

## Appendix D – Air Quality Record of Non-Applicability and Calculations

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**CLEAN AIR ACT - GENERAL CONFORMITY RULE RECORD OF  
NON-APPLICABILITY (RONA)**

**FOR  
CONSTRUCTION AND OPERATION OF A SOLAR PHOTOVOLTAIC  
SYSTEM AT NAVAL BASE VENTURA COUNTY (NBVC)  
PORT HUENEME, CALIFORNIA**

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**MAY 2015**

**PREPARED FOR**

U.S. Department of the Navy  
Navy Region Southwest  
San Diego County, California

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## **PROPOSED ACTION**

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The proposed action falls under the Record of Non-Applicability (RONA) category and is documented with this RONA.

**Action Proponent:** Commanding Officer, NBVC Port Hueneme, California

**Location:** Ventura County, California

**Proposed Action Name:** Construction and operation of a solar photovoltaic system at NBVC Port Hueneme, California

## **PROPOSED ACTION AND EMISSIONS SUMMARY**

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### **PROPOSED ACTION**

Under the Proposed Action, the Navy would install a ground-mounted solar photovoltaic (PV) system on one or more parcels of land at NBVC Port Hueneme. The project is needed to contribute towards the Navy's overall compliance with the Secretary of the Navy's renewable energy goals.

Under Alternative 1, the solar PV system would have a generation capacity of up to 10 MW of alternating current, and would be located on five parcels totaling 44.75 acres (18.1 hectares) in size. The solar PV system under Alternative 2 would be yield up to 6 MW and would be located on four parcels totaling 17.25 acres (7.0 hectare) parcel. The solar PV system under Alternative 3 would be yield up to 9 MW and would be located on two parcels totaling 40.5 acres (16.4 hectares). Construction of the ground-mounted solar photovoltaic system is expected to occur between 2015 and 2017. Due to external factors, the exact construction date cannot be determined at this time.

### **EMISSIONS SUMMARY**

Air quality impacts associated with the Proposed Action are related to emissions that would occur during construction of the ground-mounted solar photovoltaic system at NBVC Port Hueneme. The principal sources of pollutants during construction would be the construction equipment, construction crew commuting vehicles, and earth-moving activities.

## Construction

Construction for the installation of ground-mounted solar PV systems associated with the Proposed Action is estimated to take place over a 12 month period for each alternative; therefore, all construction emissions will be considered to occur in one year for the General Conformity analysis. While construction emissions are assumed to occur between 2015 and 2017, due to external factors, the exact construction date cannot be determined at this time.

Table 1 compares the maximum estimated emissions for each of the action alternatives at NBVC Port Hueneme with the *de minimis* annual emissions thresholds set forth for the South Central Coast Air Basin (per EPA General Conformity Rule and OPNAVINST M-5090.1). Based on the air quality analysis, the maximum estimated emissions for the Proposed Action at NBVC Port Hueneme would be below general conformity *de minimis* levels for all criteria pollutants for the South Central Coast Air Basin. Therefore, implementation of the Proposed Action at NBVC Port Hueneme would result in minor, localized, short-term effects on air quality during construction, and impacts during construction would not be significant.

**Table 1 Estimated Construction Emissions at NBVC Port Hueneme Compared to *de minimis* Emissions for Criteria Pollutants in the South Coast Air Basin<sup>1</sup>**

Alternative	County	Emissions (tons per year)						
		NO <sub>x</sub>	CO	VOCs	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Alternative 1 (10 MW, 44.75 acres)	Ventura	2.65	1.45	0.21	0.11	7.61	0.96	717.99
Alternative 2 (6 MW, 17.25 acres)		1.93	1.04	0.15	0.08	4.02	0.55	514.08
Alternative 3 (9 MW, 40.5 acres)		2.58	1.39	0.20	0.11	6.35	0.83	687.15
General Conformity <i>de minimis</i> Threshold		10	N/A	10	100 <sup>1</sup>	70	100	N/A

Key:

CO = carbon monoxide CO<sub>2</sub> = carbon dioxide N/A = not applicable

NO<sub>x</sub> = oxides of nitrogen

PM<sub>2.5</sub> = fine particulate matter less than or equal to 2.5 microns in diameter

PM<sub>10</sub> = suspended particulate matter less than or equal to 10 microns in diameter

SO<sub>2</sub> = sulfur dioxide

VOCs = volatile organic compounds

Notes: <sup>1</sup>Threshold is 100 tons/year when SO<sub>2</sub> is considered to be a precursor to atmospheric formation of PM<sub>2.5</sub>

Detailed construction equipment assumptions, fugitive dust emission calculations, and emissions calculations for NBVC Port Hueneme are provided in Appendix D of the Environmental Assessment.

## Operations

Long-term operation of the Proposed Action at NBVC Port Hueneme would result in avoided emissions of CO<sub>2</sub>e, NO<sub>x</sub>, and SO<sub>2</sub> by reducing the consumption of grid-supplied electricity. Subsequent years of operation would also avoid emissions produced from conventional non-renewable generating sources. Table 2 shows the estimated emissions avoided from the ground-mounted solar PV system at NBVC Port Hueneme that would be realized by reduced consumption of grid-supplied electricity. Detailed emissions calculations are provided at the end of this appendix.

**Table 2 Estimated Annual Emissions Avoided at NBVC Port Hueneme with Implementation of Each Alternative**

Alternative	County	Emissions Avoided (tons per year)		
		CO <sub>2</sub> e	NO <sub>x</sub>	SO <sub>2</sub>
Alternative 1 (10MW, 44.75 acres)	Ventura	13,651	5.91	2.49
Alternative 2 (6 MW, 17.25 acres)		8,190	3.55	1.50
Alternative 3 (9MW, 40.5 acres)		12,286	5.32	2.24

Key:

CO<sub>2</sub>e = carbon dioxide equivalent, considers CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O adjusted for their respective global warming potentials

NO<sub>x</sub> = oxides of nitrogen

SO<sub>2</sub> = sulfur dioxide

**Affected Air Basin:** South Central Coast Air Basin, California

**Date RONA Prepared:** May 2015

**Proposed Action Exemptions:** The Proposed Action is exempt because the calculated total emissions are below the *de minimis* levels set forth in the Clean Air Act General Conformity Rule.

## **ATTAINMENT AREA STATUS AND EMISSIONS EVALUATION CONCLUSION**

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The project area at NBVC Port Hueneme is located within the South Central Coast Air Basin, which is federally designated as nonattainment (serious) for ozone, unclassified for PM<sub>10</sub>, unclassified/attainment for PM<sub>2.5</sub>, NO<sub>2</sub>, CO, and lead, and attainment for SO<sub>2</sub> for the Ventura County portion of the air basin. The San Luis Obispo County and Santa Barbara County portions of the air basin are designated unclassified.

Based on the data in Table 1, it is concluded that the Clean Air Act General Conformity Rule *de minimis* thresholds for applicable criteria pollutants would not be exceeded as a result of implementation of the Proposed Action at NBVC Port Hueneme. Therefore, further formal Conformity Determination procedures are not required, resulting in this RONA.

### **RONA APPROVAL:**

Date: \_\_\_\_\_ Signature: \_\_\_\_\_

**Construction Assumptions for Alt 1 (4 sites, 44.75 acres)**

Equipment	Purpose	Usage			Miles per day	Total miles	Total Hrs	Additional Assumptions
		Quantity	Hr/day	Days				
								Construction duration is 12 months. Days based on 20 work days per month.
F-150 pickup	general use (personnel transport)	4	3	240	135	129600	na	Assumed 3 hrs @ 45 mph. Pickups are used only to transport personnel to and from site.
forklift -piers	pier moving	3	4	90	na	na	1080	
forklift - motors	move pier motors & rebar	2	4	90	na	na	720	
forklift - metal	move frames & panels	3	4	120	na	na	1440	
Bobcat or small dozer	grading, stone/soil fill	3	8	120	na	na	2880	
trenching machine	4 ft x 3 ft deep trench	2	8	30	na	na	480	3 km of trenching for electrical lines
blade scraper	grading at site	2	8	120	na	na	1920	Scraper hp assumed to be between 600 hp and 750 hp
Delivery truck	delivers panels/parts	3	3	120	80	28800	na	Assumed 80 miles per day (3hrs @ 45 mph).
welding machine	small, for installing support fixtures	3	4	120	na	na	1440	
backhoe	dig excavate foundation for new sites	2	8	90	na	na	1440	
Tacifier Truck	Spray soil adhesive	2	8	30	32	1920	na	Assume 8 hrs per day, 4 mph speed while spraying
Water Truck	dust suppression	6	4	150	16	14400	na	Assume 4 hrs per day, 4 mph speed while spraying

Nonroad Equipment	Forklift	Backhoe	Welder	Trencher	Bobcat	Scraper
Total Hrs Used	3240	1440	1440	480	2880	1920
Onroad Equipment	Light Pickups	Delivery/Water/Tacifier Trucks				
	129600	45120				

**Construction Assumptions for Alt 2 (1 site, 28 acre)**

Equipment	Purpose	Usage			Miles per day	Total miles	Total Hrs	Additional Assumptions
		Quantity	Hr/day	Days				
								Construction duration is 12 months. Days based on 20 work days per month.
F-150 pickup	general use (personnel transport)	2	2.5	240	112.5	54000	na	Assumed 2.5 hrs @ 45 mph). Pickups are used only to transport personnel to and from site.
forklift -piers	pier moving	2	4	80	na	na	640	
forklift - motors	move pier motors & rebar	2	4	80	na	na	640	
forklift - metal	move frames & panels	2	4	100	na	na	800	
Bobcat or small dozer	grading, stone/soil fill	2	8	100	na	na	1600	
trenching machine	4 ft x 3 ft deep trench	1	4	20	na	na	80	2 km of trenching for electrical lines
blade scraper	grading at site	2	8	100	na	na	1600	Scraper hp assumed to be between 600 hp and 750 hp
Delivery truck	delivers panels/parts	2	3	100	80	16000	na	Assumed 80 miles per day (3hrs @ 45 mph).
welding machine	small, for installing support fixtures	2	4	100	na	na	800	
backhoe	dig excavate foundation for new sites	1	8	80	na	na	640	
Tacifier Truck	Spray soil adhesive	1	8	20	32	640	na	Assume 8 hrs per day, 4 mph speed while spraying
Water Truck	dust suppression	3	4	120	16	5760	na	Assume 4 hrs per day, 4 mph speed while spraying

Nonroad Equipment	Forklift	Backhoe	Welder	Trencher	Bobcat	Scraper
Total Hrs Used	2080	640	800	80	1600	1600
Onroad Equipment	Light Pickups	Delivery/Water/Tacifier Trucks				
	54000	22400				

**Construction Assumptions for Alt 3 (2 sites, 40.5 acre)**

Equipment	Purpose	Usage			Miles per day	Total miles	Total Hrs	Additional Assumptions
		Quantity	Hr/day	Days				
								Construction duration is 12 months. Days based on 20 work days per month.
F-150 pickup	general use (personnel transport)	3	3	240	135	97200	na	Assumed 3 hrs @ 45 mph. Pickups are used only to transport personnel to and from site.
forklift -piers	pier moving	3	4	90	na	na	1080	
forklift - motors	move pier motors & rebar	2	4	90	na	na	720	
forklift - metal	move frames & panels	2	4	120	na	na	960	
Bobcat or small dozer	grading, stone/soil fill	3	8	120	na	na	2880	
trenching machine	4 ft x 3 ft deep trench	2	8	30	na	na	480	3 km of trenching for electrical lines
blade scraper	grading at site	2	8	120	na	na	1920	Scraper hp assumed to be between 600 hp and 750 hp
Delivery truck	delivers panels/parts	3	3	120	80	28800	na	Assumed 80 miles per day (3hrs @ 45 mph).
welding machine	small, for installing support fixtures	3	4	120	na	na	1440	
backhoe	dig excavate foundation for new sites	2	8	85	na	na	1360	
Tacifier Truck	Spray soil adhesive	2	8	30	32	1920	na	Assume 8 hrs per day, 4 mph speed while spraying
Water Truck	dust suppression	5	4	145	16	11600	na	Assume 4 hrs per day, 4 mph speed while spraying

Nonroad Equipment	Forklift	Backhoe	Welder	Trencher	Bobcat	Scraper
Total Hrs Used	2760	1360	1440	480	2880	1920
Onroad Equipment	Light Pickups	Delivery/Water/Tacifier Trucks				
	97200	42320				

**Construction Emissions for Alt 1**

Nonroad Equipment	Hours Of Operation	Fuel Type	Nonroad Emission Factor (gm/hour)									Emissions (tons per year)								
			NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
Forklift	3240	Diesel	83.72	7.09	3.87	2.55	4.35	4.22	16526.74	0.75	1.65	0.299	0.025	0.014	0.009	0.016	0.015	59.025	0.003	0.006
Backhoe	1440	Diesel	72.13	89.60	14.63	2.47	14.03	13.61	12696.45	1.90	4.16	0.114	0.142	0.023	0.004	0.022	0.022	20.153	0.003	0.007
Welding machine	1440	Diesel	23.81	23.02	5.29	0.67	3.24	3.14	3095.71	0.16	0.34	0.038	0.037	0.008	0.001	0.005	0.005	4.914	0.000	0.001
Trenching machine	480	Diesel	73.38	16.73	4.03	2.11	4.35	4.22	11981.90	1.11	2.42	0.039	0.009	0.002	0.001	0.002	0.002	6.340	0.001	0.001
Bobcat or small dozer	2880	Diesel	69.07	12.03	3.57	2.03	3.82	3.70	12081.78	0.78	1.71	0.219	0.038	0.011	0.006	0.012	0.012	38.355	0.002	0.005
Scraper	1920	Diesel	806.51	476.54	65.79	39.66	78.33	75.98	217584.42	3.04	6.67	1.707	1.009	0.139	0.084	0.166	0.161	460.503	0.006	0.014

Onroad Equipment	Miles Driven	Fuel Type	Onroad Emission Factor (gm/mile)									Emissions (tons per year)								
			NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
Pickup and Delivery Trucks	#	Gasoline	0.151	1.209	0.027	0.005	0.002	0.002	483.8	0.0871	0.0452	0.022	0.173	0.004	0.001	0.000	0.000	69.115	0.012	0.006
Dump, Delivery, Water Trucks	45120	Diesel	4.3	0.288	0.085	0.011	0.034	0.031	1198	0.0048	0.0051	0.214	0.014	0.004	0.001	0.002	0.002	59.584	0.000	0.000

Construction Fugitives	Acres Graded	Average Months of Active Disturbance per Acre <sup>1</sup>	Emission Factors (tons/acre*month)									Emissions (tons per year)								
			NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
	44.75	1.5					0.11	0.011								7.384	0.738			

<sup>1</sup> Assumes each acre of land would be subject to active disturbance (e.g., grading, drilling, equipment installation) over approximately 25% of the construction period.

Totals for Alternative 1:											NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	CO <sub>2</sub> e <sup>2</sup>
											2.65	1.45	0.21	0.11	7.61	0.96	717.99	0.03	0.04	727.56

<sup>2</sup> CO<sub>2</sub>e considers CO<sub>2</sub> plus N<sub>2</sub>O and CH<sub>4</sub> adjusted for global warming potential.

**Construction Emissions for Alt 2**

Nonroad Equipment	Hours Of Operation	Fuel Type	Nonroad Emission Factor (gm/hour)									Emissions (tons per year)								
			NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
Forklift	2080	Diesel	83.72	7.09	3.87	2.55	4.35	4.22	16526.74	0.75	1.65	0.192	0.016	0.009	0.006	0.010	0.010	37.893	0.002	0.004
Backhoe	640	Diesel	72.13	89.60	14.63	2.47	14.03	13.61	12696.45	1.90	4.16	0.051	0.063	0.010	0.002	0.010	0.010	8.957	0.001	0.003
Welding machine	800	Diesel	23.81	23.02	5.29	0.67	3.24	3.14	3095.71	0.16	0.34	0.021	0.020	0.005	0.001	0.003	0.003	2.730	0.000	0.000
Trenching machine	80	Diesel	73.38	16.73	4.03	2.11	4.35	4.22	11981.90	1.11	2.42	0.006	0.001	0.000	0.000	0.000	0.000	1.057	0.000	0.000
Bobcat or small dozer	1600	Diesel	69.07	12.03	3.57	2.03	3.82	3.70	12081.78	0.78	1.71	0.122	0.021	0.006	0.004	0.007	0.007	21.309	0.001	0.003
Scraper	1600	Diesel	806.51	476.54	65.79	39.66	78.33	75.98	217584.42	3.04	6.67	1.422	0.840	0.116	0.070	0.138	0.134	383.753	0.005	0.012

Onroad Equipment	Miles Driven	Fuel Type	Onroad Emission Factor (gm/mile)									Emissions (tons per year)								
			NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
Pickup and Delivery Trucks	54000	Gasoline	0.151	1.209	0.027	0.005	0.002	0.002	483.8	0.0871	0.0452	0.009	0.072	0.002	0.000	0.000	0.000	28.798	0.005	0.003
Dump, Delivery, Water Trucks	22400	Diesel	4.3	0.288	0.085	0.011	0.034	0.031	1198	0.0048	0.0051	0.106	0.007	0.002	0.000	0.001	0.001	29.581	0.000	0.000

Construction Fugitives	Acres Graded	Average Months of Active Disturbance per Acre <sup>1</sup>	Emission Factors (tons/acre*month)									Emissions (tons per year)								
			NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
	28	1.25					0.11	0.011									3.850	0.385		

<sup>1</sup> Assumes each acre of land would be subject to active disturbance (e.g., grading, drilling, equipment installation) over approximately 25% of the construction period.

Totals for Alternative 2:											NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	CO <sub>2</sub> e <sup>2</sup>
											<b>1.93</b>	<b>1.04</b>	<b>0.15</b>	<b>0.08</b>	<b>4.02</b>	<b>0.55</b>	<b>514.08</b>	<b>0.02</b>	<b>0.02</b>	<b>519.36</b>

<sup>2</sup> CO<sub>2</sub>e considers CO<sub>2</sub> plus N<sub>2</sub>O and CH<sub>4</sub> adjusted for global warming potential.

**Construction Emissions for Alt 3**

Nonroad Equipment	Hours Of Operation	Fuel Type	Nonroad Emission Factor (gm/hour)									Emissions (tons per year)								
			NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
Forklift	2760	Diesel	83.72	7.09	3.87	2.55	4.35	4.22	16526.74	0.75	1.65	0.255	0.022	0.012	0.008	0.013	0.013	50.281	0.002	0.005
Backhoe	1360	Diesel	72.13	89.60	14.63	2.47	14.03	13.61	12696.45	1.90	4.16	0.108	0.134	0.022	0.004	0.021	0.020	19.034	0.003	0.006
Welding machine	1440	Diesel	23.81	23.02	5.29	0.67	3.24	3.14	3095.71	0.16	0.34	0.038	0.037	0.008	0.001	0.005	0.005	4.914	0.000	0.001
Trenching machine	480	Diesel	73.38	16.73	4.03	2.11	4.35	4.22	11981.90	1.11	2.42	0.039	0.009	0.002	0.001	0.002	0.002	6.340	0.001	0.001
Bobcat or small dozer	2880	Diesel	69.07	12.03	3.57	2.03	3.82	3.70	12081.78	0.78	1.71	0.219	0.038	0.011	0.006	0.012	0.012	38.355	0.002	0.005
Scraper	1920	Diesel	806.51	476.54	65.79	39.66	78.33	75.98	217584.42	3.04	6.67	1.707	1.009	0.139	0.084	0.166	0.161	460.503	0.006	0.014

Onroad Equipment	Miles Driven	Fuel Type	Onroad Emission Factor (gm/mile)									Emissions (tons per year)								
			NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>
Pickup and Delivery Trucks	97200	Gasoline	0.151	1.209	0.027	0.005	0.002	0.002	483.8	0.0871	0.0452	0.016	0.130	0.003	0.001	0.000	0.000	51.837	0.009	0.005
Dump, Delivery, Water Trucks	42320	Diesel	4.3	0.288	0.085	0.011	0.034	0.031	1198	0.0048	0.0051	0.201	0.013	0.004	0.001	0.002	0.001	55.886	0.000	0.000

Construction Fugitives	Acres Graded	Average Months of Active Disturbance per Acre <sup>1</sup>	Emission Factors (tons/acre*month)									Emissions (tons per year)									
			NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	
	40.5	1.375						0.11	0.011									6.126	0.613		

<sup>1</sup> Assumes each acre of land would be subject to active disturbance (e.g., grading, drilling, equipment installation) over approximately 25% of the construction period.

Totals for Alternative 3:											NOx	CO	VOC	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	CO <sub>2</sub> e <sup>2</sup>
											2.58	1.39	0.20	0.11	6.35	0.83	687.15	0.02	0.04	695.52

<sup>2</sup> CO<sub>2</sub>e considers CO<sub>2</sub> plus N<sub>2</sub>O and CH<sub>4</sub> adjusted for global warming potential.

### Air Emissions Avoided under Alt 1

Greenhouse Gases, Expressed as CO2e

Power Supplied (MWh)*	Emission Factors			Emissions Avoided			
	CO2 (lb/MWh)	CH4 (lb/GWh)	N2O (lb/GWh)	CO2 (tons)	CH4 (tons)	N2O (tons)	
29200	932.82	35.91	4.55	13619	0.52	0.07	
*Assumes 8 hrs/day direct sunlight				CO2e	13619	11	21
				<b>Total (tons CO2e):</b>		<b>13651</b>	

Criteria Pollutants

Power Supplied (MWh)	Emission Factors		Emissions Avoided	
	NOx (lb/MWh)	SO2 (lb/MWh)	NOx (tons)	SO2 (tons)
29200	0.4047	0.1708	5.91	2.49

### Air Emissions Avoided under Alt 2

Greenhouse Gases, Expressed as CO2e

Power Supplied (MWh)*	Emission Factors			Emissions Avoided			
	CO2 (lb/MWh)	CH4 (lb/GWh)	N2O (lb/GWh)	CO2 (tons)	CH4 (tons)	N2O (tons)	
17520	932.82	35.91	4.55	8172	0.31	0.04	
*Assumes 8 hrs/day direct sunlight				CO2e	8172	7	12
				<b>Total (tons CO2e):</b>		<b>8190</b>	

Criteria Pollutants

Power Supplied (MWh)	Emission Factors		Emissions Avoided	
	NOx (lb/MWh)	SO2 (lb/MWh)	NOx (tons)	SO2 (tons)
17520	0.4047	0.1708	3.55	1.50

### Air Emissions Avoided under Alt 3

Greenhouse Gases, Expressed as CO2e

Power Supplied (MWh)*	Emission Factors			Emissions Avoided			
	CO2 (lb/MWh)	CH4 (lb/GWh)	N2O (lb/GWh)	CO2 (tons)	CH4 (tons)	N2O (tons)	
26280	932.82	35.91	4.55	12257	0.47	0.06	
*Assumes 8 hrs/day direct sunlight				CO2e	12257	10	19
				<b>Total (tons CO2e):</b>		<b>12286</b>	

Criteria Pollutants

Power Supplied (MWh)	Emission Factors		Emissions Avoided	
	NOx (lb/MWh)	SO2 (lb/MWh)	NOx (tons)	SO2 (tons)
26280	0.4047	0.1708	5.32	2.24

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# Appendix E – Viewshed Analysis

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# ERRATA SHEET

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SUBJECT: Final Viewshed Analysis for Construction and Operation of Solar Photovoltaic Systems at Naval Base Ventura County, Port Hueneme, California

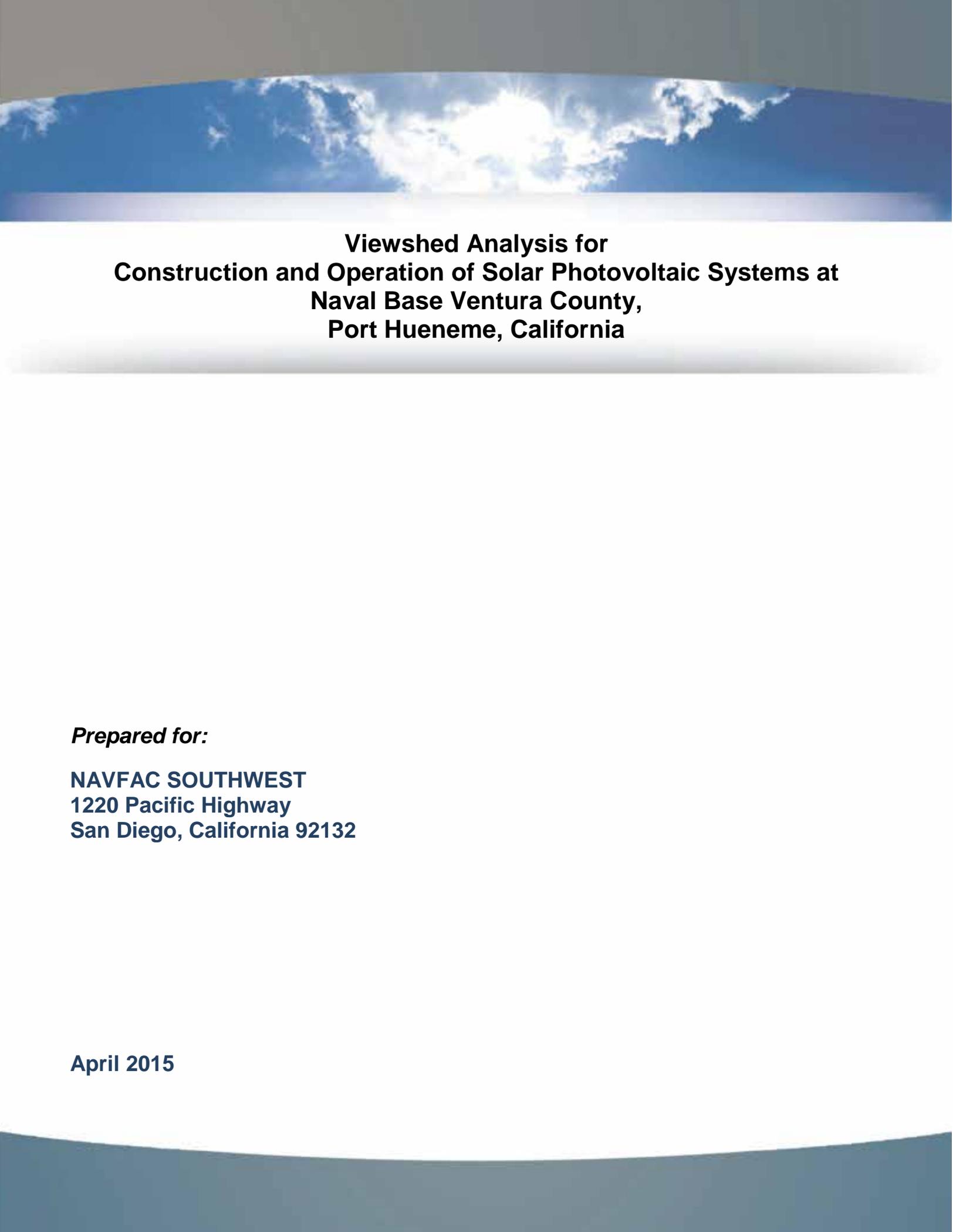
Subsequent to finalizing the subject report, the Navy modified the organization of Alternative 2 to change the parcels included for consideration under the Alternative. At the time of finalization of this report, Alternative 2 included construction and operation of a solar photovoltaic system at Parcel 9 only. Following report finalization, Alternative 2 was reorganized to exclude Parcel 9, but include Parcels 13, 16, 17, and 18. This modification reduces the size of the footprint under consideration for Alternative 2 from 28 acres (11.3 hectares) to 17.25 acres (7 hectares). Potential impacts identified with the construction and operation of a solar photovoltaic system at Alternative 2 would be less than as stated in this Final Viewshed Analysis because of the exclusion of Parcel 9 from consideration.

In addition, the estimated energy generated from each Alternative was modified to include the following: up to 10 MW under Alternative 1, up to 6 MW under Alternative 2, and up to 9 MW for Alternative 3.

This errata sheet describes revisions not present in the subject final document.

Section	Page No.	Revision
<b>Executive Summary</b>	ES-2	<u>Alternative 2: Construction of a Photovoltaic System at Parcels 13, 16, 17, and 18</u>
<b>Executive Summary</b>	ES-2	Constructed, operated, and maintained (and possibly decommissioned at the end of the lease) at Parcels 13, 16, 17, and 18. The total acreage of the combined sites is 17.25 acres (7 hectares).
<b>Executive Summary</b>	ES-2	Proposed Action/Alternative 1 would result in the generation of up to 10 megawatts (MW) of renewable energy.
<b>Executive Summary</b>	ES-2	Alternative 2 would contribute an estimated 6 MW of renewable energy.
<b>Executive Summary</b>	ES-2	Alternative 3 would contribute an estimated 9 MW of renewable energy.
<b>Executive Summary</b>	ES-4	<p><b>Alternative 2: Construction of a Photovoltaic System at Parcels 13, 16, 17, and 18</b></p> <p>Impacts to visual resources with implementation of Alternative 2 would be similar, but less than Alternative 1 due to the exclusion of Parcel 9 from consideration. Direct impacts to affected viewsheds are anticipated to decline in contrast and memorability from levels described under construction impacts. Parcels 13, 16, 17, and 18 are all located behind substantial earthen berms, dense existing vegetation, existing on-installation structures, and the Seabee Golf Course and are interior to NBVC Port Hueneme by no less than 0.20 mile (0.32 kilometers) from publicly visible locations. Combined viewer response would be weak due to low impacts to recreational/pedestrian viewer sensitivity and low impact to medium vehicular viewer sensitivity.</p> <p>Incorporation of project design considerations outlined in Section 6.0, as well as other measures designed to avoid, minimize, or mitigate potential visual effects within 0.5 mile (0.8 kilometer) from stationary and linear KOPs, would reduce visual contrast.</p>

Section	Page No.	Revision
		<u>Operation Impacts:</u> Visual impacts from operation would be similar to Alternative 1 but would be limited to Parcels 13, 16, 17, and 18.
1.2.4.1	7	Alternative 1 would result in the generation of up to 10 megawatts (MW)
1.2.4.2	7	<b>Alternative 2: Construction of a Photovoltaic System at Parcels 13, 16, 17, and 18</b> Alternative 2 would be the same as Alternative 1, except that the PV system would only be constructed, operated, and maintained (and possibly decommissioned at the end of the lease) at Parcel 13, 16, 17, and 18. The total acreage of the combined sites is 17.25 acres (7 hectares). This alternative would contribute up to 6 MW of renewable energy toward the Navy's renewable energy goal of 1 GW by the end of Year 2015.
1.2.4.3	7	This alternative would contribute an estimated 9 MW.
1.2.4.1 and 1.2.4.2	7	86 acres (34.8 hectares) to 56 acres (22.6 hectares)
Figure 2	14	Parcels Included under Alternative 2 (refer to Alternative 1 for Parcels 13, 16, 17, and 18)
5.2	45	<b>Impacts from Alternative 2 (Parcels 13, 16, 17, and 18)</b>  Impacts to visual resources with implementation of Alternative 2 would be similar but lower than compared Alternative 1 due to the exclusion of Parcel 9 from consideration. Direct impacts to affected viewsheds are anticipated to decline in contrast and memorability from levels described under construction impacts. Parcels 13, 16, 17, and 18 are all located behind substantial earthen berms, dense existing vegetation, existing on-installation structures, and the Seabee Golf Course and are interior to NBVC Port Hueneme by no less than 0.20 mile (0.32 kilometers) from publicly visible locations. Combined viewer response would be weak due to low impacts to recreational/pedestrian viewer sensitivity and low impact to medium vehicular viewer sensitivity.  Incorporation of project design considerations outlined in Section 6.0, as well as other measures designed to avoid, minimize, or mitigate potential visual effects within 0.5 mile (0.8 kilometer) from stationary and linear KOPs, would reduce visual contrast.
5.3	45	Implementation of Alternative 3 would not differ materially
Tables 9, 10, 11, 12	46 - 47	Impacts under Alternative 2 would be lower than presented in these tables with the exclusion of Parcel 9.



**Viewshed Analysis for  
Construction and Operation of Solar Photovoltaic Systems at  
Naval Base Ventura County,  
Port Hueneme, California**

***Prepared for:***

**NAVFAC SOUTHWEST  
1220 Pacific Highway  
San Diego, California 92132**

**April 2015**



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## ACRONYM LIST

GIS	geographic information system
GW	gigawatt
kph	kilometers per hour
KOP	Key Observation Point
mph	miles per hour
MW	megawatt
NBVC	Naval Base Ventura County
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
PV	photovoltaic
U.S.C.	United States Code

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## **EXECUTIVE SUMMARY**

The following document has been prepared to assess the potential off-installation visual effects related to the construction, operation, maintenance, and possible decommission of a solar photovoltaic (PV) system at one or more sites on Naval Base Ventura County (NBVC) Port Hueneme, California.

The purpose of the Proposed Action is to increase Navy installation energy security, operational capability, strategic flexibility, and resource availability through the development of renewable energy-generating assets at Navy installations by the construction and operation of a solar PV system. The Proposed Action is required to meet the renewable energy standards put forth by the 1 Gigawatt (GW) Initiative; Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance; and the Secretary of the Navy's Energy Goals.

NBVC Port Hueneme is located within the City of Port Hueneme in coastal Ventura County, California. The port facility is located on the agricultural Oxnard Plain, about 60 miles (97 kilometers) northwest of Los Angeles, on the Southern California coast. The Navy has identified five sites on NBVC Port Hueneme for the installation of the potential PV system. The sites, designated as Parcels 9, 13, 16, 17, and 18, can all be characterized as industrial and all, with the exception of Parcel 9 (a closed landfill), are topographically flat. Parcel 9 is 28 acres (11.3 hectares), Parcel 13 is 12.5 acres (5 hectares), Parcel 16 is 2.5 acres (1 hectare), Parcel 17 is 0.75 acre (0.3 hectare), and Parcel 18 is 1.5 acres (0.6 hectare) in size.

Under the Proposed Action, the Navy and a third-party developer would enter into a lease agreement to allow the third-party developer to use Navy land to construct, operate, and own the PV systems. The Proposed Action would include the construction, operation, maintenance, and possible decommission of a ground-mounted PV system.

One of two types of ground-mounted system may be constructed at the Proposed Action sites: a fixed-tilt panel system or a tracker-mounted panel system. Fixed-tilt solar arrays would remain stationary, whereas tracker-mounted arrays would be mounted on an axis and would be free to move throughout the day to maintain the best sun angle and maximize power output. It is estimated that the highest point of the solar array for a ground-mounted solar PV system of either type would not exceed 8 feet (2.4 meters) above the ground surface, with the actual height depending on the solar PV system type (i.e., fixed-tilt or tracker-mounted) and the specific tilt of the arrays. Fixed-tilt panels would maintain a fixed height, whereas the maximum height of tracker-mounted arrays would vary as the arrays move to track the sun. Ground-mounted panels would be approximately 5 feet (1.5 meters) wide and 3 feet (0.9 meter) long. The number of panels in each array, the type of ground-mounted system used, and the array configuration would depend on the third-party developer's site design.

The facilities to be constructed include solar PV panels, steel mounting and/or tracking structures, inverters, combiner boxes, and electrical switchgear, as well as associated electrical wiring, connections, and other items required for the PV system. Each ground-mounted system

would be enclosed by 8-foot-high (2.4-meter-high) chain-link panels with barbed-wire outriggers installed by the third-party developer. The purpose of the fencing would be to provide a safety barrier for unintended access to the site and equipment and as a security measure to protect from vandalism and theft. The fencing would include privacy slats (i.e. "scrim") and three strand barb wire along all Proposed Action development boundary lines. The scrim would likely be green, consistent with common industry practice.

## **Proposed Alternatives**

### Alternative 1: Construction, Operation, and Maintenance of a Ground-Mounted Photovoltaic System at Parcels 9, 13, 16, 17, and 18

Alternative 1 consists of the installation of a ground-mounted PV system as described under the Proposed Action at Parcels 9, 13, 16, 17, and 18. The total acreage of the combined five sites would be 45.25 acres (18.3 hectares). Alternative 1 includes the construction phase, operation of the PV system, and maintenance (and possible decommission at the end of the lease). Implementation of Alternative 1 would result in the generation of an estimated 6 megawatts (MW) of renewable energy toward the Navy's renewable energy goal of 1 GW by the end of Year 2015.

### Alternative 2: Construction of a Photovoltaic System at Parcel 9

Alternative 2 would be the same as Alternative 1, except that the PV system would only be constructed, operated, and maintained (and possibly decommissioned at the end of the lease) at Parcel 9, a 12-acre (11.6-hectare) parcel. This alternative would contribute an estimated 4 MW of renewable energy toward the Navy's renewable energy goal of 1 GW by the end of Year 2015.

### Alternative 3: Construction of a Photovoltaic System at Parcels 9 and 13

Alternative 3 would be the same as Alternative 1, except that the PV system would only be constructed, operated, and maintained (and possibly decommissioned at the end of the lease) at Parcels 9 and 13. The total acreage of the combined two sites would be 40.5 acres (16.4 hectares). This alternative would contribute an estimated 4 MW toward the Navy's renewable energy goal of 1 GW by the end of the Year 2015.

### Alternative 4: No Action Alternative

With selection of the No Action Alternative, a PV system would not be constructed, operated, and maintained at NBVC Port Hueneme, and NBVC Port Hueneme would not contribute toward the Navy's goal of producing 1 GW of renewable energy by the end of 2015. Current uses of the five sites would be expected to continue.

## Visual Impacts

Performance of this viewshed analysis determined that the Proposed Action would result in a visual change in the landscape; however, the change would be most noticeable during the construction phase of the Proposed Action. While this change would be common to all three build alternatives, it would be temporary in nature, and would not result in permanent adverse effects to visual resources. Specific visual effects are described below in greater detail.

### Alternative 1: Construction, Operation, and Maintenance of a Ground-Mounted Photovoltaic System at Parcels 9, 13, 16, 17, and 18

Construction Impacts: The visual landscape surrounding Parcels 9, 13, 16, 17, and 18 would be temporarily affected by construction of the proposed solar facilities and ancillary features, including graded maintenance roads, perimeter fencing, and freestanding electrical equipment including the current inverters and grid connection switchgear.

Due to the presence of an existing former landfill, other ground disturbance, existing structures, and ongoing site use activities and operations unrelated to the Proposed Action, the anticipated visual contrast of construction phase activities would range from weak to moderate depending on distance of the observer from Parcels 9, 13, 16, 17, and 18. During this temporary construction period, direct impacts to viewer sensitivity are anticipated to be moderate to high, due primarily to the number of viewers along the affected vehicular corridors. Measures to avoid and/or minimize potential temporary visual impacts, such as the use of visual screening, would reduce the overall visual contrast that would occur during construction.

Operation Impacts: Due to the low vertical profile of proposed facilities and proposed screening measures and resultant weak visual contrast, viewers passing through the project area are unlikely to notice a considerable change in visual character or to consider the visual character substantially diminished under Alternative 1; however, visual change would be most apparent to viewers in the vicinity of Parcel 9 due to the proximity, aspect, and exposure of the parcel to a higher number of viewers with direct foreground viewing opportunities; and viewers with partially obstructed foreground-middleground views across Channel Islands Harbor.

As such, implementation of the Proposed Action would introduce a moderate degree of contrast to the existing visual setting and would be viewed at immediate foreground distances by medium sensitivity viewers and foreground-middleground distances by high sensitivity viewers. The resulting level of impact would be moderate.

Decommissioning Impacts: Impacts to visual resources during the decommissioning phase of the Proposed Action would be temporary, and would be similar in nature to construction impacts. No visual impacts would remain following decommissioning.

### Alternative 2: Construction of a Photovoltaic System at Parcel 9

Impacts to visual resources with implementation of Alternative 2 would be similar to those discussed under Alternative 1 but would be limited to temporary, construction-related viewshed disturbances at Parcel 9 only. Direct impacts to viewers and existing resources would be moderate, as contrast would be moderate within low existing visual quality along S. Victoria Avenue, and moderate existing visual quality within the Hollywood Beach viewshed unit. Viewer response would be moderate, due to the combined effects of low impact on high-sensitivity recreational/pedestrian viewers, and moderate impact to medium-sensitivity vehicular viewers. The resulting level of impact would be moderate.

Operation Impacts: Visual impacts from operation would be similar to Alternative 1 but would be limited to Parcel 9 only.

Decommissioning Impacts: Impacts to visual resources during the decommissioning phase of the Proposed Action would be temporary and similar in nature to construction impacts. No visual impacts would remain following decommissioning.

### Alternative 3: Construction of a Photovoltaic System at Parcels 9 and 13

Impacts to visual resources with implementation of Alternative 3 would be similar to those discussed under Alternative 1 but would be limited to temporary, construction-related viewshed disturbances at Parcels 9 and 13 only. Direct impacts to viewers and existing resources would be moderate, as contrast would be moderate within low existing visual quality along S. Victoria Avenue, and moderate existing visual quality within the Hollywood Beach viewshed unit. Viewer response would be moderate, due to the combined effects of low impact on high-sensitivity recreational/pedestrian viewers, and moderate impact to medium sensitivity vehicular viewers. The resulting level of impact would be moderate.

Operation Impacts: Visual impacts from operation would be similar to Alternative 1 but would be limited to Parcels 9 and 13 only.

Decommissioning Impacts: Impacts to visual resources during the decommissioning phase of the Proposed Action would be temporary and similar in nature to construction impacts. No visual impacts would remain following decommissioning.

### Alternative 4: No Action Alternative

Since a PV system would not be constructed, no change to the visual setting would occur. No visual impacts would occur.

## **1.0 INTRODUCTION**

### **1.1 Purpose of the Visual Resources Report**

This viewshed analysis was prepared to assess the potential off-installation visual effects of the Construction and Operation of Photovoltaic (PV) Systems at one or more sites on Naval Base Ventura County (NBVC) Port Hueneme (Proposed Action). Potential on-installation visual effects were not assessed because viewers would be military personnel and approved government contractors who currently experience views of mission-related, industrial/military land uses consistent with views that would be seen with implementation of the Proposed Action. The methodology used for this assessment was based primarily on the Federal Highway Administration's Visual Impact Assessment approach assessing existing visual conditions while also relying on the Bureau of Land Management (BLM) Visual Resource Management system to determine the level of change in the landscape. The viewshed analysis was completed through analysis of field-based photography, a review of geographic information system (GIS)-based viewshed analyses of proposed features, and view corridors and Key Observation Points, and through simulated depictions of the Proposed Action alternative sites with PV systems constructed. This document also includes proposed measures to avoid, minimize, or mitigate adverse visual impacts associated with construction and operation of the Proposed Action.

### **1.2 Proposed Action and Alternatives**

#### **1.2.1 Purpose and Need**

The purpose of the Proposed Action is to increase Navy installation energy security, operational capability, strategic flexibility, and resource availability through the development of renewable energy-generating assets at Navy installations by the construction and operation of a solar PV system. The Proposed Action is required to meet the renewable energy standards put forth by the 1 Gigawatt (GW) Initiative; Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance; and the Secretary of the Navy's Energy Goals. The policy requirements for energy security and increased production of energy from alternative sources by 2020 are addressed in part by including, in any potential agreement (or real estate outgrant) entered into by the Navy and a private partner, a requirement that project infrastructure be "micro-grid-ready," meaning that the Navy would have the option to use any energy produced "on-base" in the event of an area power outage or other circumstances.

#### **1.2.2 Proposed Action Locations**

NBVC Port Hueneme is located within the City of Port Hueneme in coastal Ventura County, California (**Figure 1**). NBVC Port Hueneme is bordered by the City of Port Hueneme to the north and west, the City of Oxnard to the east, and Channel Islands Harbor to the west. Silver Strand Beach and the Pacific Ocean border the southern portion of NBVC Port Hueneme, and Port Hueneme Beach is southeast of the Port Hueneme Harbor entrance channel. The port facility is located on the agricultural Oxnard Plain, about 60 miles (97 kilometers) northwest of Los Angeles, on the Southern California coast.

**Figure 1. Project Location Map**

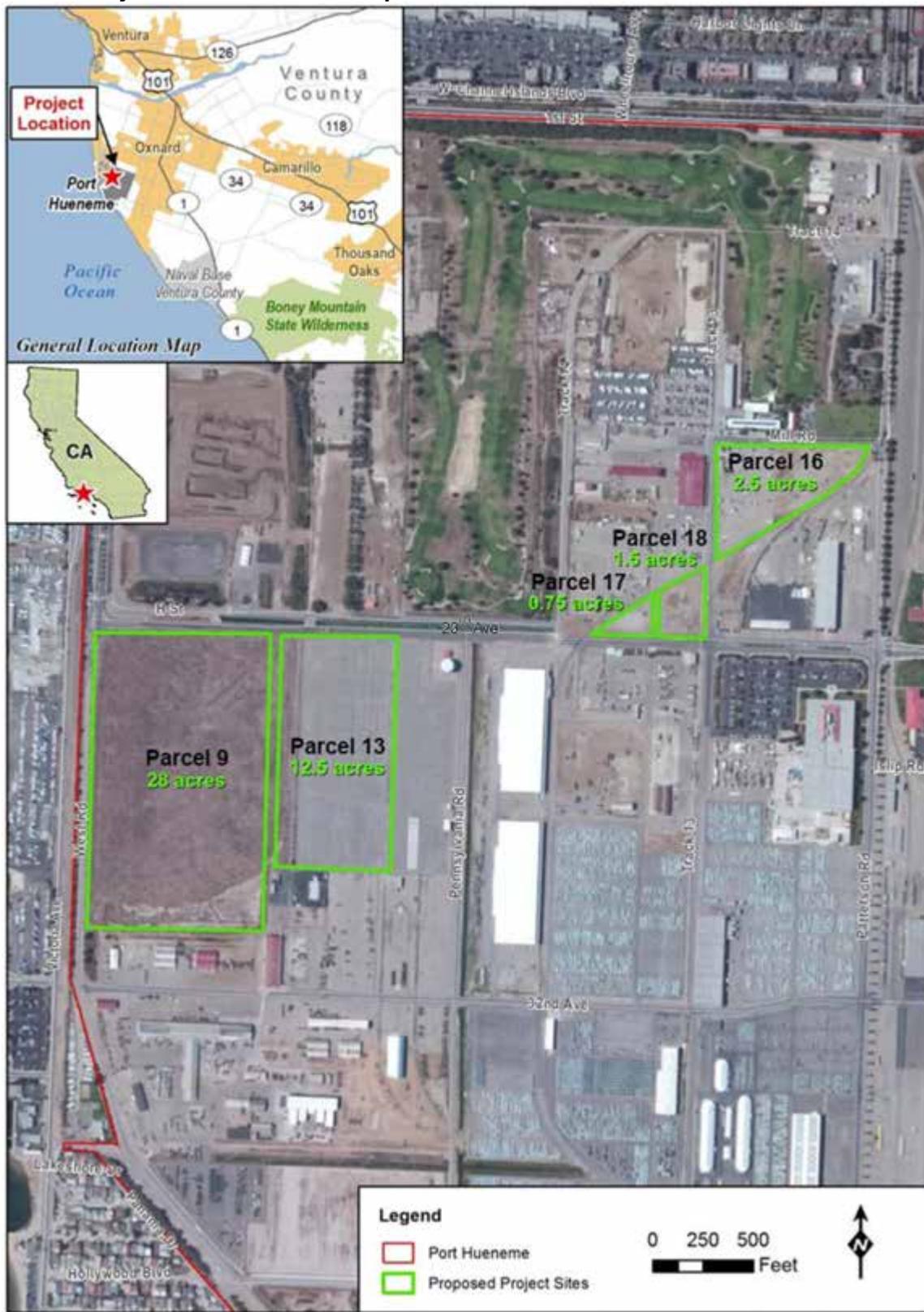


The Navy has identified five sites, designated as Parcels 9, 13, 16, 17, and 18, as potential locations to be analyzed for construction and operation of a PV system at NBVC Port Hueneme (**Figure 2**). All five sites can be characterized as industrial and, with the exception of Parcel 9 (a closed landfill), all sites are topographically flat.

### Parcel 9

Parcel 9 is a 28-acre (11.3-hectare) site located on a closed landfill bounded on the north by 23rd Avenue and on the west by West Road. It is located north of 32nd Avenue and west of Pennsylvania Road. Because of its current land use as a closed landfill, the topography is gently mounded with a demonstrated swale on the southern end. The swale dips into a topographically flat area that serves as a retention area for rainfall. The area is connected to an outfall that flows into the municipal system. Two groundwater wells and approximately 30 raised landfill gas vents are incorporated into the design of the landfill cover.

Figure 2. Project Parcel Location Map



### Parcel 13

Parcel 13 is a flat, 12.5-acre (5-hectare) site located on a mostly paved lot bounded on the north by 23rd Avenue and is immediately east of Parcel 9 on Toledo Road. Like Parcel 9, it is located north of 32nd Avenue and west of Pennsylvania Road. This parcel contains railroad trackage. It has several groundwater monitoring wells currently installed. It is mostly vacant but is used sporadically for parking.

### Parcel 16

Parcel 16 is a flat, 2.5-acre (1-hectare) vacant, unused lot bounded on the north by Mill Road, on the west by Track 13 Road, and along the southeast by a set of railroad tracks. It is located west of Patterson Road and north of 23rd Avenue. The Quarters D complex, evaluated as historic district eligible for the National Register of Historic Places, is located approximately 250 feet north of Parcel 16, but is visually shielded from Parcel 16 by existing large trees.

### Parcel 17

Parcel 17 is a flat, 0.75-acre (0.3-hectare) vacant, unused lot bounded on the south by 23rd Avenue and along the northwest by a set of railroad tracks. It is located immediately west of Parcel 18, between Track 13 Road and Track 14 Road.

### Parcel 18

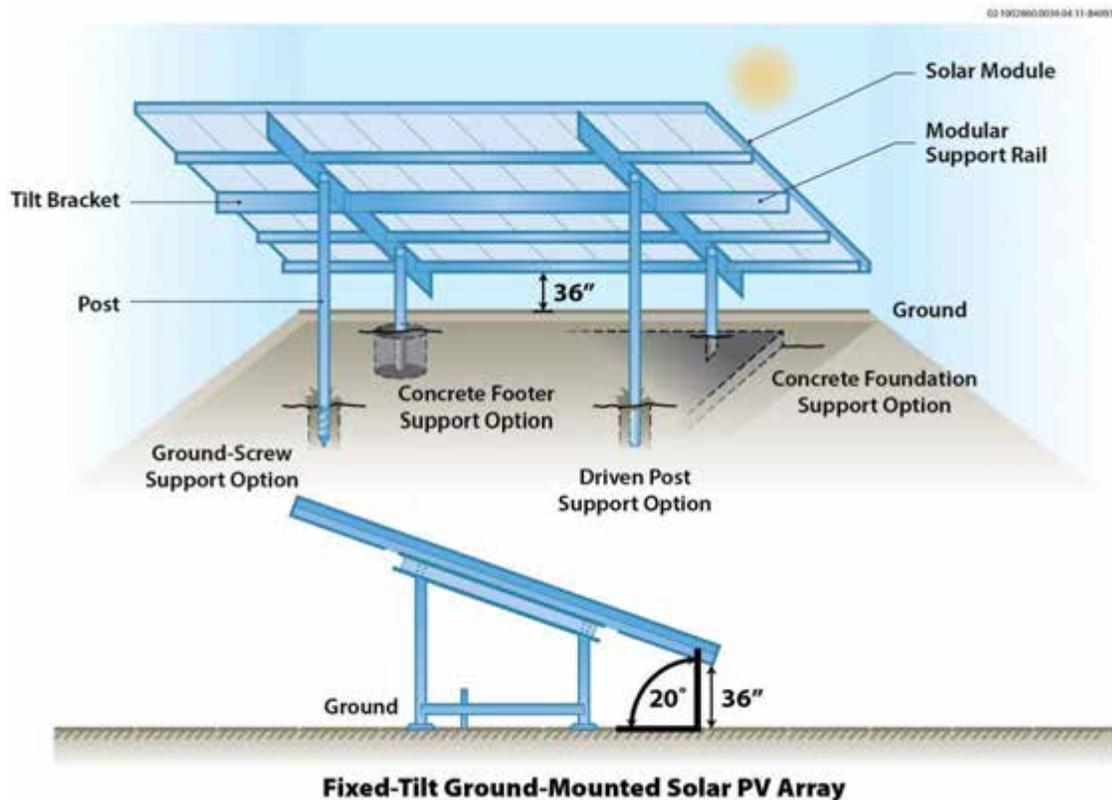
Parcel 18 is a flat, 1.5-acre (0.6-hectare) partially vacant lot bounded on the south by 23rd Avenue, on the east by Track 13 Road, and on the north by a set of railroad tracks. It is located immediately east of Parcel 17. A major portion of the paved northwestern area of the parcel is used as a parking lot.

## **1.2.3 Proposed Action**

The Navy and a third-party developer would enter into a lease agreement to allow the third-party developer to use Navy land to construct, operate, and own the PV system or systems. The Proposed Action would include the construction, operation, maintenance, and possible decommission of a ground-mounted PV system.

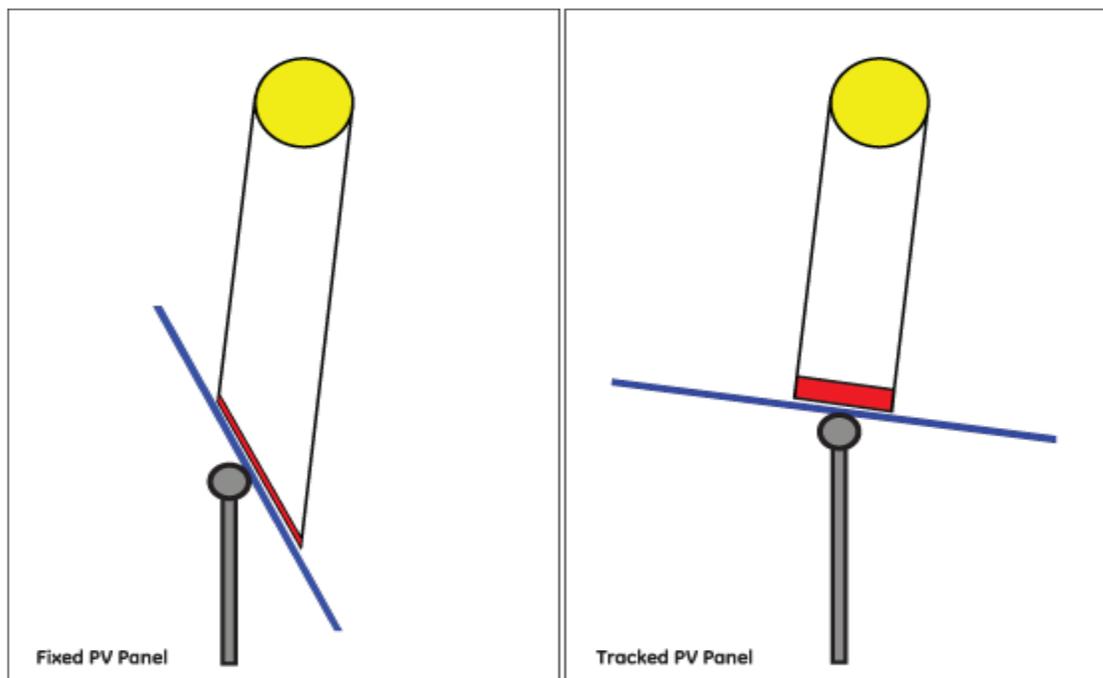
A typical configuration for this type of system is to install vertical members into the ground, with panel mounting hardware, frames, motors, and/or the solar panels themselves affixed atop the constructed mounting structure. Pole footings (or similar) would be used, and each footing would consist of a 4-inch (10-centimeter) cross-sectional area and would require a depth of 4 feet to 6.5 feet (1.2 meters to 2 meters) below ground surface (**Figure 3**). Note that pole footings and pile depth indicated are typical approximations. The actual pile depth would depend on the site geotechnical data and final structure design. Pile spacing would depend on the final design configuration determined by the installer.

**Figure 3. Panel Mounting Methods**



One of two types of ground-mounted systems may be constructed at the project sites, depending on the third-party developer's site design: a fixed-tilt panel system or a tracker-mounted panel system. Fixed-tilt solar arrays would remain stationary, whereas tracker-mounted arrays would be mounted on an axis and would be free to move throughout the day to maintain the best sun angle and maximize power output (**Figure 4**). The estimated highest point of the solar array for a ground-mounted solar PV system would not exceed 8 feet (2.4 meters) above the ground surface and would depend on the solar PV system type (i.e., fixed-tilt or tracker-mounted) and tilt of the arrays. Fixed-tilt panels would maintain a fixed height, whereas the maximum height of tracker-mounted arrays would vary as the arrays move to track the sun. Ground-mounted panels would be approximately 5 feet (1.5 meters) wide and 3 feet (0.9 meter) long. The number of panels in each array, the type of ground-mounted system used, and the array configuration would depend on the third-party developer's site design. The third-party developer would create a conceptual design to allow for the most efficient placement and configuration of PV panels on the property. The third-party developer would also be responsible for the decommissioning and disposal of the facilities and to restore the sites to existing conditions at the end of the agreement period.

**Figure 4. Fixed-Tilt Panel versus Single-Axis Tracking**



The facilities to be constructed include solar PV panels, steel mounting and/or tracking structure, inverters, combiner boxes, and electrical switchgear, as well as associated electrical wiring, connections, and other items required for the PV system. Each ground-mounted system would be enclosed by 8-foot-high (2.4-meter-high) chain-link panels with barbed-wire outriggers installed by the third-party developer in accordance with force protection standards. The fencing would include privacy slats (i.e. “scrim”) and three strand barb wire along all Proposed Action development boundary lines. The scrim will likely be green, consistent with common industry practice. The purpose of the fencing would be to provide a safety barrier against unintended access to the site and equipment and as a security measure to protect from vandalism and theft.

Construction and installation of ground-mounted PV panels may involve the following site preparations:

- Grading to remove vegetation
- Installation of underground electrical lines (3 feet [0.9 meter] deep)
- Trenching between panels for installation of electrical circuits
- Placement of 6 to 8 inches (15 to 20 centimeters) of gravel over the entire area
- Installation of fencing around the perimeter of the project

Equipment used to install the PV arrays may include bulldozers, scrapers, backhoes, pile drivers, water trucks, trenchers, and truck-mounted mobile cranes.

## **1.2.4 Proposed Alternatives**

### **1.2.4.1 Alternative 1: Construction, Operation, and Maintenance of a Ground-Mounted Photovoltaic System at Parcels 9, 13, 16, 17, and 18**

Alternative 1 consists of the installation of a ground-mounted PV system as described under the Proposed Action at Parcels 9, 13, 16, 17, and 18. The total acreage of the combined five sites would be 45.25 acres (18.3 hectares). Alternative 1 includes the construction phase, operation of the PV system, and maintenance (and possible decommissioning at the end of the lease). Implementation of Alternative 1 would result in the generation of an estimated 6 megawatts (MW) of renewable energy toward the Navy's renewable energy goal of 1 GW by the end of Year 2015.

### **1.2.4.2 Alternative 2: Construction of a Photovoltaic System at Parcel 9**

Alternative 2 would be the same as Alternative 1, except that the PV system would only be constructed, operated, and maintained (and possibly decommissioned at the end of the lease) at Parcel 9, a 28-acre (11.3-hectare) parcel. This alternative would contribute an estimated 4 MW of renewable energy toward the Navy's renewable energy goal of 1 GW by the end of Year 2015.

### **1.2.4.3 Alternative 3: Construction of a Photovoltaic System at Parcels 9 and 13**

Alternative 3 would be the same as Alternative 1, except that the PV system would only be constructed, operated, and maintained (and possibly decommissioned at the end of the lease) at Parcels 9 and 13. The total acreage of the combined two sites would be 40.5 acres (16.4 hectares). This alternative would contribute an estimated 4 MW toward the Navy's renewable energy goal of 1 GW by the end of the Year 2015.

### **1.2.4.4 Alternative 4: No Action Alternative**

With selection of the No Action Alternative, a PV system would not be constructed, operated, and maintained at NBVC Port Hueneme, and NBVC Port Hueneme would not contribute toward the Navy's goal of producing 1 GW of renewable energy by the end of 2015. Existing land uses on Parcels 9, 13, 16, 17, and 18 would continue. The No Action Alternative provides a measure of the baseline/existing conditions against which the impacts of the action alternatives can be compared. No further assessment was performed on the No Action Alternative based on the assumption that operations would be maintained at the status quo (no new land use would occur at Parcels 9, 13, 16, 17, and 18).

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## **2.0 REGULATORY FRAMEWORK**

### **2.1 Federal Regulations**

The following federal statutes and regulations are pertinent to visual landscapes and aesthetics.

#### National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969, as amended (Public Law 91-190), 42 United States Code (U.S.C.) 4321 and 4331–4335) states purposes are “To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality” (U.S.C. 1970). The following sections of NEPA relate to the visual landscape and to aesthetics:

(Section 101-b) “In order to carry out the policy set forth in this Act, it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may—

(2) “assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;”

(Section 102-2) “all agencies of the Federal government shall...

(A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man’s environment;”

(B) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the visual landscape, a detailed statement by the responsible official on—

(i) the environmental impact of the proposed action,

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented...”

This viewshed analysis has been prepared by the Navy to support the Environmental Assessment process and ensure that the relevant provisions of NEPA identified above are met. This technical analysis is intended to serve as the primary analytical tool for assessing and addressing impacts to visual quality.

### National Historic Preservation Act

The National Historic Preservation Act (NHPA) includes language protecting the visual integrity of sites listed or eligible for the National Register of Historic Places: “Examples of adverse effects...include...introduction of visual, atmospheric, or audible elements that diminish the integrity of the property’s significant historic features...” (36 Code of Federal Regulations Part 800.5). Impacts to visual resources protected by the NHPA are discussed in the Cultural Resources sections of the Environmental Assessment for Construction and Operation of Solar Photovoltaic Systems at Naval Base Ventura County, California.

### **3.0 VIEWSHED ANALYSIS METHODOLOGY**

#### **3.1 Existing Resource Inventory**

This assessment was performed in accordance with NEPA regulation using a hybridized methodology combining aspects of two Federally-published visual resource assessment methodologies. Given the type of visual settings, anticipated types of viewer exposure, and the aesthetic qualities inherent to the systems proposed for development; visual character/quality and viewer response were determined through the assessment methods furnished by the Federal Highway Administration (FHWA). To determine the potential relationship between existing setting and the Proposed Action, color and textural changes in the landscape were assessed utilizing the contrast rating system established by the Bureau of Land Management (BLM) Visual Resource Management (VRM) system.

To begin the viewshed analysis, the visual limit of the study area or the physical extent of areas from which the Proposed Action could be viewed must be identified. This boundary was determined in the field and through analysis of existing development, topography, and aerial photographs. Once delineated, viewer groups and conceptual Key Observation Points (cKOPs) locations were determined through field observations and corridor-specific viewshed modeling. cKOPs were then verified for efficacy through view-specific visibility modeling and field reconnaissance, and final KOPs were chosen when determined to represent the most sensitive viewpoints or those viewpoints most high-frequently encountered by viewers in the landscape.

##### **3.1.1 Determining Project Viewshed**

A project viewshed boundary, or limit of visibility, was then defined as the area within which a project could be visible. The viewshed boundary is also synonymous with the limits of viewers likely to be affected by visual changes from implementation of the Proposed Action. Four of five parcels considered for development under the Proposed Action (Parcels 13, 16, 17, 18) are located behind substantial earthen berms, dense existing vegetation, existing on-installation structures, and the Seabee Golf Course and are interior to NBVC Port Hueneme by no less than 0.20 mile (0.32 kilometers) from publicly visible locations. Therefore, the highest potential for adverse effects would occur within 0.5 mile (0.8 kilometer) of Parcel 9.

This project viewshed boundary includes the area bounded by West Channel Islands Boulevard to the north, South Victoria Avenue to the east, San Nicholas Avenue to the south, and South Harbor Boulevard to the west. The viewshed is composed of the Channel Islands Harbor and the unincorporated neighborhoods of Hollywood Beach and Silver Strand Beach, both a part of Channel Islands Beach, a census-designated place outside of the corporate boundaries of adjacent cities of Oxnard and Port Hueneme. **Figure 5** through **Figure 7** illustrate the visible extent of each Proposed Action Alternative depicted in color from least to most visible.

## Determining Existing Character

Visual character is defined by descriptive attributes in the landscape. Natural and artificial landscape features contribute to the visual character of both regional areas and specific viewpoints. Visual character is influenced by geologic, hydrologic, botanical, wildlife, recreational, and urban features. Urban features include those associated with development such as structures, roads, utilities, earthworks, and the results of other human activities. The perception of visual character can vary seasonally, even hourly, as weather, light, shadow, and elements that compose the viewshed change. The basic elements used to describe visual character for most visual assessments are the form, line, color, and texture of landscape features. The appearance of the landscape is described in terms of the dominance of these components. **Table 1** includes the range of visual quality characteristics.

**Table 1. Viewer Expectations**

<b>High Visual Character/Quality</b>	Objective is to preserve existing character of the landscape. Changes in the landscape may attract attention but should not be evident to the viewer and should not alter existing visual character.
<b>Moderately High Visual Character/Quality</b>	Objective is to retain existing character of the landscape. Changes in the landscape may begin to attract attention but should remain subordinate to the overall viewshed and should be visually congruous with existing visual character.
<b>Moderate Visual Character/Quality</b>	Objective is to partially retain the existing character of the landscape. Changes in the landscape may attract attention of the viewer, and may be tolerated, but should not dominate the visual setting or substantially alter existing visual character.
<b>Low Visual Character/Quality</b>	Objective is to allow for activities that modify the existing character of the landscape. Changes in the landscape may attract attention of the viewer and dominate the visual setting. However, these activities should be minimized in all cases where conclusion does not result in net-positive visual changes to visual character.

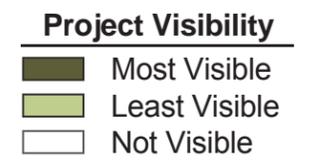
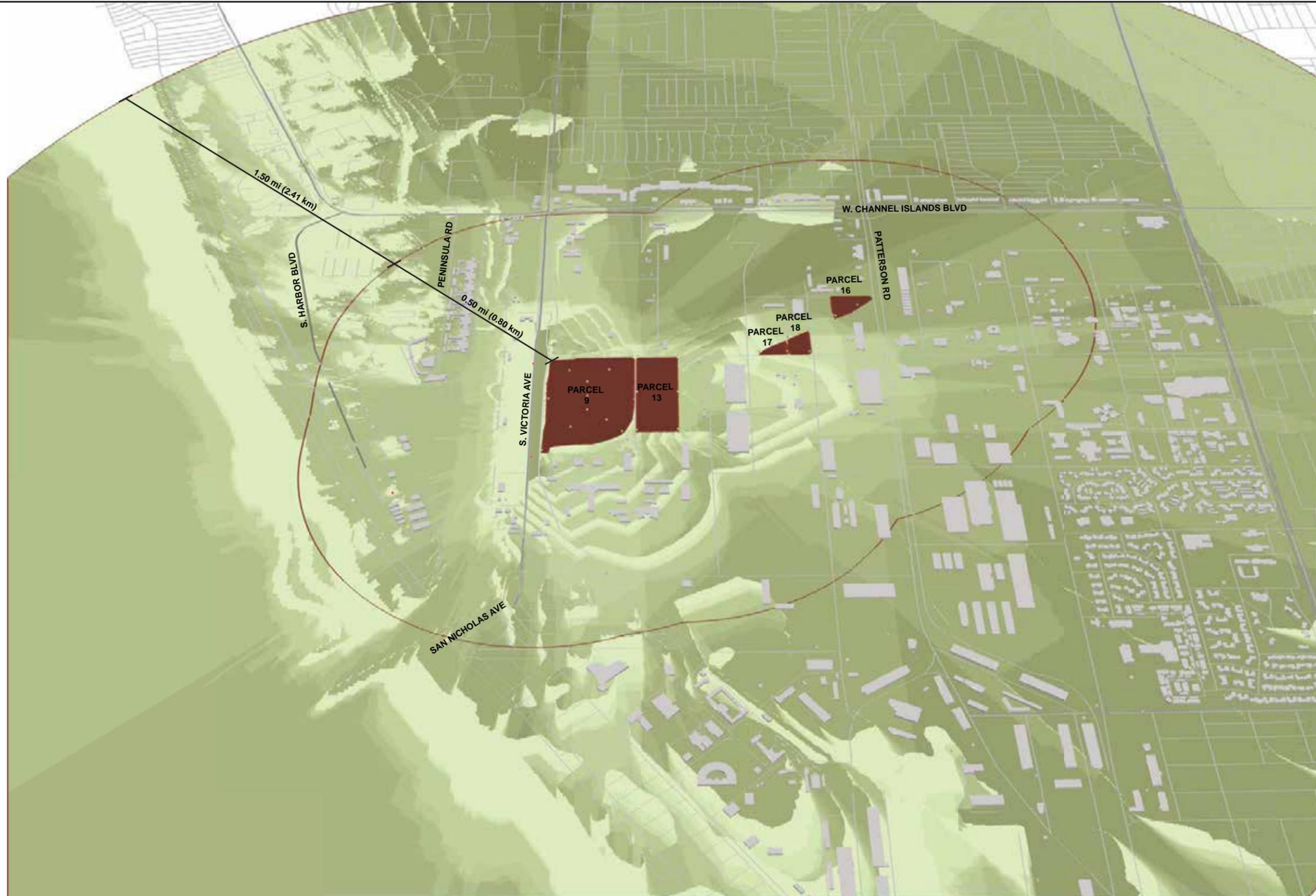
### **3.1.2 Determining Viewer Response**

Viewer response to changes in the visual landscape is based on a combination of factors:

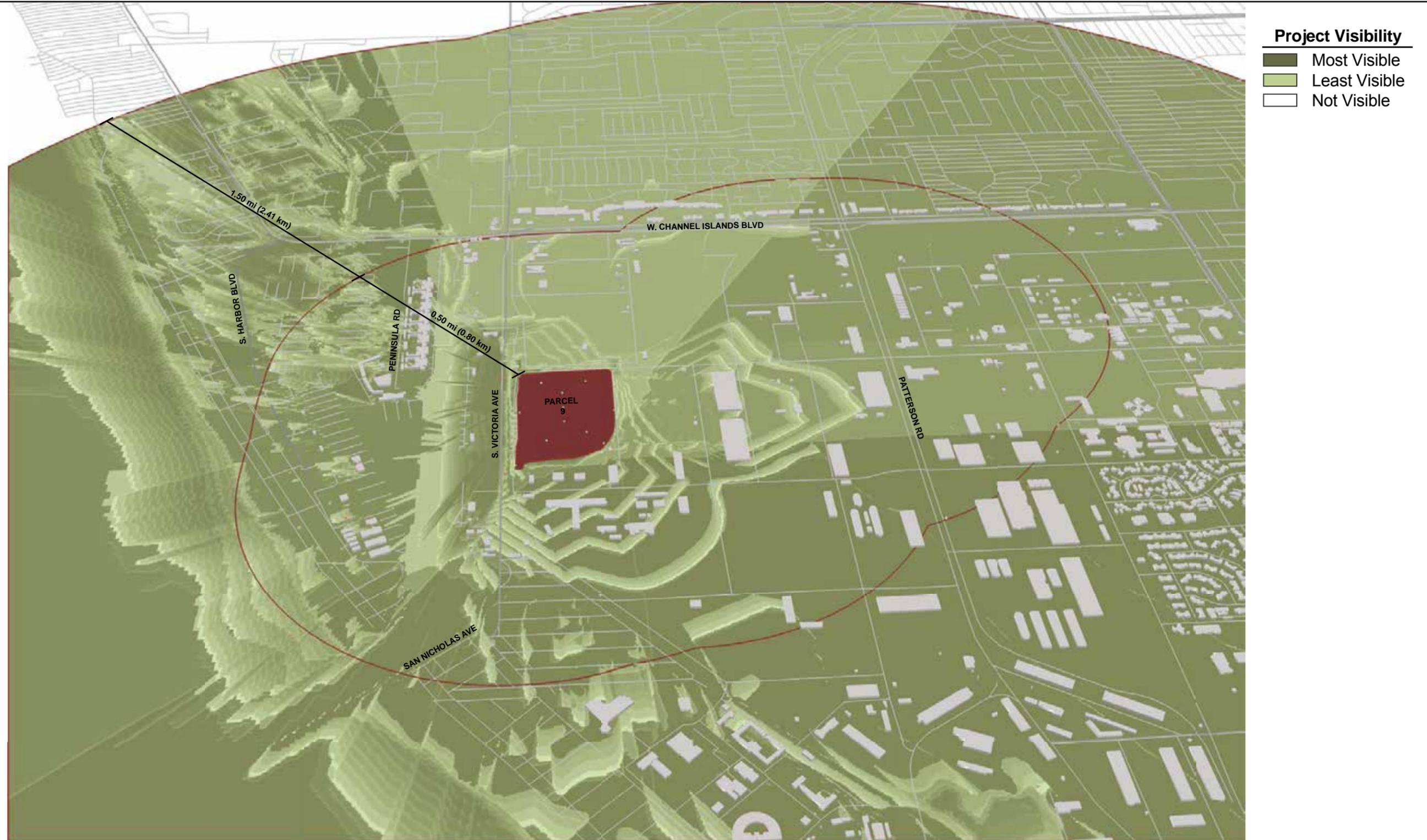
- individual viewers or groups affected by exposure to a project (viewer groups);
- viewer concern about noticeable changes to the view (viewer sensitivity); and
- frequency and duration of views (viewer exposure).

#### Existing Viewer Groups

To determine the potential number and sensitivity of anticipated viewers, lands surrounding the project area are evaluated for factors including land use designations, population density, part or full-time use/occupancy, and nature of the use or opportunity. Residential neighborhoods typically yield pedestrian and vehicular viewers, while commercial developments more often yield only vehicular viewers. Due to the proximity of the Pacific Ocean, Channel Islands Harbor and beachfront residential, hotel, visitor-serving commercial developments, as well as public amenities including park/open space and museums, recreational/pedestrian viewers are an important viewer group.



**Figure 5**  
Project Viewshed Map - Alternative 1



**Figure 6**  
Project Viewshed Map - Alternative 2

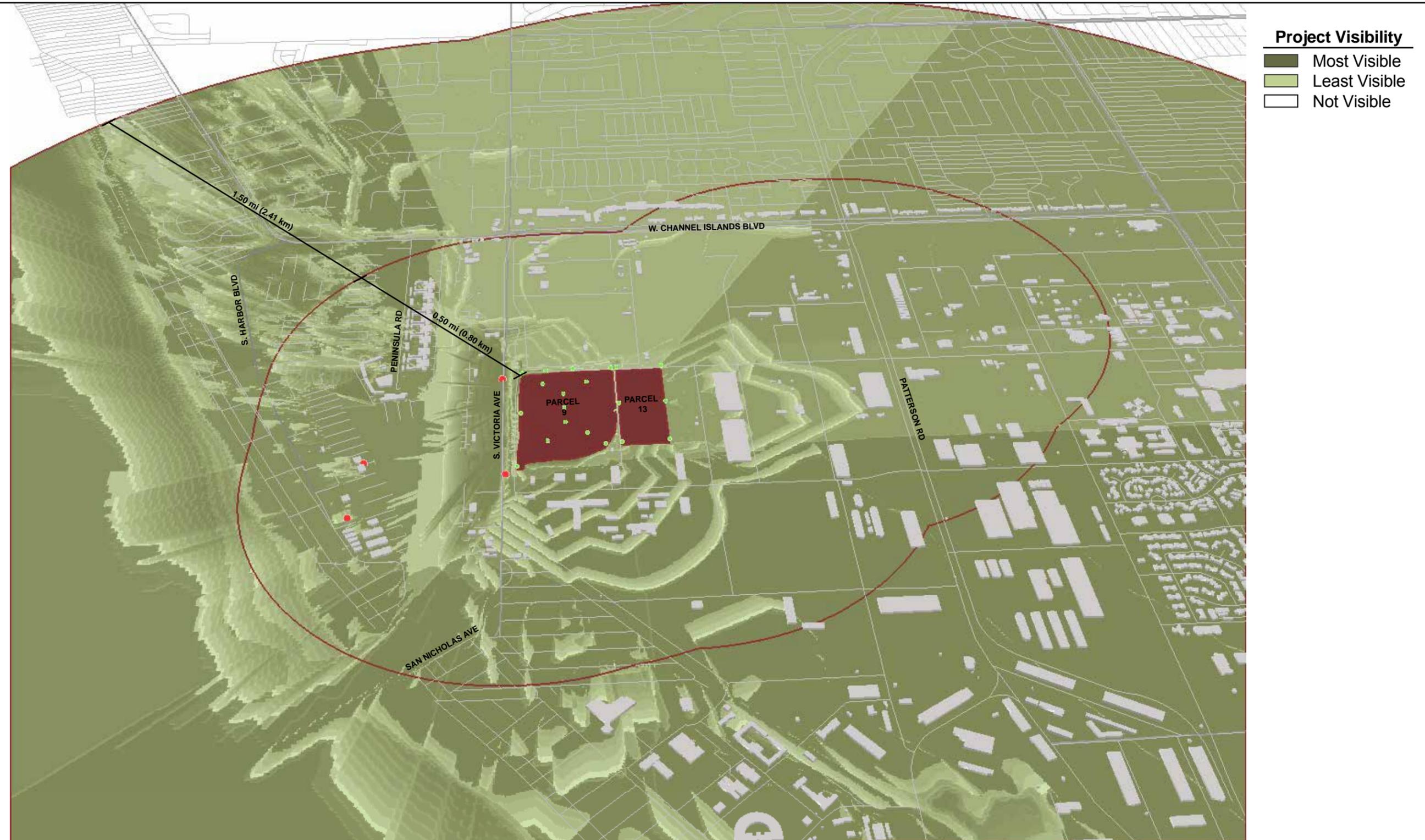


Figure 7  
Project Viewshed Map - Alternative 3

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Vehicular viewers are also anticipated to be an important viewer group due to the concentration of off-installation, north-south traffic to the west of NBVC Port Hueneme along South Victoria Avenue. Motorists are anticipated to experience unobstructed views of the Proposed Action at Parcel 9, and with limited potential north-south connections around the harbor, motorists are also anticipated to identify as members of other potential viewer groups including residents, tourists, and patrons.

### Existing Viewer Sensitivity

Viewer sensitivity is used as an evaluation term to discuss viewer concern for, and response to, changes in the visual landscape. The viewer's individual association with the environment can help determine their sensitivity to change as can their activity while viewing, so it is important to determine whether their views are incidental or sought-after. Activities such as commuting in heavy traffic can distract an observer from many aspects of the visual environment. On the other hand, recreational driving can encourage the examination of a landscape at greater length, thereby increasing the observer's attention to detail. For the purposes of this evaluation, sensitivity ratings have been based on viewer group activity and the levels of awareness typically associated with that group.

### Existing Viewer Exposure

Viewer exposure is assessed as defined in Section 3.1.2 of this document. Applied to the highest frequency viewers, as detailed previously (motorists), viewer exposure to the Proposed Action would be **high**, as the number would exceed 1,000 daily viewers.

## **3.2 Contrast Rating Analysis**

The visual resource contrast rating is a systematic process used to analyze the potential visual impact of the Proposed Action. The degree to which an activity affects the visual quality of a landscape depends on the visual contrast created between a project due to a project's alteration to, or visual incompatibility (color, texture, scale, etc.) with, the existing landscape.

## **3.3 Considerations for Determining Visual Impact**

Potential impacts to visual resources would typically result should any of the following occur from construction or operation of the Proposed Action:

- Visually obvious degradation of the foreground character or quality of a visually important landscape.
- Dominant visual changes in the landscape that are seen from highly sensitive viewer locations such as community enhancement areas (e.g., community gateways, roadside parks, viewpoints, and historic markers) or locations with special scenic, historic, recreation, cultural, archaeological, and/or natural qualities that have been recognized as such through legislation or some other official declaration.

Overall analysis considerations for Visual Resources are described in **Table 2**. The analysis of visual resources impacts to the visual landscape (water, people, and exposures) is based on the assumptions that degradation of public views and degradation in the scenic landscape are impact parameters that would affect how the public engages or interacts with a visual resource.

**Table 2. Analysis Considerations for Visual Resources**

Topic	Analysis Considerations and Relevant Assumptions
Impacts to Viewers (viewing public)	Measure the extent of and describe the effects of the Proposed Action's vertical structures and site disturbances on people through spatial analysis of baseline visual resources, sensitivity levels, and distance zones.
Proposed Visual Quality/Character	Measure the extent of and describe the effects of the Proposed Action's structures, site disturbances, and physical changes to the landscape through spatial and viewshed analysis (including visual simulations).
Consistency with Existing Visual Resources	Determine level of visual contrast from Key Observation Points to describe the form, line, color, and texture of existing structures and those of the Proposed Action. Compare the Proposed Action against baseline conditions to determine degree of visual contrast between existing and proposed conditions.

The 10 most common criteria used to determine viewer exposure and the attention afforded to visual contrasts were interpreted for applicability for the types of solar development and ancillary facilities associated with the Proposed Action. Those criteria include (1) the distance between observer and Proposed Action; (2) length of time the project is in view (linear or stationary viewers – KOPs); (3) the angle of observation; (4) whether the structures are sun lit (brighter, lighter blues/grays) or in shade (darker, less apparent blues/grays); (5) the presence of new vertical structures (including transmission support, buildings, tracking structures); (6) type of structures in view; (7) relative size or scale of development; (8) location within a scenic viewshed; (9) presence of residential (fixed, longer duration) viewers; and (10) reclamation recovery time.

Visual Quality/Character impacts (**Table 3**) are determined based on the level of change caused by the project with the existing conditions within an affected environment. The results are based on consideration of existing visual quality rating, existing landscape character, presence or absence of similar existing industrial development (building structures, transmission lines, fencing, etc.), and the effect of the Proposed Action on the landscape as either a new or an additional cultural modification.

**Table 3. Visual Quality/Character Impacts**

Existing Visual Quality	Proposed Action's Visual Change		
	Strong	Moderate	Weak
High	High	High	Moderate
Moderate	High	Moderate	Low
Low	Moderate	Low	Low

Impacts to viewer sensitivity were determined based on the comparison of change caused by the Proposed Action with sensitivity/user concern levels, distance zones (0 to 0.5 mile [0 to 0.8 kilometer], 0.5 to 1.5 miles [0.8 to 2.4 kilometers], 1.5 to 5 miles [2.4 to 8 kilometers], and greater than 5 miles [8 kilometers]) (**Table 4**), and visibility of the Proposed Action (**Table 5**).

**Table 4. Sensitivity Level Impacts**

Project Visibility	Proposed Action's Visual Change		
	Strong	Moderate	Weak
<b>High Viewer Sensitivity Impacts</b>			
0 – 0.5 mile (0 – 0.8 kilometer)	High	Moderate	Moderate
>0.5 – 1.5 miles (>0.8 – 2.4 kilometers)	Moderate	Moderate	Low
>1.5 – 5 miles (>2.4 – 8 kilometers)	Moderate	Low	Low
<b>Medium Viewer Sensitivity Impacts</b>			
0 – 0.5 mile (0 – 0.8 kilometer)	High	Moderate	Moderate
>0.5 – 1.5 miles (>0.8 – 2.4 kilometers)	Moderate	Low	Low
>1.5 – 5 miles (>2.4 – 8 kilometers)	Low	Low	Low

**Table 5. Viewing Distances**

Distance Zones	Distance from Proposed Action
Immediate Foreground	0 – 0.5 mile (0 – 0.8 kilometer)
Foreground-Middleground	>0.5 – 1.5 miles (>0.8 – 2.4 kilometers)
Background	>1.5 – 5 miles (>2.4 – 8 kilometers)
Seldom Seen	Greater than 5 miles (8 kilometers)

General visual impact levels are outlined in **Table 6**. Impacts to existing visual quality were determined by measuring the extent of effects of the Proposed Action's overall visibility, including structures, access roads, and newly disturbed rights-of-way through comparative spatial analysis of proposed project features.

**Table 6. Visual Impact Level Criteria**

Impact	Criteria
High	The Proposed Action would be dominant within an area of High Existing Visual Quality. The Proposed Action would introduce strong contrast within 0.5 mile (0.8 kilometer) of high sensitivity viewers.
Moderate	The Proposed Action would be co-dominant within an area of Moderate Existing Visual Quality. The Proposed Action would introduce moderate contrast within 0 to 1.5 miles (0 to 2.4 kilometers) of medium sensitivity viewers.
Low	The Proposed Action would be co-dominant within an area of Low Existing Visual Quality. The Proposed Action would introduce weak contrast within 0 to 1.5 miles (0 to 2.4 kilometers) of medium sensitivity viewers.

Impacts to viewers were determined by measuring the extent of effects introduced by the Proposed Action, including structures, access roads, and vegetation removal through spatial analysis; the existing visual resource inventory; sensitivity levels; and viewing distance zones.

Typically, mitigation measures would be considered as certain criteria were encountered. These commonly applied criteria are summarized below in **Table 7**.

**Table 7. Mitigation Consideration Criteria**

<b>Mitigation Considered</b>	<b>Criteria</b>
Yes	The Proposed Action would have a strong or moderate contrast within High Visual Quality. The Proposed Action would have a strong contrast within Moderate Visual Quality.
No	The Proposed Action would have a moderate contrast within Moderate Visual Quality. The Proposed Action would have a weak contrast in areas with Low Visual Quality.

## **4.0 VISUAL RESOURCES INVENTORY**

### **4.1 Existing Visual Character and Quality**

Per the methodology outlined in Section 3.0, Viewshed Analyses Methodology, the description of visual character is based on defined attributes characterized as neither positive nor negative. As such, a change in visual character cannot be described as being positive or negative until it is compared against anticipated viewer response to that change.

In this context, the surrounding visual character would be defined as a mosaic of widely varying land uses with each possessing distinct visual identity and contribution to character. Examples of these defining elements include open spaces including the Pacific Ocean, beaches, and public park spaces; densely developed residential neighborhoods along wide collector and arterial roadways; and visitor-serving retail buildings, hotels, light-industrial/harbor related-development, and resort commercial including private yacht clubs and marinas.

The most prominent cultural disturbances in the project area are roadway corridors, surrounding commercial developments, and historical landform modifications adjacent to the proposed sites as they contribute high-contrast surfaces, manufactured topography, moving objects, both moving and fixed light sources, and urbanizing elements such as large-scale signage and traffic signals. Examples of surrounding visual context are illustrated in **Figure 8**.

The level of existing quality was assessed by evaluating the vividness, unity, and intactness of the visual conditions as presently experienced. Vividness is the visual power or memorability of landscape components as they combine in distinctive visual patterns. Intactness is the visual integrity of the natural and man-built landscape and its freedom from encroaching elements. Unity is the visual coherence and compositional harmony of the landscape considered as a whole. It frequently attests to the careful design of individual manmade components in the landscape.

As detailed above, only one of five parcels (Parcel 9) considered for development under the Proposed Action is currently visible to the public. To more accurately describe these existing visual conditions and potential effects, existing visual conditions have been subdivided into two smaller viewshed units: Hollywood Beach and South Victoria Avenue corridor.

#### **4.1.1 Hollywood Beach**

The Hollywood Beach viewshed subarea is located to the west of NBVC Port Hueneme between Peninsula Road and the Pacific Ocean. Land uses include several hotels and restaurants, public parks (Peninsula Park and Harbor View Park), and public attractions including Ventura County Maritime Museum and Channel Islands National Marine Sanctuary Visitors Center. Dense, two- and three-story residential developments line the western frontage of S. Harbor Boulevard and extend west to Hollywood Beach.

Motorists and pedestrians traveling through this area experience intermittently obstructed, immediate foreground and foreground-middleground views across Channel Islands Harbor when facing north, east, and south; however, views west are fully obstructed by existing residential development until the southern terminus of S. Harbor Boulevard at Channel View Park. Existing visual character in this area is defined primarily by coastal architectural styles, beach-inspired public art and signage, and palm tree-lined streets and alley-ways. Large parking lots separate harborside development and public open spaces from S. Harbor Boulevard.

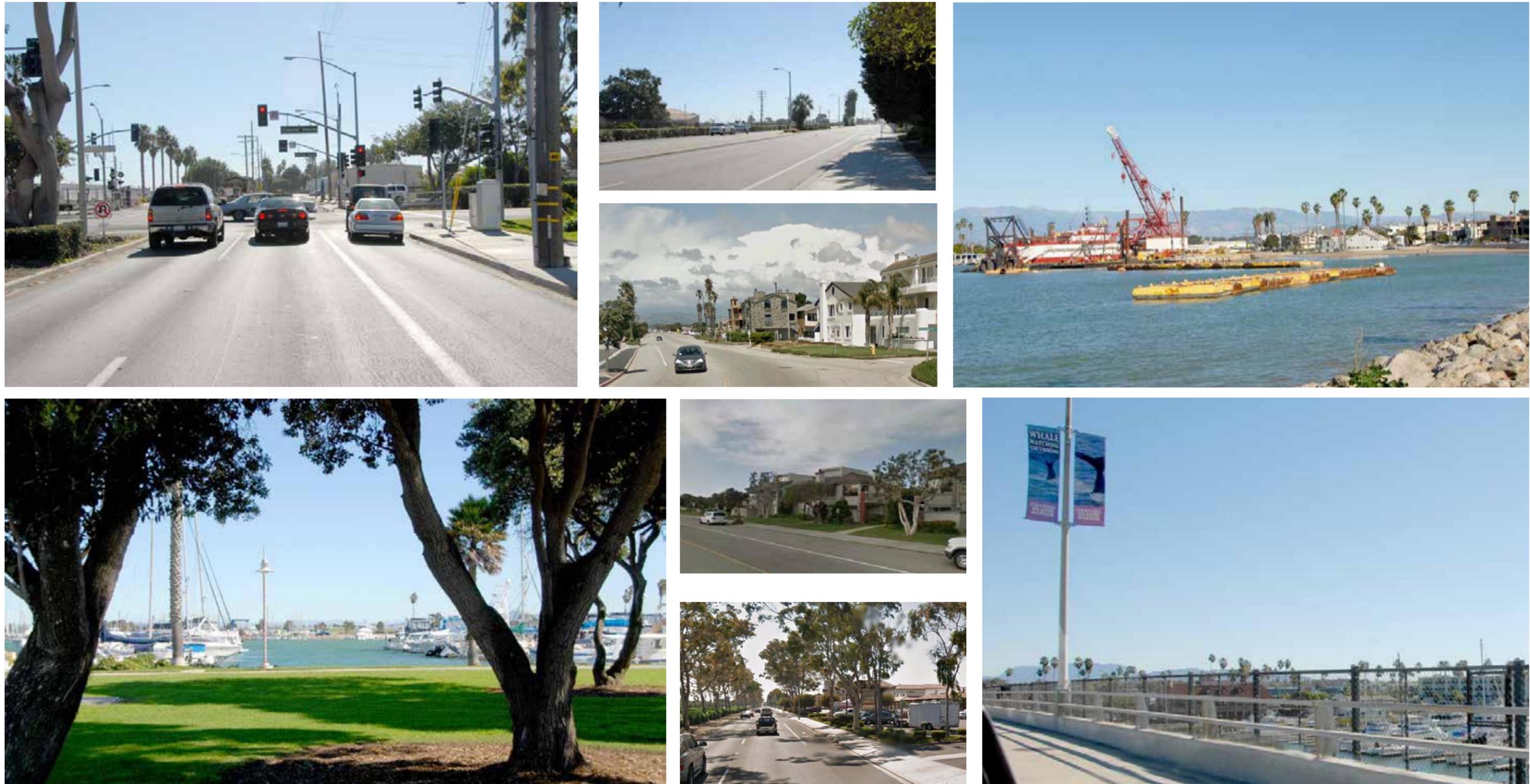
Depending on precise viewer location, views across Channel Islands Harbor of the Proposed Action range from partially to fully obstructed by building structures, heavily used marina slips, vegetation, and ongoing Harbor maintenance activities (dredging). Vividness, unity, and intactness are moderate to moderately strong in this viewshed unit and overall visual character/quality is moderate.

#### **4.1.2 South Victoria Avenue Corridor**

This viewshed unit is located immediately west of the Proposed Action, parallel with and adjacent to the western boundary of NBVC Port Hueneme; bound on the north by W. Channel Islands Boulevard, and the south by San Nicholas Avenue. Land uses through the majority of the corridor are heavily focused in maritime support, and include facilities providing boat storage and repair, and private boat launch and storage. South of Murre Way, the corridor becomes more densely lined with one- and two-story residential buildings, small neighborhood markets and restaurants, and public beach access to Silver Strand Beach.

Parcel 9 of the Proposed Action is separated from S. Victoria Avenue and this viewshed unit by uniformly spaced shade trees, security fencing, and an on-installation frontage road paralleling the fence line. Immediately adjacent to Parcel 9 is a lot used as open parking for large tractor-trailer/boat haulers, as well as general off-street parking. On-installation, Parcel 9 is a large expanse of open rolling grassland that gains elevation from north to south, and west to east away from the corridor.

Motorists and pedestrians traveling through this area experience occasionally direct, but most often partially obstructed, immediate foreground views of the Proposed Action when facing north, east, and south. Views west across Channel Islands Harbor are partially to fully obstructed by roadside fencing, structures, and occupied boatslips within the marinas. However, occasional open views across the water toward S. Harbor Drive and Hollywood Beach are available at specific points. Existing visual character in this area is heavily influenced by the semi-industrial appearance of these purpose-driven land uses, and vividness, unity, and intactness are low throughout this corridor; as such, existing visual quality is low in this location.



**Figure 8**  
**Surrounding Visual Context**

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## 4.2 Viewer Response

### 4.2.1 Viewer Groups

Two general viewer groups were considered by this analysis to evaluate viewer exposure, sensitivity, and anticipated response: vehicular viewers and recreational/pedestrian viewers. Generally speaking, very few direct foreground views exist of the project sites. Vehicular viewers would typically have a low to moderate awareness of the parcels composing the Proposed Action, and viewers would experience potential visual changes most directly along only one view corridor (S. Victoria Avenue). Although viewer sensitivity within this group is generally low due to the shorter durations of exposure, and proposed changes would remain largely consistent with viewer expectations of the site; vehicular viewers represent the largest population of affected viewers with unobstructed/partially obstructed, immediate foreground views of the Proposed Action.

Recreational/pedestrians viewers comprise the second primary viewer group potentially affected by the Proposed Action. Viewer sensitivity within this group is generally considered moderate to high due to typically longer-duration exposure to proposed changes, and often more purpose-driven expectations of a visual setting (e.g., coastal public access, waterfront restaurants, and park settings.) Because the Proposed Action is physically and visually adjacent to Channel Islands Harbor, viewer sensitivity and viewer expectation of stronger visual cohesion/higher visual quality are anticipated to be higher than average; however, viewers in this group would experience long-duration, foreground-middleground views of the Proposed Action (Parcel 9, particularly) from points along S. Harbor Boulevard.

### 4.2.2 Viewer Sensitivity

The quality of a visual landscape is largely determined by the extent of the public's interest in, and concern for, a particular view. For purposes of evaluating this public concern, Viewer Response is composed of two elements: *Viewer Sensitivity* and *Viewer Exposure*. These elements combine to form a method of predicting how the public might react to visual changes brought about by the Proposed Action.

*Viewer sensitivity* is defined as both the viewers' concern for scenic quality and the viewers' response to change in the visual resources that compose the view. To establish a measurable threshold for this concern, views are assigned a value of visual sensitivity. The public is generally concerned about areas possessing a high degree of visual character or quality, and these views typically contain highly visible or memorable landscape elements. Publicly accessible views from or within residential areas are generally considered to have greater visual sensitivity than views of, or from, more urbanized locations.

### 4.2.3 Corridor Viewsheds and Viewer Exposure

*Viewer exposure* is assessed by measuring the number of viewers experiencing potential changes in their visual environment. Those viewers are sorted by type of activity, duration of

view, speed at which the viewer is traveling, and the resulting positions of the viewer relative to proposed changes. Typically, viewer exposure would be characterized as low if a view were experienced by less than 100 viewers daily, moderate if experienced by between 100 and 1,000 viewers daily, or high when experienced by greater than 1,000 viewers daily. Viewer exposure would be high, as the number would exceed 1,000 daily viewers.

The analysis considered the viewing corridors as well as viewer position, duration of exposure, and the rate of travel to more accurately define the most sensitive viewpoints. **Table 8** below outlines this specific viewer data for each of the corridors considered in this analysis.

**Table 8. Calculated Viewer Exposure**

View Corridor	Posted Speed mph (kph)	Viewing Distance feet (meters)	Rate of Travel feet per second (meters per second)	Time of Exposure seconds
S. Victoria Ave	50 (80.4)	4,518 (1,377)	73.3 (22.3)	61.6
S. Victoria Ave/San Nicholas Ave, south of Murre Way	25 (40.2)	1,807 (551)	36.7 (11.2)	49.2
S. Harbor Blvd	40 (64.4)	2,761 (841)	58.7 (17.9)	47
W. Channel Islands Blvd, west of S. Victoria Ave	35 (56.3)	1,884 (574)	51.3 (15.6)	36.7
W. Channel Islands Blvd, between S. Victoria Ave and S. Patterson Rd	45 (72.4)	3,986 (1,214)	66.0 (20.1)	60.4

mph – miles per hour  
kph – kilometers per hour

These corridor viewsheds and viewing distances were integral to forming a well-nuanced viewer sensitivity and exposure determination, and conclusions were determined through detailed evaluation of nearby travel routes as experienced at the posted speed limit:

- South Victoria Avenue / San Nicholas Avenue, south of Murre Way
- South Harbor Boulevard
- W. Channel Islands Boulevard, between S. Harbor Boulevard and S. Victoria Avenue
- W. Channel Islands Boulevard, between S. Victoria Avenue and S. Patterson Road

Combined, these corridors compose the largest proportions of daily viewers. Vehicular corridor viewsheds are depicted in **Figure 9** through **Figure 12**.

### 4.3 Key Observation Points

To better understand existing conditions and potential viewer response, KOPs were selected based on a composite evaluation of the preceding project and corridor analyses. Because it was not feasible to analyze all views of the project, four KOPs were selected for their ability to simultaneously represent existing conditions and authentically depict the effects of implementation. These views established a baseline visual condition to which potential change was compared. The chosen KOP locations are identified in **Figure 13**. The anticipated viewshed of each KOP has been illustrated in **Figure 14**.



**Figure 9**  
Corridor Viewshed Map - S. Harbor Boulevard



Figure 10  
Corridor Viewshed Map - S. Victoria Ave / San Nicholas Ave

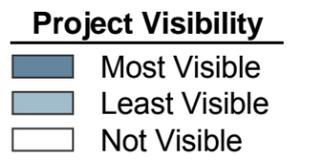


Figure 11  
Corridor Viewshed Map - W. Channel Islands Blvd (West)

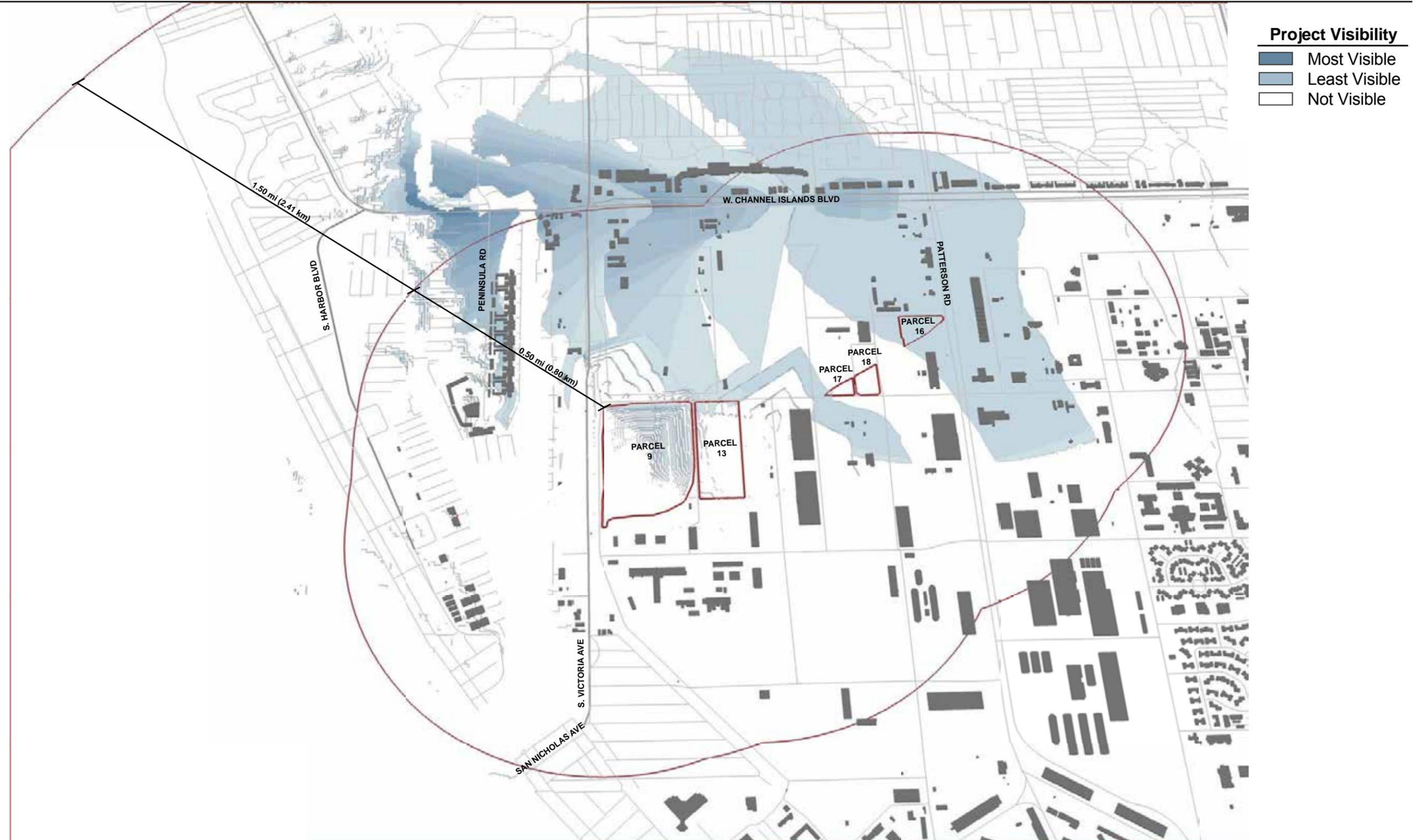


Figure 12  
Corridor Viewshed Map - W. Channel Islands Blvd (East)





Source: AECOM; DigitalGlobe, 2015



Figure 13  
KOP Location Map

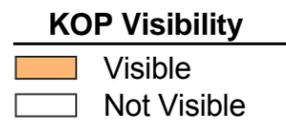
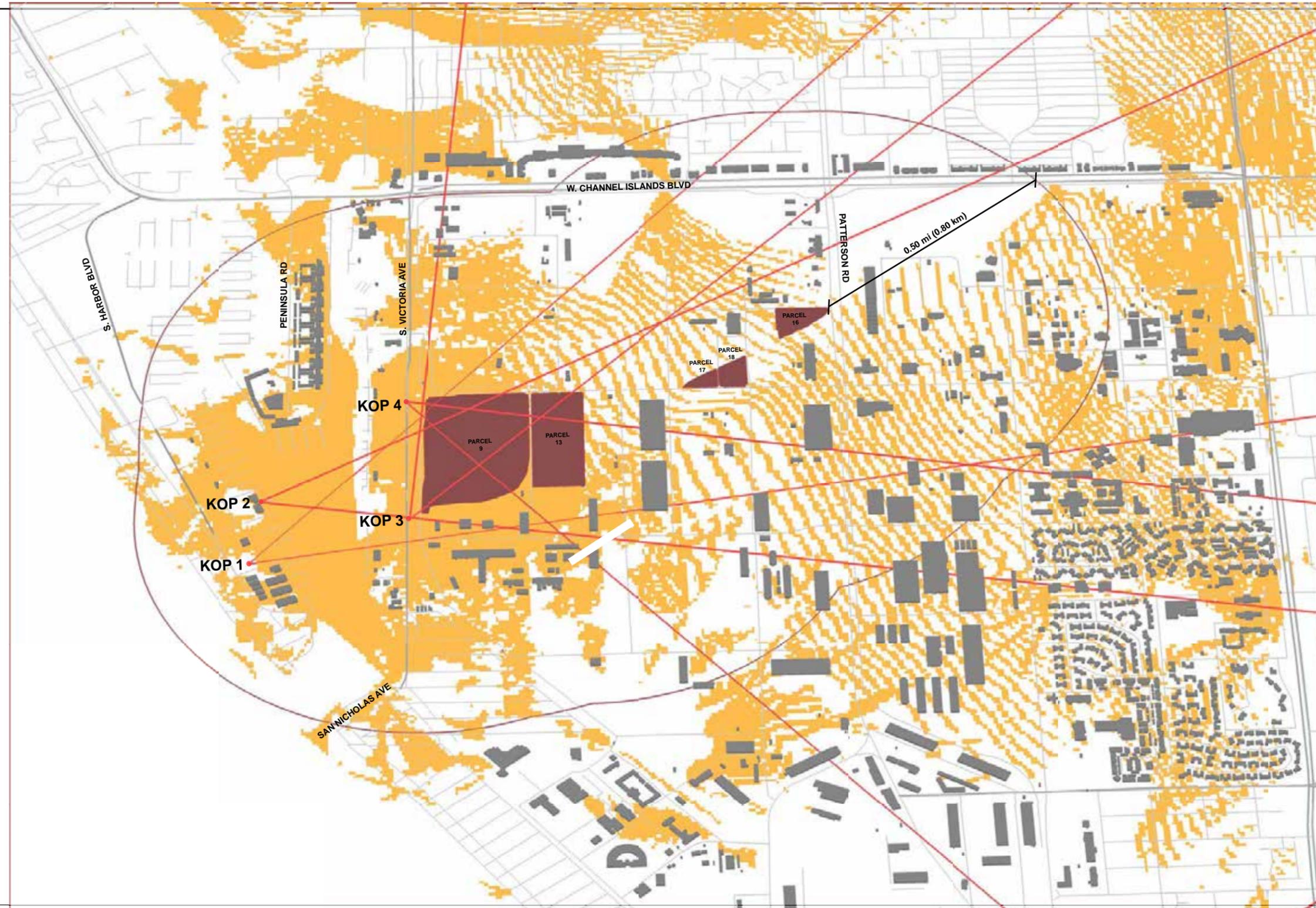


Figure 14  
KOP Viewshed Map

**KOP 1** faces east toward Parcel 9 across Channel Islands Harbor from Harbor View Park. This KOP illustrates a typical view experienced by recreational/pedestrian visitors to the Hollywood Beach neighborhood and the restaurant, commercial, and yacht club development along the eastern edge of South Harbor Boulevard (western side of the harbor). Viewers in this location are anticipated to experience long-duration foreground-middleground views of the Proposed Action.

Existing visual character is defined primarily by maritime architecture and activity; views east across the harbor are composed of shimmering white light mixed with deep blues from the water surface in the foreground and a mixture of greens, greys, and browns in the foreground-middleground as views extend over existing NBVC Port Hueneme open-space. Occasionally, background views of the Santa Paula Range and South Mountain are possible from these locations as both mountain ranges rise over 2,300 feet behind foreground views of boat masts and active port operations. **Figure 15** illustrates existing visual conditions at KOP 1.

**KOP 2** faces east toward Parcel 9 across the harbor from the Channel Islands Maritime Museum. This KOP illustrates a typical view experienced by recreational/pedestrian visitors and tourists visiting the adjacent waterfront attractions. Viewers in this location are anticipated to experience medium- to long-duration foreground-middleground views of the Proposed Action (Parcel 9), though views are almost always partially to fully obstructed from this edge of Channel Islands Harbor. Existing visual character and quality in this location are as described under KOP 1. **Figure 16** illustrates the existing visual conditions at KOP 2.

**KOP 3** faces north toward Parcel 9 along S. Victoria Avenue. Vehicular viewers in this location are approximately 110 feet (33.5 meters) from the western boundary of NBVC Port Hueneme (**Figure 17**). Several similar opportunities exist along this corridor for unobstructed, immediate foreground views of the Proposed Action; however, most viewers in this location are anticipated to be passing by Parcel 9 at speeds between 25 and 50 mph (40.2 to 80.4 kph) and would have a limited exposure and awareness of visual changes. Implementation of the project as proposed would introduce a third fence around the perimeter of the solar array to buffer direct, at-grade views from S. Victoria Avenue, but direct foreground views of the array are anticipated to remain above the fence line (at-grade installation would follow the existing vertical profile of Parcel 9 and appear above the screen fence until vanishing over the highest point on Parcel 9).

**KOP 4** faces southeast toward Parcel 9 from the southbound lane of S. Victoria Avenue. Vehicular viewers in this location are approximately 160 feet (48.8 meters) from the western boundary of Parcel 9, and the Proposed Action (**Figure 18**). Several similar opportunities exist along this corridor for unobstructed, immediate foreground views of the Proposed Action; however, most viewers along this corridor are anticipated to be traveling at the posted speed limit of 50 mph (80.4 kph), and would typically have limited exposure and awareness of visual changes at NBVC Port Hueneme. Implementation of the project as proposed would introduce a third fence around the perimeter of the solar array to buffer direct, at-grade views from S. Victoria Avenue, but direct foreground views of the array are anticipated to remain above the fence line as described under KOP 3.

**Figure 15. KOP 1 – Existing Conditions**



**Figure 16. KOP 2 – Existing Conditions**



**Figure 17. KOP 3 – Existing Conditions**



**Figure 18. KOP 4 – Existing Conditions**



#### **4.4 Additional View Locations Considered**

##### W. Channel Islands Boulevard and S. Patterson Road

Located approximately 0.31 mile (0.48 kilometer) north of Parcel 16, this view was anticipated to illustrate the southern viewshed along S. Patterson Road, as experienced by vehicular viewers approaching the “North Gate” at NBVC Port Hueneme. This location was initially studied as a KOP due to its proximity and potential line of sight to Parcels 16, 17, and 18 of the Proposed Action and number of average daily viewers. Field investigation determined, however, that due to dense existing vegetation along W. Channel Islands Boulevard and the northern perimeter of NBVC Port Hueneme and intervening building structures, the Proposed Action would not be publicly visible in this location or from surrounding publicly accessible locations, and implementation would be unlikely to alter existing visual character or quality.

##### W. Channel Islands Boulevard and S. Victoria Avenue

Located approximately 0.47 mile (0.76 kilometer) north of Parcels 9 and 13, this intersection was studied initially as a KOP due to the proximity to all parcels of the Proposed Action and number of average daily viewers passing through this intersection. Field investigation determined that due to dense existing vegetation along S. Victoria Ave and on-installation in the northwest corner of NBVC Port Hueneme, existing intervening building structures, and existing landform alteration (earthen berms), the Proposed Action would not be visible from this location or those immediately surrounding it, and implementation would be unlikely to alter existing visual character or quality.

##### Channel View Park

Channel View Park is located 0.39 mile (0.63 kilometer) from the nearest boundary of the Proposed Action (Parcel 9), at the southern terminus of S. Harbor Boulevard. Potential viewer groups included pedestrian/recreational and vehicular viewers; however, as determined in the field, visibility of the Proposed Action ranged from extremely limited to not visible, and impacts to visual resources would be very unlikely.

##### Peninsula Park

Peninsula Park is located approximately 0.31 mile (0.50 kilometer) from the nearest boundary of the Proposed Action on the western edge of the Peninsula Road, adjacent to the Hampton Inn Channel Islands property. Potential viewer groups included pedestrian/recreational and vehicular viewers; however, as determined in the field, visibility of the Proposed Action ranged from extremely limited to not visible, and impacts to visual resources would be unlikely.

##### San Nicholas Avenue / Channel Islands Beach access

The public beach access/parking for Silver Strand Beach is located 0.48 mile (0.77-kilometer) south of the nearest boundary of the Proposed Action, along San Nicholas Avenue. Potential

viewer groups included pedestrian/recreational and vehicular viewers; however, as determined in the field, visibility of the Proposed Action is fully obstructed by high-density marina operations, multi-story residential development, and existing mature vegetation. On balance, those viewers facing northwest would experience unobstructed views across Channel Islands Harbor toward the Santa Paula range in the background. Existing visual quality is moderately high-high in this location.

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## 5.0 CONTRAST RATING AND IMPACT RESULTS

A number of factors inform the overall degree of contrast (see Section 3.2), change to visual quality or character, and ultimately potential impacts resulting from project implementation. The composite analysis includes the following elements:

- proposed visual character/visual quality
- level of viewer response
- level of change to visual quality/character
- resulting visual impact

The resulting level of change was determined by comparatively evaluating proposed visual quality/character against existing conditions and considered factors such as landform alteration, vegetation removal, and built project features that would alter existing conditions in a noticeable way.

To evaluate the proposed conditions, visual simulations were prepared to illustrate the visual effects of the Proposed Action. The visual simulations were created by: photographing the site and surroundings with a global positioning system-enabled, high-resolution digital single-lens reflex camera; verifying the three-dimensional model of Proposed Action features provided by the Applicant; matching digital camera metadata to in-model cameras, and preparing a digital rendering of the final results at each KOP location. The project features depicted in the simulations have been provided for evaluation of conceptual solar development arrays within the chosen visual setting.

### 5.1 Impacts from Alternative 1

#### Construction Impacts

The visual landscape surrounding all parcels would be temporarily affected by construction of the proposed solar facilities and ancillary features such as perimeter fencing, and freestanding electrical equipment including current inverters and grid connection switchgear. Given the inherently dynamic visual aspects of construction activities, temporary viewshed disturbances would result from the staging, stockpiling, and placement of PV panels and inverter stations; construction-related traffic and equipment; temporary debris storage; and standard ground-clearing operations for construction.

Due to the presence of ongoing construction and various types of heavy equipment in use both on- and off-installation, existing bulk materials storage, and site grading operations unrelated to the Proposed Action, the anticipated visual contrast of construction phase activities would range from **weak** to **moderate** depending on distance of the observer from Parcel 9, most notably. In all cases, construction activities occurring in the immediate foreground view of the observer, particularly along S. Victoria Avenue, would cause greater temporary impacts to the visual landscape than those appearing at farther distances (the majority of the proposed area).

During this temporary construction period, direct impacts to viewer sensitivity are anticipated to be moderate to high, due primarily to the number of viewers along the affected vehicular corridors. Project construction activities, as discussed previously, that are located within 0.5 mile (0.8 kilometer) of high or moderate viewer sensitivity and that have moderate contrasts and/or impacts to the visual landscape would be short term. Measures to avoid and/or minimize potential temporary visual impacts, such as the use of visual screening, would reduce the overall visual contrast that would occur during construction.

### Operation Impacts

Direct impacts to affected viewsheds are anticipated to decline in contrast and memorability from levels described under construction impacts with the exception of Parcel 9. Because of the low vertical profile of proposed facilities and proposed screening measures, viewers passing through the project area are unlikely to notice a considerable change in visual character or to consider the visual character substantially diminished for the overwhelming majority of parcels developed under Alternative 1. However; visual change would be most apparent to viewers in the vicinity of Parcel 9 due to the proximity, aspect, and exposure of the parcel to a higher number of viewers with direct foreground viewing opportunities, and partially obstructed foreground-middleground views across Channel Islands Harbor.

As such, implementation of the Proposed Action would introduce a moderate degree of contrast to the existing visual setting; it would be viewed at immediate foreground distances by medium sensitivity viewers and foreground-middleground distances by high sensitivity viewers, and the resulting level of impact would be moderate as proposed. Incorporation of project design considerations and other measures designed to avoid, minimize, or mitigate potential visual effects within 0.5 mile (0.8 kilometer) from stationary and linear KOPs would reduce visual contrast from moderate to weak. **Figure 19** through **Figure 22** illustrate the potential visual effects of the Proposed Action. Potential new permanent night-time lighting would be confined to the switchgear area of each parcel and minimized to the extent permitted by OSHA and force protection standards and, further, down shield lights would be used to reduce night glare and light pollution. In addition, switchgear lighting would only be on when use is required for personnel to conduct work or during an inspection. Lighting would be off when use is not required. Lighting at inverters would be task-type lighting where a convenience outlet would be provided to plug in a work light. Lighting would not be continuous and would be only as needed. As a result, in combination with proposed screening measures, no adverse visual effects during night hours are anticipated.

Indirect viewshed impacts would result from disturbance by occasional maintenance operations and as-needed equipment replacement associated with the Proposed Action.



**Existing Conditions** - view facing east toward Parcel 9 from Harbor View Park

**Simulation** - view of Proposed Action from KOP 1

**Figure 19**  
**KOP 1 - Existing and Proposed Conditions**



**Existing Conditions** - view facing southeast toward Parcel 9 from the public patio at Channel Island Maritime Museum



**Simulation** - view of Proposed Action from KOP 2

**Figure 20**  
**KOP 2 - Existing and Proposed Conditions**



**Existing Conditions** - view facing northeast toward Parcel 9 from the northbound lane of South Victoria Avenue



**Simulation** - view of Proposed Action from KOP 3

**Figure 21**  
**KOP 3 - Existing and Proposed Conditions**



**Existing Conditions** - view facing southeast toward Parcel 9 from the southbound lane of South Victoria Avenue.

**Simulation** - view of Proposed Action from KOP 4

**Figure 22**  
**KOP 4 - Existing and Proposed Conditions**

## Decommissioning Impacts

Impacts to visual resources during the decommissioning phase of the Proposed Action would be temporary and similar in nature to construction impacts. No visual impacts would remain following decommissioning, provided the open grassland or similar naturalized aesthetic is restored to Parcel 9 through parallel restoration efforts.

### **5.2 Impacts from Alternative 2 (Parcel 9 Only)**

Impacts to visual resources with implementation of Alternative 2 would be similar to those described under Alternative 1. Direct impacts to viewers and existing resources would be moderate, as contrast would be moderate within low existing visual quality along S. Victoria Avenue, and moderate existing visual quality within the Hollywood Beach viewshed unit. Combined viewer response would also be moderate due to low impacts to recreational/pedestrian viewer sensitivity and moderate impact to medium vehicular viewer sensitivity.

Implementation of Alternative 2 would not differ materially from visual impacts described under Alternative 1. Incorporation of project design considerations outlined in Section 6.0, as well as other measures designed to avoid, minimize, or mitigate potential visual effects within 0.5 mile (0.8 kilometer) from stationary and linear KOPs, would reduce visual contrast from moderate to weak.

### **5.3 Impacts from Alternative 3 (Parcels 9 and 13 only)**

Impacts to visual resources with implementation of Alternative 3 would be similar to those discussed under Alternatives 1 and 2. Direct impacts to viewers and existing resources would be moderate, as Alternative 3 would introduce the same degree of contrast experienced in both Alternatives 1 and 2. However; the additional development on Parcel 13 would be obscured from view by the existing topography of Parcel 9 and would not result in additional effects to visual resources.

Implementation of Alternative 2 would not differ materially from visual impacts described under Alternative 1. Incorporation of project design considerations outlined in Section 6.0, as well as other measures designed to avoid, minimize, or mitigate potential visual effects within 0.5 mile (0.8 kilometer) from stationary and linear KOPs, would reduce visual contrast from moderate to weak.

### **5.4 Summary of Impacts**

Results are summarized in **Table 9** through **Table 14**, with relevant impact determinations indicated in bold text.

Impacts to visual quality and character (**Table 9**) were determined based on the comparison of change caused by the Proposed Action with the existing visual resources inventory of the

affected environment. The results are based in consideration of quality rating, existing landscape character, presence or absence of existing industrial development (transmission lines, fencing, structures, etc.), and the Proposed Action's contribution to the landscape as only an additional cultural modification.

**Table 9. Summary of Visual Quality/Character Impacts**

Alternative	Existing Visual Quality Rating	Proposed Action's Visual Change		
		Strong	Moderate	Weak
1	Moderate	High	<b>Moderate</b>	Low
2	Moderate	High	<b>Moderate</b>	Low
3	Moderate	High	<b>Moderate</b>	Low

**Table 10** presents a summary of Viewer Sensitivity Impacts determined based on the comparison of change caused by the Proposed Action. Viewer sensitivity was determined to be **high** for the recreational/pedestrian viewer group (concentrated around Channel Islands Harbor); while the higher-frequency vehicular viewer group was determined to be **medium** (over 1,000 daily viewers along S. Victoria Ave, solely and aggregated with those along S. Harbor Blvd). Visibility of the Proposed Action was determined to be concentrated within 0 to 1.5 miles (0 to 2.4 kilometers) as shown in **Table 11**.

**Table 10. Summary of Viewer Sensitivity Impacts**

Alternative	Project Visibility	Proposed Action's Visual Change		
		Strong	Moderate	Weak
<b>High Viewer Sensitivity Impacts (Recreational/Pedestrian Viewers)</b>				
1, 2, 3	0 – 0.5 miles (0 – 0.8 kilometer)	High	<b>Moderate</b>	Moderate
1, 2, 3	>0.5 – 1.5 miles (0.8 – 2.4 kilometers)	Moderate	Moderate	<b>Low</b>
<b>Medium Viewer Sensitivity Impacts (Vehicular Viewers)</b>				
1, 2, 3	0 – 0.5 miles (0 – 0.8 kilometer)	High	<b>Moderate</b>	Moderate
1, 2, 3	>0.5 – 1.5 miles (>0.8 – 2.4 kilometers)	Low	Low	<b>Low</b>

**Table 11. Summary of Viewing Distances**

Alternative	Distances	Distance from Proposed Action
1, 2, 3	<b>Immediate Foreground</b>	<b>0 – 0.5 mile</b> (0 – 0.8 kilometer)
1, 2, 3	<b>Foreground-Midground</b>	<b>&gt;0.5 – 1.5 miles</b> (>0.8 – 4 kilometers)

Visual impact levels are outlined by alternative in **Table 12**. Impacts to existing visual quality were determined by measuring the extent of effects of the Proposed Action’s structures, access roads, and site disturbances through comparative spatial analysis of the existing visual resource inventory, anticipated viewer response, and visual quality ratings.

**Table 12. Summary of Impact Levels**

Alternative	Impact	Criteria
1, 2, 3	Moderate	<ul style="list-style-type: none"> <li>• The Proposed Action would be co-dominant within an area of Moderate Existing Visual Quality.</li> <li>• The Proposed Action would introduce moderate contrast within 0 to 1.5 miles (0 to 2.4 kilometers) of medium viewer sensitivity.</li> </ul>
None	Low	<ul style="list-style-type: none"> <li>• The Proposed Action would be co-dominant within an area of Low Existing Visual Quality.</li> <li>• The Proposed Action would introduce weak contrast within 0 to 1.5 miles (0 to 2.4 kilometers) of medium viewer sensitivity.</li> </ul>

Conformance with typical viewer expectations were determined through comparison of visual contrast ratings from four KOPs, evaluating three build alternatives. **Table 13** outlines typical viewer expectations and conformance of the Proposed Action. Criteria for consideration of mitigation is summarized by alternative in **Table 14**.

**Table 13. Typical Viewer Expectation Benchmarks**

Existing Visual Quality	Typical Viewer Expectations
Low and Moderate to Moderately High	<ul style="list-style-type: none"> <li>• Objective is to allow for activities that modify the existing character of the landscape. Changes in the landscape may attract attention of the viewer and dominate the visual setting. However, these activities should be minimized in all cases where conclusion does not result in net-positive visual changes to visual character.</li> <li>• <b>As outlined in Section 5.0, implementation of the Proposed Action would introduce moderate contrasts within viewsheds possessing low and moderate to moderately high existing visual quality. In aggregate, the existing visual quality is Moderate.</b></li> </ul> <p><b>Primary visual changes include alterations of color and texture with change from existing grassland open space to photovoltaic surface, which may attract attention but would not dominate the surrounding visual setting.</b></p>

**Table 14. Summary of Mitigation Consideration Criteria**

Alternative	Mitigation Considered	Criteria
1, 2, 3	Yes	<ul style="list-style-type: none"><li>• The Proposed Action would have a high or moderate contrast within High Existing Visual Quality.</li><li>• The Proposed Action would have a high contrast within Moderate Existing Visual Quality.</li><li>• <b>The Proposed Action would have a moderate contrast within Moderate Existing Visual Quality.</b></li></ul>

## 6.0 MITIGATION MEASURES AND AVOIDANCE AND MINIMIZATION MEASURES

### 6.1 Mitigation Measures

Because implementation of the Proposed Action would not result in substantial impacts to visual resources, no mitigation measures are currently proposed. However, recommendations to help avoid and minimize moderate visual impacts are included in Section 6.2.

### 6.2 Recommended Project Design Considerations

Each of the parcels that would potentially be developed under Proposed Action are located within the Industrial Functional District of NBVC Port Hueneme as defined in the NBVC Installation Appearance Plan (NAVFAC Southwest 2008). Installation Appearance Plan site design objectives for the Industrial Functional District include mitigation of harsh industrial environment through screening, streetscape development, and district identification. Of these objectives, screening is directly applicable to the Proposed Action and would be implemented through use of privacy slats on exterior project fencing as previously described, although the topography of Parcel 9 diminishes the relative effectiveness of screening when compared to the other potential Proposed Action development parcels.

The following recommended project design considerations would further reduce the potential for adverse effects to viewers and existing visual resources. In assessing the potential impacts to nearby viewsheds, it was determined that all alternatives of the Proposed Action would have at least a "low" level of impact. **Table 15** summarizes these recommended design considerations.

**Table 15. Recommended Visual Resource (VR) Project Design Considerations**

VR-1	<b>Use BLM or equivalent environmental colors (Standard Environmental Colors, Color Chart CC-001, 2008) for surface coatings of permanent buildings, fences, gates, and other vertical structures to the extent practicable. Paint grouped structures the same color to reduce visual complexity and color contrast. This Project Design Consideration does not apply to PV surfaces.</b>
Effectiveness	This design consideration would reduce the visual contrast of vertical elements and site boundary fencing within the landscape.
VR-2	<b>Locate structures, roads, and other project elements as far from crossing roads, bike trails, and public gathering locations (linear KOPs) as possible. Where feasible, continue existing employment of landform alteration (berming) and vegetated screening to obstruct views along these view corridors.</b>
Effectiveness	This design consideration would reduce visual contrast by decreasing the apparent size and extent of structures, if not eliminating view accessibility.
VR-3	<b>Feather hard fence-line edges in the immediate foreground and foreground-middleground view distance zones from linear (roadway) and stationary (park) KOPs.</b>
Effectiveness	This design consideration would substantially reduce the visual contrast between hard edges and straight site boundary lines.

<b>VR-4</b>	<b>Materials and surface treatments of structures and land disturbances should repeat and/or blend with the existing form, line, color, and texture of the landscape and have little or no reflectivity (nonspecular). This measure does not apply to PV surfaces.</b>
Effectiveness	This design consideration would reduce line and form structure contrasts by blending structures with existing structures.
<b>VR-5</b>	<b>Minimize lighting at switchgear and inverters to the extent permitted by OSHA and force protection standards and downshield lights to reduce night glare and light pollution.</b>
Effectiveness	This design consideration would substantially reduce night-time visual contrasts by diminishing the effects of lighting on the night landscape.

BLM = Bureau of Land Management; KOP= Key Observation Point; OSHA = Occupational Safety and Health Administration; PV = photovoltaic.

## **7.0 REFERENCES**

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