SES Solar One

In Response to CEC and BLM Data Requests Set 1, Part 2: Data Requests 113-127

Application for Certification (08-AFC-13)

August 2009

Submitted to:
Bureau of Land Management
2601 Barstow Road
Barstow, CA 92311

Submitted to:
California Energy Commission
1516 9th Street, MS 15
Sacramento, CA 95814-5504

Submitted by:
SES Solar Three, LLC
SES Solar Six, LLC

Stirling Energy Systems
4800 N. Scottsdale Road, Suite 5500
Scottsdale, AZ 85251

Tessera Solar™
power from stirling energy systems

August 20, 2009

Mr. Christopher Meyer
CEC Project Manager
Attn: Docket No. 08-AFC-13
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512

Mr. Jim Stobaugh
BLM Project Manager
Attn: Docket No. 08-AFC-13
Bureau of Land Management
P.O. Box 12000
Reno, NV 89520

RE: SES Solar One Project
Applicant's Responses to CEC and BLM Data Requests 113-127

TECHNICAL AREA: TRAFFIC AND TRANSPORTATION

Data Request 116. Please provide Caltrans peak hour delay and Level of Service for the freeway road segments during the AM and PM peak hours for the eastbound and westbound directions on Interstate 40 for all studies scenarios. Also, please provide the associated back up data (i.e. peak hour volumes and analysis worksheets.)

Response: The following tables provide the Caltrans directional peak hour densities and Level of Service (LOS) for the freeway road segments during the AM and PM peak hours for the worst case peak directions on Interstate 40 for all studies scenarios. The 2000 Highway Capacity Manual Operational Methodology for Basic Freeway Segments calculates peak hour freeway segment LOS in terms of vehicle density expressed in passenger car per mile per lane (pc/mi/ln), not in peak hour stopped delay since freeway segments operate as limited access and uninterrupted flow facilities.

The attached calculations and Highway Capacity worksheets, provided behind this response as attachment TRAF-2, demonstrates the peak hour volume used in the analyses.

Table 1
Existing Roadway Level of Service

Roadway	Location	Classification	AM Peak Hour Directional Density	AM Peak Hour Peak Directional LOS	PM Peak Hour Directional Density	PM Peak Hour Peak Directional LOS
I-40	West of Hector Road	Freeway	9.3	A	10.6	A
I-40	East of Hector Road	Freeway	10.0	A	11.4	B

Table 2
Year 2011 No Project Roadway Level of Service

Roadway	Location	Classification	AM Peak Hour Directional Density	AM Peak Hour Peak Directional LOS	PM Peak Hour Directional Density	PM Peak Hour Peak Directional LOS
I-40	West of Hector Road	Freeway	10.0	A	11.5	B
I-40	East of Hector Road	Freeway	10.8	A	12.3	B

Table 3
Year 2011 Project Construction Roadway Level of Service

Roadway	Location	Classification	AM Peak Hour Directional Density	AM Peak Hour Peak Directional LOS	PM Peak Hour Directional Density	PM Peak Hour Peak Directional LOS
I-40	West of Hector Road	Freeway	10.0	A	16.8	B
I-40	East of Hector Road	Freeway	12.3	B	12.3	B

Table 4
Year 2014 No Project Roadway Level of Service

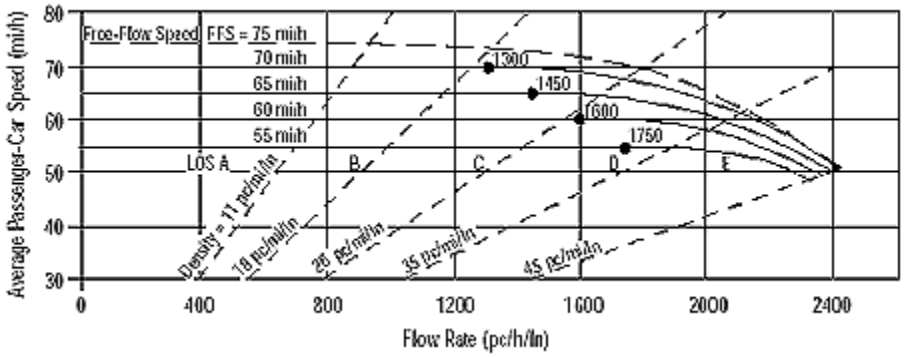
Roadway	Location	Classification	AM Peak Hour Directional Density	AM Peak Hour Peak Directional LOS	PM Peak Hour Directional Density	PM Peak Hour Peak Directional LOS
I-40	West of Hector Road	Freeway	10.7	A	12.2	B
I-40	East of Hector Road	Freeway	11.5	B	13.1	B

Table 5
Year 2014 Project Operation Roadway Level of Service

Roadway	Location	Classification	AM Peak Hour Directional Density	AM Peak Hour Peak Directional LOS	PM Peak Hour Directional Density	PM Peak Hour Peak Directional LOS
I-40	West of Hector Road	Freeway	10.8	A	13.2	B
I-40	East of Hector Road	Freeway	11.8	B	13.2	B

TRAF-2

BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	AM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	W/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2008

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1042 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	651	pc/h/ln
S	70.0	mi/h
D = v_p / S	9.3	pc/mi/ln
LOS	A	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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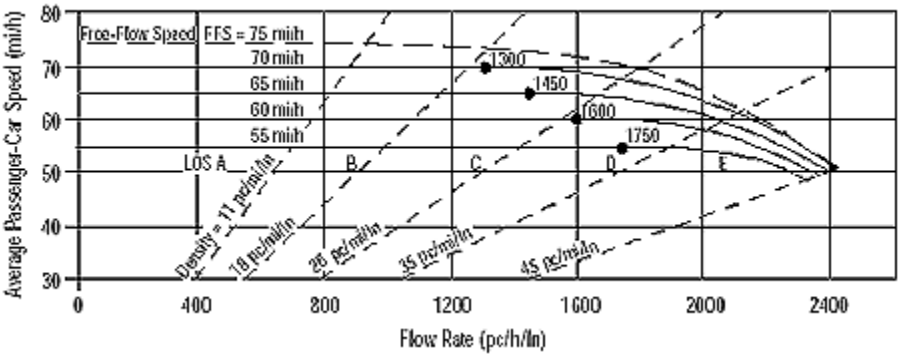
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	AM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	E/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2008

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1121 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	701	pc/h/ln
S	70.0	mi/h
D = v_p / S	10.0	pc/mi/ln
LOS	A	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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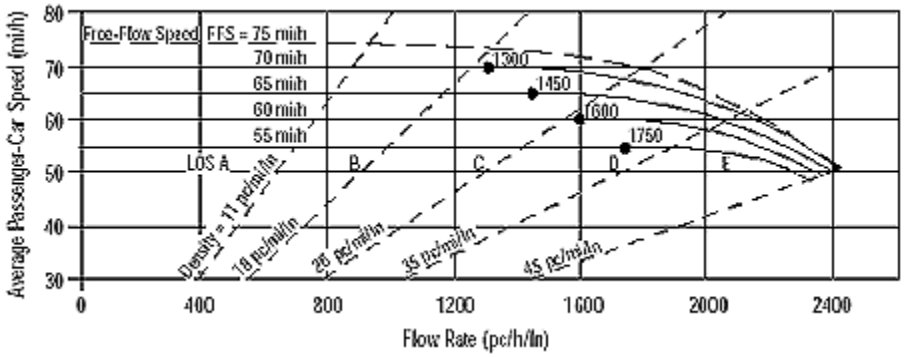
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	PM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	W/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2008

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1189 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	743	pc/h/ln
S	70.0	mi/h
D = v_p / S	10.6	pc/mi/ln
LOS	A	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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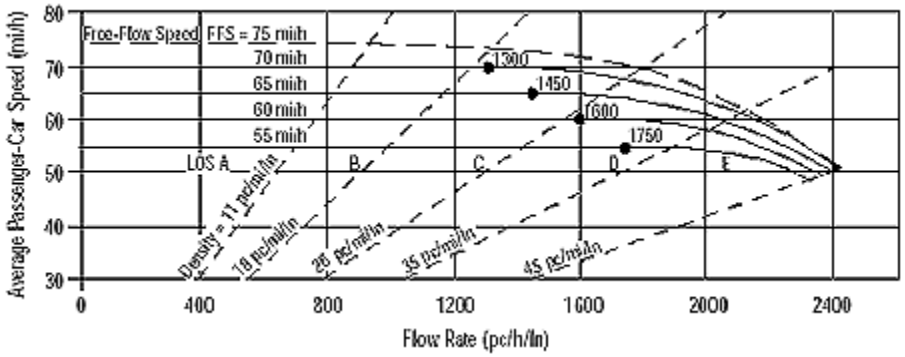

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	PM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	E/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2008

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1280 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	800	pc/h/ln
S	70.0	mi/h
D = v_p / S	11.4	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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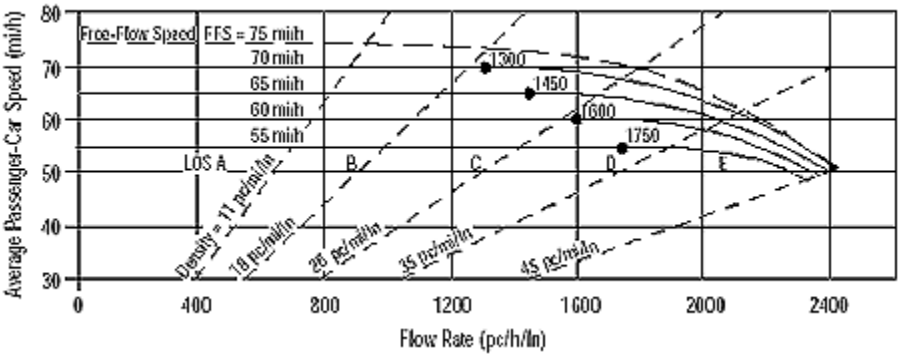
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	AM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	W/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2011

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1125 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	703	pc/h/ln
S	70.0	mi/h
D = v_p / S	10.0	pc/mi/ln
LOS	A	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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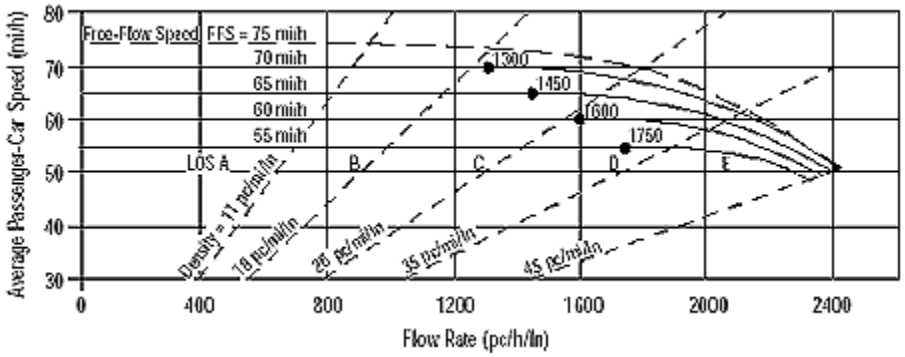
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	AM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	E/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2011

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1211 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	757	pc/h/ln
S	70.0	mi/h
D = v_p / S	10.8	pc/mi/ln
LOS	A	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
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f_N - Exhibit 23-6
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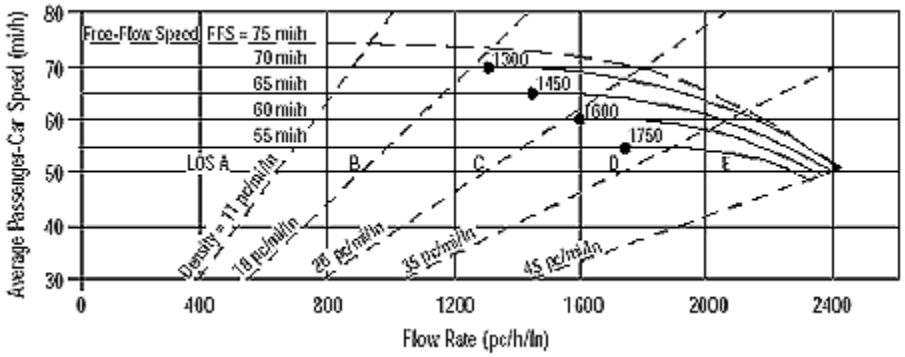
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	PM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	W/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2011

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1285 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	803	pc/h/ln
S	70.0	mi/h
D = v_p / S	11.5	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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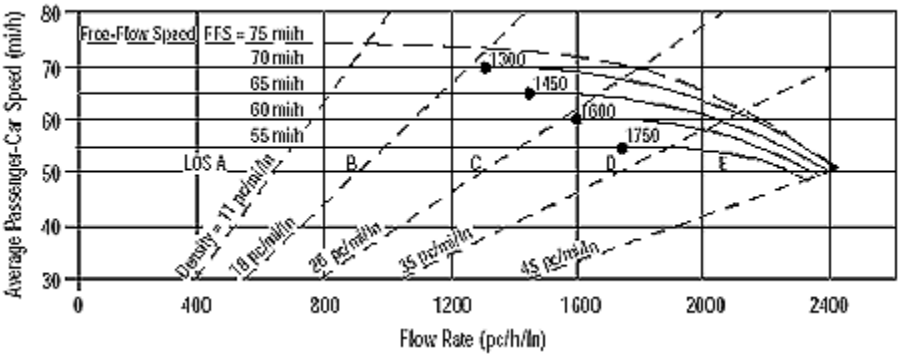
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	PM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	E/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2011

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1382 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	864	pc/h/ln
S	70.0	mi/h
D = v_p / S	12.3	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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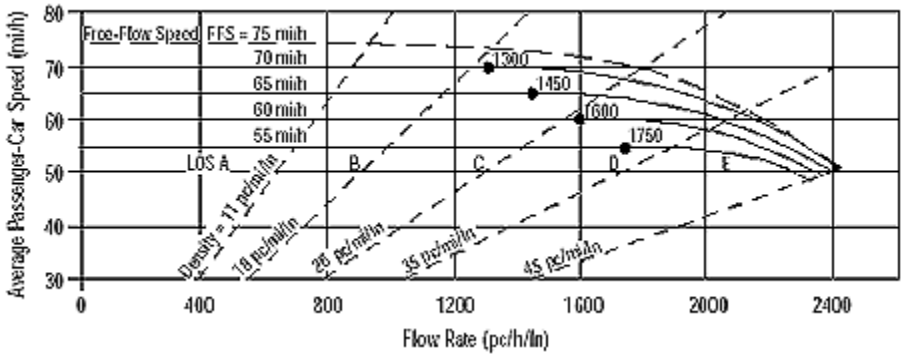
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	AM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	W/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2011 PLUS PROJECT

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1125 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	703	pc/h/ln
S	70.0	mi/h
D = v_p / S	10.0	pc/mi/ln
LOS	A	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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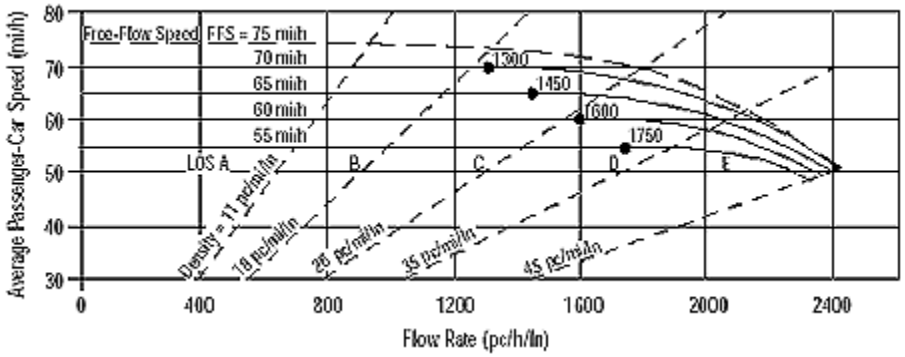

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	AM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	E/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2011 PLUS PROJECT

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1374 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	859	pc/h/ln
S	70.0	mi/h
D = v_p / S	12.3	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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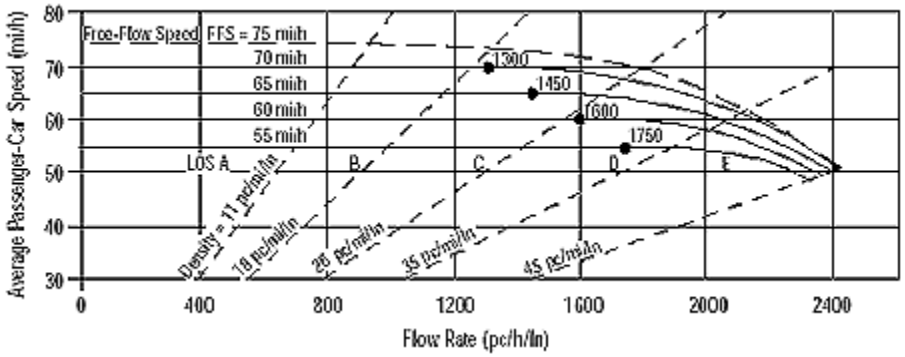

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	PM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	W/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2011 PLUS PROJECT

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1882 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1176	pc/h/ln
S	70.0	mi/h
D = v_p / S	16.8	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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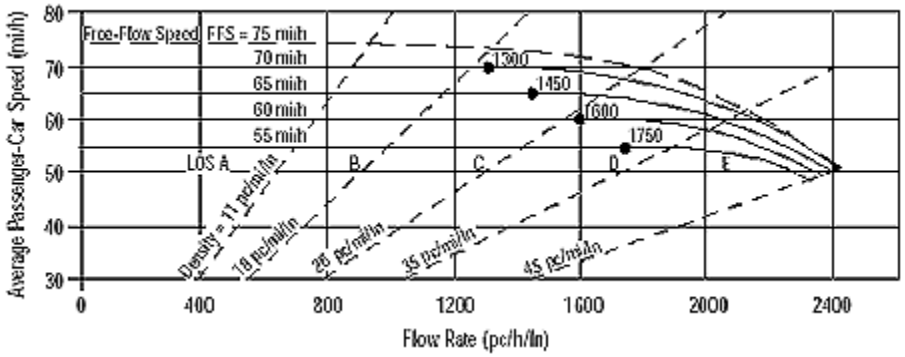

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	PM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	E/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2011 PLUS PROJECT

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1382 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	864	pc/h/ln
S	70.0	mi/h
D = v_p / S	12.3	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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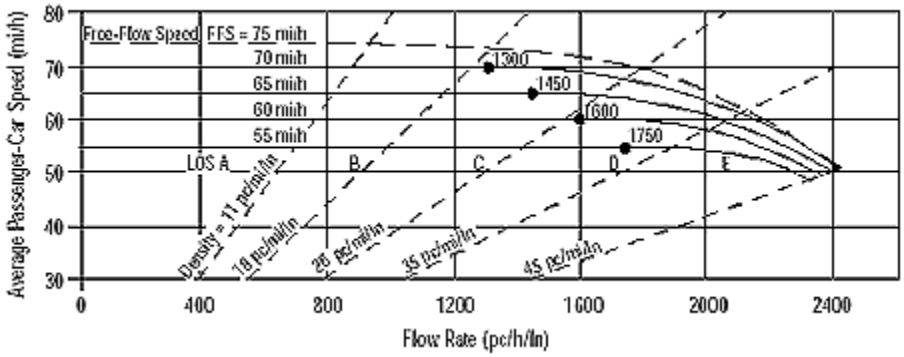

Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	AM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	W/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2014

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1198 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	749	pc/h/ln
S	70.0	mi/h
D = v_p / S	10.7	pc/mi/ln
LOS	A	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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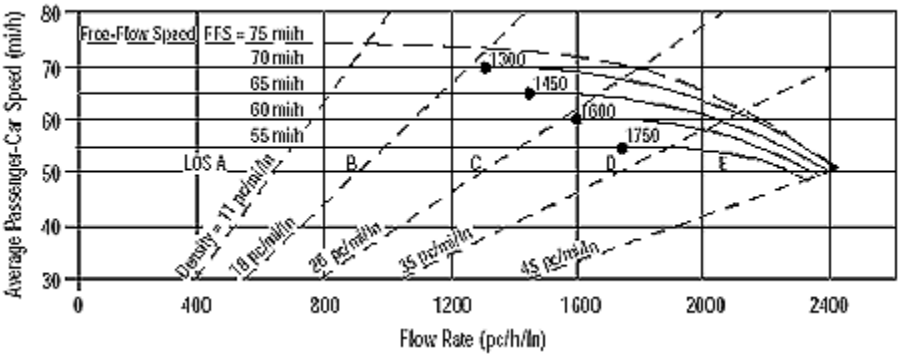
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	AM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	E/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2014

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1289 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	806	pc/h/ln
S	70.0	mi/h
D = v_p / S	11.5	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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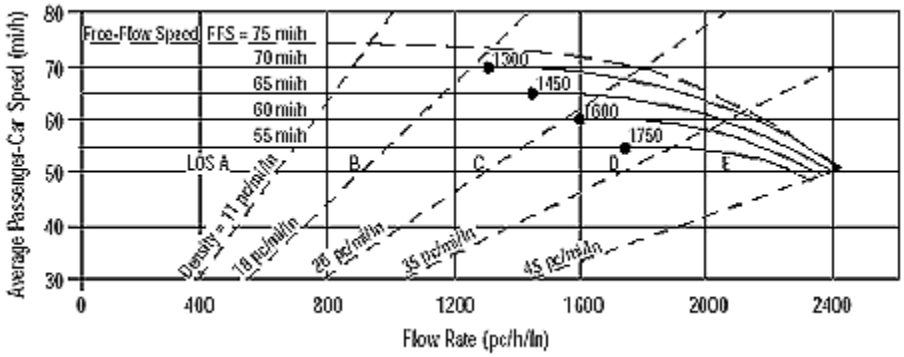
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	PM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	W/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2014

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1368 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	855	pc/h/ln
S	70.0	mi/h
D = v_p / S	12.2	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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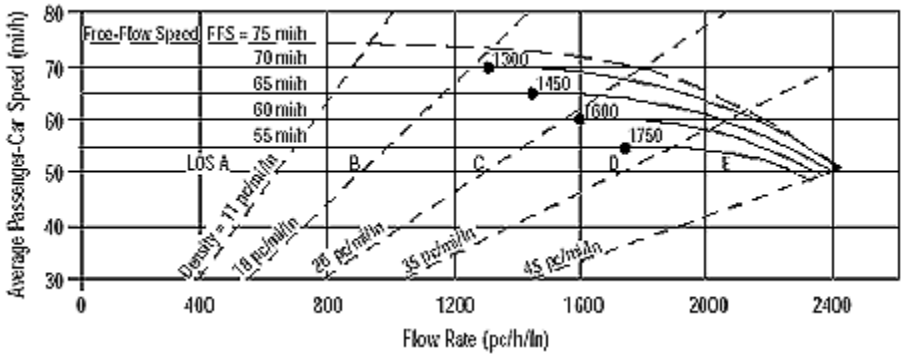
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	PM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	E/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2014

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1472 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	920	pc/h/ln
S	70.0	mi/h
D = v_p / S	13.1	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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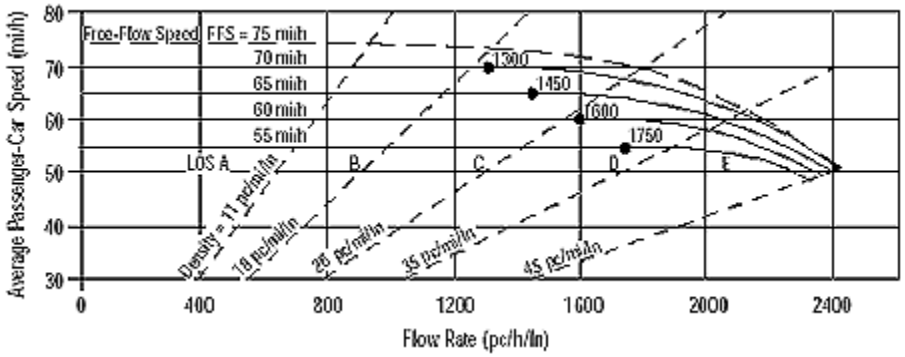
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	AM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	W/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2014 PLUS PROJECT

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1206 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	754	pc/h/ln
S	70.0	mi/h
D = v_p / S	10.8	pc/mi/ln
LOS	A	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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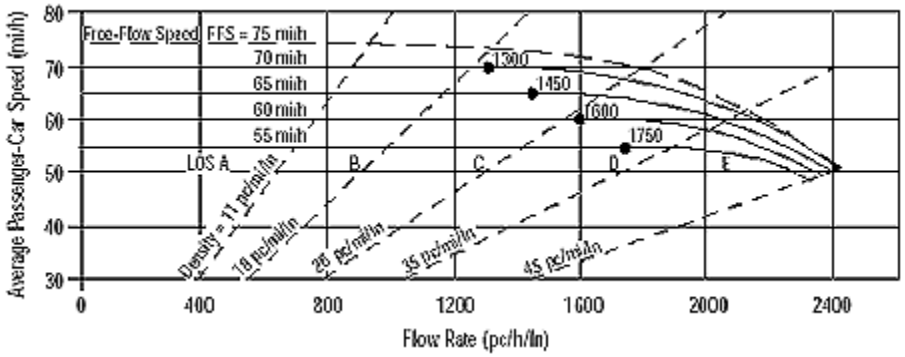
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	AM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	E/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2014 PLUS PROJECT

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1318 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	824	pc/h/ln
S	70.0	mi/h
D = v_p / S	11.8	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits23-8, 23-10
E_T - Exhibits 23-8, 23-10, 23-11
f_p - Page 23-12
LOS, S, FFS, v_p - Exhibits 23-2, 23-3
f_{LW} - Exhibit 23-4
f_{LC} - Exhibit 23-5
f_N - Exhibit 23-6
f_{ID} - Exhibit 23-7

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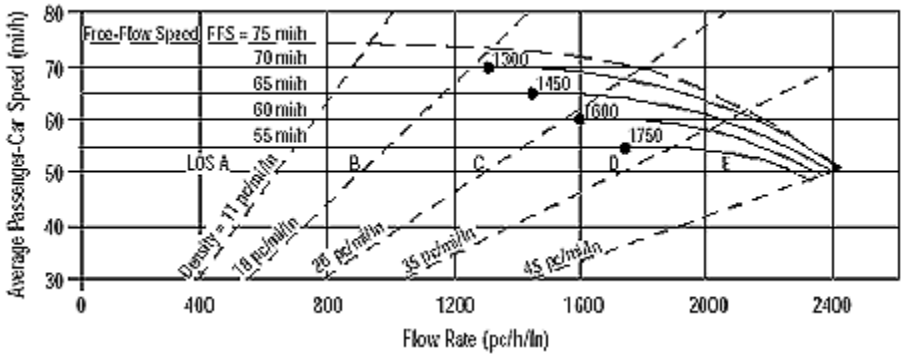
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	PM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	W/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2014 PLUS PROJECT

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1475 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	922	pc/h/ln
S	70.0	mi/h
D = v_p / S	13.2	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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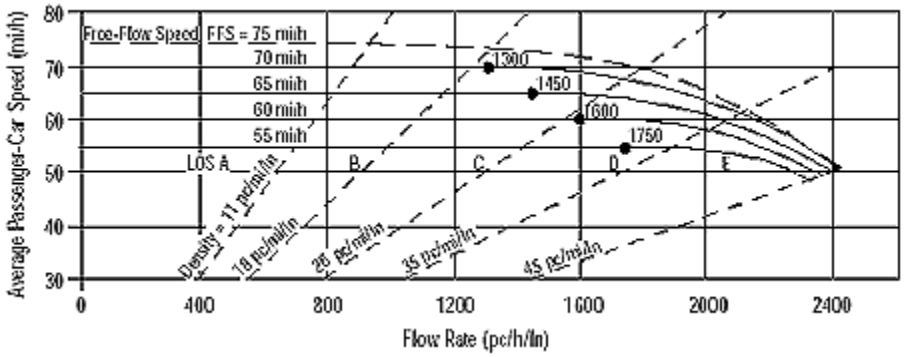
BASIC FREEWAY SEGMENTS WORKSHEET



Application	Input	Output
Operational (LOS)	FFS, N, v_p	LOS, S, D
Design (N)	FFS, LOS, v_p	N, S, D
Design (v_p)	FFS, LOS, N	v_p, S, D
Planning (LOS)	FFS, N, AADT	LOS, S, D
Planning (N)	FFS, LOS, AADT	N, S, D
Planning (v_p)	FFS, LOS, N	v_p, S, D

General Information

Analyst	NVC
Agency or Company	URS
Date Performed	8/10/2009
Analysis Time Period	PM

Site Information

Highway/Direction of Travel	I-10 WB
From/To	E/O HECTOR RD
Jurisdiction	SB COUNTY
Analysis Year	2014 PLUS PROJECT

Project Description SOLAR ONE

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	1473 veh/h	Peak-Hour Factor, PHF	0.90
AADT	veh/day	%Trucks and Buses, P_T	25
Peak-Hr Prop. of AADT, K		%RVs, P_R	0
Peak-Hr Direction Prop, D		General Terrain:	Level
DDHV = AADT x K x D	veh/h	Grade % Length	mi
Driver type adjustment	1.00	Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.889

Speed Inputs

Lane Width	12.0	ft
Rt-Shoulder Lat. Clearance	6.0	ft
Interchange Density	0.50	I/mi
Number of Lanes, N	2	
FFS (measured)	70.0	mi/h
Base free-flow Speed, BFFS		mi/h

Calc Speed Adj and FFS

f_{LW}		mi/h
f_{LC}		mi/h
f_{ID}		mi/h
f_N		mi/h
FFS	70.0	mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	921	pc/h/ln
S	70.0	mi/h
D = v_p / S	13.2	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h
S		mi/h
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits23-8, 23-10	f_{LW} - Exhibit 23-4
E_T - Exhibits 23-8, 23-10, 23-11	f_{LC} - Exhibit 23-5
f_p - Page 23-12	f_N - Exhibit 23-6
LOS, S, FFS, v_p - Exhibits 23-2, 23-3	f_{ID} - Exhibit 23-7

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TECHNICAL AREA: TRAFFIC AND TRANSPORTATION

Data Request 117. Please provide emergency access routes and geometrics (turning radii, load capacities, grades, etc.).

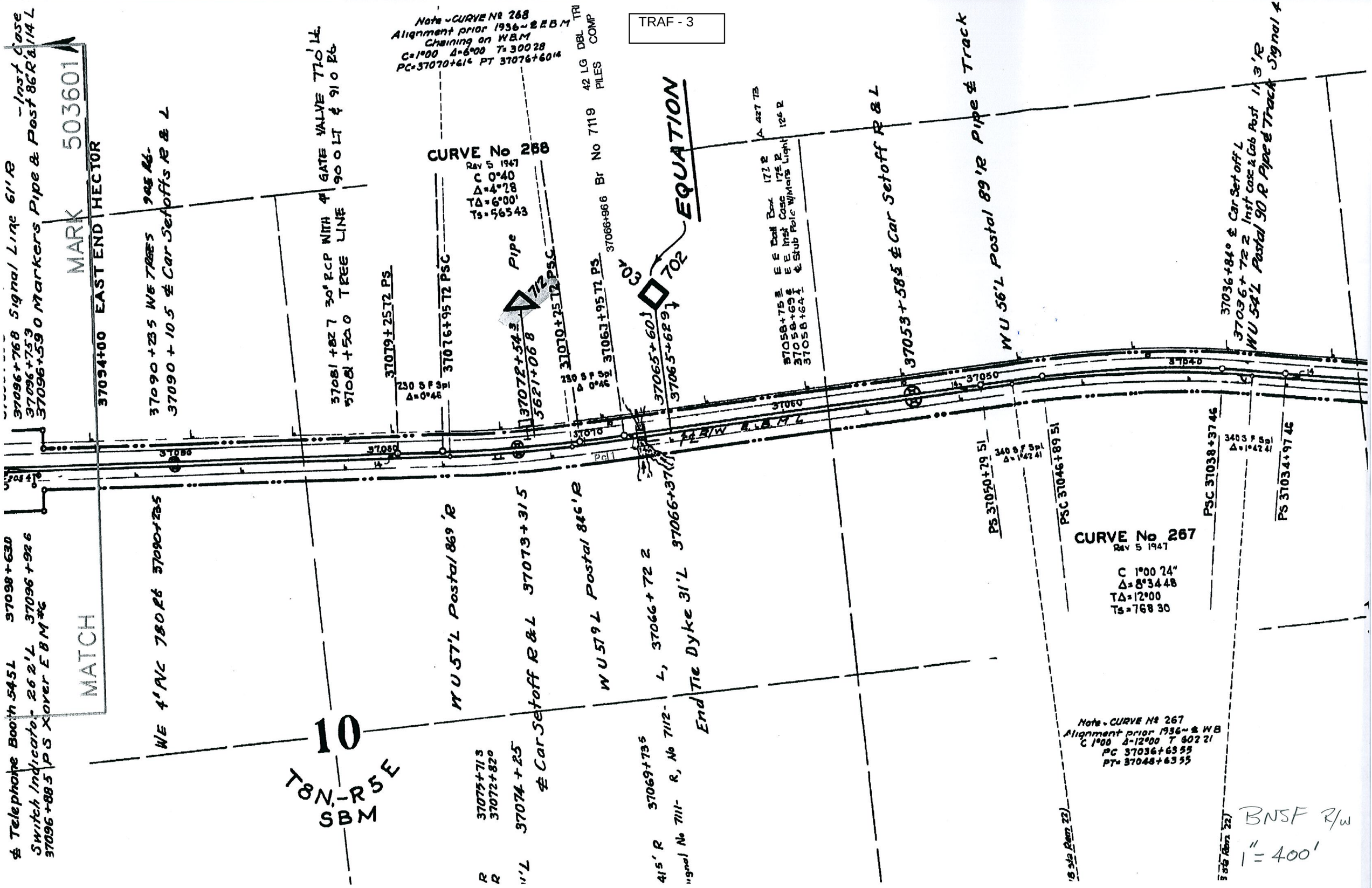
Response: The scaled plans are provided as attachment TRAF-1 located behind the response to Data Request 115.

TECHNICAL AREA: TRAFFIC AND TRANSPORTATION

Data Request 118. Please provide BNSF right-of-way (ROW) and setbacks requirements.

Response: BNSF currently has a 200 ft wide right-of-way adjacent to the SES Solar One Project as depicted in attachment TRAF-3, provided behind this response. BNSF does not have additional right-of-way or set-back requirements.

TRAF - 3


MARK 503601
MATCH
EAST END HECTOR
Note ~ CURVE Nº 268
Alignment prior 1936 ~ 2 E B M
Chaining on W B M
C = 1°00 Δ = 6°00 Ts = 30028
PC = 37070+61.6 PT 37076+60.14
CURVE No 268
Rev 5 1947
C 0°40
Δ = 4°28
TΔ = 6°00'
Ts = 56.43
EQUATION
CURVE No 267
Rev 5 1947
C 1°00 24"
Δ = 8°34 48
TΔ = 12°00
Ts = 768 30
Note ~ CURVE Nº 267
Alignment prior 1936 ~ 2 W B
C 1°00 Δ = 12°00 T 602 21
PC 37036+63 55
PT = 37048+63 55
T8N.-R5E
SBM
10
BNSF R/W
1" = 400'

TECHNICAL AREA: TRAFFIC AND TRANSPORTATION

Data Request 119. Please provide information pertaining to the California Public Utility Commission's requirements for crossing the BNSF ROW.

Response: The California Public Utilities Commission (CPUC) regulates and oversees all railroad grade crossing activities in California.

Public Utilities Code Sections 1201-1205 describes CPUC's jurisdictional authority over railroad crossings. In addition, the CPUC issues General Orders and has specific set of General Order rules applicable to railroad grade crossings. The following General Orders are applicable for rail crossing activities within BNSF ROW:

- General Order (GO 26-D) – Defines clearance requirements on railroads and street railroads as to side and overhead structures, parallel tracks and crossings.
- General Order (GO 75-B) – Construction & Maintenance – Defines the standard types of pavement construction at railroad grade crossings.
- General Order (GO 75-D) – Defines the regulations governing standards for warning devices for at-grade railroad crossings in the State of California.
- General Order (GO 88-B) – Establishes criteria for alteration at existing railroad grade crossings.
- General Order (GO 118) – Defines regulations governing the construction, reconstruction of walkways and control of vegetation adjacent to railroad tracks.
- General Order (GO 135) – Defines regulations on train operations blocking railroad grade crossings.
- General Order (GO 145) – Defines regulations governing railroad crossings to be classified exempt from the mandatory stop requirements of Section 22452 of the California Vehicle Code (CVC).

TECHNICAL AREA: VISUAL RESOURCES

Data Request 120. Please provide a detailed quantitative analysis of the project's potential to cause different levels of glare impact (hazard, disability, nuisance) to motorists, train passengers, pilots and on-site workers. The analysis should describe:

a. specific project measures and characteristics that address those types of impacts;

b. mirror material and its reflective characteristics adequate to analyze levels of diffuse reflection;

c. potential for on-site workers to be exposed to harmful glare from heliostats in non-operational (stowed and transitional) positions, and measures to avoid or mitigate such exposure if it exists.

Response: Please see the attached Glint and Glare report labeled as attachment VIS-1.

Glint and Glare Study

Since the SES Solar One Project (Solar One or Project) will be located in proximity to major roadways, there are often questions about whether there is any risk to motorists or spectators from glint shining outside the plant's boundary and if the sun's image can be reflected from the mirrors into oncoming cars or aircraft. Potential glint reflecting off the system is minimal but will be analyzed below.

The SunCatcher is a parabolic dish that tilts in elevation and rotates in azimuth to track the sun. It has the capability to rotate to almost any position. SunCatchers are covered with mirrors that concentrate light on a single point 22 ft from the dish surface. The SunCatcher is designed to efficiently capture and use the sunlight that is incident upon it. During operation, very little light reflected from the mirrors escapes the system.

A glint analysis needs to consider any combination of sun position, dish angle, and observer position. The analysis also needs to consider normal and abnormal operating conditions.

The SunCatcher is designed with its Power Conversion Unit (PCU) at the focal point of the parabolic dish (22 feet from the dish surface). During operation, by design, the image of the sun is reflected from the mirrors onto the PCU where it is absorbed. The sun light striking the dish mirrors is not reflected in any other direction. It is not possible to see the image of the sun reflected in the mirrors while it is generating power.

The mirror material consists of a silver reflector which has greater than 95% specular reflectors. The diffuse reflection from these mirrors is less than 3%.

Beyond the focal point, at the PCU the concentrated light quickly returns to ambient level at approximately 50 ft from the vertex of the parabolic dish. The reflected light at this point is no brighter than the sun light as it strikes the earth. This is illustrated in Figure One.

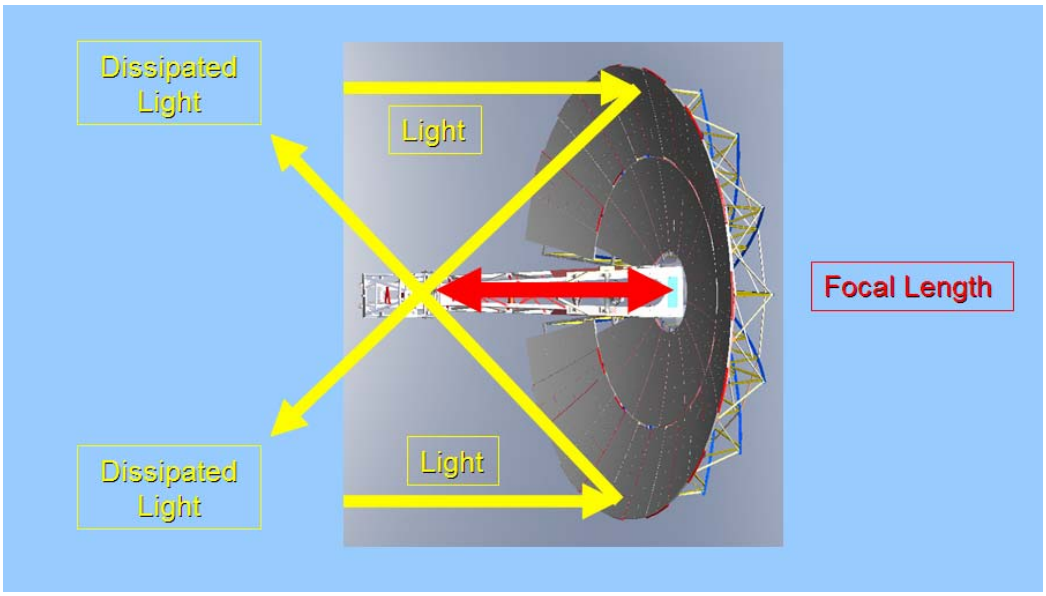


Figure One: Top view of the sunlight reflected during offset tracking

The boundary line of the Solar One plant is a minimum of 60 feet away from the nearest SunCatcher. At this distance, any glint will be dissipated to a fraction of the intensity of the sun. The shoulder of I-40 is at least 460 feet from the nearest dish.

The intensity of light at the plant boundary and nearest roadways was calculated using first the nominal focal length of the dish to describe the glint during offset tracking and second using a wind stow or slew case where the focal distance has grown to 100 ft. The results of these calculations are provided in the table below:

Distance from Dish (ft)	Irradiance of Reflected Light Assuming Nominal Focal Distance (kW/m^2)	Irradiance of Reflected Light Assuming a Worst case Focal Distance of 100 ft (kW/m^2)
Boundary of Plant (60 ft)	0.009	0.444
Nearest Shoulder of Roadway (460 ft)	0.004	0.147

For comparison, the sun on a bright day typically has an irradiance of 1.000 kW/m^2.
When a temporary cloud passes overhead, the SunCatcher enters an offset tracking mode. The SunCatcher repositions 10 degrees off sun while still tracking. This mode is designed to place the focus of the sun 10 degrees above the PCU in order to prevent the PCU from being damaged when the sunlight returns.

At night, the SunCatchers are stored facing North in the service position where it is tilted down at minus 22 degrees in elevation. This is also the position that the dish will be in when it is undergoing service during evening and night time hours. This position was selected because Barstow has a maximum solar declination of 23.17 degrees so that no matter the position of the sun, the mirrors will always shade themselves.

During windy periods of the day or night, the SunCatchers are stored in “Wind Stow” position with the dish pointing directly up. As the Sun moves across the sky, the light will be focused at approximately 100 ft. (maximum) from the vertex. At distances beyond this focal point, the concentrated light dissipates quickly. At twice the distance from the dish to the point where light focuses, the reflected light will be no brighter than the sun as it strikes the earth surface.

Occasionally, such as after maintenance work, a SunCatcher will need to move to a different position. Theoretically, the dish can be moved to any position, with the sun at any location, without causing a concentrated image of the sun to be reflected at a passerby outside the boundary fence.

The parabolic dish with the sun hitting it at an angle will focus the light in mid air close to the dish but not at the PCU. Similarly to the “Wind Stow” position, the light dissipates quickly the further away it is from the focus.

If an azimuth or elevation drive fails, the dish may be unable to move but the dish will still focus the light and the focus the light dissipates from the vertex approximately 100 ft. and within 200 ft. the concentration will return to a normal level.

It is not anticipated that during windy, transitional, service, or failure periods, on-site workers will be within 200 feet of the vertex and therefore, not be exposed to light more concentrated than ambient levels.

There is no hazard to passing airplanes. Glint from above has been compared to seeing the sun reflected in a lake.[1] Figure 2 below is a picture of the glint of a parabolic trough plant from a small airplane. The SunCatcher field will be similar though the glint will have a more circular appearance.

Figure Two: Image of a parabolic trough plant from a low flying airplane[1]

For the reasons discussed above, it is not anticipated that glint or glare from the Solar One Project will impact either off-site viewers or on-site workers. Additionally, it is not anticipated that nearby airplanes will be impacted by glint or glare from the Project.

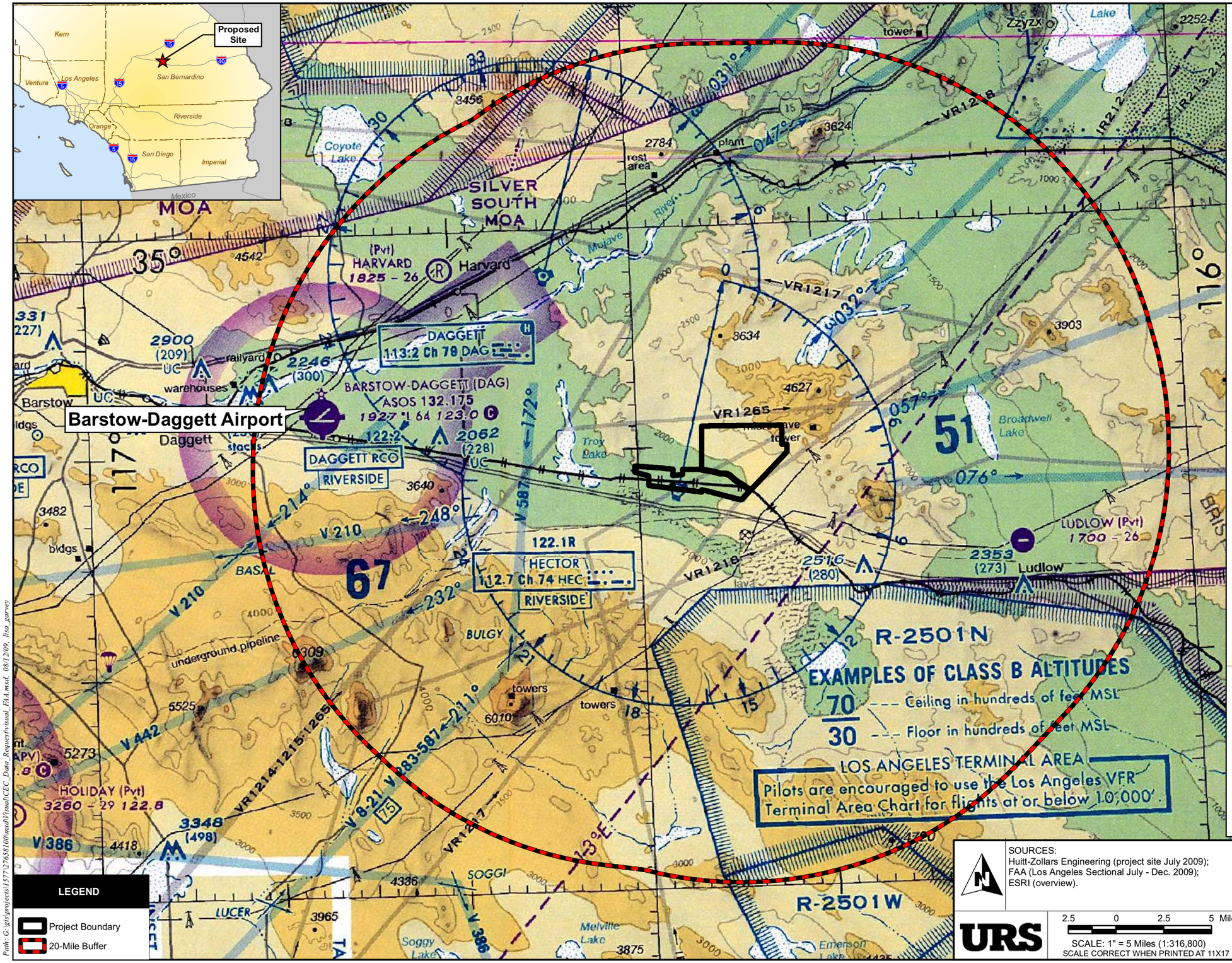
[1] Letter from Jeff K. Brown, California Department of Transportation, Division of Aeronautics, to Jim Adams, California Energy Commission December 11, 2007

TECHNICAL AREA: VISUAL RESOURCES

Data Request 121. Please provide a map of all flight paths within the area of the project's potential glare effects.

Response: Please see attachment VIS-2, provided behind this response, which depicts Daggett Airport and all flight paths for 20 miles surrounding the Project. While there are a couple flight paths that traverse the site, glare originating with the Project is not anticipated to result in impacts to aircraft. Currently there are two solar facilities near to the Barstow Daggett Airport; SEGS I & II, and Solar One Tower. According to Airport Operations Manager Brett Godown, there have been no complaints regarding the solar facilities causing glare issues. According to a letter written by the Department of Transportation, Division of Aeronautics to Jim Adams of the California Energy Commission, the Project will most likely look like a water feature from the sky.

The letter also states the following. "A study on glare effects from representative solar thermal power facilities was conducted by Department of Transportation, Division of Aeronautics. Overflights of Kramer Junction and Harper Lake solar facilities were conducted, both at low altitude and traffic pattern altitude, to simulate conditions approximate to those that might be found at Victorville2. At approach altitudes of 200 to 300 feet, we found no unusual turbulence or thermal plume rising from the surface of the solar array. The consistency of the surface at the two existing facilities and the turbulence directly above and downwind of the surfaces was roughly similar to overflight of a smooth water surface. We found the reflections to be somewhat sharper and cleaner than those compared at the same time over water; however, the flash and distraction level appeared to be the same by four observers, in two separate light aircraft" (Source: Letter from Department of Transportation Division of Aeronautics to Jim Adams of the California Energy Commission. December 11, 2007. 07-AFC-1.).



AIRPORT TRAFFIC SERVICE AND AIRSPACE INFORMATION

Only the controlled and reserved airspace effective below 18,000 ft. MSL are shown on this chart. All times are local.

- Class B Airspace
- Class C Airspace (Mode C - see FAR 91.215/AIM.)
- Class D Airspace
- [40] Ceiling of Class D Airspace in hundreds of feet (A minus ceiling value indicates surface up to but not including that value.)
- Class E (sfc) Airspace
- Class E Airspace with floor 700 ft. above surface
- Class E Airspace with floor 1200 ft. or greater above surface that abuts Class G Airspace
- 2400 MSL / 4500 MSL — Differentiates floors of Class E Airspace greater than 700 ft. above surface.

Class E Airspace exists at 1200' AGL unless otherwise designated as shown above.

Class E Airspace low altitude Federal Airways are indicated by center line. Intersection - Arrows are directed towards facilities which establish intersection.

132° → V 69

Total mileage between NAVAIDs on direct Airways: 169

Class E Airspace low altitude RNAV Routes are indicated by center line.

T 319 GRANT

RNAV waypoint and name

- Prohibited, Restricted, Warning and Alert Areas; Canadian Advisory and Restricted Areas
- MOA - Military Operations Area
- Special Airport Traffic Area (See FAR 93 for details.)
- ADIZ - Air Defense Identification Zone
- MODE C (See FAR 91.215/AIM.)
- National Security Area
- Terminal Radar Service Area (TRSA)

SOURCES:
Huitt-Zollars Engineering (project site July 2009);
FAA (Los Angeles Sectional July - Dec. 2009);
ESRI (overview).

MAP OF OVERFLIGHTS
SOLAR ONE PROJECT

URS

2.5 0 2.5 5 Miles
SCALE: 1" = 5 Miles (1:316,800)
SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: LG	DATE: 08-12-09	FIG. NO:
PM: WM	PROJ. NO: 27658189.40003	121

Path: G:\gis\projects\1577\27658100\mxd\Visual\CEC_Data_Requests\visual_FAA.mxd, 08/12/09, lisa_garvey

SOUTH

LOS ANGELES

NORTH

LEGEND

Airports having Control Towers are shown in Blue, all others in Magenta. Consult Airport/Facility Directory (A/FD) for details involving airport lighting, navigation aids, and services. For additional symbol information refer to the Chart User's Guide.

AIRPORTS

Other than hard-surfaced runways

Seaplane Base

Hard-surfaced runways 1500 ft. to 8069 ft. in length

Hard-surfaced runways greater than 8069 ft. or some multiple runways less than 8069 ft.

Open dot within hard-surfaced runway configuration indicates approximate VOR, VOR-DME, or VORTAC location.

All recognizable hard-surfaced runways, including those closed, are shown for visual identification. Airports may be public or private.

ADDITIONAL AIRPORT INFORMATION

Private "(Pvt)" - Non-public use having emergency or landmark value

Military - Other than hard-surfaced; all military airports are identified by abbreviations AFB, NAS, AAF, etc. DoD users, for complete airport information consult DoD FLIP.

Heliport Selected

Unverified

Abandoned - paved having landmark value, 3000 ft. or greater

Ultralight Flight Park Selected

Services - fuel available and field tended during normal working hours depicted by use of ticks around basic airport symbol. (Normal working hours are Mon thru Fri 10:00 A.M. to 4:00 P.M. local time.) Consult A/FD for service availability at airports with hard-surfaced runways greater than 8069 ft.

★ Rotating airport beacon in operation Sunset to Sunrise

AIRPORT DATA

Box indicates FAR 93 Special Air Traffic Rules & Airport Traffic Patterns.

FSS — FAR 91

NO SVFR — Location Identifier

NAME (NAM) (PNAM) — ICAO

Runways with Right Traffic Patterns (public use) — CT - 118.3 ★ Ⓒ ATIS 123.8 — Location Indicator shown outside contiguous U.S.

285 L 72 122.95

RP 23, 34

RP ★ Special conditions exist - see A/FD.

VFR Advsy 125.0 — UNICOM

AOE — Airport of Entry

FSS - Flight Service Station

NO SVFR - Fixed-wing special VFR flight is prohibited.

CT - 118.3 - Control Tower (CT) - primary frequency

★ - Star indicates operation part-time. See tower frequencies tabulation for hours of operation.

Ⓒ - Common Traffic Advisory Frequencies (CTAF)

ATIS 123.8 - Automatic Terminal Information Service

ASOS/AWOS 135.42 - Automated Surface Weather Observing Systems (shown where full-time ATIS not available). Some ASOS/AWOS facilities may not be located at airports.

UNICOM - Aeronautical advisory station

VFR Advsy - VFR Advisory Service shown where full-time ATIS not available and frequency is other than primary CT frequency.

285 - Elevation in feet

L - Lighting in operation Sunset to Sunrise

*L - Lighting limitations exist; refer to Airport/Facility Directory.

72 - Length of longest runway in hundreds of feet; usable length may be less.

When information is lacking, the respective character is replaced by a dash. Lighting codes refer to runway edge lights and may not represent the longest runway or full length lighting.

AIRPORT TRAFFIC SERVICE AND AIRSPACE INFORMATION

Only the controlled and reserved airspace effective below 18,000 ft. MSL are shown on this chart. All times are local.

Class B Airspace

Class C Airspace (Mode C - see FAR 91.215/AIM.)

Class D Airspace

40 — Ceiling of Class D Airspace in hundreds of feet (A minus ceiling value indicates surface up to but not including that value.)

Class E (sfc) Airspace

Class E Airspace with floor 700 ft. above surface

Class E Airspace with floor 1200 ft. or greater above surface that abuts Class G Airspace

2400 MSL / 4500 MSL — Differentiates floors of Class E Airspace greater than 700 ft. above surface.

Class E Airspace exists at 1200' AGL unless otherwise designated as shown above.

Class E Airspace low altitude Federal Airways are indicated by center line. Intersection - Arrows are directed towards facilities which establish intersection.

132° V 69

Total mileage between NAVAIDs on direct Airways — 169

Class E Airspace low altitude RNAV Routes are indicated by center line.

GRANT T 319

RNAV waypoint and name

Prohibited, Restricted, Warning and Alert Areas; Canadian Advisory and Restricted Areas

MOA - Military Operations Area

Special Airport Traffic Area (See FAR 93 for details.)

ADIZ - Air Defense Identification Zone

MODE C (See FAR 91.215/AIM.)

National Security Area

Terminal Radar Service Area (TRSA)

IR211 — MTR - Military Training Route

COMMUNICATION BOXES

122.1R 122.6 123.6 — OAKDALE Ⓣ — 362★ ~~118.8~~ OAK

Underline indicates no voice on frequency.

- Crosshatch indicates Shutdown status.

★ - Operates less than continuous or On-Request.

Ⓐ - ASOS/AWOS

Ⓗ - HIWAS

Ⓣ - TWEB

122.1R — MIAMI — FSS radio providing voice communication

122.1R — CHICAGO CHI

Heavy line box indicates Flight Service Station (FSS). Frequencies 121.5, 122.2, 243.0 and 255.4 (Canada - 121.5, 126.7 and 243.0) are available at many FSSs and are not shown above boxes. All other frequencies are shown.

Certain FSSs provide Airport Advisory Service, see A/FD.

R - Receive only

Frequencies above thin line box are remoted to NAVAID site. Other FSS frequencies providing voice communication may be available as determined by altitude and terrain. Consult Airport/Facility Directory for complete information.

RADIO AIDS TO NAVIGATION

VHF OMNI RANGE (VOR)

VORTAC

VOR-DME

Other facilities, i.e., FSS Outlet, RCO, etc.

Non-Directional Radiobeacon (NDB)

NDB - DME

OBSTRUCTIONS

1000 ft. and higher AGL

below 1000 ft. AGL

Group Obstruction

Obstruction with high-intensity lights; may operate part-time.

2049 — Elevation of the top above mean sea level

(1149) — Height above ground

UC — Under construction or reported: position and elevation unverified

NOTICE: Guy wires may extend outward from structures.

MISCELLANEOUS

1°E — Isogonic Line (2005 VALUE)

Ultralight Activity

Hang Glider Activity

Glider Operations

Parachute Jumping Area (See Airport/Facility Directory.)

VPXYZ — VFR Waypoints (See Airport/Facility Directory for latitude/longitude.)

NAME (VPXYZ)

Fl ★ Flashing Light

Marine Light

TOPOGRAPHIC INFORMATION

Roads & Road Markers

Railroad

Power Transmission Line

Aerial Cable

Landmark Feature - stadium, factory, school, golf course, etc.

Outdoor Theater

Lookout Tower 618 (Elevation Base of Tower)

CG Coast Guard Station

Race Track

Tank - water, oil or gas

Oil Well — Water Well

Mine or Quarry

Mountain Pass

11823 (Elevation of Pass)

(Pass symbol does not indicate a recommended route or direction of flight and pass elevation does not indicate a recommended clearance altitude. Hazardous flight conditions may exist within and near mountain passes.)

Perennial Lake — Dams — Pier — Rocks — Non-Perennial Lake — Bridges and Viaducts

SOURCE:
FAA (Los Angeles Sectional July - Dec. 2009).

LEGEND
MAP OF OVERFLIGHTS
SOLAR ONE PROJECT

URS

NO SCALE

CREATED BY: LG	DATE: 08-12-09	FIG. NO:
PM: WM	PROJ. NO: 27658189.40003	121A

Path: G:\gis\projects\1577\27658100\mxd\Visual\CEC_Data_Request\visual_FAA_legend.mxd, 08/12/09, lisa_garvey

TECHNICAL AREA: VISUAL RESOURCES

Data Request 122. According to the AFC (Glint and Glare, page 5.13-32) the heliostats do not track the sun from east to west, but only by seasonal solar altitude. Please confirm and clarify these statements. Please provide the lowest and highest anticipated annual solar altitude positions of the heliostats.

Response: The SunCatcher tracks the sun from east to west and automatically adjust the vertical angle based upon the sun's altitude during seasonal changes.

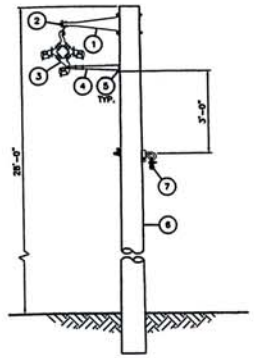
The SunCatcher in wind-stow position (boom up) has a maximum height of 39'7". When perpendicular (boom parallel to the ground) has a height of 38'4".

TECHNICAL AREA: VISUAL RESOURCES

Data Request 123. According to the AFC (Section 3.4.5.2) overhead power lines will collect and transmit power from the heliostat groups to the substation. Please illustrate the numbers and typical spacing of those power lines in plan detail, and provide a dimensional elevation of the proposed collection lines.

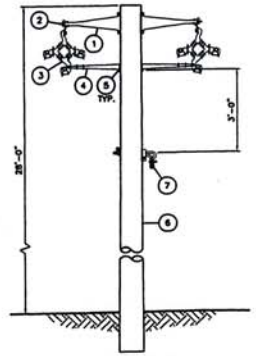
Response: Typical pole spacing for the SES Collection System is between 50 feet to 75 feet and will be dependent upon the final SunCatcher field design. Please see the attached drawings for the SES collection lines depicted in attachment VIS-3, provided behind this response.

VIS - 3



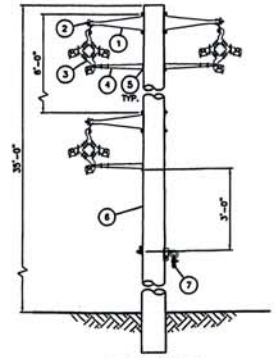
SINGLE CIRCUIT

BILL OF MATERIALS				
ITEM	QTY	STOCK#	DESCRIPTION	MANUFACTURER
1	1		TANGENT MESSENGER BRACKET	
2	1		MESSENGER CLAMP	
3	1		SPACER BRACKET	
4	1		ANTI-SWAY BRACKET	
5	3		⅝" BOLTS	
6	1		ENGINEERED POLE	
7	1		FIBER ATTACHMENT ASS'Y.	



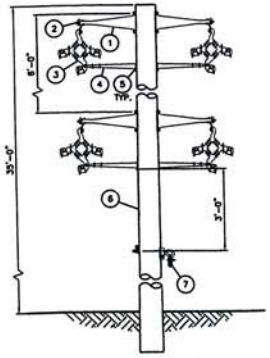
DOUBLE CIRCUIT

BILL OF MATERIALS				
ITEM	QTY	STOCK#	DESCRIPTION	MANUFACTURER
1	2		TANGENT MESSENGER BRACKET	
2	2		MESSENGER CLAMP	
3	2		SPACER BRACKET	
4	2		ANTI-SWAY BRACKET	
5	3		⅝" BOLTS	
6	1		ENGINEERED POLE	
7	1		FIBER ATTACHMENT ASS'Y.	



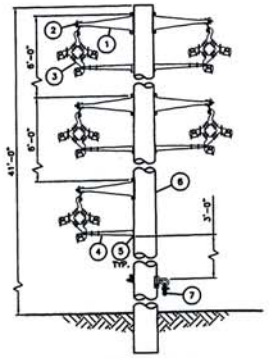
TRIPLE CIRCUIT

BILL OF MATERIALS				
ITEM	QTY	STOCK#	DESCRIPTION	MANUFACTURER
1	3		TANGENT MESSENGER BRACKET	
2	3		MESSENGER CLAMP	
3	3		SPACER BRACKET	
4	3		ANTI-SWAY BRACKET	
5	6		⅝" BOLTS	
6	1		ENGINEERED POLE	
7	1		FIBER ATTACHMENT ASS'Y.	



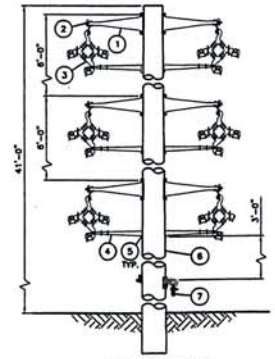
QUADRUPLE CIRCUIT

BILL OF MATERIALS				
ITEM	QTY	STOCK#	DESCRIPTION	MANUFACTURER
1	4		TANGENT MESSENGER BRACKET	
2	4		MESSENGER CLAMP	
3	4		SPACER BRACKET	
4	4		ANTI-SWAY BRACKET	
5	6		⅝" BOLTS	
6	1		ENGINEERED POLE	
7	1		FIBER ATTACHMENT ASS'Y.	



PENTUPLE CIRCUIT

BILL OF MATERIALS				
ITEM	QTY	STOCK#	DESCRIPTION	MANUFACTURER
1	5		TANGENT MESSENGER BRACKET	
2	5		MESSENGER CLAMP	
3	5		SPACER BRACKET	
4	5		ANTI-SWAY BRACKET	
5	9		⅝" BOLTS	
6	1		ENGINEERED POLE	
7	1		FIBER ATTACHMENT ASS'Y.	



HEXTUPLE CIRCUIT

BILL OF MATERIALS				
ITEM	QTY	STOCK#	DESCRIPTION	MANUFACTURER
1	6		TANGENT MESSENGER BRACKET	
2	6		MESSENGER CLAMP	
3	6		SPACER BRACKET	
4	6		ANTI-SWAY BRACKET	
5	9		⅝" BOLTS	
6	1		ENGINEERED POLE	
7	1		FIBER ATTACHMENT ASS'Y.	

REFERENCE ONLY

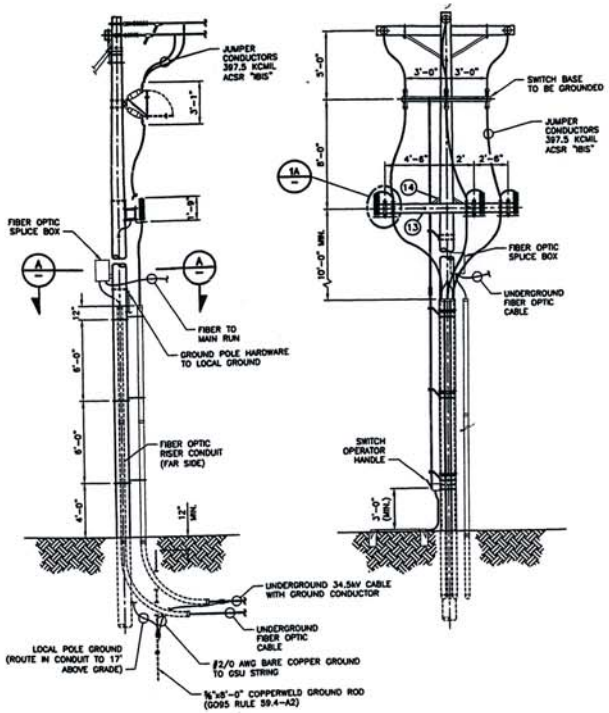
NO.	DATE		BY	APP.
A	3/17/09	ISSUED FOR BID	GL	

STANTEC CONSULTING INC.
9400 S.W. BARNES ROAD
STE. 200
PORTLAND, OREGON, 97225
503.297.1631
STANTEC.COM

SES Stirling Energy Systems

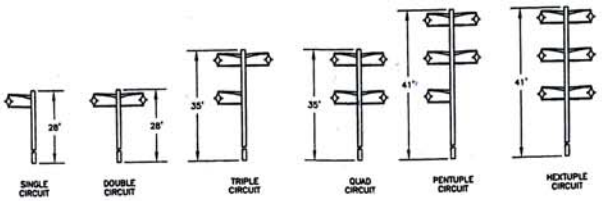
DRN.	CHK.	DATE	PROJECT.	CAD FILE:	SHEET SIZE:	DWG	SHT	REV
SDB	DEF	11/18/08	2000029801	S2-E0542-001RL.dwg	Arch D (24x36)	S2-E-0542	1 of 1	A

SCALE NONE | APP. PNH | DATE



34.5KV RISER ASSEMBLY

SCALE: 3/4"=1'-0"



TYPICAL SPACER CABLE STRUCTURE TYPES AND ESTIMATED HEIGHTS

(SEE DRAWING S2-E-0542)

NOT TO SCALE

REFERENCE ONLY

NO.	DATE		BY	APP.
A	3/17/09	ISSUED FOR BID		

STANTEC CONSULTING INC.
9400 S.W. BARNES ROAD
STE. 200
PORTLAND, OREGON, 97225
503.297.1631
STANTEC.COM

SES Stirling Energy Systems

DRN. SDB	DES. DEF	CHK. DEF	DATE 11/18/08	PROJECT: 2000026801	CAD FILE: S2-E0544-001RE.dwg	SHEET SIZE: Arch D (24x36)	DWG S2-E-0544	SHT. 1 of 1	REV. A
SCALE AS NOTED		APP. PNH	DATE						

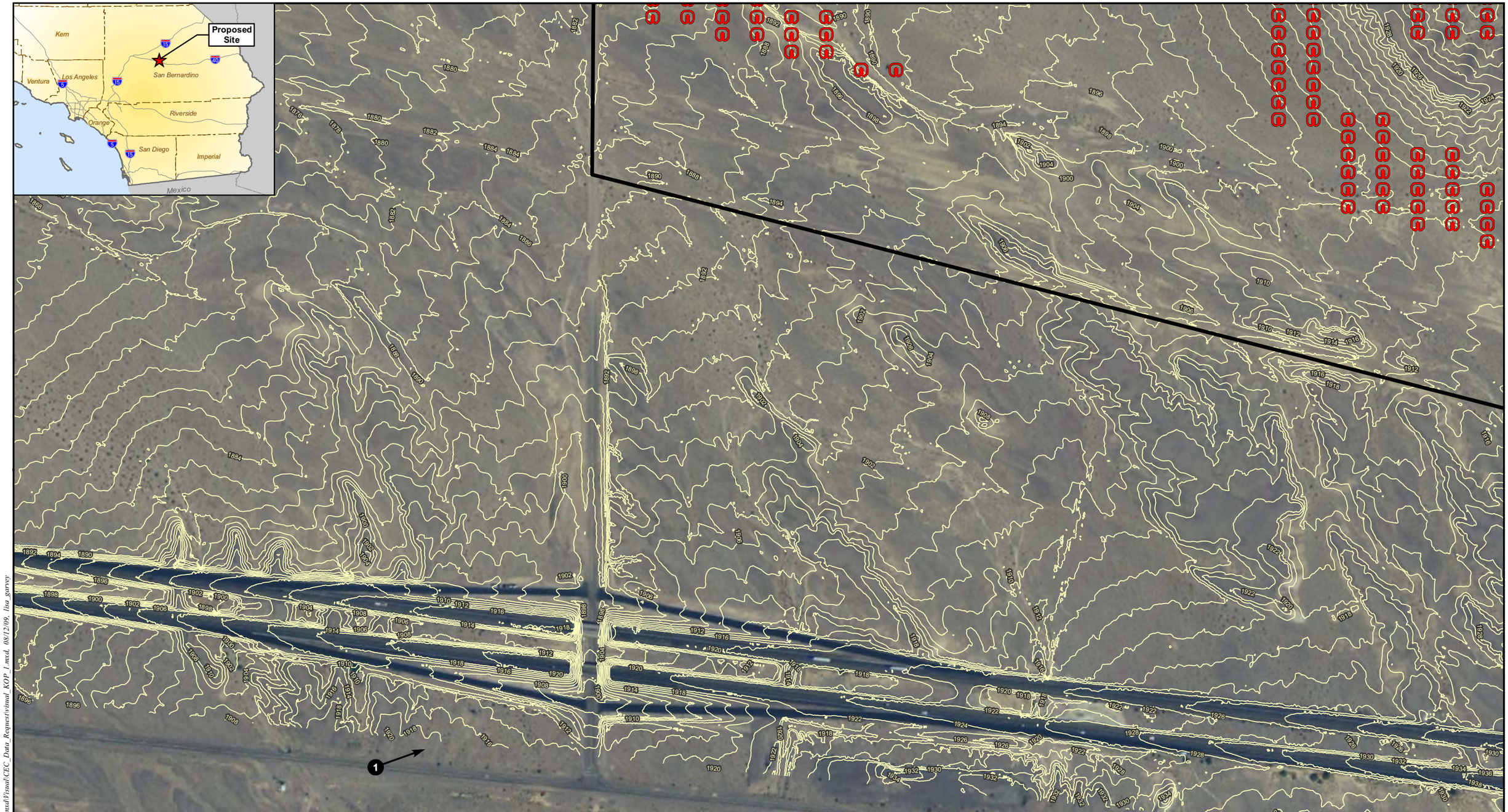
RELEASED FOR CONSTRUCTION

TECHNICAL AREA: VISUAL RESOURCES

Data Request 124. Please provide a close-up plan of the camera location of Figure 5.13-11 showing assumed topography and source, along with horizontal angle of view of the photo. Please also describe, preferably in plan, the plant layout setback assumptions being depicted. Finally, please check simulation model camera matching and adjust image if appropriate.

Response: Please see attachment VIS-4 behind this response, which depicts assumed topography and source, plant layout setback assumptions and camera angle. The camera's horizontal angle is parallel to the ground. As can be seen in VIS-4, the Project boundary is setback 655 feet from the KOP 1 on Route 66 and the nearest SunCatcher is approximately 2,550 feet from KOP 1. Due to the elevated Highway, and the setback, the Project features may appear inaccurate. However, the model is to scale based upon GPS coordinates, CAD input files of SunCatcher location and design, and assumed topography, and as such, the simulation provides a representative view from that location.

VIS-4



LEGEND

- Key Observation Point (KOP)
- Suncatcher
- Project Boundary
- Contours (in feet)

SOURCES:
Huitt-Zollars Engineering (project site July 2009);
Nolte (contours 2008); ESRI (overview);
USDA (NAIP aerial 2005).

ORIENTATION AND TOPOGRAPHY AT KOP 1 SOLAR ONE PROJECT

URS

150 0 150 300 Feet
SCALE: 1" = 300' (1:3600)
SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: LG	DATE: 08-12-09	FIG. NO:
PM: WM	PROJ. NO: 27658189.40003	124A

Path: G:\gis\projects\1577\27658189\mxd\Visual\CEC_Data_Request\visual_KOP_1.mxd, 08/12/09, lisa_garvey

TECHNICAL AREA: VISUAL RESOURCES

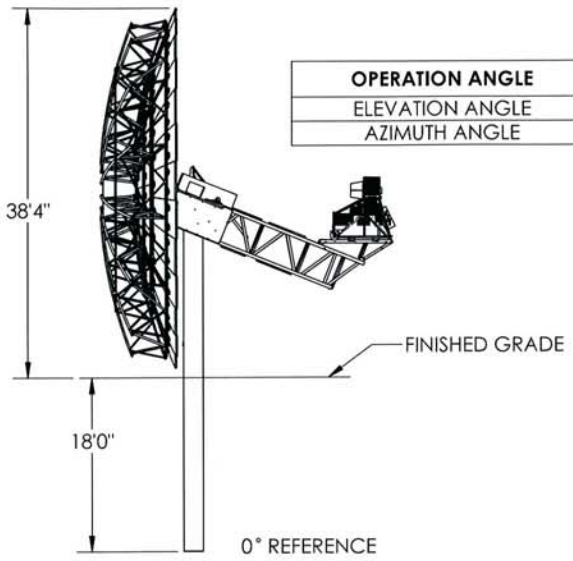
Data Request 125. Please provide a scaled elevation drawing of a heliostat unit in front and side view with support structure, along with a description of minimum and maximum anticipated annual solar altitude.

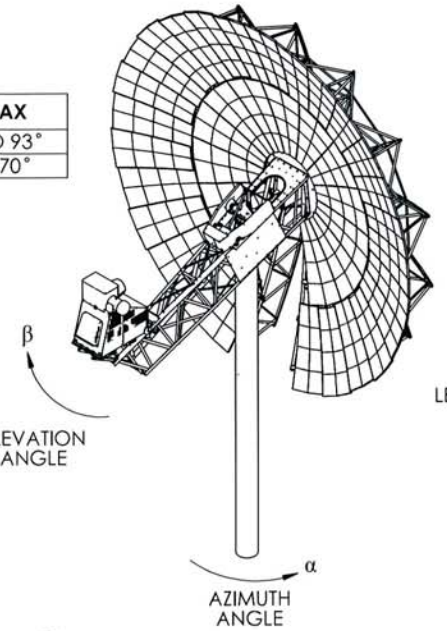
Response: The scaled elevation drawing of the SunCatcher is provided as Attachment VIS-5. The SunCatcher in wind-stow position (boom up) has a maximum height of 39'7". When perpendicular (boom parallel to the ground) has a height of 38'4".

VIS - 5

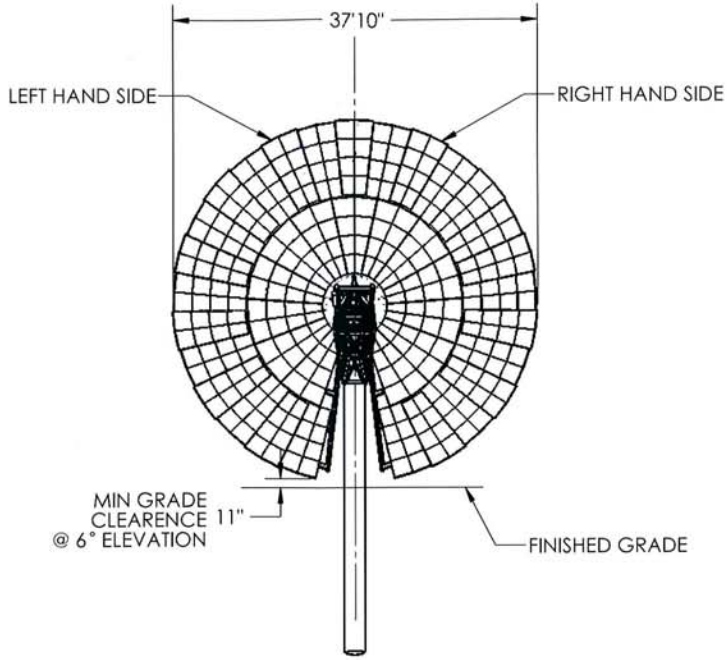
REVISIONS				
REV.	ECN	DESCRIPTION	DATE	APPROVED

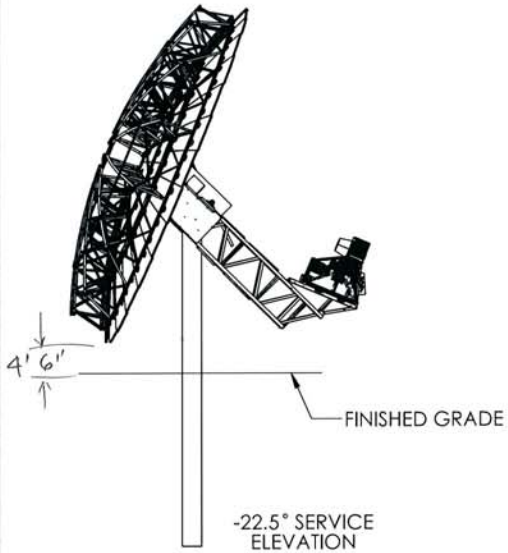
OPERATION ANGLE	MIN-MAX
ELEVATION ANGLE	-22.5° TO 93°
AZIMUTH ANGLE	0° TO 270°

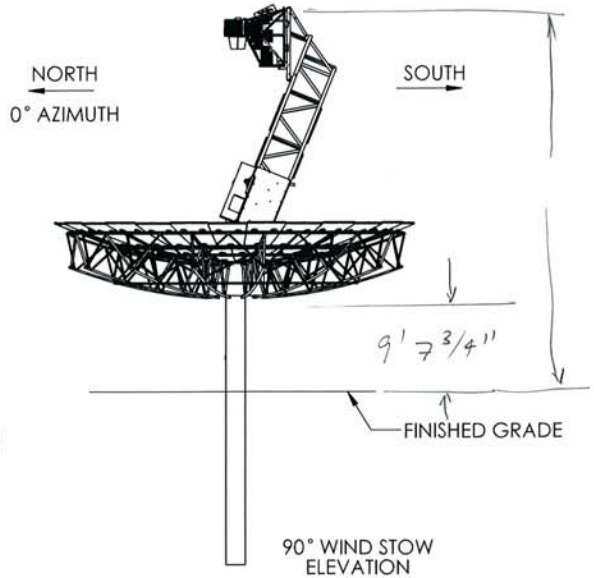




WIND SPEED (MPH)	ELEVATION ANGLE	ON SUN OPERATION
0 - 35	ALL	YES
35 - 50	ALL	NO
50 - 90	90°	NO







UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: ANGLE: ± .5 .X = ± 0.1 .XX = ± 0.01 .XXX = ± 0.005	DRAWN	E. LOVE	5-19-09
	CHECKED		
	APPROVED		
ALL FRACTION TOLERANCES ±1/16"			
INTERPRET PER: ASME Y14.5			
MATERIAL -			
FINISH -			
DO NOT SCALE DRAWING			

SES

TITLE: SPECIFICATION, SUNCATCHER DESIGN

P/N:

REV 01

APPLICATION: SUN CATCHER GEN 1

SIZE B

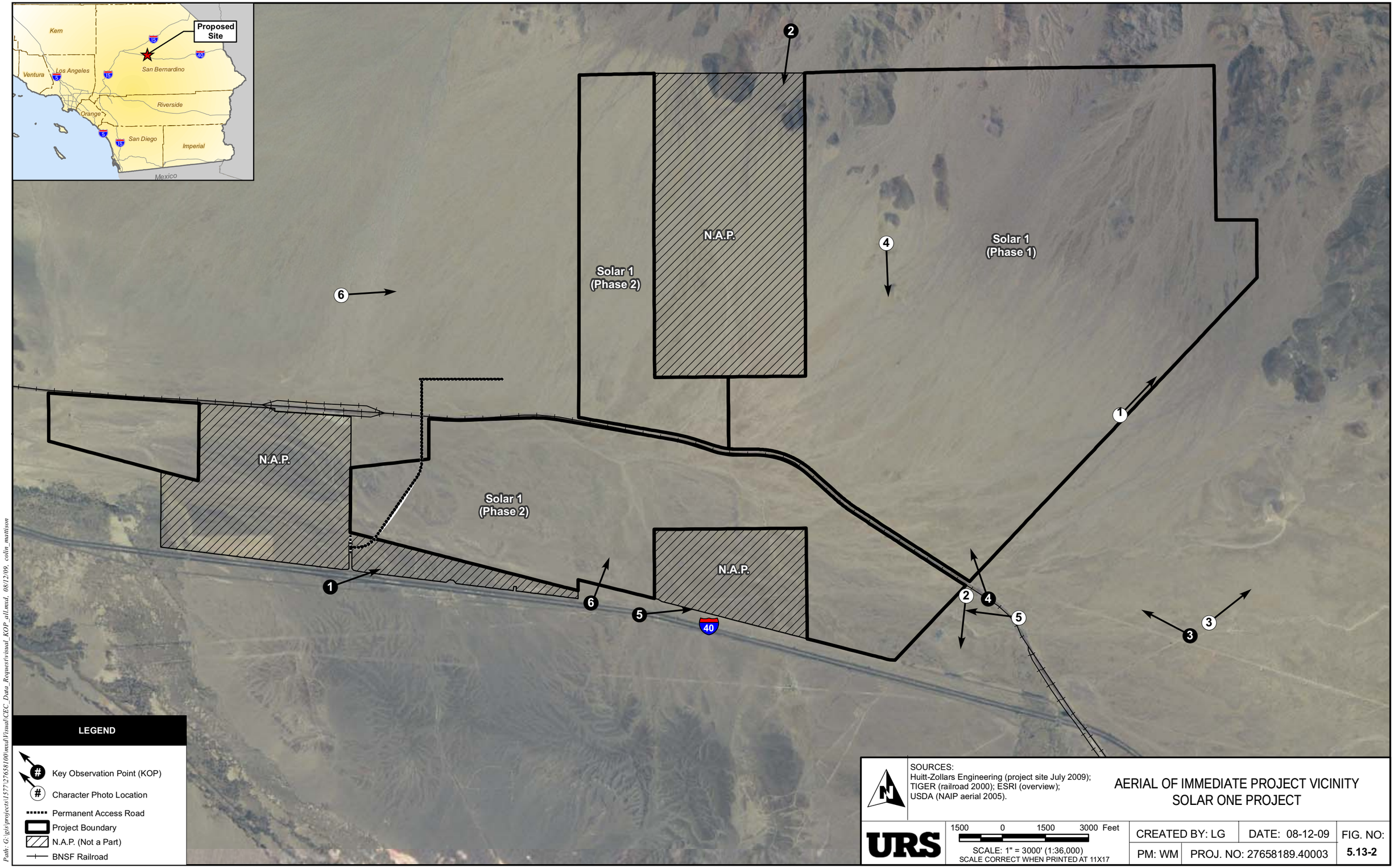
SCALE: 1:192 SHT 1 OF 2

TECHNICAL AREA: VISUAL RESOURCES

Data Request 126. Please prepare a simulation from an additional KOP, depicting the view of motorists on Highway 40 in the segment directly adjoining project Phase 2. The simulation should represent the view of westbound motorists on Highway 40, with the project Phase 2 in the roadside foreground as indicated in the AFC layout plans, with a 'normal' field of view, rotated to the northwest with mountains visible in the background. The photograph should not depict an atypical grade relationship to the highway, e.g. unusually low areas. Similarly, the simulation should depict the heliostats in an 'average' vertical (solar altitude) orientation, midway between the lowest and highest overall height. Along with the simulation please provide a close-up plan depicting the simulation location, project siting assumptions depicted (e.g., setback from road), along with assumed topography and horizontal field of view of the photograph.

Response: Please see attachment VIS-6 behind this response for a revised AFC Figure 5.13-2 showing the new KOP location, an additional visual simulation depicting the existing and simulated motorist view of the Project from Highway 40 and plan view of the photo location. The simulation represents the view of westbound motorists on Highway 40, with the Project's Phase II development in the roadside foreground. The motorist would be traveling in the segment directly adjoining Project Phase II. The SunCatchers in the simulated image are depicted in an average vertical orientation, midway between the lowest and the highest overall height.

VIS-6



SOURCES:
Huitt-Zollars Engineering (project site July 2009);
TIGER (railroad 2000); ESRI (overview);
USDA (NAIP aerial 2005).

AERIAL OF IMMEDIATE PROJECT VICINITY
SOLAR ONE PROJECT

URS

1500 0 1500 3000 Feet
SCALE: 1" = 3000' (1:36,000)
SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: LG	DATE: 08-12-09	FIG. NO:
PM: WM	PROJ. NO: 27658189.40003	5.13-2

Path: G:\gis\projects\1577\27658100\mxd\Visual\CEC_Data_Request\visual_KOP_all.mxd, 08/12/09, colin_mattison

Existing motorist view from I40 looking north toward the Project site. This photo location is meant to represent “worst-case” motorist views.

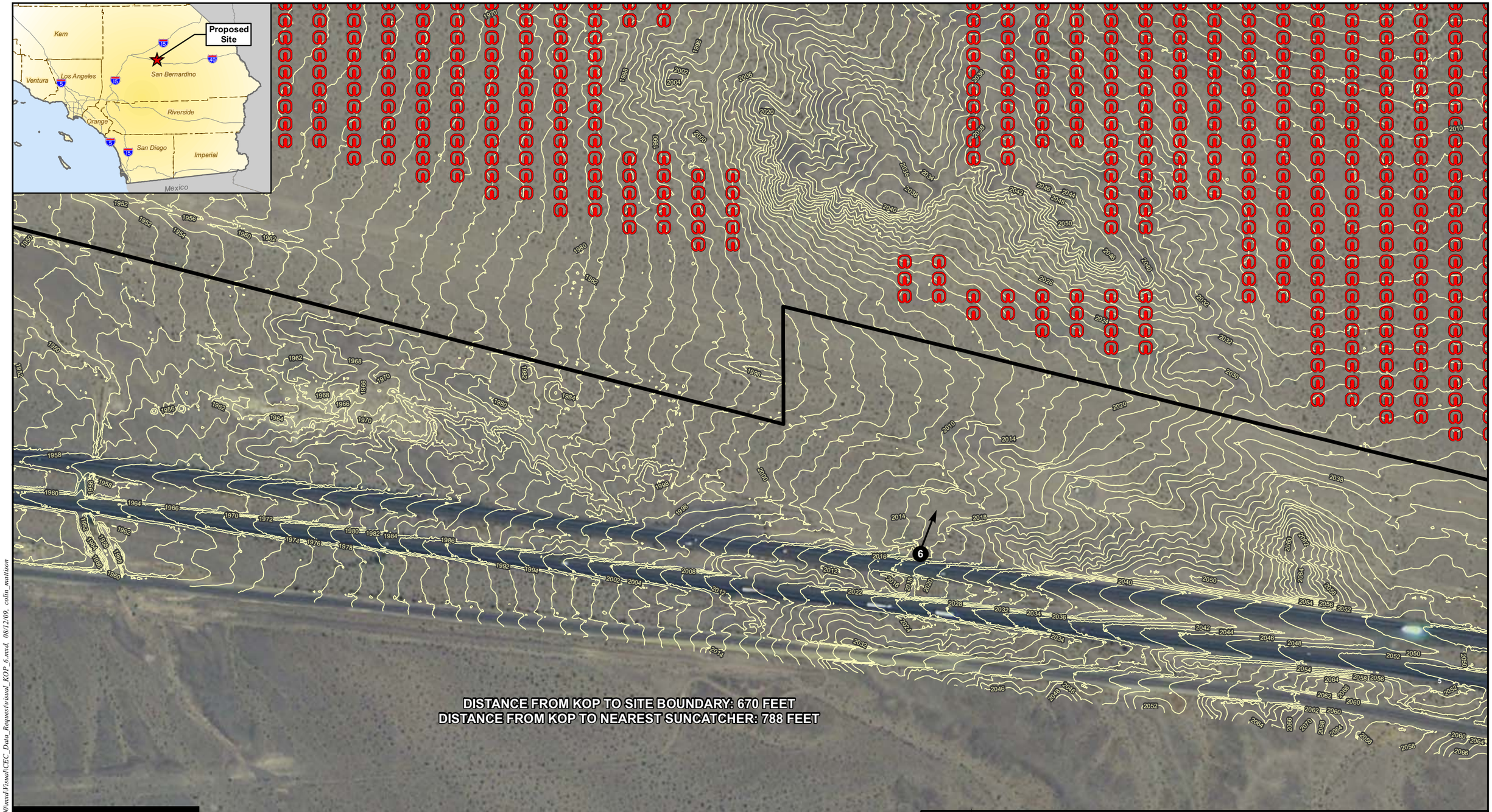
EXISTING VIEW OF PROJECT FROM I40
SOLAR ONE

URS	NO SCALE	CREATED BY: SH	DATE: 8-11-09	FIG. NO: 126B
		PM: WM	PROJ. NO: 27658183.10000	

Simulated motorist view from I40 looking north toward the Project site. This photo location is meant to represent “worst-case” motorist views.

SIMULATED VIEW OF PROJECT FROM I40
SOLAR ONE

URS	NO SCALE	CREATED BY: SH	DATE: 8-11-09	FIG. NO: 126C
		PM: WM	PROJ. NO: 27658183.10000	



LEGEND

- Key Observation Point (KOP)
- Suncatcher
- Project Boundary
- Contours (in feet)

SOURCES:
Huitt-Zollars Engineering (project site July 2009);
Nolte (contours 2008); ESRI (overview);
USDA (NAIP aerial 2005).

ORIENTATION AND TOPOGRAPHY
AT KOP 6
SOLAR ONE PROJECT

URS

150 0 150 300 Feet
SCALE: 1" = 300' (1:3600)
SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: LG	DATE: 08-12-09	FIG. NO:
PM: WM	PROJ. NO: 27658189.40003	126A

Path: G:\gis\projects\1577\27658100\mxd\Visual\CEC_Data_Request\visual_KOP_6.mxd, 08/12/09, colin_mattison

TECHNICAL AREA: VISUAL RESOURCES

Data Request 127. Please provide a dimensional plan and elevation of the satellite services complex.

Response: The satellite services complex has been removed from the Project scope. The Applicant will not be constructing the satellite services complex.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION
For the SES SOLAR ONE PROJECT

Docket No. 08-AFC-13

PROOF OF SERVICE
(Revised 7/20/09)

APPLICANT

Felicia Bellows,
Vice President of Development
Tessera Solar
4800 North Scottsdale Road,
Ste. 5500
Scottsdale, AZ 85251
felicia.bellows@tesserasolar.com

Camille Champion
Project Manager
Tessera Solar
4800 North Scottsdale Road,
Suite 5500
Scottsdale, AZ 85251
camille.champion@tesserasolar.com

CONSULTANT

Bill Magdych
AFC Project Manager
URS Corporation
1615 Murray Canyon Rd.,
Ste. 1000
San Diego, CA 92108
bill_magdych@urscorp.com

APPLICANT'S COUNSEL

Allan J. Thompson
Attorney at Law
21 C Orinda Way #314
Orinda, CA 94563
allanori@comcast.net

INTERESTED AGENCIES

California ISO
e-recipient@caiso.com

Jim Stobaugh
BLM – Nevada State Office
P.O. Box 12000
Reno, NV 89520
jim_stobaugh@blm.gov

Rich Rotte
Project Manager
Bureau of Land Management
Barstow Field Office
2601 Barstow Road
Barstow, CA 92311
Richard_Rotte@blm.gov

*Becky Jones
California Department of
Fish & Game
36431 41st Street East
Palmdale, CA 93552
dfgpalm@adelphia.net

INTERVENORS

California Unions for Reliable
Energy (CURE)
Loulena A. Miles,
Marc D. Joseph
Adams Broadwell Joseph &
Cardozo
601 Gateway Boulevard,
Ste. 1000
South San Francisco, CA 94080
lmiles@adamsbroadwell.com

Basin and Range Watch
Laura Cunningham
Kevin Emmerich
P.O. Box 70
Beatty, NV 89003
atomictoadranch@netzero.net

Patrick C. Jackson
600 N. Darwood Avenue
San Dimas, CA 91773
E-MAIL SERVICE PREFERRED
ochsjack@earthlink.net

ENERGY COMMISSION

JAMES D. BOYD
Vice Chair and Presiding Member
jboyd@energy.state.ca.us

JEFFREY D. BYRON
Commissioner and Associate Member
jbyron@energy.state.ca.us

Paul Kramer
Hearing Officer
pkramer@energy.state.ca.us

Caryn Holmes, Galen Lemei
Staff Counsels
cholmes@energy.state.ca.us
glemei@energy.state.ca.us

Christopher Meyer
Project Manager
cmeyer@energy.state.ca.us

Public Adviser
publicadviser@energy.state.ca.us

DECLARATION OF SERVICE

I, Corinne Lytle declare that on Aug. 20, 2009, I served and filed copies of the attached Applicant's Responses to CEC and BLM Data Requests 113 - 127. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: [www.energy.ca.gov/sitingcases/solarone].

The document has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

FOR SERVICE TO ALL OTHER PARTIES:

__X__ sent electronically to all email addresses on the Proof of Service list;

__X__ by personal delivery or by depositing in the United States mail at _____ with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses NOT marked "email preferred."

AND

FOR FILING WITH THE ENERGY COMMISSION:

__X__ sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (*preferred method*);

OR

_____ depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. __08-AFC-13__
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Original Signed By
Corinne Lytle