alternative retains the existing on-street bike lanes between Pacific Avenue and California Street. The bike lanes were retained to preserve the existing on-street parking utilized by adjacent businesses. This segment of San Pablo Avenue is particularly challenging to widen given the width of the existing bridge structure across Rodeo Creek and the potential impacts to adjacent businesses. If the study is approved and the project moves forward into the design phase, there will be an opportunity to further refine the transitions between bicycle lanes and the shared use path.
21	If the shared use path were wide enough, it could be used as an emergency vehicle road.	Noted. This is something that the County will need to consider during the design phase of the project.
22	The existing angled parking at the Dead Fish is not desirable adjacent to the shared use path. If the parking is to remain, suggest moving the trail in front of the angled parking.	The recommended alternative proposes to remove the angled parking in front of the Dead Fish restaurant and replace it with parallel parking. A drive aisle would be provided between the parallel parking stalls and the shared use path to allow space for vehicles to maneuver in/out of the parking stalls without impacting the shared use path.
23	Cyclists, especially skilled cyclists, often ignore short trail segments if out-of-the way. Provisions should be made to keep roadway lanes safe for cyclists that choose to use road.	If the study is approved and the project moves forward into the design phase, the County will look at opportunities to widen the roadway and provide paved shoulders where feasible.
24	The refinery often has heavy equipment transported by wide load trucks during turnaround times that need to be accommodated along the roadway.	Travel lanes in each direction are planned to maintain the existing 12 foot lane width. Wide load trucks would be able to use the roadway in the same manner as the existing conditions, presumably with a leading vehicle and proper notification for drivers on the roadway. Section 6.3 of the Feasibility Report has been updated to expand the discussion of refinery turnarounds.
25	Have impacts to school traffic along the roadway been considered?	Yes, the County reached out to the John Swett Unified School District to obtain the bus and school schedules and student counts. Traffic counts were collected and analyzed in the traffic study during peak periods that included school traffic.
26	Have the impacts of additional traffic on emissions been considered?	A traffic analysis was conducted for existing and future conditions and is provided in Appendix D. The project is not expected to increase the volume of traffic along the roadway, in fact, the project has the potential to encourage users to utilize more active modes of transportation, thereby reducing emissions.

27	What potential funding sources is the County looking at for the improvements?	The County has not identified any specific funding for the next phases of the project. However, there are a number of competitive federal, state, and regional grant programs aimed at promoting active modes of transportation that the project would compete well for. If the study is approved and the project moves forward, the County intends to seek grant funding for future phases.
28	Would collisions be monitored along the corridor? Is there criteria for "failure" for the County to remove project?	The County does not have set criteria for "failure". The County does have a three collision review policy and will conduct an investigation of a location if three or more traffic collisions occur within a 12 month period. If the project is implemented, the County will continue to monitor the performance along the roadway. The County expects this project to make the roadway safer by reducing speeds and aims to only construct projects that will be effective.
29	Can we reduce the speed along the roadway?	Unfortunately speed limits are not arbitrarily set by the County. The California Vehicle Code requires that speed limits be set at the 85th percentile speed observed from an engineering traffic survey.
30	Did the study consider the impact of the turnaround?	Yes, the study concluded that smaller turnarounds, which may occur several times a year, will not negatively impact the roadway's traffic level-of-service and will only cause a small increase in delay during these times. Larger turnarounds, which may occur every six to seven years, were not analyzed because they are so infrequent. For more information, please see section 6.3 of the Feasibility Report, which has been expanded to provide more discussion of the turnarounds. Also see Appendix H for additional technical details.
31	Did you look at population forecasts when doing study?	Yes, future traffic volumes were modeled in the traffic study; see section 6 and Appendix D.
32	This project will also make the roadway safer for vehicles too. It is not just a safety project for bicyclists and pedestrians.	Noted. Providing a safe roadway for all users, including vehicles, is a key goal for this study. As noted in Section 6.4 of the report, implementing a road diet -- in this case, to provide dedicated roadway space for cyclists and pedestrians -- has been shown to make roads safer by reducing the incidence of speeding and collisions.

Contra Costa County
Public Works
Department

Julia R. Bueren, Director
Deputy Directors
Brian M. Balbas, Chief
Mike Carlson
Stephen Kowalewski
Carrie Ricci
Joe Yee

April 24, 2017

Comment #2

Phillips 66 – Rodeo Refinery
Community Advisory Panel
Attn: Tom Stewart
1380 San Pablo Avenue
Rodeo, CA 94572

RE: Comments on Draft Report for
San Pablo Avenue Complete Streets Study
Project No.: 0662-6R4142

Dear Mr. Stewart:

Thank you for submitting the letter dated March 27, 2017, regarding the Community Advisory Panel's comments on the Draft Report for the San Pablo Avenue Complete Streets Study. In the letter, opposition was expressed to all the alternatives presented in the Draft Report and consideration for other alternatives (not identified in the letter) was requested.

The County began the subject study in May 2015. The study process included community outreach that began in October 2015, including a presentation to the CAP on May 23, 2016, and has been ongoing throughout the study. The proposed alternatives were presented and vetted through the community outreach process. The study originally only proposed two alternatives to be evaluated (Bike Lane Alternative and Shared Use Path Alternative); however, based on Phillips 66's desire to maintain the existing number of travel lanes along the refinery's frontage, the County developed Alternative 3. Alternative 3 maintains the existing four lane configuration along San Pablo Avenue from Rodeo to Cummings Skyway while widening the roadway to provide a shared bicycle/pedestrian path on the north side of the roadway. Your letter indicates formal opposition to all three alternatives presented in the study, including the alternative (Alternative 3) developed for the refinery.

A Complete Street is a transportation facility that is planned, designed, operated, and maintained to provide safe mobility for all users, including bicyclists, pedestrians, transit vehicles, trucks and motorists. In July 2016, the County Board of Supervisors adopted a Complete Streets Policy directing staff to incorporate Complete Streets infrastructure into existing streets to improve the safety and convenience for all users and to maximize opportunities for Complete Streets, connectivity, and cooperation. In accordance with the County's Complete Streets Policy, this study aims to improve safety for all users along a segment of San Pablo Avenue.

While only 1% of existing traffic data collected was attributed to bicycles during the weekday, the online survey revealed that 44% of people taking the survey currently use other modes of travel, such as walking or biking, as an alternative or in addition to vehicles to travel along this segment of the roadway. In addition, findings from the online survey show that if various bicycle and pedestrian facilities were made available along San Pablo Avenue, 75% of people would utilize them. This is consistent with numerous studies which have shown that if new facilities are constructed, bicyclists and pedestrians are more likely to use these roadways and that low usage statistics can be more indicative of a need for facilities rather than the opposite[1].

The letter also raised a number of health and safety concerns for neighboring communities in the area. The County has specifically contacted the Contra Costa Health Services Department and local law enforcement to provide feedback in response to the health and safety concerns raised. The Sheriff's Office at Bay Station has indicated that the project would improve the safety for both pedestrians and bicyclists in the area and would not impact their response to calls for service. This feedback is consistent with studies which establish that projects of this type increase safety for pedestrians, cyclists, and motorists[2]. Enclosed is specific feedback received by the Contra Costa County Public Health Director.

Existing traffic counts show that only approximately 25% of the existing roadway capacity is currently being used. While the recommended alternative proposes to reduce the existing 4-lane roadway to a 3-lane configuration, this would still leave approximately 50% of the roadway capacity during the peak hour available if an emergency situation were to arise.

Concern for negative impacts to the local economy was also raised in the letter submitted. Rodeo is identified as a Disadvantaged Community as designated by the California Environmental Protection Agency pursuant to SB535. Completion of this gap in the Bay Trail along San Pablo Avenue has the potential to positively impact the economy of the local communities by creating new connections and attracting people to local businesses. This is consistent with studies examining the economic benefits of bicycle/pedestrian infrastructure[3]. If constructed, the project will connect on the west

[1] • *Lessons from the Green Lanes: Evaluating Protected Bike Lanes in the U.S.* 2014/Monsere, Portland State University: "*The average protected bike lane sees bike counts increase 75 percent in its first year alone.*":
http://www.peopleforbikes.org/blog/entry/everywhere-they-appear-protected-bike-lanes-seem-to-attract-riders
• In the two U.S. cities that first started building modern protected bike lanes, New York and Washington D.C., bike commuting doubled from 2008 to 2013. US Census:
http://www.peopleforbikes.org/blog/entry/nyc-and-dc-protected-lane-pioneers-just-doubled-biking-rates-in-4-years
• *Cycling increased tenfold in Seville after construction of miles of bike tracks*, London Cycling Campaign:
http://lcc.org.uk/pages/seville-goes-dutch

[2] • Protected Bicycle Lanes in NYC, September 2014, Polly Trottenberg, Commissioner/New York City Department of Transportation, "*…protected bike lanes make streets safer not just for cyclists, but pedestrians and drivers as well…*":
http://nyc.streetsblog.org/2014/09/05/new-dot-report-shows-protected-bike-lanes-improve-safety-for-everybody/
• *When protected bike lanes are installed, injury crashes for all road users (drivers, pedestrians, and cyclists) typically drop by 40 percent and by more than 50 percent in some locations.* Wolfson, H., 2011 - Memorandum on Bike Lanes, City of New York, Office of the Mayor, 21 March 2011: http://www.nyc.gov/html/om/pdf/bike_lanes_memo.pdf

[3] • "*Mounting new evidence shows an almost universal positive connection between well-designed open spaces and trails and important economic development indicators.*" Trails and Economic Development, Rails-To-Trails Conservancy.

end to East Bay Regional Park's planned Lone Tree Point trail improvements. The planned trail will provide access to the Hercules Intermodal Station. On the east end, the project will connect to the existing trail on the Alfred Zampa Bridge into the Vallejo waterfront and the North Bay. The project will help to create connections to transit and businesses that will help attract people to live in the Rodeo and Crockett areas. The project would also increase the quality of life of local residents by promoting alternative forms of transportation and reducing carbon emissions.

Safety remains the County's number one concern along San Pablo Avenue. The recommended alternative was selected because it provides improved safety and mobility for all modes of travel. Pedestrian and bicycle safety is improved by creating a dedicated path separated by a physical barrier from vehicles. Vehicle and truck safety is improved by creating striped medians between travel lanes in opposite directions, truck climbing lanes on steep inclines, and turning lanes to provide a safe place outside of the traffic stream to make left turns. All of these facilities will help to improve safety along the roadway for all users.

Again, thank you for submitting your comments on the San Pablo Avenue Complete Streets Study.

Sincerely,

Angela Villar
Associate Civil Engineer
Transportation Engineering Division

AV:sr
G:\transeng\Projects\San Pablo Ave Complete Streets (Rodeo to Crockett)\Feasibility Study\Comments on Draft Public Report\response letter - Phillips 66 CAP - 2017-04-24.docx
Enclosure: Phillips 66 CAP comment letter dated March 27, 2017
Contra Costa Health Services letter dated April 18, 2017
c: S. Kowalewski, Deputy
J. Fahy, TE
N. Wein, TE
Vincent Manuel, Supervisor District V

https://www.railstotrails.org/resourcehandler.ashx?id=4620

• *A 20-year study of efforts to make streets less convenient for autos and better for pedestrians and cyclists found that after changes are implemented, businesses in these areas show stronger growth than auto-friendly shopping centers.* Hass-Klau, C., 1993 - Impact of pedestrianization and traffic calming on retailing: A reviews of the evidence from Germany and the UK, Transport Policy, 1, 21-31

• *"The revival of the city is driven, in part, by the trail," says Mayor Lee Fiedler, who ordered bike racks installed on downtown street corners. "No one thought people with bikes would spend money, but they were wrong. Business is spreading back from the trail." Trail's opening eyed as path to prosperity* Baltimore Sun, 2006 - http://articles.baltimoresun.com/2006-12-13/news/0612130079_1_rail-trail-cumberland-great-allegheny-passage

Phillips 66 – Rodeo Refinery
Community Advisory Panel

March 27, 2017

Members of the San Pablo Avenue Technical Committee and the
Contra Costa County Public Works Department Transportation Engineering Division
c/o Ms. Angela Villar, PE
Associate Civil Engineer
255 Glacier Drive
Martinez, CA 9455

RE: Communication Regarding the Opposition of the Phillips 66 Community Advisory Panel to the Proposed Options Contained in the Draft 4 Report for the San Pablo Avenue Complete Streets Study (dated March 2, 2017) and Recommending that an Alternative Option which Better Addresses Safety Concerns and Community Needs Be Perused Instead

To the Members of the San Pablo Technical Advisory Committee (San Pablo TAC) and the Transportation Engineering Division (Engineering Division) of Contra Costa County Public Works Department:

The Phillips 66 Community Advisory Panel (CAP), an advisory body to the Phillips 66 Rodeo Refinery (Refinery) that began meeting in 1996, is composed of residents and organizational representatives from the unincorporated communities that border or are downwind from the refinery (Crockett, Port Costa, Rodeo, and Tormey). The CAP met on Monday, March 27, 2017 and by motion added to its agenda as an urgency item, discussion of the Draft Report for the San Pablo Avenue Complete Streets Study (Study) and potentially taking a position on the proposed options presented in the Draft 4 Report for the San Pablo Avenue Complete Streets Study (Study), dated March 2, 2017.

> ***Following discussion of the Study, a motion was unanimously approved by the CAP that it go on record as: a) Formally opposing the three options (or alternatives) currently included in the Study as detrimental to the health, safety, and well-being of those living or working in Rodeo and the surrounding communities, b) Encourage the San Pablo TAC and the Engineering Division to consider and identify other alternatives, cost notwithstanding, to those currently included in the Study that would better address the needs and concerns of the local community, c) Incorporate in any recommendations made and in its decision-making processes the fact that only one percent of the current traffic is related to non-vehicular bicycle and foot traffic, and d) Avoid selecting an alternative that would negatively impact the already challenged economies of Rodeo and the surrounding communities. (Approved March 27, 2017)***

As background, the CAP had previously received a presentation by Ms. Angela Villar on May 23, 2106 on behalf of the Transportation Engineering Division of Contra Costa County's Public Works Department during which she described the options that the County was evaluating. Following her presentation, both community members and organizational representatives serving as CAP members, with no priority assigned by the CAP, raised a number of health and safety concerns including:

- Access by emergency vehicles in the event of a vehicular accident on Interstate 80 in which San Pablo serves as the alternative route and quickly becomes congested,
- There is an incident involving the refinery and access by emergency responders would be impacted, or the railroad
- If a fire or natural disaster occurs, the ability of emergency response vehicles to access locations in the community would be impeded or blocked,
- Potential danger or inconvenience to school children traveling by bus,
- Additional health impacts associated with emissions from vehicles forced to idle on Parker and San Pablo avenues and
- Potential danger associated with what amounts to creating a "suicide lane" through the community of Rodeo.

Additional concerns not related to safety included (with no priority assigned by the CAP):

- The fact that only one percent of the traffic on Parker and San Pablo avenues has been attributed in a County traffic study to non-vehicular bicycle or foot traffic thereby bringing into question the allocation of scarce transportation resources to address a miniscule population,
- The inconvenience and potential loss of business to merchants and other businesses, and to residents who would be impacted by the proposed changes.

As a potential solution, the CAP encourages the County to look for other alternatives, including one that would achieve the objectives of:

- Extending or connecting the Bay Trail, providing reasonable access to bikers and hikers to the San Pablo Bay waterfront and view shed,
- Promoting alternative forms of transportation and reducing carbon emissions without negatively impacting Rodeo and the neighboring communities' health and safety,
- Creating additional negative impacts to an already challenged economy, or
- Diminishing the quality of life of those living or working locally in order to achieve something that would benefit only one percent of the population with the majority of that one percent coming from outside the community.

The CAP requests that these comments along with the CAP's opposition to the three alternatives presented in the study be included in the official proceedings related to this proposed project and further, that the County continue to meet with and schedule meetings in the impacted community, and that addressing community concerns relating to the health and safety be adopted by the San Pablo TAC and the staff of the Transportation Engineering Division as the highest priority leading to the identification and selection of an alternative option.

WILLIAM B. WALKER, MD
HEALTH SERVICES DIRECTOR

DAN PEDDYCORD, RN, MPA/HA
DIRECTOR OF PUBLIC HEALTH

CONTRA COSTA
HEALTH SERVICES

Contra Costa
Public Health

597 Center Avenue, Suite 200
Martinez, California 94553
Ph 925-313-6712
Fax 925-313-6721
DANIEL.PEDDYCORD@HSD.CCCOUNTY.US

April 18, 2017

Dear Julie Bueren, Director, Contra Costa County Public Works,

On 3/2/2017, Contra Costa Public Works published a draft of the San Pablo Avenue Complete Streets Plan. In response to the Plan, the Phillips 66 Community Advisory Panel produced a letter, dated 3/27/2017, in which they expressed numerous public health and safety concerns about the Plan's recommendations. Contra Costa Health Services (CCHS) is writing in response to some of the Phillips 66 Community Advisory Panel's concerns and in support of the recommendations in the San Pablo Ave Complete Streets Plan. This Plan, once constructed, will reduce vehicle speed, decrease vehicle collisions, encourage physical activity, increase bicycle and pedestrian safety, further the vision established in Contra Costa's Complete Streets policies, and provide a regional benefit by filling in a large gap in the Bay Trail.

"Complete Streets" is a term that describes constructing streets that incorporate the needs of all roadway users, including motorists, pedestrians, bicyclists, and individuals with disabilities. CCHS supports Complete Streets for two main reasons. First, Complete Streets have been shown to improve public health and safety by reducing the number and severity of collisions. Vehicle speed is directly correlated with injury and death, meaning that the faster a vehicle is travelling, the more likely serious injury and death will occur if there is a collision. Pedestrians and bicycles are particularly vulnerable to injury and death from speeding cars. For example, according to the National Association of City Transportation Officials (2010), pedestrians hit by a car traveling at 20 miles per hour have a survival rate of 95%. However at 40 miles per hour, only 15% survive. According to the Federal Highway Administration (FHWA), wide multi-lane streets encourage cars to drive fast, even if the posted speed limits state otherwise. In addition, a safety evaluation performed by the FHWA in 2007 showed that reducing vehicle travel lanes and adding center turn lanes reduce all types of traffic collisions and improve roadway safety. Since this stretch of San Pablo Avenue has higher than average collision rates and excess roadway capacity, reducing vehicle travel lanes and adding a center turn lane would be possible and make the street safer for users.

Numerous studies, including those conducted by the British Medical Journal (2013) and the National Association of City Transportation Officials (2016), show that adding bicycle lanes to a road reduces collisions between motorists and bicyclists. A study by the American Journal of Public Health (2012) calculated that bicycle lanes reduce injury rates on roads by 50%. Protected bicycle lanes have additional separation with on-street paint or physical barriers and can reduce injury by as much as 90%. Separated bicycle lanes and pedestrian paths have large physical barriers, such as those on the Bay Trail, and further reduce risk of injury.

Second, Complete Streets encourage more people to get daily physical activity by walking and bicycling to their destinations. Increased rates of physical activity are directly related to lower rates of obesity, heart disease, cancer, and stroke. The American Heart Association, the Mayo Clinic, the Center for Disease Control and the World Health Organization all recommend at least 30 minutes of moderate-intensity physical activity, five times a week.

The Phillips 66 Community Advisory Panel letter states that bicycles and pedestrians do not make up a large portion of the roadway users on San Pablo Avenue, however studies such as the BMJ study mentioned above, as well as those conducted by San Francisco Municipal Transportation Agency (2012) and the National Institution for Transportation and Communities (2014), show that, "if you build it, they will come" – that is, bicyclists and pedestrians are more likely to use streets that are built to support those uses. For example, bicyclists are more than 2.5 times more likely to ride on routes that have separated lanes of travel.

Another influential 2012 study done by Portland State University found that an estimated 60% of the population is "interested yet concerned" about bicycling and safety. Of those 60%, only 5% said they would ride bicycles on streets with no bicycle lanes; however, if the bicycle lanes were separated from motor vehicles more than 80% said they would ride. The more separation between motorists and pedestrian and bicyclists, the more people feel comfortable bicycling and walking. If this 3-mile stretch of the Bay Trail is constructed with a Complete Streets model, more people will bicycle and walk along this route, thus getting more physical activity in a safer environment.

The San Pablo Avenue Complete Streets Plan is consistent with many existing plans and policies, including the San Francisco Bay Trail Design Guidelines & Toolkit and Contra Costa County's Complete Streets policies. CCHS supports the recommendations in the draft Complete Streets Plan as a way to encourage physical activity and reduce injuries.

Sincerely,

Daniel Peddycord, RN, MPA/HA
Contra Costa County Public Health Director

Contra Costa County
Public Works
Department

Julia R. Bueren, Director
Deputy Directors
Brian M. Balbas, Chief
Mike Carlson
Stephen Kowalewski
Carrie Ricci
Joe Yee

April 24, 2017

Comment #3

Paula Edmonds
307 Duperu Drive
Crockett, CA 94525

RE: Comments on Draft Report for
San Pablo Avenue Complete Streets Study
Project No.: 0662-6R4142

Dear Ms. Edmonds:

Thank you for submitting your letter dated March 8, 2017, regarding your comments on the Draft Report for the San Pablo Avenue Complete Streets Study. In your letter, you expressed concerns for the safety at the San Pablo Avenue and Cummings Skyway intersection. The existing configuration of this intersection is essentially 3-lanes with one lane in each direction and a dedicated turn lane (eastbound right turn lane/westbound left turn lane). The alternatives proposed in the Draft Report would maintain the existing 3-lane configuration through the intersection.

The recommended alternative presented in the study proposes to install a shared use path on the north side of the roadway through the San Pablo Avenue/Cummings Skyway intersection. This means that bicycles and pedestrians facilities would be separated from vehicle and truck traffic. Furthermore, bicycles and pedestrians using the shared use path would not need to stop at the intersection, eliminating conflicts between bicycles/pedestrians and vehicles.

The recommended alternative was selected because it provides improved safety and mobility for all modes of travel. Pedestrian and bicycle safety is improved by creating a dedicated path separated by a physical barrier from vehicles. Vehicle and truck safety is improved by creating striped medians between travel lanes in opposite directions, truck climbing lanes on steep inclines, and turning lanes to provide a safe place outside of the traffic stream to make left turns. All of these facilities will help to improve safety along the roadway for all users.

Again, thank you for submitting your comments on the San Pablo Avenue Complete Streets Study.

Sincerely,

Angela Villar
Associate Civil Engineer
Transportation Engineering Division

AV:sr
G:\transeng\Projects\San Pablo Ave Complete Streets (Rodeo to Crockett)\Feasibility Study\Comments on Draft Public Report\response letter - Edmonds - 2017-04-24.docx
Enclosure: Comment letter dated March 8, 2017
c: S, Kowalewski, Deputy
J. Fahy, TE
N. Wein, TE

RECEIVED
MAR 13 2017
BY:

March 8, 2017

Angela Villar, Associate Civil Engineer
Contra Costa County Public Works Dept.
255 Glacier Drive,
Martinez, CA 94553

RE: COMMENTS ON DRAFT REPORT FOR SAN PABLO AVENUE STREETS STUDY

Dear Angela,

After reading through the report, my concern for this project lies at the intersection of San Pablo Avenue and Cummings Skyway. This study (Alternative 2) discusses converting 4 lanes to 2 with a turn pocket and a 10-foot wide bike/pedestrian lane with a barrier. There are only 3 lanes at this section.

The Cummings Skyway extension to San Pablo Avenue was developed so that all of the refinery truck traffic would use this extension rather than driving through Rodeo. Currently at the intersection of Cummings Skyway and San Pablo Avenue, the lanes have been reduced to 3 lanes to accommodate the extensive truck traffic. This segment is known to have significantly higher truck traffic than at other locations along San Pablo Avenue. All the more reason to meticulously consider pedestrian/bicycle safety at this location.

The "Complete Streets" transportation facilities are said to be designed to "provide safe mobility for all users". However, at this intersection, pitting the pedestrians against the vehicle traffic, plus minimizing the lanes size, is putting the pedestrians and bicyclists at significant and unnecessary risk and certainly not providing "safe mobility for all users". An alternative should be developed to avoid any possible injuries or fatalities.

I would suggest that since this particular section is so very dangerous for pedestrians and bicyclists, why not develop an alternative path that takes the pedestrians/bicyclists over the adjacent hillside. This would remove the pedestrians/bicyclist from any potential collisions with vehicle traffic. Sure this may be a more costly alternative, but not near as costly for family and friends who lose a family member.

This project may help complete the Bay Trail, but at the intersection of Cummings Skyway and San Pablo Avenue, pedestrians and bicyclist will be pitted against trucks and cars. I urge you to reconsider the design of this particular intersection.

Thank you for your consideration,

Paula Edmonds

Paula Edmonds
307 Duperu Drive, Crockett, CA 94525
(510) 787-1758

Comment #4

Angela Villar

From: Angela Villar
Sent: Monday, April 24, 2017 1:05 PM
To: 'Ariana Hirsh'
Cc: Nancy Wein; Jerry Fahy; Steve Kowalewski; 'vincent.manuel@bos.cccounty.us'; Michael Iswalt (michael.iswalt@arup.com)
Subject: RE: Bay Trail extension in Contra Costa

Dear Ms. Hirsh,

Thank you for your comments on our Draft Report for the San Pablo Avenue Complete Streets Study. The recommended alternative includes a shared use pedestrian and bicycle path on the north side of the roadway for the majority of the corridor. It would provide continuous bicycle and pedestrian facilities along San Pablo Avenue and connections on either end as part of the Bay Trail.

Again, thank you for submitting your comments on the San Pablo Avenue Complete Streets Study.

Best regards,

Angela Villar, PE
Associate Civil Engineer
Contra Costa County
Public Works
Department
Transportation Engineering Division
255 Glacier Drive
Martinez, CA 94553
Phone: (925) 313-2016
Fax: (925) 313-2333
e-mail: angela.villar@pw.cccounty.us

From: Ariana Hirsh [mailto:ari.r.hirsh@gmail.com]
Sent: Monday, April 03, 2017 8:47 PM
To: Angela Villar
Subject: Bay Trail extension in Contra Costa

Dear Ms. Villar,

I am writing to support an extension of the Bay Trail by three miles in contra costa- from Crockett to Rodeo. Specifically, I think a class 1 trail along San Pablo Ave, with walking and protected bike lanes, is the best choice. Access to continuous bike and walking routes is great for transit, and public health and quality of life.

Thank you for your service.

Best,

Ariana Hirsh

Comment #5

Angela Villar

From: Angela Villar
Sent: Monday, April 24, 2017 1:04 PM
To: 'Eileen Housteau'
Cc: Nancy Wein; Jerry Fahy; Steve Kowalewski; 'vincent.manuel@bos.cccounty.us'; Michael Iswalt (michael.iswalt@arup.com)
Subject: RE: Bay Trail along San Pablo Ave

Dear Ms. Housteau,

Thank you for your comments on our Draft Report for the San Pablo Avenue Complete Streets Study. The recommended alternative does include a shared use pedestrian and bicycle path on the north side of the roadway from California Street to Merchant Street. It would provide continuous bicycle and pedestrian facilities along San Pablo Avenue and connections on either end as part of the Bay Trail.

Again, thank you for submitting your comments on the San Pablo Avenue Complete Streets Study.

Best regards,

Angela Villar, PE
Associate Civil Engineer

Transportation Engineering Division
255 Glacier Drive
Martinez, CA 94553
Phone: (925) 313-2016
Fax: (925) 313-2333
e-mail: angela.villar@pw.cccounty.us

-----Original Message-----
From: Eileen Housteau [mailto:ecoeileen@mindspring.com]
Sent: Tuesday, April 04, 2017 12:18 PM
To: Angela Villar
Subject: Bay Trail along San Pablo Ave

Hello,

I'm writing in support of the Class I path along San Pablo from Crockett to Rodeo as part of the larger Bay Trail project. Please help us create a Trail for healthier families.

Thanks for your consideration,
Eileen Housteau
40 Glen Ave
Oakland, CA 94611

Sent from my mobile device

Comment #6

Angela Villar

From: Angela Villar
Sent: Monday, April 24, 2017 1:05 PM
To: 'erin sanders'
Cc: Nancy Wein; Jerry Fahy; Steve Kowalewski; 'vincent.manuel@bos.cccounty.us'; Michael Iswalt (michael.iswalt@arup.com)
Subject: RE: Bay Trail from Crockett to Rodeo

Dear Ms. Sanders,

Thank you for your comments on our Draft Report for the San Pablo Avenue Complete Streets Study. The recommended alternative includes a shared use pedestrian and bicycle path on the north side of the roadway for the majority of the corridor. It would provide continuous bicycle and pedestrian facilities along San Pablo Avenue and connections on either end as part of the Bay Trail. If implemented, the County hopes that the trail would attract bicycles and pedestrians and have positive impacts to the local communities.

Again, thank you for submitting your comments on the San Pablo Avenue Complete Streets Study.

Best regards,

Angela Villar, PE
Associate Civil Engineer
Contra Costa County
Public Works
Department
Transportation Engineering Division
255 Glacier Drive
Martinez, CA 94553
Phone: (925) 313-2016
Fax: (925) 313-2333
e-mail: angela.villar@pw.cccounty.us

From: erin sanders [mailto:polyphone@hotmail.com]
Sent: Tuesday, April 04, 2017 10:47 AM
To: Angela Villar
Subject: Bay Trail from Crockett to Rodeo

Dear Ms. Villar,

I'm writing to express my support for the Bay Trail extension from Crockett to Rodeo. This area of CC County has many great biking opportunities, and this spur will help connect them. This section of the Bay Trail is especially important as it will help riders connect to the Carquinez Bridge much more easily.

The more bike infrastructure we have in CC County, the more riders we'll attract. And when we attract bike riders, we attract customers for our restaurants and retail.

I hope that in the future, the County will also consider adding a bike lane to San Pablo Ave through Pinole. This is another natural gap-filler in the Bay Trail route. The alternative, along the Richmond Parkway, is unpleasant and not really designed for bikes.

Thanks for your time. I look forward to riding more in this area of Contra Costa County!

Sincerely,
Erin Sanders
Richmond, CA

Angela Villar

Comment #7

From: Angela Villar
Sent: Monday, April 24, 2017 1:05 PM
To: 'Adler, Paul'
Cc: Nancy Wein; Jerry Fahy; Steve Kowalewski; 'vincent.manuel@bos.cccounty.us'; Michael Iswalt (michael.iswalt@arup.com)
Subject: RE: San Pablo Avenue
Attachments: response letter - 2016-09-13 - Crockett-Carquinez Fire Dept.pdf

Dear Mr. Adler,

Thank you for your email in regards to the Draft Report for the San Pablo Avenue Complete Streets Study.

Back in September 2016, the attached response letter was sent to the Crockett-Carquinez Fire Department in response to their concerns. The comment letter and response is included in the appendix of the Draft Report. Similarly, comments and responses received throughout the study process have been incorporated into the design of the alternatives, in addition to including responses to them in the appendix of the Draft Report.

Proposed Alternative 3 maintains a 4-lane roadway configuration along San Pablo Avenue from Rodeo to Cummings Skyway and was developed in response to comments from Phillips 66. While alternative 3 meets the complete streets goals, it requires significant roadway widening at a very high cost and the potential for significant impacts to right-of-way, utilities, and the environment. The recommended alternative better balances the study goals by providing a complete street, while also minimizing impacts. If the project moves forward into the design phase, the County will need to work with Phillips 66 and other interested parties, such as the fire districts, to coordinate the detailed design of the project.

Thank you for submitting your comments on the San Pablo Avenue Complete Streets Study.

Best regards,

Angela Villar, PE
Associate Civil Engineer
Contra Costa County
Public Works
Department
Transportation Engineering Division
255 Glacier Drive
Martinez, CA 94553
Phone: (925) 313-2016
Fax: (925) 313-2333
e-mail: angela.villar@pw.cccounty.us

From: Adler, Paul [mailto:Paul.Adler@p66.com]
Sent: Tuesday, April 04, 2017 10:53 AM
To: Angela Villar
Subject: San Pablo Avenue

Angela,
Please review the following attachment from Ridge Greene of the Crockett Carquinez Fire Protection District.
Within this letter concerns are raised about the San Pablo Avenue Complete Streets project. Fire Chief Jerry Littleton and Rodeo Hercules Fire Protection Chief Bryan Craig also have similar concerns. Phillips 66's
Safety is Phillips 66's number one priority and decreasing San Pablo Avenue from 4 lanes to 3 lanes is a concern for our refinery because of the transportation of coke petroleum products that use large transportation trucks that exit our refinery and drive to our Carbon Plant every 5-7 minutes.
If the San Pablo Avenue Complete Street project advances, numerous employees, contractors and residents will have an increase in their commute time and additional accidents (and hazards) will escalate due to the congestion of trucks that use this road and wait to enter NuStar's transportation terminal facility.
I strongly encourage Contra Costa County's Public Works Department to maintain a 4 lane road on San Pablo Avenue, specifically to prevent head-on-collisions and other accidents that could occur if a decrease to 3 lanes occur. Please review the numerous concerns our employees raised in the Complete Streets survey that was conducted by the Public Works department and reflect on the opinions raised.
Thank you for giving me the opportunity to comment on this project. Please work with our refinery and the two local fire jurisdictions before any future change/development occurs.

Paul Adler
Manager, Communications and Public Affairs
Phillips 66 - San Francisco Refinery
paul.adler@p66.com
510-245-4400 (w)
510-260-5957 (m)

From: Angela Villar [mailto:angela.villar@pw.cccounty.us]
Sent: Thursday, March 30, 2017 4:47 PM
To: Lohr, Aimee
Cc: Adler, Paul; Inform Public Relations (informpr@sbcglobal.net)
Subject: [EXTERNAL]RE: Statistics

Hi Aimee,

Thanks for attending our TAC meeting this morning and providing your feedback. On page 29 in the draft report, Figure 10 shows a chart from the online survey we conducted. The results showed that 44% of the people that took the survey use some other mode of travel either besides or in addition to cars. This includes walking, biking, and bus. Let me know if you have any other questions.

Thanks,

Angela Villar, PE
Associate Civil Engineer
Contra Costa County
Public Works
Department
Transportation Engineering Division
255 Glacier Drive
Martinez, CA 94553
Phone: (925) 313-2016
Fax: (925) 313-2333
e-mail: angela.villar@pw.cccounty.us

From: Lohr, Aimee [mailto:Aimee.Lohr@p66.com]
Sent: Thursday, March 30, 2017 2:39 PM
To: Angela Villar
Cc: Adler, Paul; Inform Public Relations (informpr@sbcglobal.net)
Subject: Statistics

Hi Angela,

Thank you for the opportunity to attend today's TAC meeting. After the meeting I was thinking about something you said. You mentioned the survey that was done, and if I remember correctly, you said about 46% of the respondents stated that they use an alternate method of transportation or "non-vehicle" and so I was curious as I am here 5-6 days a week and this is not reflective of what I see on a daily basis. Did that question include buses? I am trying to understand how that number could be so high when that is not what I see in real life.

Again, thank you for allowing us to give our input.

All the best,

Aimee M. Lohr

Community Affairs / Public Relations Rep.
Phillips 66
1380 San Pablo Avenue
Rodeo, CA. 94572
office: 510-245-5130
cell: 925-766-7303
"Our lives are not determined by what happens to us, but by how we react to what happens; not by what life brings to us, but by the attitude we bring to life. A positive attitude causes a chain reaction of positive thoughts, events and outcomes. It is a catalyst...a spark that creates extraordinary results."

Contra Costa County
Public Works
Department

Julia R. Bueren, Director
Deputy Directors
Brian M. Balbas
Stephen Kowalewski
Joe Yee

September 13, 2016

Mr. Ridge Greene, Commissioner-Secretary
Crockett-Carquinez Fire Department
746 Loring Avenue
Crockett, CA 94525

RE: San Pablo Avenue Complete Streets Study
Project No.: 0662-6R4142

Dear Mr. Greene:

Thank you for submitting your letter dated July 28, 2016, expressing your concerns for the planning study being conducted along San Pablo Avenue between Rodeo and Crockett. The purpose of the planning study is to analyze the configuration of the existing roadway and evaluate the feasibility of incorporating bicycle and pedestrian facilities along this segment of San Pablo Avenue. The County's Public Works Department has received a Priority Development Area (PDA) Planning Grant through the Contra Costa Transportation Authority (CCTA) to conduct the complete streets planning study. The County is working with a consultant selected by CCTA, Arup, on the study currently underway.

This segment of San Pablo Avenue is designated as part of the San Francisco Bay Trail alignment adopted in 1990. The 3-mile study corridor would fill an existing gap in the regional Bay Trail between the Lone Tree Point improvements planned by the East Bay Regional Park District (EBRPD) on the west end and the existing Carquinez Bridge trail on the east end. The Bay Trail currently has a number of active projects at various stages that would provide a continuous trail stretching from Vallejo to the Oakland waterfront. This project would fill a critical gap to provide 77 miles of continuous Bay Trail.

To qualify as a Bay Trail segment, the study corridor would need to provide on-street bikes lanes with sidewalks, at a minimum, or separated bicycle and pedestrian facilities as a preferred option. This study is considering the feasibility of removing one travel lane along this segment of San Pablo Avenue to provide these pedestrian and bicycle facilities in a cost effective manner.

In 2008, the state passed the California Complete Streets Act of 2008 that required local jurisdictions to integrate specific transportation policies that accommodate the needs of all users. In April 2008, the Contra Costa County Board of Supervisors adopted a General Plan Amendment that added language to the Transportation and Circulation Element for the purpose of "promoting the development of bicycle and pedestrian facilities", in lines with "complete streets" principles. This identified the need for roadway projects to balance the needs of all users. Promoting alternative modes of transportation not only promotes a more active lifestyle, but has benefits to public health and the environment. Just recently in July 2016, the County adopted a specific Complete Streets Policy expressing its commitment to providing roadways that serve all users. This policy is attached for your reference.

The safety of all users along the roadway is of utmost importance to the County. The traffic analysis indicates that the existing four-lane roadway is underutilized and future volumes are not expected to increase significantly. This creates opportunities to reconfigure the roadway to repurpose one travel lane to provide dedicated facilities for bicyclists and pedestrians with additional separation between travel lanes, dedicated turn pockets for key driveways and intersections, dedicated truck climbing lanes, and refuge areas for traffic entering/existing the roadway. All of these facilities will help to improve safety along the roadway for all users.

The current layouts consider truck climbing lanes on two of the three segments with the steepest grades and highest truck traffic between the Phillips 66 refinery and Cummings Skyway. These lanes will allow vehicles to safely pass slower moving trucks. Climbing lanes are not required east of Cummings Skyway near Vista Del Rio because truck volumes are very low on the segment between Cummings Skyway and the Carquinez Bridge.

There are a number of constrained areas along this segment of San Pablo Avenue, such as overhead and underground pipeline crossings and steep grades on either side of the roadway, which make improvements challenging. The County designs its roadways to meet County standards, as well as Caltrans Highway Design Manual standards. Any improvements to the roadway will be designed to both these standards during the design phase of the project. We are currently conducting the feasibility study as part of the planning phase and expect to present the study to our Board of Supervisors for consideration this winter.

We appreciate your concerns and will consider incorporating them into our study. Thank you for your consideration as we work to balance the need of all users, including emergency vehicles, along San Pablo Avenue.

Should you have any questions about the study, you may contact me at (925) 313-2016 or angela.villar@pw.cccounty.us.

Sincerely,

Angela Villar
Associate Civil Engineer
Transportation Engineering Division

AV:nn
grpdata\transeng\Projects\San Pablo Ave Complete Streets (Rodeo to Crockett)\Coordination\Community

Attachment: Complete Streets Policy of Contra Costa County

c: Steve Kowalewski, Admin, CCCPWD
Jerry Fahy, TE, CCCPWD
Nancy Wein, TE, CCCPWD
Vincent Manuel, Supervisor District V
Michael Iswalt, Arup

July 28, 2016

To: Angela Villar, P. E.

CCC Public Works

255 Glacier Dr., Martinez, 94553.

RE: San Pablo Avenue Complete Streets Study between Rodeo and Crockett.

Dear Ms. Villar,

The Crockett Carquinez Fire Commission has a number of concerns in regards to the study fact sheet along with general concerns regarding a bike and pedestrian trail.

Our primary concern as First Responders is safety for the bicycle riders, pedestrians and vehicle drivers who would be sharing the use of the roadway, our concerns and comments are as follows:

1. The design of a three lane vehicle roadway could potentially create dangerous and confusing conditions for vehicle drivers for example frustrated drivers stuck behind trucks trying to pass in left turn pockets or turn lanes not dedicated to climbing trucks.
2. Constrained areas where the roadway will be difficult to widen for example the pipe crossing overpass at the refinery.
3. Crossings at areas where there is significant commercial vehicle traffic entering and exiting the roadway.
4. Connecting paths of travel between existing sections of the Bay Trail are unimproved and this new section will attract and cause a larger number of riders on unmarked and unimproved surface streets between improved sections raising the question of why current studies and funding aren't being directed towards increasing contiguous sections of the bike trail. For example the 27 mile loop trail that includes the Carquinez and Martinez bridges have large sections without marked or protected bike trails and limited signage. We have observed that other roadways including Cummings Skyway and Franklin Canyon have significantly more bicycle traffic than the roadway between Rodeo and Crockett.

In closing we feel that the safety of all involved requires further consideration in regards to the design of the roadway and in regard to where existing funding is applied to construct improvements to provide safe passage in higher use areas .

Sincerely

Ridge Greene
Commissioner-Secretary
Crockett-Carquinez Fire Department

Comment #8

Angela Villar

From: Angela Villar
Sent: Monday, April 24, 2017 1:05 PM
To: 'Michael G. Kellogg'
Cc: Nancy Wein; Jerry Fahy; Steve Kowalewski; 'vincent.manuel@bos.cccounty.us'; Michael Iswalt (michael.iswalt@arup.com)
Subject: RE: San Pablo Avenue Complete Streets Study

Hi Mr. Kellogg,

Thank you for your comments on our Draft Report for the San Pablo Avenue Complete Streets Study. The recommended alternative does primarily implement Alternative 2 with a shared use pedestrian and bicycle path on the north side of the roadway from California Street to Merchant Street. It would provide continuous bicycle and pedestrian facilities along San Pablo Avenue and connections on either end.

With regard to the issue of turnarounds, we have worked with the refinery throughout the study, including a visit to their site to talk with their operations and security staff. We believe we have a strong understanding of their operations under normal operating conditions, which is typically how transportation impact analyses are conducted.

We recognize that turnarounds of different sizes occur at various times throughout the year and that these turnarounds involve additional workers who arrive at the site on staggered shifts. While the refinery was not able to provide us with any traffic count data for their turnaround activities, our previous version of the Feasibility Report included some detail on the size, frequency, and a qualitative discussion of their potential impacts.

Since releasing the draft Feasibility Report, we have obtained further detail from Philips 66 regarding both small and large turnarounds and we have updated the report to include an expanded discussion of these events that reflects this more accurate understanding.

For the smaller turnarounds (400 additional employees) that occur several times a year, we conducted an analysis of future evening peak hour traffic conditions at the San Pablo Avenue / Refinery Road intersection, with the proposed reduction from four to three travel lanes. We took a very conservative approach with regard to the number of vehicle trips that the additional turnaround employees would generate. We assumed that all of the employees would arrive by car and that 50% would arrive or depart the refinery during the peak hour. We know that employee arrivals and departures would likely be spread out across a longer time period. Therefore, the assumption that 50% arrive or depart in a single peak hour is a conservative assumption. We concluded that, during a smaller turnaround event, there would be a very modest increase in intersection delay and that the level-of-service there would remain LOS C during evening peak hour conditions (the PM peak hour has been identified as the "peak" hour of the day). You can find more information in Section 6.3 of the updated Feasibility Report.

For the larger turnarounds, which occur every three to five years, we did not conduct a similar focused analysis due to the very infrequent nature of these events. Our research confirms your statement that for these events, employees drive and park at the Selby site at the San Pablo Avenue / A Street intersection and are bused to the Phillips 66 site. We can understand that these turnarounds may impact local roadway operations, though our understanding is that the arrival and departure times for these trips are spread out over a window of multiple hours, which spreads out the impact on San Pablo Avenue. Overall, however, we typically do not analyze and plan for very infrequent events such as this because that would result in overbuilding our infrastructure. We believe a traffic management plan, developed in conjunction with Phillips 66 and the community, could manage any potential queuing and operational issues associated with these larger turnarounds.

We hope that this information addresses your concerns about refinery turnarounds. Again, thank you for submitting your comments on the San Pablo Avenue Complete Streets Study.

Best regards,

Angela Villar, PE
Associate Civil Engineer
Contra Costa County
Public Works
Department
255 Glacier Drive
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Fax: (925) 313-2333
e-mail: angela.villar@pw.cccounty.us

From: Michael G. Kellogg [mailto:mgkellogg@comcast.net]
Sent: Tuesday, April 04, 2017 12:06 PM
To: Angela Villar
Subject: San Pablo Avenue Complete Streets Study

Dear Angela,
Thank you very much for the opportunity to review and comment on the Feasibility Report for the San Pablo Avenue Complete Streets Study. I agree with the conclusions of the Feasibility Report and support the selection of the shared-use path (Alternative 2) as the preferred alternative. Alternative 2 is the only alternative that meets all the goals of the study without the need to widen the existing roadway which would result in significant increased costs and delay. Alternative 2 will qualify the study area for inclusion in the Bay Trail and meets the needs of all users, not just some.

Despite my agreement with the conclusions of the Feasibility Report, I continue to have concerns about refinery turnarounds that I first raised in an e-mail to you dated 9/30/2016 and that have still not been addressed. I initially raised my concerns because the Common Traffic Q&A sheet made available at the 2nd community workshop held in Crockett (9/29/2016) indicated "It's our understanding that many of these workers are bussed to the facility…" and "We did not analyze this condition… and we do not have precise data on the "turn-arounds". I pointed out to you that you needed to obtain detailed information on the turnarounds because the bussing occurs WITHIN THE STUDY AREA (emphasis added) and greatly affects traffic at the A Street/Old County Road intersection. I can't tell you how frustrating and disappointing it is to see that my request was ignored and the misinformation repeated on page 40 of the Feasibility Report: "For the larger turnarounds, workers are transported to the site using buses, which also minimizes the traffic impacts on local streets." The cover of the Feasibility Report indicates that the authors (ARUP North America Ltd) took into account "…the particular instructions and requirements of our client." Were they instructed to not include refinery turnarounds in their analyses or was it their decision? If the former why and if the latter how did they justify the omission? Will the oversight be corrected before a recommendation is forwarded to the Board of Supervisors? The Feasibility Report is currently inaccurate concerning refinery turnarounds and needs to be corrected. Can you provide any assurances that it will be?

Thank you again for the opportunity to review the Feasibility Report. While I agree substantially with the conclusions of the report I am concerned that the underlying study improperly dismisses an important issue based upon erroneous information that is easily corrected.
Mike

Michael G. Kellogg
181 Old County Road
Crockett, CA 94525

Contra Costa County
Public Works
Department

Julia R. Bueren, Director
Deputy Directors
Brian M. Balbas, Chief
Mike Carlson
Stephen Kowalewski
Carrie Ricci
Joe Yee

Comment #9

April 24, 2017

Ms. Cynthia Armour, Advocacy Manager
Bike East Bay
P.O. Box 1736
Oakland, CA 94604

Mr. Sean Dougan, Trails Development Program Manager
East Bay Regional Parks District
2950 Peralta Oaks Court
Oakland, CA 94605

Mr. Lee Chien Huo, Bay Trail Planner
Association of Bay Area Governments
375 Beale Street, Suite 700
San Francisco, CA 94105

RE: Comments on Draft Report for
San Pablo Avenue Complete Streets Study
Project No.: 0662-6R4142

Dear Ms. Armour, Mr. Dougan, and Mr. Huo:

Thank you for submitting your comment letter dated April 4, 2017, expressing your support for the San Pablo Avenue Complete Streets Study. In your letter you expressed support for Alternative 2 with a number of suggestions:

1. Comment 1: We ask that Public Works plan for a seamless connection between both ends of the path. We strongly disagree with the recommendations to implement the bike lanes concept (based on Alternative 1) from Parker Avenue to California Street in Rodeo. The recommended alternative calls for a Class I path to begin at California Street – it should begin where the Lone Tree Way path ends, as originally proposed in Alternative 2, in order to seamlessly connect with the rest of the Bay Trail. This will also establish an attractive "gateway" to the SF Bay Trail within Rodeo that will improve and activate the downtown area. The Bay Trail Design Guidelines and Toolkit does not recommend 4 feet wide bike lanes, and this on-street segment would not qualify as a Bay Trail segment as proposed.

Response: In the recommended alternative, on-street bike lanes are proposed between Pacific Avenue and California Street. During community meetings, existing business owners expressed concerns for losing on-street parking adjacent to their businesses along this segment. This area also serves as a gateway to downtown Rodeo for the local community with existing enhancements such as median islands, lighting, and landscaping that were completed in 2008. Given the existing constraints and potential impacts to local businesses, the study recommends maintaining the existing on-street bike lanes and completing continuous sidewalks through this short segment. This still meets the complete streets goals of the study by providing continuous bicycle and pedestrian facilities through the corridor.

We had our consultant look further at the configuration of this segment and the enclosed exhibit shows some optional concepts that could be considered during the design phase of the project. Optional concepts would require further consideration for existing on-street parking, median islands, landscaping, and community enhancements. The design phase of the project would also need to carefully consider the design of transitions between existing facilities and new improvements. Given the conceptual approval the study is seeking, this additional analysis and discussion would need to take place during the design phase of the project.

2. Comment 2: We recommend the study include pedestrian and bicycle improvements along San Pablo Avenue in downtown Rodeo, specifically, creating shortened crossing distances for people walking across Railroad Avenue and Vaqueros Avenue, as well as providing painted crosswalks.

   Response: Striping of the crosswalks along San Pablo Avenue across Railroad Avenue and Vaqueros Avenue will be added to the recommended alternative. Given the skewed angle of the existing side streets, bulb-outs are not recommended since they would impede the turning radius of vehicles at the intersection.

3. Comment 3: On page 44 of the draft report, various means of providing physical separations for the path are explored. We do not support a flexible barrier or mountable curb solution for this project and ask that the adopted design provides for an inflexible physical barrier that will protect people walking and bicycling from large vehicles, such as K-rail.

Response: A concrete physical barrier is described in the recommendations of Section 9 in the study. Details on the type of barrier will need to be determined during the design phase of the project. The report has been updated to emphasize the need for a physical barrier between vehicles and the shared use path.

4. Comment 4: We also encourage the County to analyze sections of San Pablo Avenue where road widening is financially viable (as proposed in Alternative 3) to address any vehicular constraints that may arise from implementing a road diet along the entire corridor.

   Response: If the study is approved and the project moves forward into the design phase, the County will look at opportunities to widen the roadway and provide paved shoulders where feasible.

5. Comment 5: We request that the County work with the owner of the Dead Fish Restaurant to reconfigure parking along San Pablo Avenue to restrict vehicular movements across the proposed segment of Bay Trail. Safety and the integrity of the separated pathway will be compromised along this segment from vehicles entering and exiting the parking area.

   Response: The recommended alternative proposes to remove the angled parking in front of the Dead Fish restaurant and replace it with parallel parking. A drive aisle would be provided between the parallel parking stalls and the shared use path to allow space for vehicles to maneuver in/out of the parking stalls without impacting the shared use path.

6. Comment 6: At the end of the study area, connecting the path along San Pablo Avenue to the Alfred Zampa Bridge is important to ensure the connectivity of the bikeway network and the SF Bay Trail.

   Response: The County recognizes the importance of connections to the trail network in order to create continuous facilities. The proposed segment along San Pablo Avenue would close a 3-mile gap in the Bay Trail, connecting users to the west to future Lone Tree Point trail improvements by EBRPD and users to the east to the existing trail on the Alfred Zampa Bridge.

7. Comment 7: Figure 7 on page 16 of the draft study report is out of date, and should be updated to show recent SF Bay Trail gap closures recently implemented.

   Response: The County will review this map with ABAG and update it accordingly in the study report.

We will consider incorporating your comments into our final study. If the study is approved, we hope to work with your organizations to close the Bay Trail Gap along San Pablo Avenue. Again, thank you for submitting your comments on the San Pablo Avenue Complete Streets Study.

Sincerely,

Angela Villar
Associate Civil Engineer
Transportation Engineering Division

AV:sr
G:\transeng\Projects\San Pablo Ave Complete Streets (Rodeo to Crockett)\Feasibility Study\Comments on Draft Public Report\response letter - Bike East Bay-EBRPD-Bay Trail - 2017-04-24.docx
Enclosure: Comment letter received April 4, 2017
San Pablo Avenue Complete Streets Study: Parker to California Street Optional Concepts
c: S. Kowalewski, Deputy
J. Fahy, TE
N. Wein, TE
Vincent Manuel, Sr. Dist. Rep., Dist. V

Tuesday April 4, 2017

To: Angela Villar
Contra Costa County Public Works Department
Transportation Engineering Division
255 Glacier Drive
Martinez, CA 94553

Re: Preferred Alternative for the San Pablo Avenue Complete Streets Study

Dear Angela,

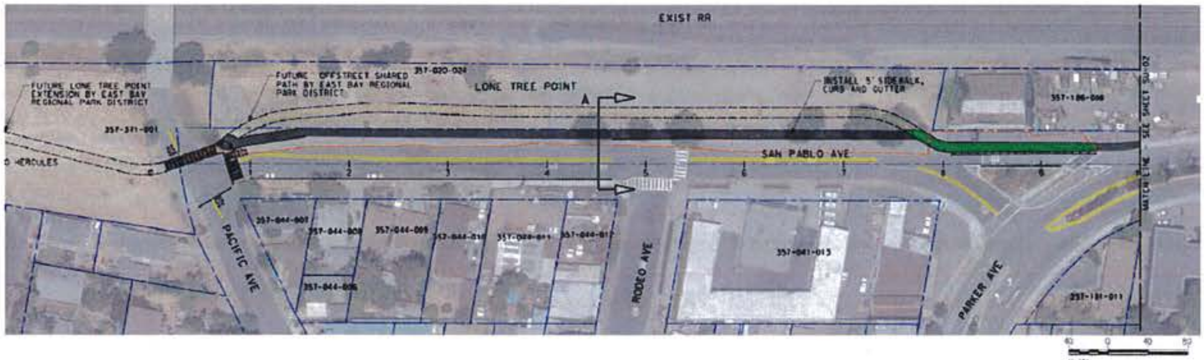
Thank you for your work on the San Pablo Avenue Complete Streets Study. We appreciate the County Public Works Department's efforts to extend the Bay Trail and designing a complete street project along San Pablo Avenue.

The East Bay Regional Park District (Park District), the San Francisco Bay Trail, and Bike East Bay prefer the greatest separation of bicycle and pedestrian users from vehicles on future SF Bay Trail improvements made to San Pablo Ave between Crockett and Rodeo.

The study identifies three alternatives and analyzes the cost of each. We understand that cost is a major factor in the feasibility of these options. **Alternative 1** is the least expensive option but does not meet the Bay Trail goals and does not provide sufficient separation of users to improve safety along this corridor. **Alternative 2** meets the Bay Trail standards while taking advantage of significant unused capacity on the roadway. **Alternative 3** meets the same minimum Bay Trail goals as Alternative 2, provides sufficient separation of users, but will not improve road safety along this corridor. Alternative 3 will cost an additional $15M over Alternative 2 and is cost prohibitive. We would only support this alternative if private funding and ROW was provided from the refineries requesting this widening.

As such, we support staff's recommendation to adopt Alternative 2, with the following comments:

1. We ask that Public Works plan for a seamless connection between both ends of the path. We strongly disagree with the recommendation to Implement the bike lanes concept (based on Alternative 1) from Parker Ave. to California St. in Rodeo. The recommended alternative calls for a Class I path to begin at California Street - it should begin where the Lone Tree Way path ends, as originally proposed in Alternative 2, in order to seamlessly connect with the rest of the Bay Trail. This will also establish an attractive "gateway" to the SF Bay Trail within Rodeo that will improve and activate the downtown area.



The [Bay Trail Design Guidelines and Toolkit] does not recommend 4' wide bike lanes, and this on-street segment would not qualify as a Bay Trail segment as proposed:

"Class II Bike Lanes: In some urban cases there may be physical conditions where it is not possible to develop a separated bikeway within the width of the road right-of-way, even with the option of reconfiguring or downsizing traffic lanes. In such situations, consider a Class II bike lane with pedestrians using the sidewalk. A Class II bike lane serving as the Bay Trail should begin and end at traffic controlled intersections. ***The Bay Trail bicycle lane should be 6 feet wide.*** *The bike facility should be signed as the Bay Trail with appropriate directional signs, safety signs and markings, and/or other bicycle signal control devices at intersections to safely connect with the shared-use portions of the Bay Trail."*

2. We recommend the study include pedestrian and bicycle improvements along San Pablo Ave in downtown Rodeo, specifically, creating shortened crossing distances for people walking across Railroad Ave and Vaqueros Ave as well as providing painted crosswalks.
3. **On page 44 of the draft report, various means of providing physical separations for the path are explored. We do not support a flexible barrier or mountable curb solution for this project and ask that the adopted design provides for an inflexible physical barrier that will protect people walking and bicycling from large vehicles, such as K-rail.**
4. **We also encourage the County to analyze sections of San Pablo Ave where road widening is financially viable (as proposed in Alternative 3) to address any vehicular constraints that may arise from implementing a road diet along the entire corridor.**
5. **We request that the County work with the owner of the Dead Fish Restaurant to reconfigure parking along San Pablo Avenue to restrict vehicular movements across the proposed segment of Bay Trail. Safety and the integrity of the separated pathway will be compromised along this segment from vehicles entering and exiting the parking area.**

PO Box 1736, Oakland, CA 94604
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6. At the end of the study area, connecting the path along San Pablo Ave to the Alfred Zampa Bridge is important to ensure the connectivity of the bikeway network and the SF Bay Trail.
7. Figure 7 on page 16 of the draft study report is out of date, and should be updated to show recent SF Bay Trail gap closures recently implemented.

The East Bay Regional Park District is proposing many great improvements in the Rodeo area such as: Currently designing a segment of the SF Bay Trail from the Victoria by the Bay residential area in Hercules to Rodeo; Redesigning the staging area, installing park improvements, and installing a restroom at Lone Tree Point. The Park District is currently applying for grants for shoreline repair and stabilization and hazardous waste clean-up along the shoreline of Lone Tree Point as well.

The Park District has currently placed these improvements as high priority due to the County's efforts to close the SF Bay Trail Gap along San Pablo Ave. We strongly urge the County to finalize this study and place a high priority on constructing these improvements in the near future to not jeopardize the momentum and regional connectivity our combined efforts will provide.

Thank you again for your dedicated work on this project. You have our organizations' combined support and encouragement to design a continuous, separated and protected bicycle and pedestrian facility that will be an exemplary segment of the Bay Trail as part of the San Pablo Complete Streets Study.

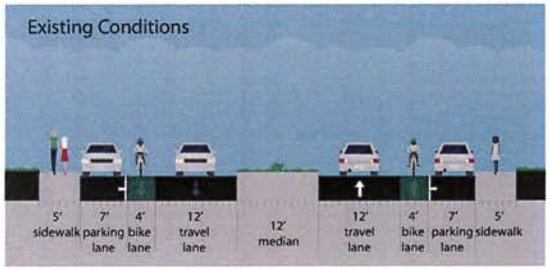
Sincerely,

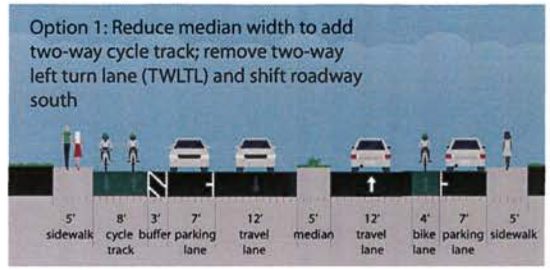
Cynthia Armour

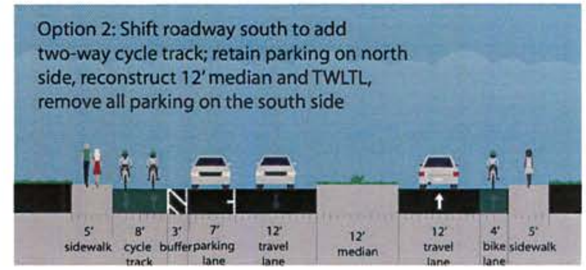
Cynthia Armour
Advocacy Manager
Bike East Bay

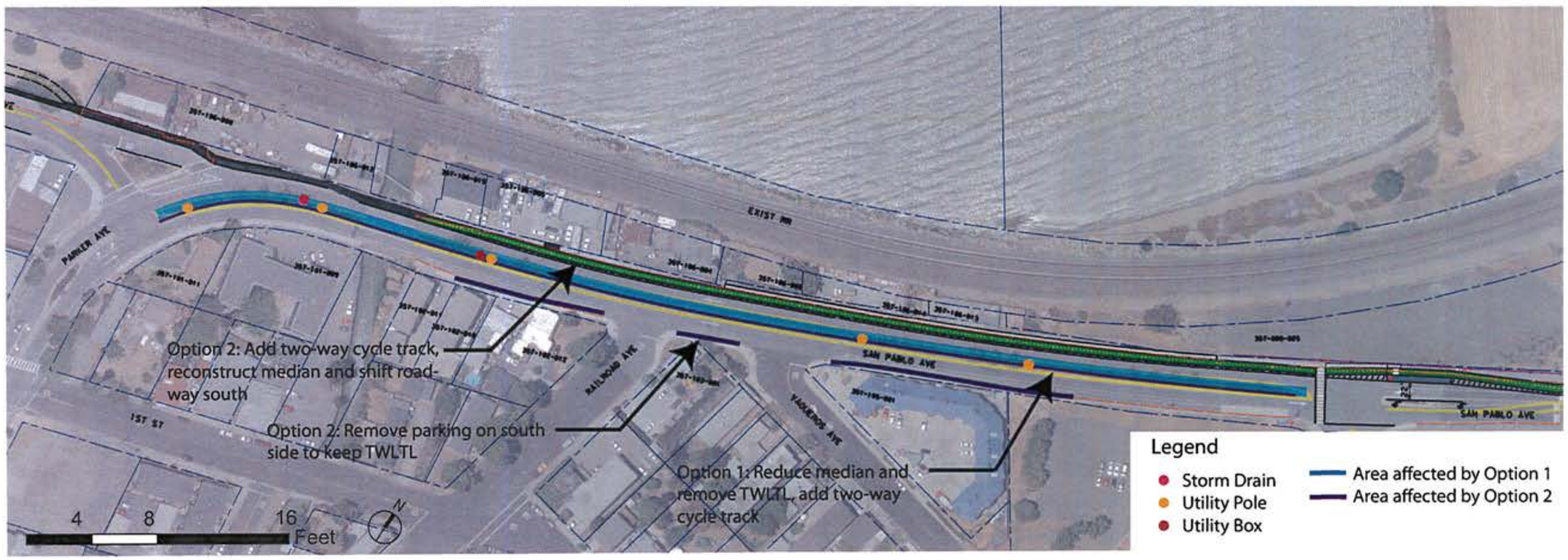
Sean Dougan
Trails Development Program Manager
East Bay Regional Parks District

Lee Chien Huo
Bay Trail Planner
San Francisco Bay Trail Project









ARUP Arup North America Ltd. 560 Mission Street, Suite 700 San Francisco, CA 94105 USA www.arup.com	NO. REVISION DATE 04/2 /20 7	Client CONTRA COSTA COUNTY PUBLIC WORKS DEPARTMENT	Job Title SAN PABLO AVENUE COMPLETE STREETS STUDY	Stamp	Key Plan	Drawing Title San Pablo Avenue Complete Streets Study: Parker to California Street Optional Concepts	Scale File Name INFO-ARUP22X34H.DWG Drawing Status DRAFT - FOR DISCUSSION ONLY Drawn By J. STITT Checked By Job No 243261 Drawing No

Comment #10

Angela Villar

From:	Angela Villar
Sent:	Monday, April 24, 2017 1:05 PM
To:	'Wendy Malone'
Cc:	Nancy Wein; Jerry Fahy; Steve Kowalewski; 'vincent.manuel@bos.cccounty.us'; Michael Iswalt (michael.iswalt@arup.com)
Subject:	RE: San Pablo Ave complete streets study

Dear Ms. Malone and Mr. Hirst,

Thank you for your comments on our Draft Report for the San Pablo Avenue Complete Streets Study. The recommended alternative does primarily implement Alternative 2 with a shared use pedestrian and bicycle path on the north side of the roadway from California Street to Merchant Street. It would provide continuous bicycle and pedestrian facilities along San Pablo Avenue and connections on either end as part of the Bay Trail. A concrete physical barrier is described in the recommendations of Section 9 in the report. Details on the types of barrier will need to be determined during the design phase of the project.

Again, thank you for submitting your comments on the San Pablo Avenue Complete Streets Study.

Best regards,

Angela Villar, PE
Associate Civil Engineer
Contra Costa County
Public Works
Department
Transportation Engineering Division
255 Glacier Drive
Martinez, CA 94553
Phone: (925) 313-2016
Fax: (925) 313-2333
e-mail: angela.villar@pw.cccounty.us

From: Wendy Malone [mailto:atypicalpointe@gmail.com]
Sent: Friday, April 07, 2017 2:54 PM
To: Angela Villar
Subject: San Pablo Ave complete streets study

Good afternoon,
We apologize for missing the April 4th cut off date.

After reviewing the draft report, I believe Alternative two is the best choice for traffic flow and pedestrian/bike safety. A 'K-rail' to separate pedestrians from cars in west bound sections where there will be only one lane is preferred.

Thank you for time,

Sincerely,
Wendy Malone and Jerry Hirst

Appendix H.3: Supplemental analysis to support comment responses

Appendix H.3

A traffic analysis of the San Pablo Avenue / Refinery Road intersection under the Cumulative + Reduced Lanes (2040) Refinery Peak scenario assumes the following:

- The "road diet" concept is implemented, which involves removing one travel lane in each direction and providing dedicated left-turn lanes at major intersections, and center two-way left-turn lanes, truck climbing lanes, and wide striped medians at other locations.
- The analysis assumes a typical turnaround that occurs several times per year with 400 employees (the high end of the typical turnaround event).
- The analysis assumes that all employees drive to the refinery and park at parking lots accessed via Refinery Road.
- Arrival/departure rates: the analysis assumes 50% of the employees arrive during the AM and depart during PM "refinery" peak hour. This is a conservative assumption given the staggered shifts, which would likely further spread out the arrival and departure patterns of turnaround employees.
- Average vehicle occupancy: 1.2 persons per vehicle. This is the average Bay Area vehicle occupancy and reflects a modest amount of carpooling activity amongst employees.
- The number of additional peak direction vehicle trips (inbound AM or outbound PM) is 170 vehicle trips (400 employees * 1.2 persons per vehicle = 170 vehicle trips). In addition, 20 off-peak direction trips (approximately 10%) were also added into the analysis. These trips were added to the San Pablo Avenue / Refinery Road intersection and analyzed under 2040 conditions with the Refinery Peak. The volumes for the affected movements are presented below:

San Pablo Avenue / Refinery Road Turnaround Analysis - Traffic Volume Assumptions

			Added Trips		
Movement	**Existing**	**%**	**Peak**	**Off-peak**	**Adj Volumes**
NBL	13	6%	10	1	24
NBR	34	15%	25	3	62
SBL	144	63%	107	13	263
SBR	38	17%	28	3	70
	229	1	170	20	**419**

The additional vehicles associated with a 400 person turnaround would result in LOS C operations with 24.7 seconds of delay for the PM Refinery peak hour under the Cumulative + Reduced Lanes scenario. The Highway Capacity Manual (HCM) technical calculation sheet is attached. The turnaround trips do not negatively impact LOS and cause only a small increase in delay compared to the traffic analysis results presented in section 6.2 above. Without the additional turnaround trips, the intersection LOS at San Pablo Avenue / Refinery Road is LOS C with 21.5 seconds of delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	144	9	26	121	18	24	41	62	263	32	70
Future Volume (vph)	10	144	9	26	121	18	24	41	62	263	32	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.93			0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (prot)	1612	1681		1612	1663			1570			1595	
Flt Permitted	0.95	1.00		0.95	1.00			0.99			0.97	
Satd. Flow (perm)	1612	1681		1612	1663			1570			1595	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	157	10	28	132	20	26	45	67	286	35	76
RTOR Reduction (vph)	0	3	0	0	7	0	0	46	0	0	8	0
Lane Group Flow (vph)	11	164	0	28	145	0	0	92	0	0	389	0
Turn Type	Prot	NA		Prot	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		4	4		3	3	
Permitted Phases												
Actuated Green, G (s)	2.1	12.1		2.1	12.1			8.1			18.5	
Effective Green, g (s)	2.1	12.1		2.1	12.1			8.1			18.5	
Actuated g/C Ratio	0.04	0.21		0.04	0.21			0.14			0.31	
Clearance Time (s)	4.0	6.0		4.0	6.0			4.0			4.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	57	345		57	342			216			501	
v/s Ratio Prot	0.01	c0.10		c0.02	0.09			c0.06			c0.24	
v/s Ratio Perm												
v/c Ratio	0.19	0.47		0.49	0.42			0.43			0.78	
Uniform Delay, d1	27.5	20.6		27.8	20.3			23.2			18.3	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	1.7	1.4		6.5	1.2			1.9			7.8	
Delay (s)	29.2	22.0		34.3	21.5			25.1			26.1	
Level of Service	C	C		C	C			C			C	
Approach Delay (s)		22.4			23.5			25.1			26.1	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	58.8	Sum of lost time (s)	18.0
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group