

TECHNICAL MEMORANDUM

Preliminary Solar Siting Study for the Island of Guam

Prepared for:
Guam Power Authority
P.O. Box 2977
Hagatna, GU 96913
Tel.: 671-648-3000
Fax: 671-648-3164
www.guampowerauthority.com



Prepared by:



194 Hernan Cortez Avenue, Suite 213
Hagatna, Guam 96910
Tel.: 671.472.6792
Fax: 671.477.6229
www.w-and-k.com

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1.0 INTRODUCTION

This Technical Memorandum was prepared by Winzler & Kelly (W&K) on behalf of the Guam Power Authority (GPA) in support of GPA's Integrated Resource Plan (IRP). The purpose of the memorandum is to summarize W&K's evaluation of various Guam properties for potential use as a photovoltaic (pv) solar power plant. It is the intent that this memorandum will be included as an attachment to GPA's upcoming Invitation for Multi-Step Bid (IFB) for renewable energy resources to provide guidance and background information to potential solar power plant developers. Solar power is just one of several options that will be considered under the IFB but it is the focus of this memorandum.

The criteria that were used to evaluate sites in this memorandum were developed in conjunction with the GPA and R.W. Beck which is also providing consultation services in support of GPA's IRP. It should be noted that this memorandum is only presented as a guide and does not establish any specific requirements that potential solar power plant developers must follow to satisfy the requirements of the IFB. The criteria and resulting evaluation of sites contained herein are merely presented as a starting point for potential developers to utilize as they desire. It is also important to note that no land owners of sites evaluated herein have been contacted nor has any effort been made to evaluate potential real estate or other costs.

In general, the Scope of Work for this Memorandum included the following:

- Investigate between 3 and 6 sites outside of Department of Defense property. Note: RW Beck provided footprint information of 60-80acres per 10MW plant which GPA advised us to adopt.
- Review topological data, access roads, proximity to GPA transmission/distribution systems, other improvements, land use and property ownership (based on publicly available information at the Department of Land Management, no title reports required).
- Submit Technical Memorandum that describes advantages and disadvantages for the potential solar development locations including potential plant sizes in investigated areas.

2.0 SITE PARAMETERS

2.1 Overview

This section contains discussion of the site parameters used in the Siting Study. These site parameters were investigated using the best available data and following the methodology described in the next section.

The Island of Guam contains approximately 46,800 parcels on 133,900 acres. The Northern part of the Island is relatively flat and is more developed as compared to the Southern part of the island. The Island's electricity is generated by a number of relatively small fossil fuel burning power plants. GPA Electricity is delivered through a transmission and distribution grid consisting of a combination of 115 kVA, 34.5 kVA, and 13.8 kVA lines.

A suitable site for a solar electric generating facility on the Island of Guam would have the following general characteristics, in order to enhance the cost effectiveness of the project:

- Adequate unoccupied area (60-80 acres)
- Flat or gradual southerly sloped terrain with minimal vegetative cover
- Close proximity to electrical transmission/distribution lines, access roads, and electrical load centers
- Favorable land-use designation or a clear indication that the land use designation can be changed to accommodate the solar project

The following sections provide further information on the site parameters used in this analysis.

2.2 Zoning

Land zoned for military use as well as land zoned as conservation was ruled out of the analysis. All other zoning designations were considered to be either suitable or relatively easy to change.

2.3 Occupancy of Parcel

Parcels that are substantially occupied were ruled out of the analysis. It should be noted that the parcel map used is 2 years old and some parcels have been subdivided since this data was created. Therefore, several large parcels in the analysis below contain a number of residences, but have large areas unoccupied. In cases such as these, the unoccupied areas of the parcel were considered suitable and it is assumed that the subdivided portions of the parcel do not substantially interfere with the potential future use of the unused areas.

2.4 Size/Shape of Parcel

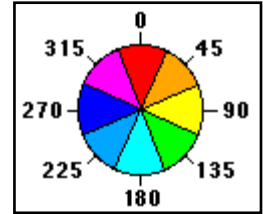
RW Beck provided footprint information of 60-80 acres per 10MW plant, which GPA accepted as a target parameter for the basis of this memorandum. Based on this parameter, highly irregularly shaped parcels may not be suitable if their shape prohibits the existence of 60 acre area. However, for the purposes of the IFB the minimum size is 5MW.

2.5 Topography: Percent of Slope

Relatively flat areas are ideal, but a slope of up to 10% was considered acceptable for this study. Anything beyond 10% was considered unacceptable.

2.6 Topography: Aspect of Slope

Areas with a southern-facing slope aspect are ideal, but any slope between 90 degrees and 270 degrees (based on compass degrees) was considered acceptable. Any aspect north of this line was considered unacceptable.



2.7 Proximity to Roadways

An ideal site has close proximity to access roads. Most if not all of the sites are adjacent to roads that have access to village streets or highways. Thus, in general this site parameter was satisfied by most properties that were evaluated.

2.8 Proximity to Power Transmission and Distribution Lines

For economic reasons an ideal site shall be located in close proximity to electrical transmission/distribution lines and also the electrical load center. A 34.5-kV feeder connection to the transmission system could be up to 15 or 20 miles in length without incurring significant voltage drop. A 13.8-kV feeder connection to the distribution system could be up to 2 miles in length without incurring significant voltage drop. The actual voltage drop and energy losses in the feeder line will be dependent on the wire size, circuit length, line configuration as well as on the magnitude of the current (amperes) flowing in the line.

Monitory considerations such as cost of step-up transformers, switching and protective devices and pole line construction will also have a significant impact in determining the point of connection and system voltage.

Although GPA's preference is to have the Solar Power Plant connect to the transmission (34.5-kV) system, there are potential cost and equipment factors that may make a connection to the distribution system more advantageous for certain locations. Potential Solar Power Plant developers will be required to undertake a System Impact Study to analyze the benefits, impacts and necessary upgrades to the GPA transmission (34.5-kV) or distribution (13.8-kV) systems due to their proposed system(s). The figures presented in Appendix D show the existing GPA transmission and distribution systems near the proposed sites that were selected in this study. Additional information on the transmission and distribution systems can be obtained from GPA for other areas of the island, upon request.

3.0 METHODOLOGY

3.1 Overview

The following sections outline the step-by-step methodology used to screen all known parcels on the island. All steps below were undertaken in the Geographic Information Systems (GIS) software program ArcInfo by ESRI, using the Spatial Analyst toolset.

3.2 Source Data and Known Data Gaps

The data used for the analysis in this report was primarily obtained from the following GIS layers:

1. Parcels (Cadastre2007.shp) - last updated March 2007
2. Zoning (ZoneMap_update.shp) - last updated March 2006
3. Digital Elevation Model (ned_35956460_GuamGCS93.shp) - created March 2009

It should be noted that the Parcel layer was obtained through existing government of Guam GIS databases being used by GWA and other government agencies. This layer is missing lot numbers and ownership information on approximately 11% of the island due to “holes” in the data. However, these land areas were evaluated for slope and slope aspect and it was found that only two areas contain potential sites (the other “holes” consist of areas that are too steep). These lots are identified by the lot number “L0” and will require further research by any interested developers to determine land ownership and confirm the extents of the parcels because they are not in the currently available Cadastre files.

3.3 Zoning

A total of 46,819 parcels are in the Parcel layer, 586 of which were zoned “Military” and 1 of which was zoned “Conservation.” These 587 parcels were removed from consideration, leaving 46,232 parcels, all parcels under the following zoning designations:

- Agricultural
- Commercial
- Industrial
- Residential

3.4 Size/Shape of Parcel

Once inappropriately zoned parcels were eliminated, the remaining _ parcels were screened to eliminate all parcels less than 60 acres, leaving 134 appropriately zoned parcels ≥ 60 acres. Of these parcels, none were eliminated due to highly irregular shapes/dimensions that made the parcel unusable. The remaining 134 appropriately zoned parcels that were ≥ 60 acres were of sufficient quantity to eliminate the need to search for parcels smaller than 60 acres. However, it should be noted that additional candidate sites may exist in the form of multiple contiguous parcels smaller than 60 acres. For instance, two contiguous parcels that are each 50 acres (and each matching the necessary slope and aspect criteria) could be joined to create a 100-acre parcel. However, this approach was not utilized for this initial screening.

3.5 Tiers

Next, the 134 remaining parcels were placed into Tiers using the screening criteria discussed below (occupancy, percent of slope, and aspect of slope). Tier 1 represents parcels that appear to be the best suited for the intended purposes. Tier 2 represents parcels that have some problems, but are generally well suited according to most screening criteria. Tier 3 represents parcels that appear to have fatal flaws (such as being primarily occupied).

3.6 Occupancy of Parcel

Of the 134 parcels remaining for consideration, many were occupied. Occupied parcels were divided into two categories: primarily occupied and minimally occupied. Minimally occupied parcels may have included large tracts of land with residential or other uses on their periphery. Primarily occupied parcels were placed into Tier 3. It should be noted that some occupied parcels could have lot line adjustments to move unoccupied portions into combination with neighboring parcels. However, this level of analysis was not considered in this study.

3.7 Percent of Slope

Percent of slope was calculated based on a Digital Elevation Model (DEM) with a 100ft resolution. This means that elevation data for the entire island was divided into discrete cells, each consisting of 10,000 square feet (100' x 100'). This DEM was used to generate each cell's slope through the following process:

- (1) The average elevation of each cell is compared to the eight cells surrounding it,
- (2) the degree of change in elevation from the cell to its immediate neighbors is determined,
- (3) an average slope value (in %) is assigned to the cell based on this degree of change in elevation.

In this way, an average slope was calculated for each 10,000sf block of land on the island. All cells with a slope value great than 10% were symbolized, while all cells with a slope value of 10% or less were not symbolized. The result is a *Percent of Slope* layer in which areas that are too steep (according to the site parameter criteria established above) are shaded red.

All parcels were evaluated to identify contiguous areas internal to the parcel that were at least 60 acres and had a slope value of 10% or less. Parcels that did not meet these criteria were placed into Tier 3.

3.8 Aspect of Slope

The same DEM referenced above was used to generate each cell's aspect through a similar process as was used to calculate percent of slope. All cells with a northerly aspect were symbolized, while all cells with a southerly aspect were not symbolized. The result is an *Aspect of Slope* layer in which areas in which the slope is at the wrong aspect (according to the site parameter criteria established above) are shaded yellow. When the *Aspect of Slope* layer is overlaid on the *Percent of Slope* layer, the result is as follows: areas that are too steep are shaded red, areas that are at the wrong aspect are shaded yellow, while areas that are both too steep and at the wrong aspect are shaded orange.

All parcels were evaluated to identify contiguous areas internal to the parcel that were at least 60 acres and had the appropriate slope aspect. Slope aspect was not weighed as heavily as percent of slope. Therefore, many parcels with the wrong slope aspect were permitted into Tiers 1 and 2, as long as the slope percent was acceptable.

3.9 Proximity to Roadway

For the Tier 1 parcels, distance to roadway was calculated and recorded and is shown in Appendix C.

3.10 Proximity to Power Transmission and Distribution Lines

For the Tier 1 parcels, distance to the nearest power transmission or power distribution lines was calculated and recorded and are shown in Appendix C.

4.0 CANDIDATE SITE SELECTION

4.1 Results of Preliminary Screening

One-hundred thirty-four parcels were appropriate zoned and ≥ 60 acres. These parcels were evaluated and placed into three Tiers. For a list of these tiered parcels, see Appendix B: Ranking of Appropriately Zoned Parcels ≥ 60 Acres. For an overview of Tier 1 Parcels, see Appendix C: Overview of Tier 1 Parcels. For individual maps of the Tier 1 parcels, see Appendix D: Site Maps of Tier 1 Parcels

4.2 Top 7 Parcels

The top seven parcels (in no particular order) from Tier 1 identified during this study are shown in Table 4.1 below.

Table 4.1: Top seven parcels identified in the analysis	
Lot Number(s)	Total Acres
L57-2	168.9
L177-4-R2	1,072
L186NEW-1	71.5
L450-R3	1,124.5
L7163	415.5
L0	110.9
L10140-R5 and L10164-R3	190.7

The remainder of this section briefly describes these eight parcels. Maps of these parcels are included as the first eight maps in Appendix C.

Parcel L57-2

This parcel is located roughly in the center of the South Island.

Advantages

- Large area with gradual slope and favorable aspect
- The land is largely undeveloped
- Reasonably close proximity to:
 - Electrical transmission/distribution lines
 - Access road
 - Electrical loads

Disadvantages

- Southern portion of parcel appears to have varied topography, including some areas with slope greater than 10% and northerly aspect
- Parcel appears to be heavily forested
- Not as close to electrical infrastructure, roads, and electrical loads as L7163, L0, or L186NEW-1

Parcel L177-4-R2

This parcel is located in the central part of the island.

Advantages

- Very large parcel
- The land is largely undeveloped
- Reasonably close proximity to:
 - Electrical transmission/distribution lines
 - Access road
 - Electrical loads

Disadvantages

- Substantial portions of parcel appears to have varied topography, including some areas with slope greater than 10% and northerly aspect

Parcel L186NEW-1

This parcel is located at roughly mid latitude on the island close to the Eastern shore in close proximity to Parcel LO, which is described above.

Advantages

- Close proximity to Parcel LO
 - Parcels could be combined into one large project site
- Close proximity to:
 - Electrical transmission/distribution lines
 - Access road
 - Electrical loads

Disadvantages

- Parcel appears to have varied topography, including some areas with slope greater than 10% and northerly aspect
- Some structures do exist along the southern edge of the parcel
- Parcel appears to be heavily forested

Parcel L450-R3

This parcel is located in the central part of the island.

Advantages

- Very large parcel
- The land is largely undeveloped
- Near the Ordot Landfill
- Reasonably close proximity to:
 - Electrical transmission/distribution lines
 - Access road
 - Electrical loads

Disadvantages

- Substantial portions of parcel appears to have varied topography, including some areas with slope greater than 10% and northerly aspect

Parcel L7163

This parcel is located on a bluff on the North Eastern shore of the Island.

Advantages

- Large area with a high percentage of flat or gradually sloped land
- Close proximity to:
 - Electrical transmission/distribution lines

- Access road
 - Electrical loads
- A significant portion of the property appears to have been cleared previously
- The land is undeveloped (i.e. no structures exist on parcel)

Disadvantages

- Potential impacts to recreation

Parcel LO

This parcel is located at roughly mid latitude on the island close to the Eastern shore.

Advantages

- Large area with a high percentage of flat or gradually sloped land
- Close proximity to:
 - Electrical transmission/distribution lines
 - Access road
 - Electrical loads
- A significant portion of the property appears to have been cleared previously
- The land is undeveloped (i.e. no structures exist on parcel)

Disadvantages

- None apparent

Parcels L10164-R3 & L10140-R5

These adjacent parcels are located roughly in the center of the North Island.

Advantages

- Together, these parcels have a reasonably large area with gradual slope and favorable aspect
- Close proximity to:
 - Electrical transmission/distribution lines
 - Access road
 - Electrical loads

Disadvantages

- Parcels both have some residential and agricultural development on them
- Parcel L10164-R3 does have some area that is greater than 10% slope.
 - However, this area is southerly facing.
- The undeveloped area on these parcels appears to be moderately forested
- Closest proximity to electrical infrastructure appears to be to either transmission or distribution lines, not both.
 - Data was not sufficient to make a further determination on this point

5.0 SUMMARY

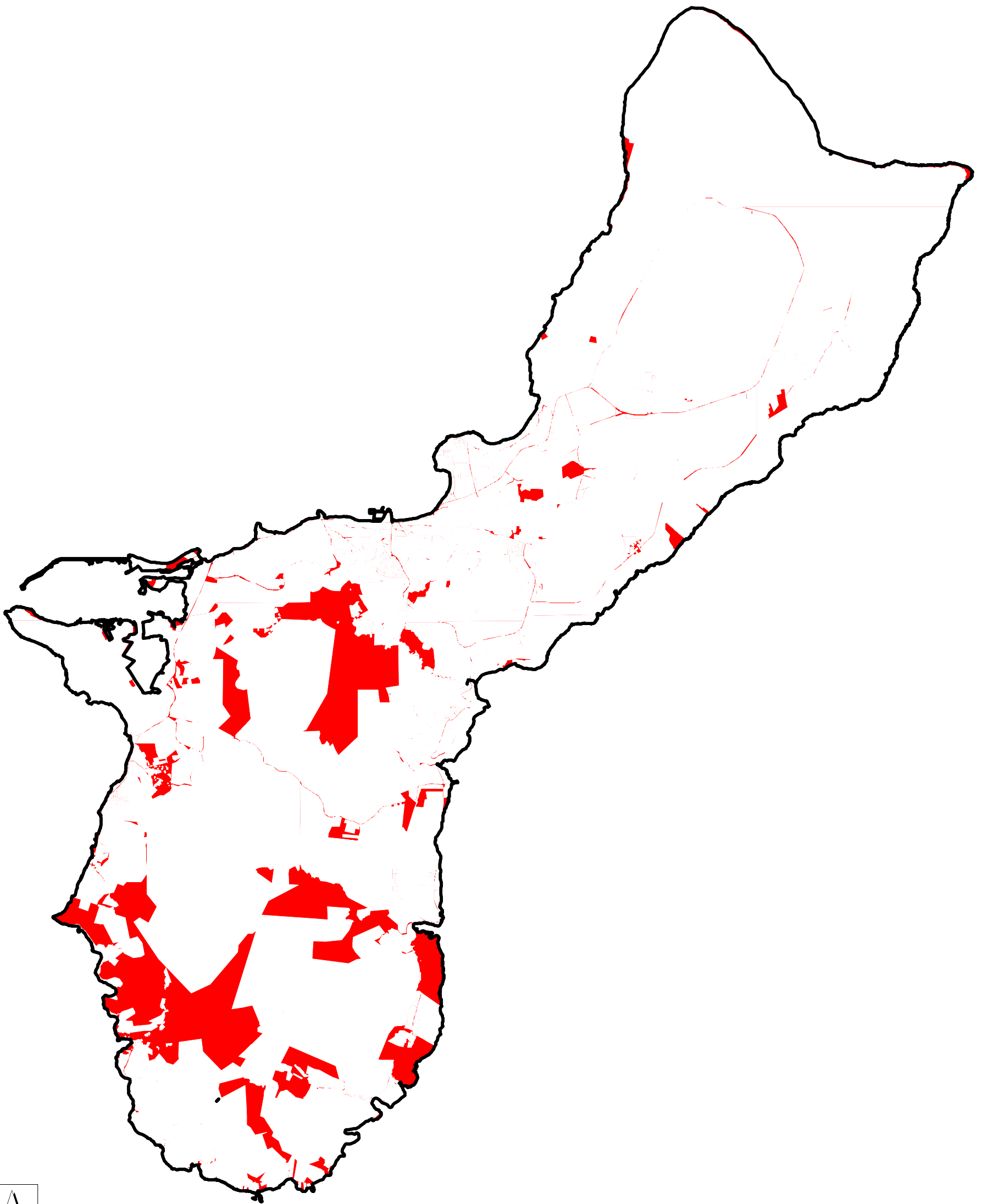
Based on this preliminary study it appears that there are numerous properties available on Guam that could support a 10 MW solar power plant. However, potential developers must include provisions to perform a System Impact Study for any potential site they may consider. This should include a review of the adjacent GPA transmission and/or distribution systems, load centers, line losses, proximity to roads and improvements that may be required to satisfy other aspects of the IFB.

APPENDICES:

- A- Know Data Gaps
- B – Ranking of Appropriately Zoned Parcels ≥ 60 Acres
- C – Overview of Tier 1 Parcels
- D – Site Maps of Tier 1 Parcels

APPENDIX A

P:\2008 & Beyond\04065 - Guam_Solar_Siting\GIS



0 6,500 13,000 26,000 Feet

Known Data Gaps



Known Data Gaps in the Parcel layer

Guam Geodetic Network 1993
Projection: Transverse_Mercator
GCS North American 1983 HARN
Map Created 03/16/09
RCH

APPENDIX B

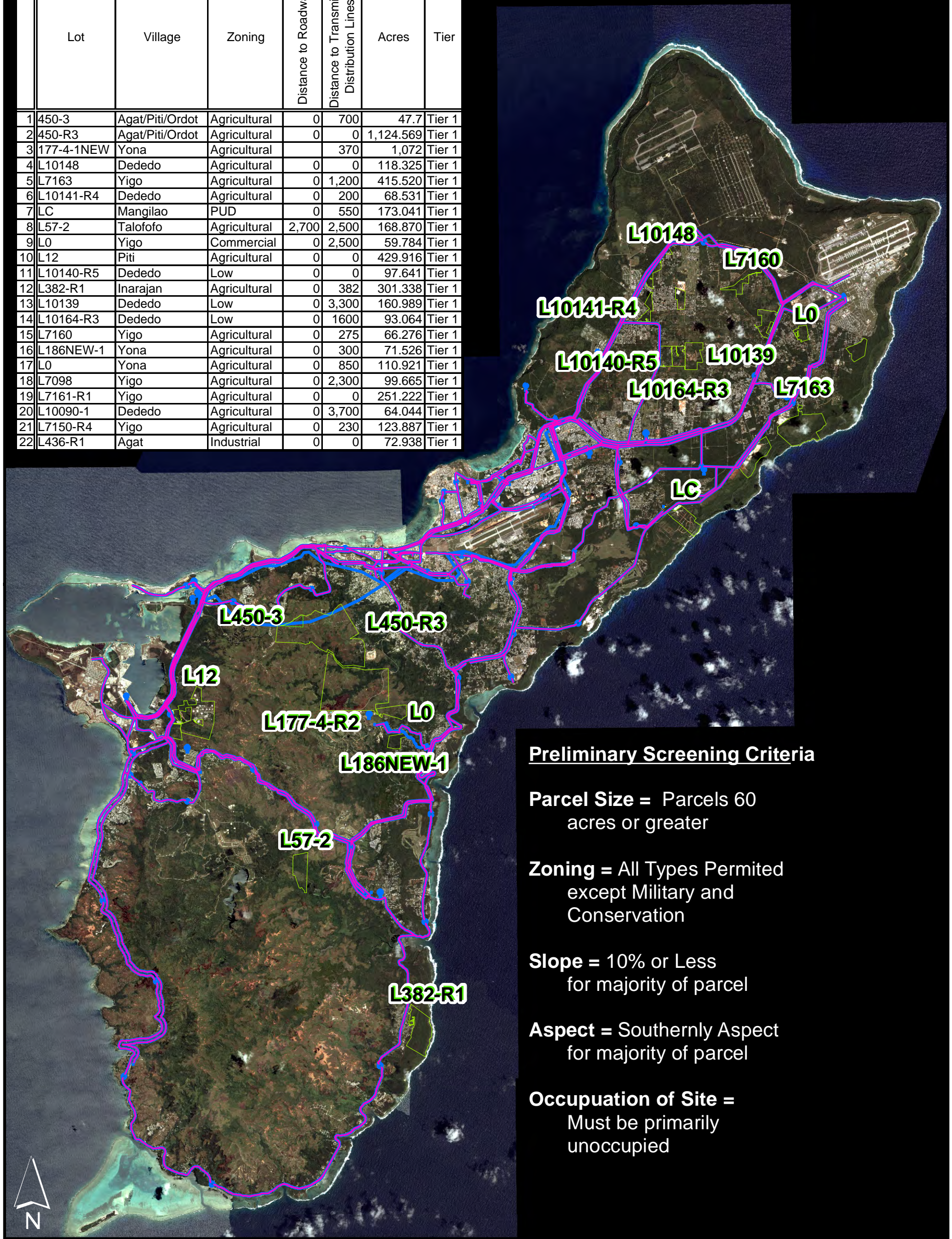
APPENDIX B: Ranking of Appropriately Zoned Parcels >60 Acres

	DLMTAG	LOT	VILLAGE	Acres	Tier	Comments
1	M05T0B0U0L10148	L10148	DEDED0	118.325	Tier 1	Irregular shape; wrong aspect, but good slope
2	M13T0B0U0L7163	L7163	YIGO	415.51999	Tier 1	Majority of parcel usable; coastal bluffs too steep; some of parcel wrong aspect
3	M05T0B0U0L10141-R4	L10141-R4	DEDED0	68.531403	Tier 1	irregular shape
4		L6		61.775902	Tier 1	NW corner of parcel excellent slope/aspect
5	M04T1531B0U0LC	LC	BARRIGADA-MANG	173.041	Tier 1	May be developed since aerial; preliminary road cuts?; large usable areas
6	M11T0B0U0L57-2	L57-2	TALOFOFO	168.87	Tier 1	North half of parcel has flat usable area
7		L0		59.783798	Tier 1	
8		L12		429.91599	Tier 1	Occupied (WWTP?); 60+ acres on southern half of parcel meet criteria
9		L10140-R5		97.641403	Tier 1	Partially occupied; excellent slope/aspect
10	M06T0B0U0L382-R1	L382-R1	INARAJAN	301.33801	Tier 1	100+ usable areas that are difficult to access due to steep slopes within parcel
11		L10139		160.989	Tier 1	Partially Occupied
12		L10164-R3		93.064499	Tier 1	Partially occupied; excellent slope/aspect
13		L7160		66.276199	Tier 1	Irregular shape; some aspect problems
14		L186NEW-1		71.525597	Tier 1	Spotty slope and aspect problems, but usable parcel with good access; partially occupied?
15		L0		110.921	Tier 1	
16	M13T0B0U0L7161-R1	L7161-R1	YIGO	251.222	Tier 2	Occupied?; Landing strip?; quarry?
17	M05T0B0U0L10090-1	L10090-1	DEDED0	64.043503	Tier 2	Entire parcel wrong aspect, but gently sloping
18	M05T0B0U0L10125-9	L10125-9	DEDED0	64.2444	Tier 2	Occupied
19	M04T0B0U0L2517-R17	L2517-R17	BARRIGADA-MANG	159.992	Tier 2	Portions of parcel usable, but difficult to access due to steep slopes within parcel
20	M13T0B0U0L7150-R4	L7150-R4	YIGO	123.887	Tier 2	Partially occupied
21	M02T0B0U0L436-R1	L436-R1	AGAT	72.938499	Tier 2	Majority of parcel wrong aspect, but gently sloping
22	M06T0B0U0LB-3-REM	LB-3-REM	INARAJAN	1785.4399	Tier 2	Large parcel; much of parcel is wrong aspect; some is too steep; usable area in NW of parcel
23		L7098		99.665703	Tier 2	Excellent slope; poor aspect for most of parcel; usable
24		L90-3		94.841599	Tier 2	60 acres of usable area in center, but not ideal
25	M05T0B0U0L10122-R17	L10122-R17	DEDED0	414.552	Tier 2	Parcel sporatically occupied with single family residences; large portions of parcel meet criteria
26		L11		85.993896	Tier 2	Majority of parcel wrong aspect and/or too steep
27		L10125-11-R2		119.514	Tier 2	Partial occupied; wrong aspect
28	M13T0B0U0L7099NEW	L7099NEW	YIGO	316.47601	Tier 2	100+ usable areas that are difficult to access due to steep slopes within parcel
29	MM05T0B0U0L7159	L7159	DEDED0	120.316	Tier 2	Occupied?; Wrong aspect
30	M13T0B0U0L7164	L7164	YIGO	376.93399	Tier 2	Two large usable areas that are difficult to access due to steep slopes within parcel
31		L10120-R20		386.20801	Tier 2	Extremely odd shaped parcel; sporatically occupied with residences; portions of parcel meet criteria
32	M02T0B0U0L401-1-9	L401-1-9	AGAT	246.84	Tier 2	Majority of parcel wrong aspect and/or too steep
33	M11T0B0U0L59-2NEW-R1	L59-2NEW-R1	TALOFOFO	979.711	Tier 2	N side of parcel is best, but wrong aspect
34	D1M09T0B0U0LPCL-1	LPCL-1	PITI	176.243	Tier 2	Irregular shape; coastal; bad location; very flat and usable areas
35		L11-R2		831.91699	Tier 2	Not a strong candidate; unusual shape; majority of parcel wrong aspect and/or too steep
36		L177-5		601.65198	Tier 2	Not a strong candidate; 50% of parcel wrong aspect; 50% too steep
37	M06T0B0U0LUNK-9	LUNK-9	INARAJAN	219.675	Tier 2	Majority of parcel wrong aspect and/or too steep
38		L209		154.847	Tier 2	Majority of parcel wrong aspect and/or too steep
39	M06T0B0U0L275	L275	INARAJAN	518.12402	Tier 2	Not a strong candidate; 50% of parcel wrong aspect; 50% too steep
40		L7153		206.161	Tier 2	Majority of parcel occupied with residences; large usable areas
41	M04T0B0U0L5376NEW-5-R1	L5376NEW-5-R1	BARRIGADA-MANG	76.577499	Tier 3	Occupied
42	M05T0B0U0L10098-R1	L10098-R1	DEDED0	90.934898	Tier 3	Occupied
43	M05T5312B7U0L0	L0	DEDED0	88.171204	Tier 3	Occupied; Golf Course
44	M04T0B0U0L5376NEW-R5	L5376NEW-R5	BARRIGADA-MANG	68.150902	Tier 3	Occupied
45	M05T0B0U0L10098-1	L10098-1	DEDED0	95.516602	Tier 3	Occupied; Golf Course
46	M04T0B0U0L5353-1	L5353-1	BARRIGADA-MANG	63.6147	Tier 3	Occupied
47	M05T0B0U0L10125-R8	L10125-R8	DEDED0	60.964298	Tier 3	Occupied
48	M11T0B0U0LUNK2	LUNK2	TALOFOFO	127.751	Tier 3	Majority of parcel wrong aspect and/or too steep
49	M13T0B0U0L7147	L7147	YIGO	191.808	Tier 3	Majority of parcel wrong aspect and/or too steep
50	M05T0B0U0L10171	L10171	DEDED0	100.771	Tier 3	Mostly occupied; excellent aspect and slope
51	M04T0B0U0L5292-3-3-R24	L5292-3-3-R24	BARRIGADA-MANG	237.466	Tier 3	Occupied?; Quarry?; Majority of parcel wrong aspect and/or too steep
52	MM05T0B0U0L10154-5	L10154-5	DEDED0	87.838303	Tier 3	Occupied
53	M04T0B0U0L5412	L5412	BARRIGADA-MANG	89.209801	Tier 3	Majority of parcel wrong aspect and/or too steep
54	M13T0B0U0L7146	L7146	YIGO	527.65399	Tier 3	Majority of parcel wrong aspect and/or too steep
55	M11T0B0U0L58-4-R6	L58-4-R6	TALOFOFO	83.547203	Tier 3	Majority of parcel wrong aspect and/or too steep
56	M04T1427B5U0L2	L2	BARRIGADA-MANG	106.714	Tier 3	Occupied
57	M05T0B0U0L10124-R3	L10124-R3	DEDED0	168.515	Tier 3	Occupied
58	M02T0B0U0L401-21-R6	L401-21-R6	AGAT	77.043503	Tier 3	Majority of parcel wrong aspect and/or too steep
59	M11T0B0U0L57-3	L57-3	TALOFOFO	167.13	Tier 3	Majority of parcel wrong aspect and/or too steep
60	D1M09T0B0U0LPCL-4	LPCL-4	PITI	130.265	Tier 3	Water(?)
61	M02T0B0U0L480	L480	AGAT	199.405	Tier 3	Majority of parcel wrong aspect and/or too steep
62	M11T0B0U0L435	L435	TALOFOFO	98.873802	Tier 3	Majority of parcel wrong aspect and/or too steep
63	M04T0B0U0L5397	L5397	BARRIGADA-MANG	139.826	Tier 3	Majority of parcel wrong aspect and/or too steep
64	MM02T0B0U0L98-R1	L98-R1	AGAT	2452.1599	Tier 3	Majority of parcel wrong aspect and/or too steep
65	M11T0B0U0L59-3-1	L59-3-1	TALOFOFO	250.33701	Tier 3	Majority of parcel wrong aspect and/or too steep
66	MM02T0B0U0L252	L252	AGAT	123.865	Tier 3	Majority of parcel wrong aspect and/or too steep
67		L11-1		102.68	Tier 3	Majority of parcel wrong aspect and/or too steep
68	MM02T0B0U0L98-1	L98-1	AGAT	364.888	Tier 3	Majority of parcel wrong aspect and/or too steep
69		L248-1-R1		94.892502	Tier 3	Majority of parcel wrong aspect and/or too steep
70	M11T0B0U0L48-R26	L48-R26	TALOFOFO	66.624901	Tier 3	Majority of parcel wrong aspect and/or too steep
71	D1M09T0B0U0LPCL-3	LPCL-3	PITI	154.735	Tier 3	Water(?)
72	M11T0B0U0LUNK4	LUNK4	TALOFOFO	95.743896	Tier 3	Majority of parcel wrong aspect and/or too steep
73		L439-R1		301.534	Tier 3	Majority of parcel wrong aspect and/or too steep
74	D2M09T0B0U0LPCL-2	LPCL-2	PITI	189.358	Tier 3	Water(?)
75	M03T0B0U0L468-R1	L468-R1	ASAN	98.834801	Tier 3	Majority of parcel wrong aspect and/or too steep
76	M03T0B0U0L469-R1	L469-R1	ASAN	71.065903	Tier 3	Majority of parcel wrong aspect and/or too steep
77	M04T0B0U0L5403	L5403	BARRIGADA-MANG	93.639801	Tier 3	Occupied
78	M04T0B0U0L5292-3-3-22	L5292-3-3-22	BARRIGADA-MANG	303.608	Tier 3	Occupied; Golf Course
79	M11T0B0U0L59-6	L59-6	TALOFOFO	452.21301	Tier 3	Majority of parcel wrong aspect and/or too steep
80	M09T0B0U0LA-1-R3	LA-1-R3	PITI	134.83701	Tier 3	Majority of parcel wrong aspect and/or too steep
81	M11T0B0U0L414	L414	TALOFOFO	302.26401	Tier 3	Majority of parcel wrong aspect and/or too steep; large flat areas are wrong aspect
82	M02T319B0U0L350-R4	L350-R4	AGAT	123.581	Tier 3	Occupied; Majority of parcel wrong aspect and/or too steep
83	M02T0B0U0L450	L450	AGAT	89.104897	Tier 3	Majority of parcel wrong aspect and/or too steep

84		L422		126.251	Tier 3	Majority of parcel wrong aspect and/or too steep
85	M06T0B0U0LAREA-5	LAREA-5	INARAJAN	866.56897	Tier 3	Entire parcel wrong aspect and/or too steep
86	M06T0B0U0L292	L292	INARAJAN	241.58701	Tier 3	Majority of parcel wrong aspect and/or too steep
87	M02T0B0U0LUNK-19	LUNK-19	AGAT	93.3675	Tier 3	Occupied
88	M09T2141B0U0LA-1-3-R1	LA-1-3-R1	PITI	83.129204	Tier 3	Majority of parcel wrong aspect and/or too steep
89		L0		91.292801	Tier 3	Occupied
90	M02TEAB0U0L478	L478	AGAT	124.018	Tier 3	Majority of parcel wrong aspect and/or too steep
91	M02T0B0U0LUNK-9	LUNK-9	AGAT	109.365	Tier 3	Majority of parcel wrong aspect and/or too steep
92	M02T0B0U0L266-1-R1	L266-1-R1	AGAT	66.829002	Tier 3	Irregular shape; occupied; Majority of parcel wrong aspect and/or too steep
93	M10T0B0U0L3384	L3384	SINAJANA	71.405701	Tier 3	Majority of parcel wrong aspect and/or too steep
94	M14T2912B0U0L4	L4	YONA	332.49301	Tier 3	Majority of parcel wrong aspect and/or too steep
95	M08T0B0U0L439	L439	MERIZO	62.904202	Tier 3	Majority of parcel wrong aspect and/or too steep
96	M06T0B0U0LPCL1	LPCL1	INARAJAN	159.007	Tier 3	Occupied; excellent parcel
97	M06T0B0U0L248	L248	INARAJAN	60.013302	Tier 3	Majority of parcel wrong aspect and/or too steep
98		L8-4		75.272598	Tier 3	Majority of parcel wrong aspect and/or too steep
99	M06T0B0U0L380	L380	INARAJAN	138.80901	Tier 3	Majority of parcel wrong aspect and/or too steep; irregular shape
100		T21404-REMAINDE		106.838	Tier 3	Majority of parcel wrong aspect and/or too steep
101		L517		172.791	Tier 3	Majority of parcel too steep
102	M06T0B0U0L270	L270	INARAJAN	81.626404	Tier 3	Majority of parcel wrong aspect and/or too steep
103	M08T0B0U0L525	L525	MERIZO	101.341	Tier 3	Majority of parcel wrong aspect and/or too steep
104	M12T0B0U0L278	L278	UMATAC	78.338799	Tier 3	Irregular shape; Majority of parcel too steep
105	M08T0B0U0L527	L527	MERIZO	267.60901	Tier 3	Majority of parcel wrong aspect and/or too steep
106	M14T0B0U0L198	L198	YONA	108.415	Tier 3	Occupied; Majority of parcel wrong aspect and/or too steep
107	M14T0B0U0L91-1-A-4-REM-R	L91-1-A-4-REM-R4	YONA	302.94501	Tier 3	Occupied; Golf Course
108	M14T0B0U0L177-2	L177-2	YONA	315.62	Tier 3	Occupied; Golf Course
109		L207		171.25999	Tier 3	Majority of parcel wrong aspect and/or too steep
110	MM12T0B0U0L272	L272	UMATAC	228.41701	Tier 3	Majority of parcel wrong aspect and/or too steep
111	M14T0B0U0L154-2-4-REMNE	L154-2-4-REMNEW	YONA	167.28999	Tier 3	Occupied?
112		L7138-R1		166.86	Tier 3	Occupied
113		L421		80.614799	Tier 3	Occupied
114	M14T0B0U0L400-1-R1	L400-1-R1	YONA	480.116	Tier 3	Majority of parcel wrong aspect and/or too steep
115	M14T0B0U0L100-2-1NEW-R4	L100-2-1NEW-R4	YONA	66.531601	Tier 3	Irregular shape; Majority of parcel wrong aspect and/or too steep
116	M08T0B0U0L523	L523	MERIZO	828.79797	Tier 3	Entire parcel wrong aspect and/or too steep
117	M08T0B0U0L526NEW	L526NEW	MERIZO	384.513	Tier 3	Majority of parcel wrong aspect and/or too steep
118	M14T0B0U0L91-1-A-8	L91-1-A-8	YONA	89.739799	Tier 3	Majority of parcel wrong aspect and/or too steep
119	M14T0B0U0L186	L186	YONA	158.41	Tier 3	Occupied; Majority of parcel wrong aspect and/or too steep
120		FEDERAL INSTALL		132.25101	Tier 3	Majority of parcel wrong aspect and/or too steep
121	M06T0B0U0L276	L276	INARAJAN	75.007004	Tier 3	Majority of parcel wrong aspect and/or too steep
122		L278		117.643	Tier 3	Majority of parcel too steep
123	M08T0B0U0L528	L528	MERIZO	91.487701	Tier 3	Majority of parcel wrong aspect and/or too steep
124	M14T0B0U0L100-2-R1NEW-R	L100-2-R1NEW-R1	YONA	605.46002	Tier 3	Majority of parcel wrong aspect and/or too steep
125	M14T0B0U0L100-2-R1NEW-1	L100-2-R1NEW-1	YONA	60.611698	Tier 3	Majority of parcel wrong aspect and/or too steep
126		FEDERAL INSTALL		114.062	Tier 3	Majority of parcel too steep
127	M06T0B0U0LB-3	LB-3	INARAJAN	1169.38	Tier 3	Majority of parcel wrong aspect and/or too steep
128		L8-R25		421.84299	Tier 3	Majority of parcel wrong aspect and/or too steep
129		FEDERAL INSTALL		298.52899	Tier 3	Majority of parcel wrong aspect and/or too steep
130		L0		96.5317	Tier 3	Occupied; majority of parcel wrong aspect and/or too steep
131		L0		78.238503	Tier 3	Majority of parcel too steep
132		L500		88.733299	Tier 3	Majority of parcel wrong aspect and/or too steep
133		LA		159.146	Tier 3	Majority of parcel wrong aspect and/or too steep
134		L0		205.19901	Tier 3	Occupied; Golf Course

APPENDIX C

Tier 1 Parcels							
	Lot	Village	Zoning	Distance to Roadway (ft)	Distance to Transmission/ Distribution Lines (ft)	Acres	Tier
1	450-3	Agat/Piti/Ordot	Agricultural	0	700	47.7	Tier 1
2	450-R3	Agat/Piti/Ordot	Agricultural	0	0	1,124.569	Tier 1
3	177-4-1NEW	Yona	Agricultural		370	1,072	Tier 1
4	L10148	Dededo	Agricultural	0	0	118.325	Tier 1
5	L7163	Yigo	Agricultural	0	1,200	415.520	Tier 1
6	L10141-R4	Dededo	Agricultural	0	200	68.531	Tier 1
7	LC	Mangilao	PUD	0	550	173.041	Tier 1
8	L57-2	Talofofo	Agricultural	2,700	2,500	168.870	Tier 1
9	L0	Yigo	Commercial	0	2,500	59.784	Tier 1
10	L12	Piti	Agricultural	0	0	429.916	Tier 1
11	L10140-R5	Dededo	Low	0	0	97.641	Tier 1
12	L382-R1	Inarajan	Agricultural	0	382	301.338	Tier 1
13	L10139	Dededo	Low	0	3,300	160.989	Tier 1
14	L10164-R3	Dededo	Low	0	1600	93.064	Tier 1
15	L7160	Yigo	Agricultural	0	275	66.276	Tier 1
16	L186NEW-1	Yona	Agricultural	0	300	71.526	Tier 1
17	L0	Yona	Agricultural	0	850	110.921	Tier 1
18	L7098	Yigo	Agricultural	0	2,300	99.665	Tier 1
19	L7161-R1	Yigo	Agricultural	0	0	251.222	Tier 1
20	L10090-1	Dededo	Agricultural	0	3,700	64.044	Tier 1
21	L7150-R4	Yigo	Agricultural	0	230	123.887	Tier 1
22	L436-R1	Agat	Industrial	0	0	72.938	Tier 1



Preliminary Screening Criteria

Parcel Size = Parcels 60 acres or greater

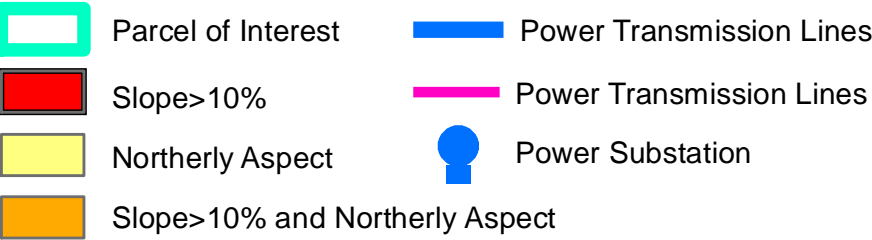
Zoning = All Types Permitted except Military and Conservation

Slope = 10% or Less for majority of parcel

Aspect = Southerly Aspect for majority of parcel

Occupation of Site = Must be primarily unoccupied

Solar Site Suitability Preliminary Screening

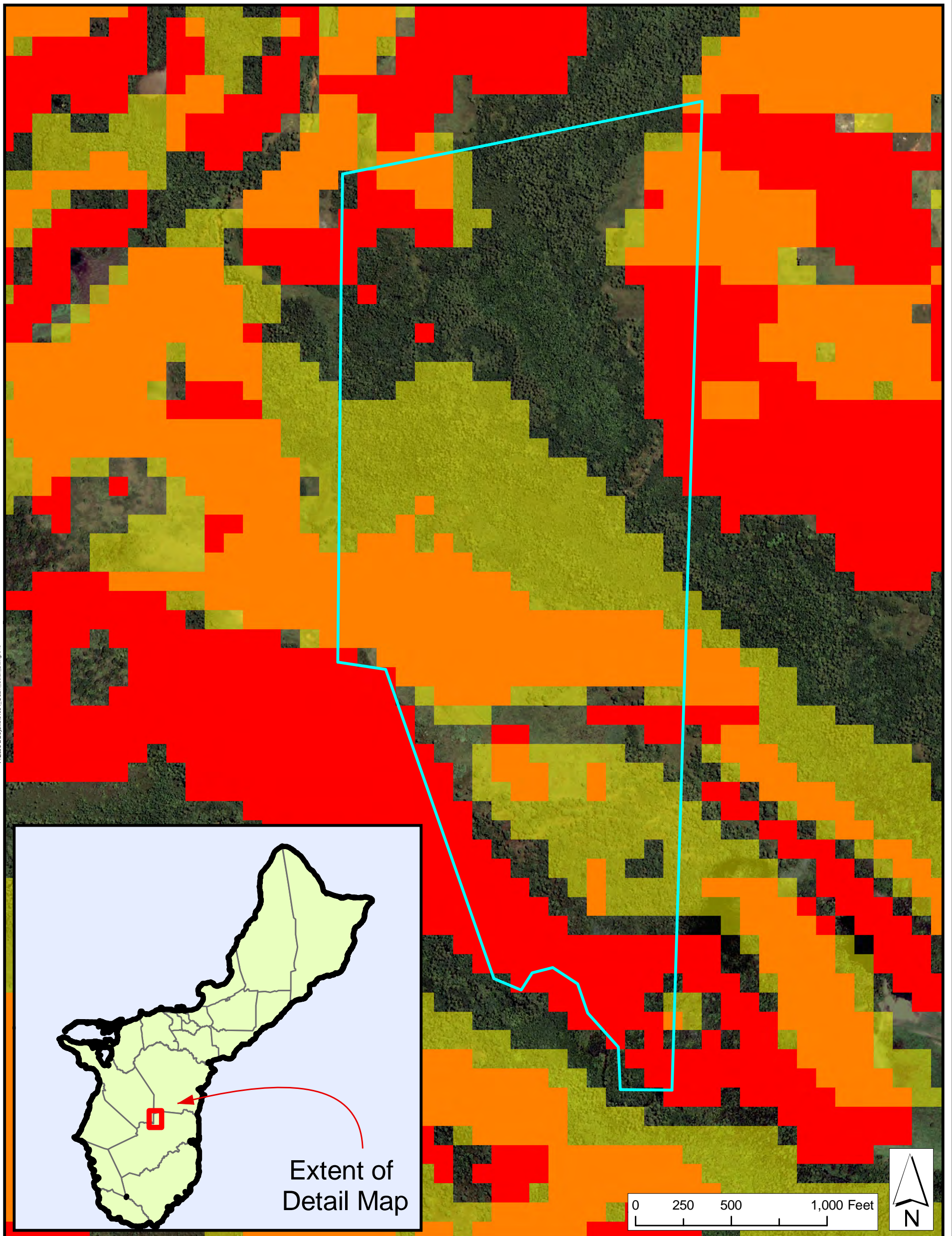


Guam Geodetic Network 1993
Projection: Transverse_Mercator
GCS North American 1983 HARN
Map Created 03/16/09
RCH










APPENDIX D

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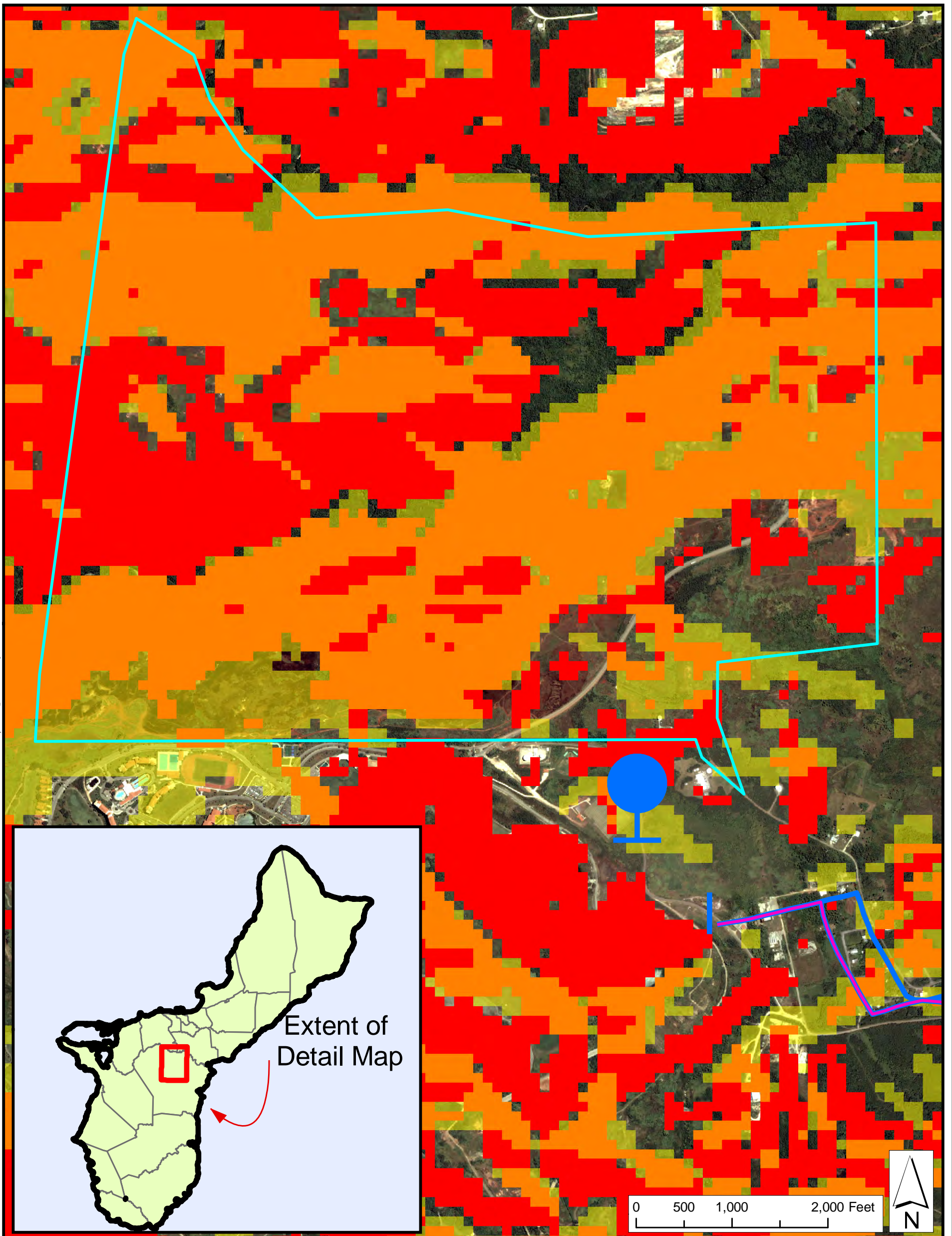
Solar Site Suitability Preliminary Screening

- | | | | |
|---|--------------------------------|---|--------------------------|
|  | Parcel of Interest |  | Power Distribution Lines |
|  | Slope>10% |  | Power Transmission Lines |
|  | Northerly Aspect |  | Power Substation |
|  | Slope>10% and Northerly Aspect | | |

Parcel Information
Lot # = L57-2
Acres = 168.870

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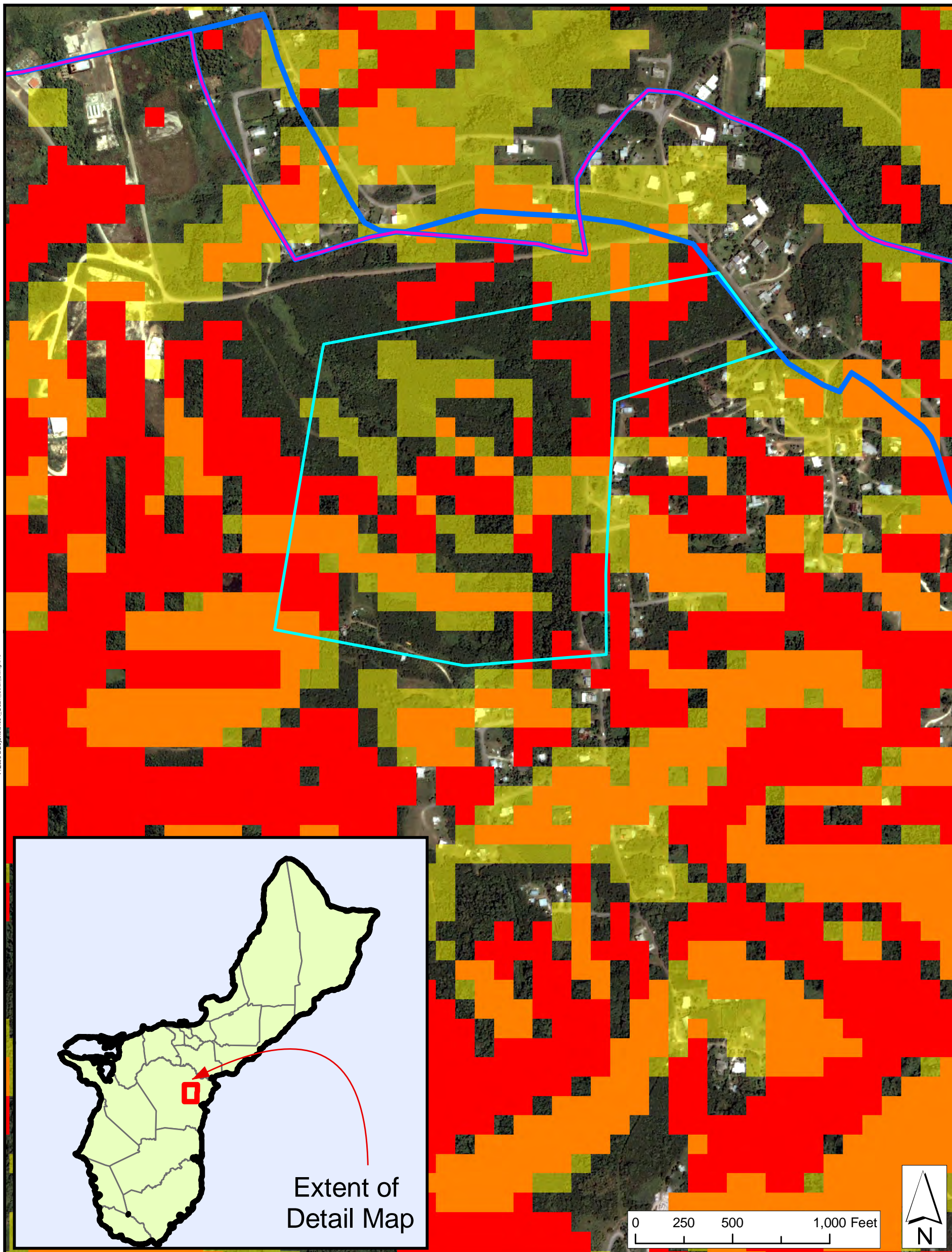
Solar Site Suitability Preliminary Screening

- | | | | |
|--|----------------------------------|--|--------------------------|
| | Parcel of Interest | | Power Distribution Lines |
| | Slope > 10% | | Power Transmission Lines |
| | Northerly Aspect | | Power Substation |
| | Slope > 10% and Northerly Aspect | | |

Parcel Information
Lot # = L177-4-R2
Acres = 1072

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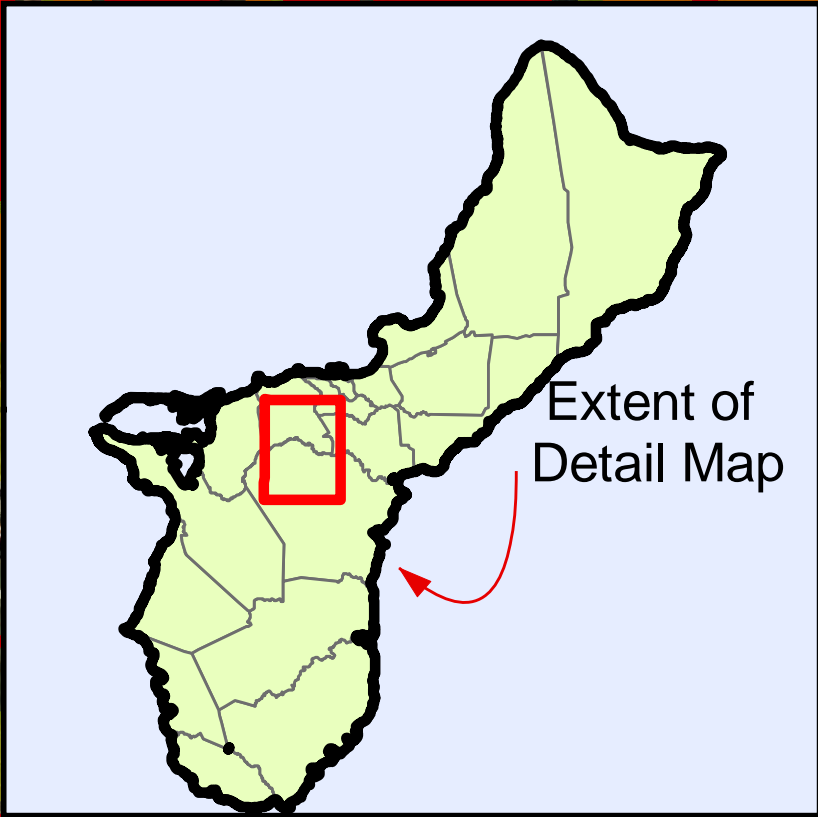
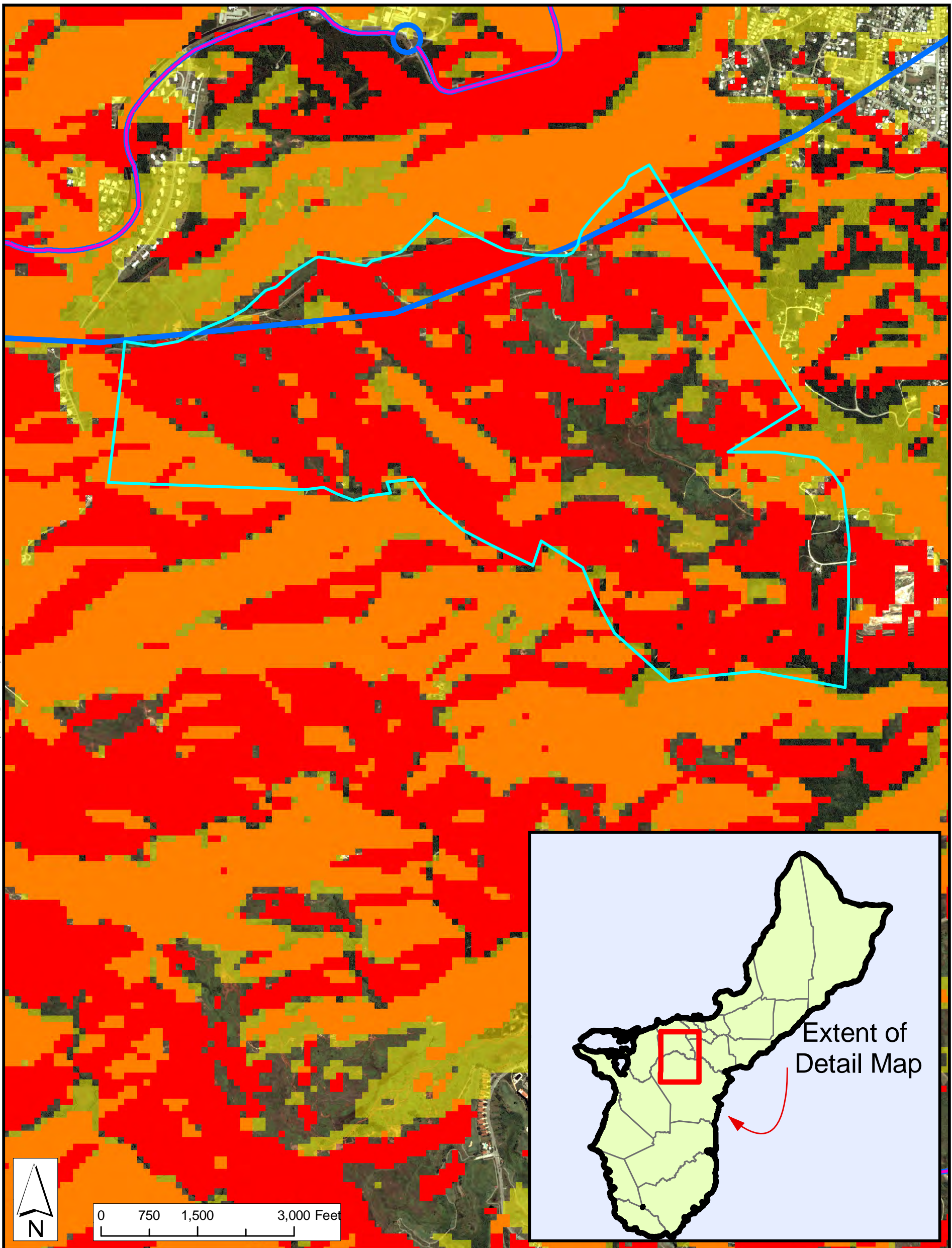
Solar Site Suitability Preliminary Screening

- | | | | |
|--|----------------------------------|--|--------------------------|
| | Parcel of Interest | | Power Distribution Lines |
| | Slope > 10% | | Power Transmission Lines |
| | Northerly Aspect | | Power Substation |
| | Slope > 10% and Northerly Aspect | | |








Parcel Information
Lot # = L186NEW-1
Acres = 71.526

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Projection: Transverse_Mercator
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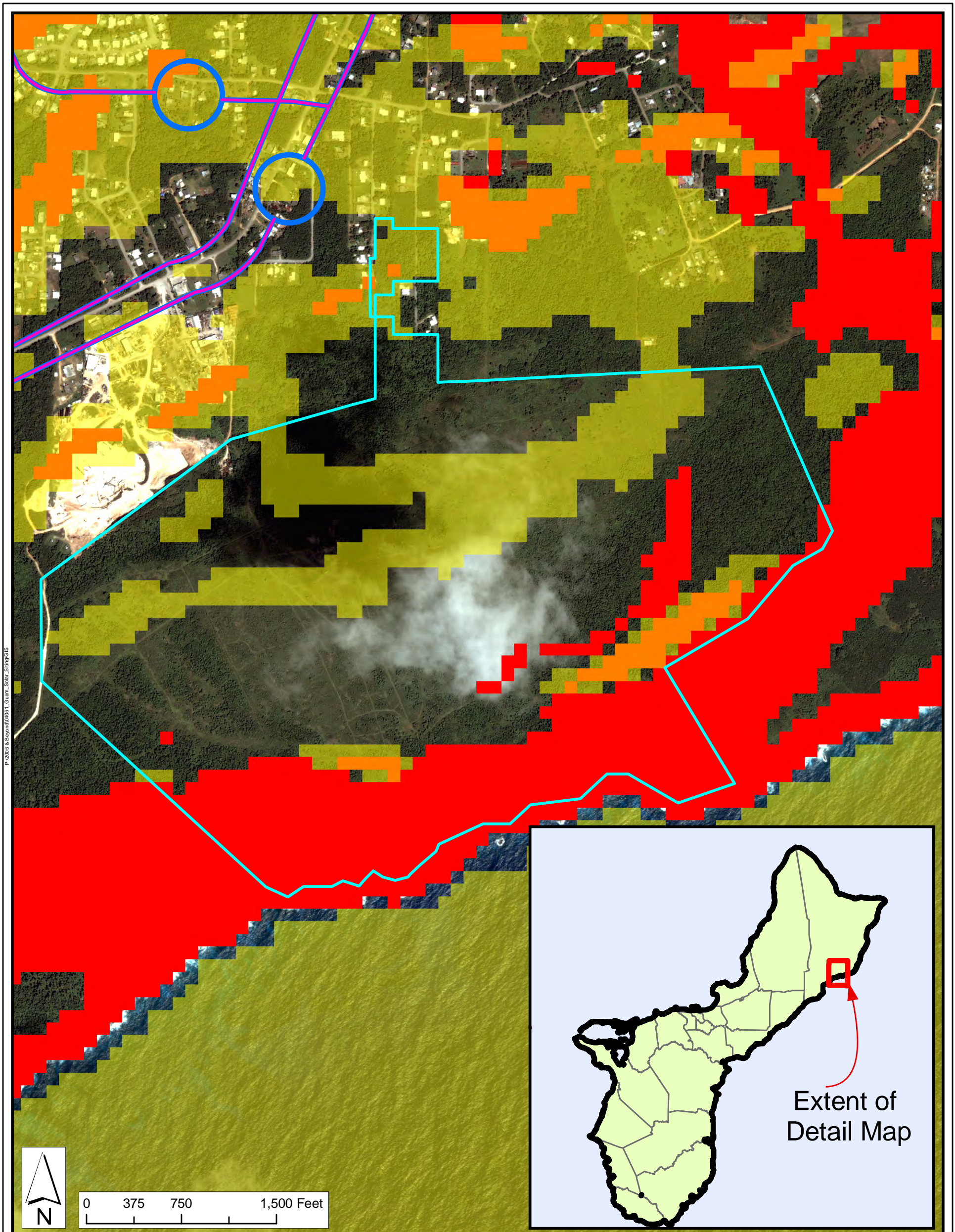
Solar Site Suitability Preliminary Screening

- | | | | |
|---|----------------------------------|---|--------------------------|
|  | Parcel of Interest |  | Power Distribution Lines |
|  | Slope > 10% |  | Power Transmission Lines |
|  | Northerly Aspect |  | Power Substation |
|  | Slope > 10% and Northerly Aspect | | |

Parcel Information
Lot # = L450-R3
Acres = 1,124.569

Guam Geodetic Network 1993
Projection: Transverse_Mercator
GCS North American 1983 HARN
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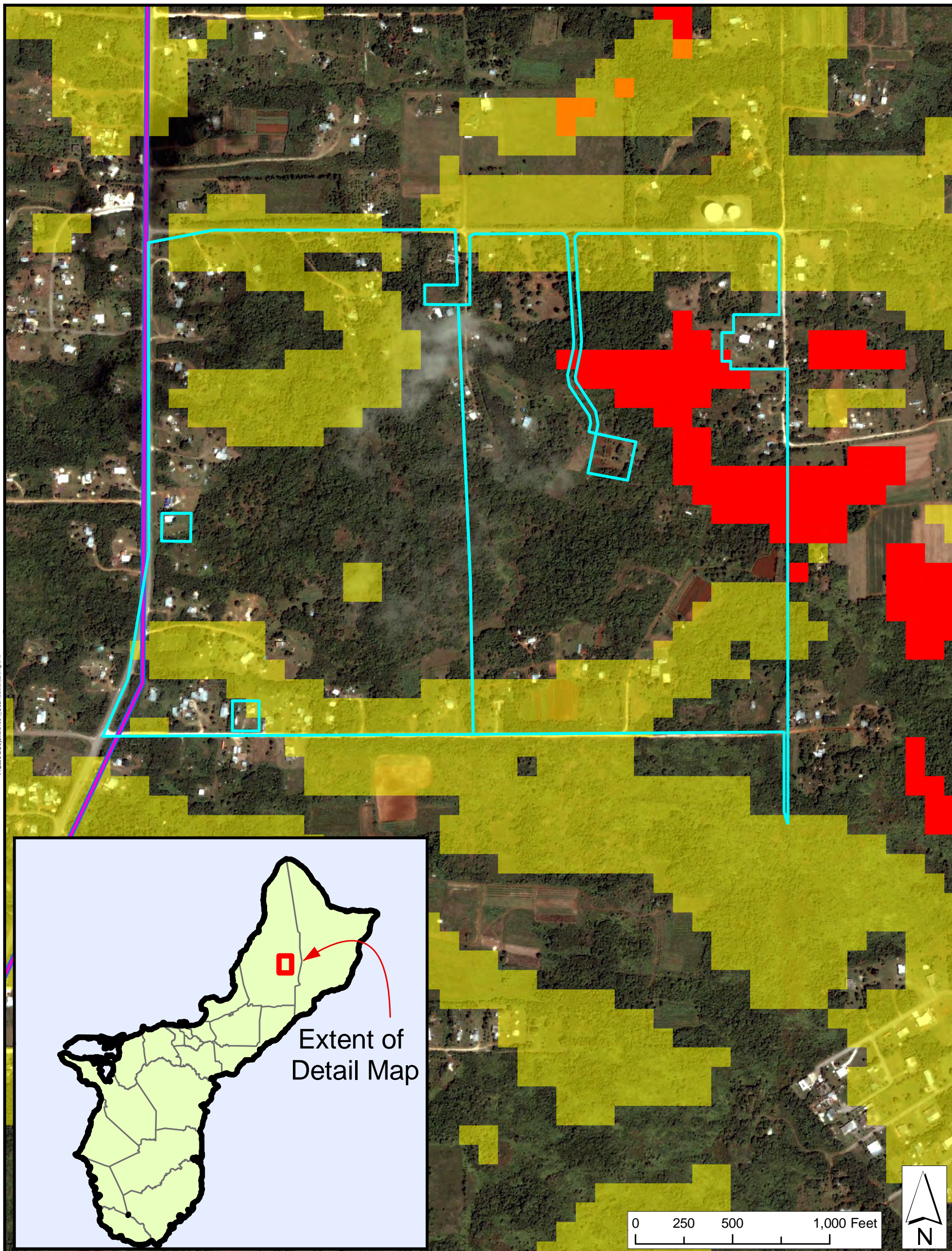
Solar Site Suitability Preliminary Screening

- | | | | |
|--|----------------------------------|--|--------------------------|
| | Parcel of Interest | | Power Distribution Lines |
| | Slope > 10% | | Power Transmission Lines |
| | Northerly Aspect | | Power Substation |
| | Slope > 10% and Northerly Aspect | | |

Parcel Information
Lot # = L7163
Acres = 415.519

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Solar Site Suitability Preliminary Screening

- | | | | |
|--|----------------------------------|--|--------------------------|
| | Parcel of Interest | | Power Distribution Lines |
| | Slope > 10% | | Power Transmission Lines |
| | Northerly Aspect | | Power Substation |
| | Slope > 10% and Northerly Aspect | | |

Parcel Information

Lot # = L10164-R3 (east)

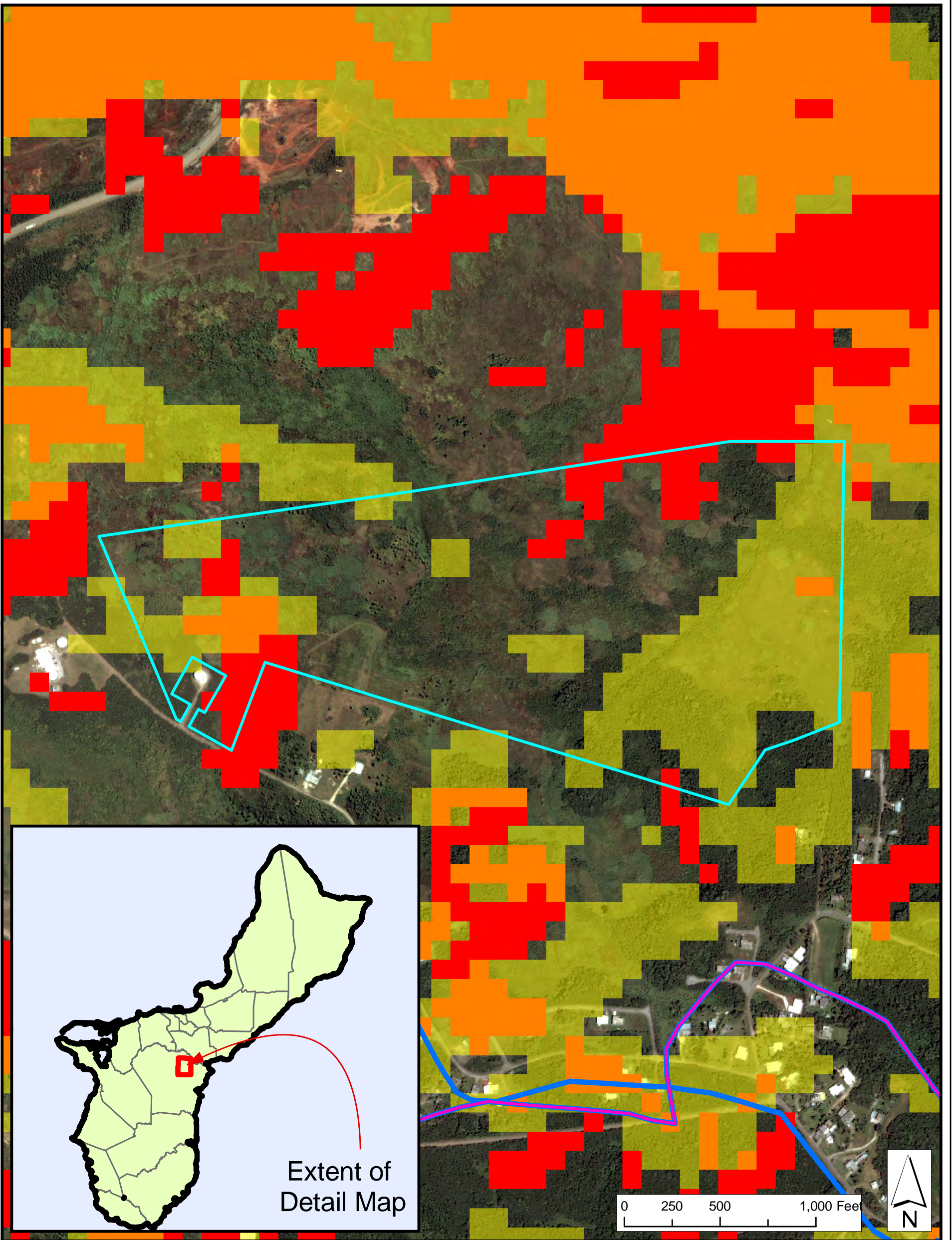
Acres = 93.064

Lot # = L10140-R5 (west)








Acres = 97.641403

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Solar Site Suitability Preliminary Screening

- | | | | |
|---|--------------------------------|---|--------------------------|
|  | Parcel of Interest |  | Power Distribution Lines |
|  | Slope>10% |  | Power Transmission Lines |
|  | Northerly Aspect |  | Power Substation |
|  | Slope>10% and Northerly Aspect | | |

Parcel Information
Lot # = LO
Acres = 110.921

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Projection: Transverse_Mercator
GCS North American 1983 HARN
Map Created 03/16/09
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