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Solar Site Pre-Screening Results

The Optony team is pleased to provide a comprehensive Solar PV site screening report on twenty-four City-owned facilities and properties. The analysis has been completed and the findings from this screening are summarized below.

Based on the information collected remotely and during pre-screening discussions, potential usable rooftop, parking, and ground-mount areas were mapped out at each of the sites. From these areas, a maximum possible PV system size was calculated and solar production numbers were estimated. The production numbers are compared to the electricity usage numbers provided by the City to determine the maximum possible electricity usage offset, assuming solar installation at all reviewed usable areas.

Potential issues such as geotechnical challenges, roof and structural suitability, system shading, electrical infrastructure, and environmental issues were considered for each site. The California Environmental Quality Act (CEQA) requires the analysis and disclosure of environmental impacts of proposed projects. SB 226 signed by Gov. Wilson lists rooftop solar PV projects as statutorily exempt from CEQA requirements. Geotechnical issues pertain to the surrounding area of the overall site such as soil condition, water table levels, and presence of fault lines. Structural issues include the age of the roof as well as the building and building layout. Potential shading sources include tall trees, rooftop mechanical equipment, and neighboring buildings. Electrical issues in this case pertain to the need to upgrade existing electrical equipment to accommodate the addition of PV-related electrical equipment. The potential issues for each site were rated on a scale from None (no issues) to High (likely to require extensive further review or remediation).

The primary financial benefit of a solar PV system is the avoided cost of energy. Facilities with PV systems that generate electricity have a reduced need to purchase electricity from a utility company. The key drivers to ensure maximum avoided costs are a proper system design (which affects system production and long-term operations) and the utility rate schedule (which determines the value for the energy produced). For “A”-rated sites, avoided costs are estimated at 100% of the Annual Electricity Cost, assuming installation of the recommended PV system sizes. Further review of specific site electrical records will be needed to provide a more detailed projection of potential energy avoided costs.

Recommended system sizing is based on an 80% electrical usage offset with PV installation. During daylight hours, the energy produced by the PV system flows into the load at the meter, reducing or eliminating the need to purchase electricity from the utility. Excess energy is passed directly onto the utility grid, building up energy credits for the site. These credits are used up at night when the solar PV system does not produce electricity. Essentially, the site sells higher-value energy to the utility company in the daytime, and uses lower-cost energy at night. Therefore, instead of offsetting the electricity usage to 100%, the recommended system size reduces the utility bill to almost zero with a smaller PV system.

Sites were evaluated based on ten different variables and ranked to determine their relative potential for technical and economic feasibility. Shown below are the sites, organized by ranking (from A being most feasible to C being least feasible) with details for each site included in the table on the final page. Notes to briefly explain opportunities and challenges are included in the far right column of the table.

Feasibility Rank: A
Nine facilities were given a rank of “A” due to their strong potential for both technical and economic viability for solar installations. These nine locations are recommended to the City to undergo a full investment-grade solar feasibility study:

- City Hall – carport and rooftop areas
- Corporate Yard – carport and rooftop areas
- 3rd & C Parking Garage – rooftop shade structure areas
- Child Care Center – rooftop and shade structure areas

- Parking Lot 925A – rooftop shade structure areas
- Pickleweed Child Center – rooftop and carport areas
- Pickleweed Community Center – rooftop and carport areas
- San Rafael Community Center – rooftop and carport areas
- Terra Linda Rec Center – rooftop and carport areas

Feasibility Ranking: B
Sites were given a "B" ranking due to potential structural, site-use, construction, or aesthetic issues that may limit the feasibility of solar installation in the near-term. Potential issues have been identified at each site, and would need to be examined internally or through a full feasibility study to determine whether these issues offer a barrier to the installation of solar PV systems. In some cases, a site may be a good candidate for solar installation, but small system size may limit the ability to be included in the SEED Fund procurement.

- 3rd & Lootens Parking Garage – rooftop shade structure areas (primary concern: small system size, structural construction concerns)
- 5th & C Parking Garage – rooftop shade structure areas (primary concern: small system size, structural construction concerns)
- Fire Station #2 – rooftop and carport areas (primary concern: small system size)
- Fire Station #3 – rooftop areas only (primary concern: small system size)
- Fire Station #4 – rooftop and carport areas (primary concern: small system size)
- Fire Station #5 – rooftop areas only (primary concern: small system size)
- Fire Station #6 – rooftop areas only (primary concern: small system size, may have insufficient available space for PV system sizing needs)
- Fire Station #7 – rooftop areas only (primary concern: small system size)
- Library – rooftop and carport areas (primary concern: historical building, if parking areas are used for City Hall solar insufficient space is available for PV system sizing needs)

Feasibility Ranking: C
Sites were given a "C" ranking when either a very high electricity usage relative to solar capacity or high-risk technical issues were noted. While a PV system may still be feasible at these sites, it is unlikely that these systems will be able to provide economic savings to the City to justify the cost of the systems at this time.

- Child Care 140 Rafael – rooftop and carport areas (primary concern: small system size, land and facility are owned by the School District)
- Falkirk Cultural Center – carport areas only (primary concern: historical building with structural and aesthetic concerns, small system size, site security issues)
- Fire House Museum – rooftop areas only (primary concern: extensive tree shading in park, small system size)
- Fire Station #1 – rooftop and carport areas (primary concern: insufficient available space for PV system sizing needs, structural questions)
- 1033 C St. – rooftop areas only (primary concern: ownership issues, small system size)
- Parking Lot E St. – carport areas only (primary concern: small system size, site security issues)

The Solar Energy and Economic Development Fund (SEED Fund) has developed a regional collaborative solar procurement, similar to the recent procurement by the County of Santa Clara in Silicon Valley. Optony has found that participants in collaborative solar procurements are likely to realize significant savings in both total system costs and transactional time and costs when compared to single-site solar procurements.

Optony encourages the City to continue participation in the SEED Fund project by reviewing this report and determining which sites are the best candidates for investment-grade feasibility assessments and possible inclusion in a collaborative solar procurement. A Memorandum of Understanding with the SEED Fund will need to be signed, after which, the SEED Fund team will make arrangements to perform feasibility assessments at selected sites with no upfront cost to the City.

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Solar Site Screening Analysis: City of San Rafael (SRAF)

Date: 9/11/2012

Site ID	Site Name	Feasibility Rank	Site Address	City	Estimated Roof Area (sq. ft.)	Estimated Maximum Roof PV Size (kW)	Parking Lot or Ground Area (sq. ft.)	Estimated Maximum Parking Lot or Ground PV Size (kW)	Total Estimated Maximum PV Size (kW)	Est. Max PV Production (kWh)	Annual Electricity Usage (kWh)	Able to offset 80% of usage	Recommended PV size (kW)	Recommended system size PV Production (kWh)	Annual Electricity Cost	PV System Cost	Estimated 5-Year CSI Rebate	Potential Issues: Shading	Geotech	Structural	Electrical	Enviro	Notes
SRAF01	City Hall	A	1400 5th Ave.	San Rafael	4,212	38	19,488	272	309	417,384	624,320	NO	309	417,384	$ 104,687	$973,897 - $1,190,318	$183,649	High	Low	Low	Low	Low	Extensive shading from buildings and trees, including a redwood. Possible aesthetic issues with tree removal. May be unable to reach needed electrical offset without significant tree removal and high-efficiency modules. Higher-efficiency HVAC getting installed.
SRAF02	Corporate Yard	A	111 Morphew St.	San Rafael	21,529	192	28,951	403	596	804,142	327,040	YES	194	261,632	$ 55,259	$610,475 - $746,136	$115,118	Low	Medium	Low	Low	Low	Potential water table issues for concrete piers. High electrical offset possible, with added benefit of vehicle shade. Land is leased, so lease terms must be examined.
SRAF03	3rd & C Garage	A	3rd and C St.	San Rafael	23,400	209		-	209	282,062	225,280	YES	133	180,224	$ 38,693	$420,523 - $513,972	$79,299	None	None	High	Low	Low	Parking structure construction requires structural engineering review. Varying levels may make construction difficult.
SRAF04	3rd & Lootens Garage	B	3rd and Lootens Place	San Rafael	30,652	274		-	274	369,477	46,055	YES	27	36,844	$ 7,476	$85,969 - $105,074	$16,211	None	None	High	Low	Low	Parking structure construction requires structural engineering review. Relatively small system size needed.
SRAF05	5th & C Garage	B	5th and C St.	San Rafael	14,000	125		-	125	168,755	22,535	YES	13	18,028	$ 3,860	$42,065 - $51,413	$7,932	None	None	High	Low	Low	Parking structure construction requires structural engineering review. Small system size needed.
SRAF06	Child Care Center	A	100 Albert Park Ln.	San Rafael	3,018	27	3,040	42	69	93,568	69,600	YES	41	55,680	$ 14,448	$129,920 - $158,791	$24,499	Low	Low	Low	Low	Low	Potential damage from baseballs. Could provide shaded area for children.
SRAF07	Child Care 140 Rafael	C	140 Rafael Dr., Ste. A	San Rafael	3,858	34	3,045	42	77	103,787	7,460	YES	4	5,968	$ 1,562	$13,925 - $17,020	$2,626	Low	Low	Low	Low	Low	Small size, but good location. Potential for bigger system in conjunction with school.
SRAF08	Falkirk Cultural Center	C	1408 Mission Ave.	San Rafael		-	1,880	26	26	35,367	23,010	YES	14	18,408	$ 4,425	$42,952 - $52,497	$8,100	Medium	Low	Medium	Medium	Medium	Small size, tree shading. Relatively long trench run for system size. Site security concerns. Retaining wall would require upgrades.
SRAF09	Fire House Museum	C	Grove and Lodge	San Rafael	504	5	-	-	5	6,075	1,498	YES	1	1,198	$ 390	$2,796 - $3,418	$527	High	None	Medium	Low	Low	Very small system size, and extensive tree shading. Structural capacity would need to be reviewed.
SRAF10	Fire Station #1	C	1039 C St.	San Rafael	662	6	493	7	13	17,254	85,560	NO	13	17,254	$ 16,998	$40,260 - $49,206	$7,592	Medium	Low	High	Low	Low	Very little space for financially beneficial system size, with much HVAC on roof. Building may need structural retrofits to hold solar weight load.
SRAF11	Fire Station #2	B	210 3rd St.	San Rafael	1,700	15	1,365	19	34	46,170	35,120	YES	21	28,096	$ 6,570	$65,557 - $80,126	$12,362	Medium	Low	Low	Low	Low	Small system size. Some tree shading possible. Roof-only installation possible.
SRAF12	Fire Station #3	B	30 Joseph Ct.	San Rafael	3,277	29	-	-	29	40,261	12,200	YES	7	9,760	$ 2,325	$22,343 - $27,308	$4,294	Low	None	Low	Low	Low	Small system size needed.
SRAF13	Fire Station #4	B	46 Castro Ave.	San Rafael	3,752	34	1,701	24	57	77,226	17,770	YES	11	14,216	$ 3,453	$33,171 - $40,542	$6,255	Low	Low	Low	Low	Low	Small system size needed.
SRAF14	Fire Station #5	B	955 Point San Pedro Rd.	San Rafael	3,087	28	-	-	28	37,210	27,692	YES	16	22,154	$ 4,985	$51,692 - $63,179	$9,748	Low	None	Low	Low	Low	Small system size needed.
SRAF15	Fire Station #6	B	650 Del Ganado Rd.	San Rafael	2,635	24	-	-	24	32,374	47,780	NO	24	32,374	$ 9,881	$74,112 - $90,581	$14,244	Medium	Low	Low	Low	Low	Small system size needed. Some shading from trees, lines, flag. Available roof space may be insufficient to offset electrical usage.
SRAF16	Fire Station #7	B	3530 Civic Center Dr.	San Rafael	2,611	23	-	-	23	32,079	30,640	YES	18	24,512	$ 5,768	$56,114 - $68,584	$10,785	High	None	Low	Low	Low	Much tree shading, seems to be from redwoods. Small system size needed.
SRAF17	1033 C St. - Leased Commercial	C	1033 C St.	San Rafael	2,970	27	-	-	27	35,800	37,757	YES	22	30,206	$ 7,103	$70,480 - $86,142	$13,290	Low	None	Low	Low	Low	Questions about property lines and ownership, tenancy.
SRAF18	Parking Lot 925A	A	925 A St.	San Rafael	12,736	114	4,340	60	174	235,164	116,920	YES	69	93,536	$ 20,660	$218,251 - $266,751	$41,156	Medium	Low	High	Low	Low	Parking structure construction requires structural engineering review. Tree removal or trimming likely to be needed.
SRAF19	Parking Lot E Street	C	Mission Ave and E St.	San Rafael	-	-	5,418	75	75	101,925	1,672	YES	1	1,338	$ 413	$3,121 - $3,815	$589	Medium	Low	None	Low	Low	Small system size needed. Site security concerns.
SRAF20	Pickleweed Child Center	A	40 Canal St.	San Rafael	13,385	120	-	-	120	161,342	21,760	YES	13	17,408	$ 4,381	$40,619 - $49,645	$7,660	None	None	Low	Low	Low	Small system size needed, but possibility to offset other meter from roof.
SRAF21	Pickleweed Community Center	A	50 Canal St.	San Rafael	-	-	20,390	284	284	383,582	172,960	YES	102	138,368	$ 32,866	$322,859 - $394,605	$60,882	Medium	Low	None	Low	Low	Tree removal necessary. Possible to offset both meters with no roof installation.
SRAF22	San Rafael Community Center	A	610 B St.	San Rafael	7,064	63	7,633	106	169	228,743	158,480	YES	94	126,784	$ 30,163	$295,829 - $361,569	$55,785	Medium	Low	Low	Low	Low	Some tree removal likely to be needed. Potential baseball hazard.
SRAF23	Library	B	1100 E St.	San Rafael	2,745	25	-	-	25	33,088	198,000	NO	25	33,088	$ 37,633	$77,205 - $94,362	$14,559	Medium	None	Medium	Low	Low	Small available roof space compared to preferred system size. With use of City Hall parking, economics may change. Historical building makes rooftop installation unlikely.
SRAF24	Terra Linda Rec Center	A	670 Del Ganado Rd.	San Rafael	5,400	48	11,571	161	209	288,214	171,040	YES	99	136,832	$ 28,783	$313,242 - $382,851	$60,206	Medium	Low	Low	Low	Low	Tree removal may be necessary.
SRAF	**Agency Totals**	**24**		**San Rafael**	**163,197**	**1,457**	**109,315**	**1,523**	**2,980**	**4,031,049**	**2,482,149**	**YES**	**1,272**	**1,721,291**	**$442,782**	**$4,007,375 - $4,897,903**	**$757,368**						
SRAF	**Recommended PV Totals**	**9**		**San Rafael**	**90,744**	**810**	**95,413**	**1,330**	**2,140**	**2,894,200**	**1,887,400**	**YES**	**1,056**	**1,427,848**	**$329,940**	**$3,325,613 - $4,064,638**	**$628,253**						

*Estimated Maximum or 80% offset system size, where possible, is based on provided electricity usage and PV potential

Feasibility Rank:

"A" rating: Sites with space for PV installation of size capable of offsetting approximately 80% of energy usage. No significant site usage, construction, or aesthetic concerns known.

"B" rating: Sites requiring changes or issue mitigation to reach recommended PV system offset.

"C" rating: Sites with too little space for PV installation to meet energy offset needs, or with significant structural or site usage concerns.

Shading Evaluation

None	No shading issues
Low	Some minor shading issue, possibly avoided by tree trimming
Medium	Significant shading issues
High	Unavoidable shading issues of most of the site

Geotechnical Evaluation

None	Confirmed no geotechnical issues
Low	Possible minor issues that need additional investigation
Medium	Possible significant issues that need additional investigation
High	Known issues or high likelihood for potential issues impacting system costs

Structural Evaluation

None	New roof within past 2 years
Low	Roof age is unknown or not verified
Medium	Roof is in poor condition or over 10 years old
High	Roof is older than 20 years, or needs repairs/upgrades to host solar system

Electrical Evaluation

None	Electrical equipment has been inspected and does not require upgrades
Low	Further review of electrical system needed
Medium	Some electrical upgrades needed
High	Significant upgrades needed

Environmental Evaluation

None	Exemption can be applied
Low	Initial study may be required
Medium	Potential issues have been identified that would require mitigation
High	Full EIR needed with potential for significant issues