Land-Use Evaluation for 2024-25 TPP Busbar Mapping

Saffia Hossainzadeh

Siting, Transmission and Environmental Protection Division

December 8, 2023

Overview

- General Approach for Land Use Evaluation around a Substation
  - CEC Core Land Use Screen: Basis of Land Feasibility and Environmental Impact Factors
  - Geospatial Approach to Metrics Calculations
  - Geothermal Resources
- Criteria Alignment Explanation for Solar and Wind Resources
- Summary of Results
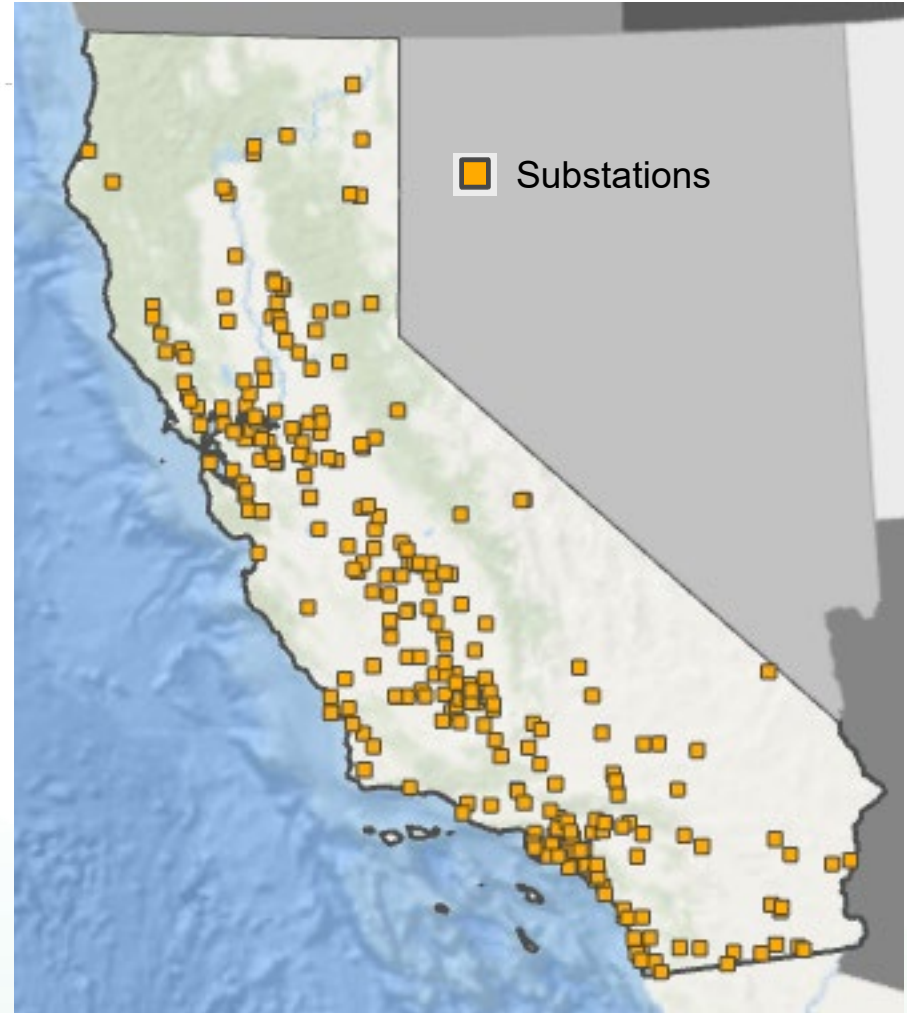
Substations that the land use and environmental geospatial analysis was performed on for busbar mapping.
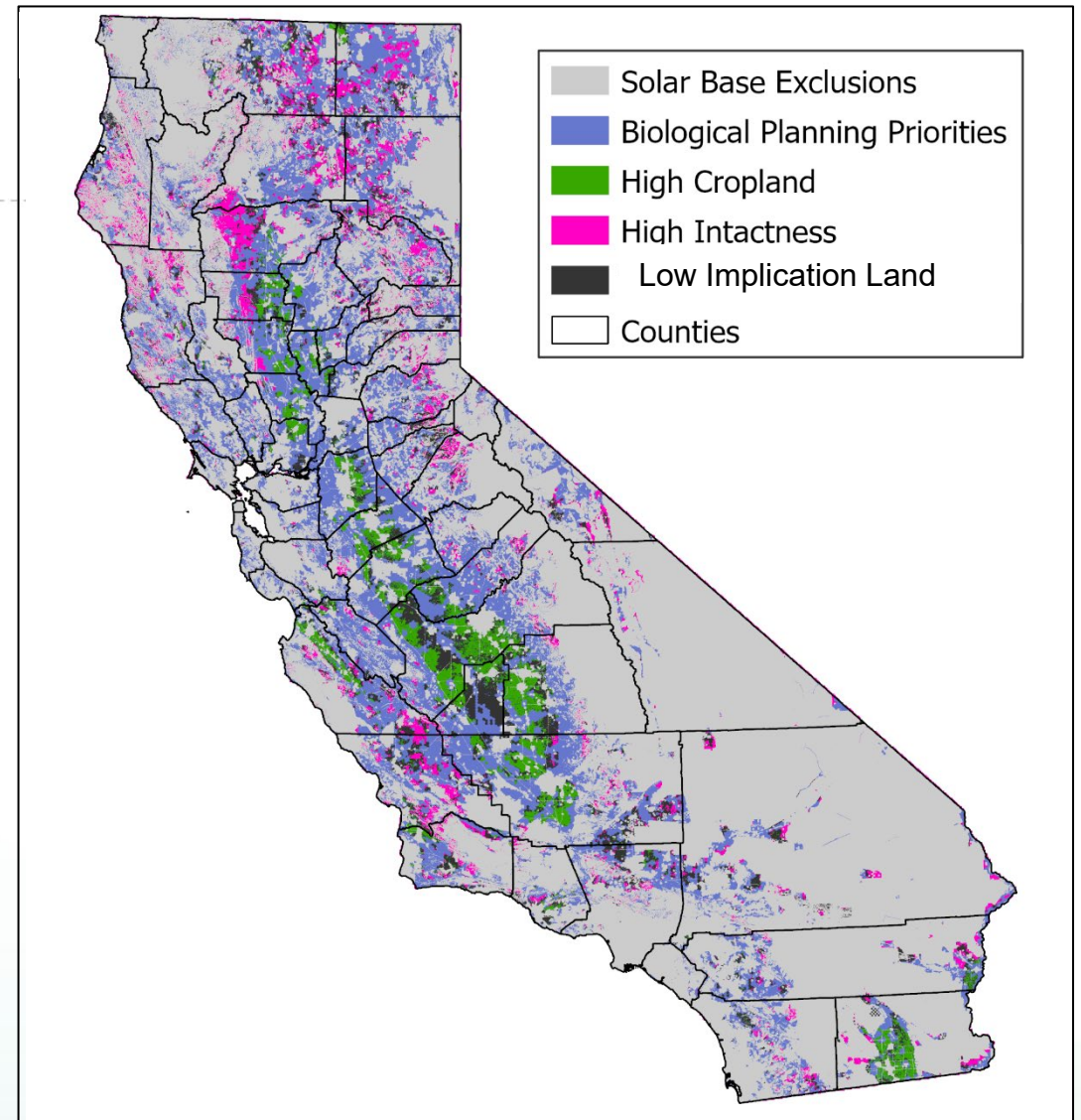
Key Terms

- **Low Implication Land:** Area remaining after applying the CEC Core Land Use Screen. This land area is considered as having lower constraints according to the components of the Core Land Use Screen. Implication is defined as a possible as a possible significance or consequence of an action. For example, planning for energy infrastructure in areas within the Core Land Use Screen has implications for other land-use planning priorities. This term can also be applied to a specific environmental variable.

- **Total Resource Potential Area:** Land area remaining after removing the protected area layer and the techno-economic exclusion layer.

- **Core Land Use Screen:** A land use screen developed by the CEC that addresses several state policy priorities, including sustaining agriculture and protecting natural lands that support biodiversity. It includes statewide information about intact landscapes.

- **Techno-economic Exclusion Layer:** A GIS layer made up of spatial datasets that capture technical (for example, competitive wind resource locations), physical (for example, slope, water bodies), and socio-economic or hazardous criteria (for example, densely populated areas, railways, airports, highways, mines). This category also includes military lands. The datasets that were used in this exclusion category were provided by CPUC staff.

- **Protected Area Layer:** A GIS layer designed to encompass areas where utility-scale renewable energy or transmission development is precluded by state or federal law, policy or regulation.

- **Parcelization:** A measure of the average number of unique land parcels in a 0.5-mile radius.

- **Rank:** A final scoring index used in California Department of Fish and Wildlife's (CDFW) Areas of Conservation Emphasis (ACE) datasets to indicate the level of importance for conservation of each variable. For biodiversity and irreplaceability, ranks are defined by a quantile distribution of the raw summary data within each ecoregion, showing the relative level of importance for each variable. For connectivity, each rank is described as its own category, with ranks 4 and 5 indicating the most important aspects for conservation.

Statewide Core Land-Use Screen

- CEC staff recently completed an update to the statewide land-use screens for electric system planning. (report, data viewer)

- Recent assessment of California land designations, physical characteristics, natural and working lands priorities

- Explicit geospatial data layers to estimate distribution and size of areas with renewable resource potential

Legend:
- Solar Base Exclusions
- Biological Planning Priorities
- High Cropland
- High Intactness
- Low Implication Land
- Counties

Base Exclusions consist of the protected area layer and the techno-economic exclusion layer.
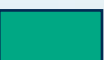
General Approach for Geospatial Evaluation
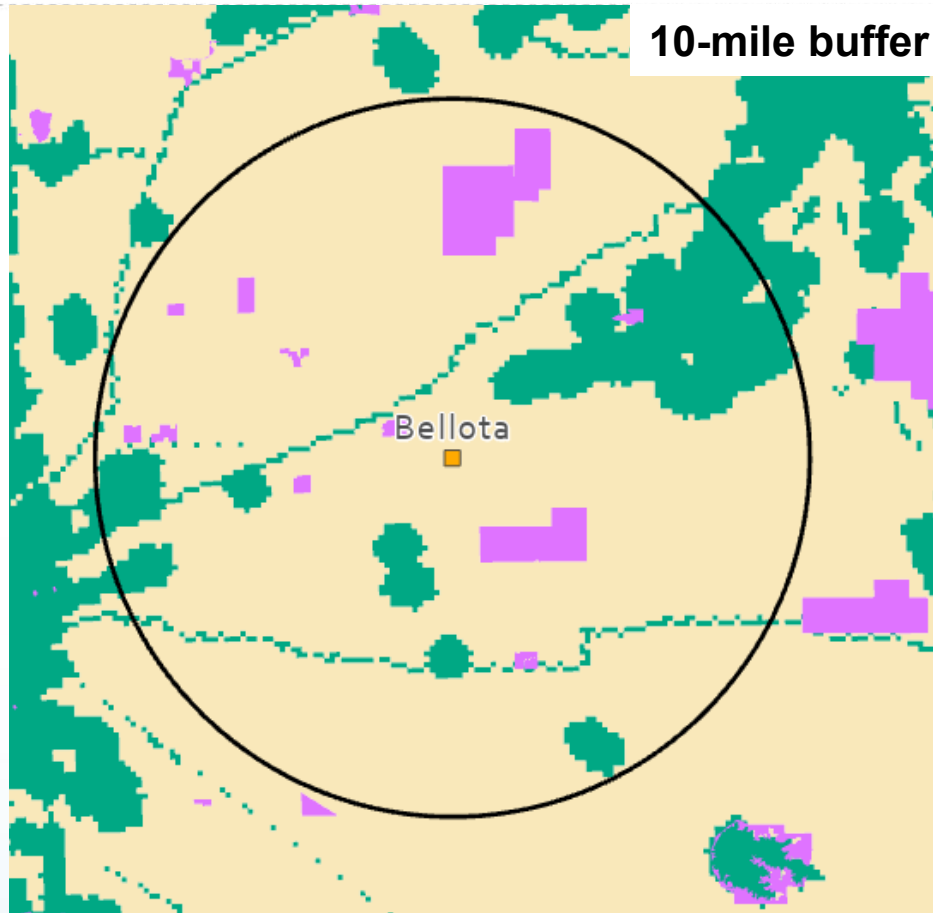
10-mile buffer

Bellota

Legend:
- Total Resource Potential Area
- Protected Area Layer
- Techno-economic Exclusions

- Create a circular buffer (radii between 5 and 30 miles) around each substation
- Calculate metrics within Total Resource Potential Area:
  1. High and low implication acreages, defined by Core Land Use Screen
  2. Intersection of high environmental, cropland, fire threat and parcelization variables
  3. Percent of high implication areas
  4. Compare allocated capacity with high (and low) metrics to determine level of criteria alignment

Areas of the state that remain with technical resource potential after applying base exclusions define the total resource potential area used in this analysis.

Metrics Group 1: Land Use Implications and Feasibility

Intersection of low implication land areas with total resource potential area

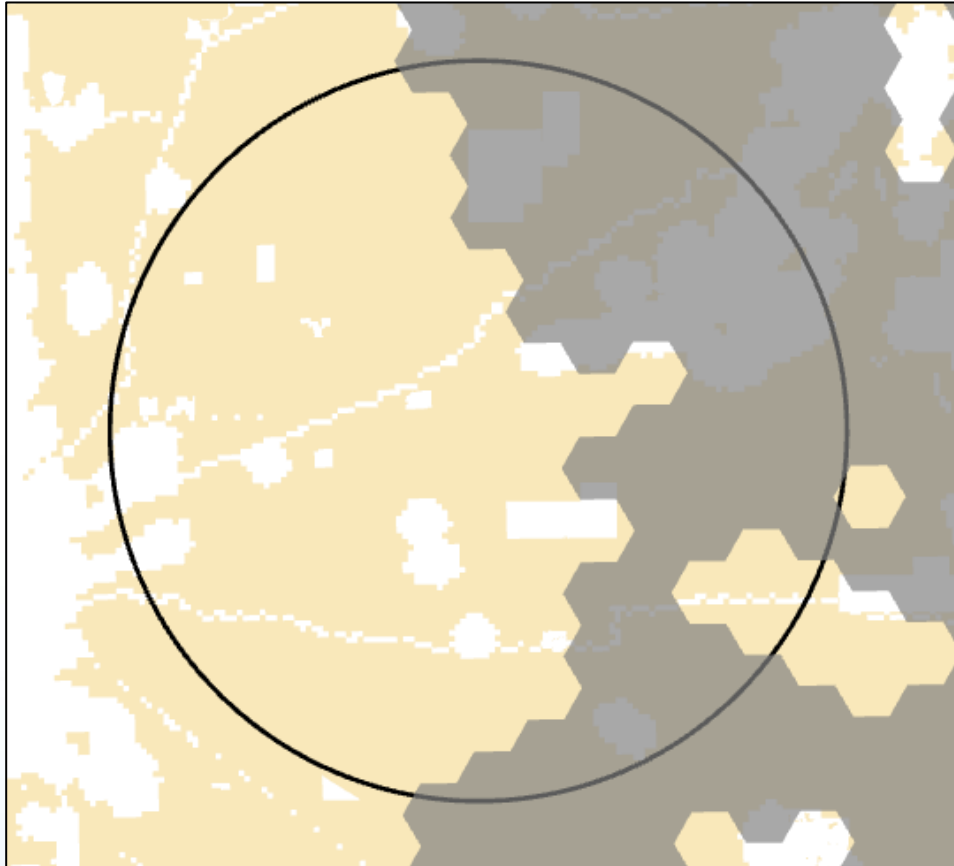Total Resource Potential Area

Low Implication Land

Within the total resource potential area within each substation buffer, CEC staff calculates:

- **Land Use Feasibility based on the Core Land Use Screen** → The raw acreage and percent of low (and high) implication land

- **Parcelization***
  - Raw acreage and percent of low and medium parcelization levels
  - 10th percentile value

- **CEC Cropland Index Model***
  - Raw acreage and percent of lower and higher cropland areas

- **Fire Threat**
  - Raw acreage and percent of Tier 2 (Elevated), Tier 3 (Extreme) areas

*Applied for solar resources only

Metrics Group 2: Environmental (Conservation and Biological) Impact Factors

Total Resource Potential Area

High Connectivity Area (Ranks 4 and 5)

Within the total resource potential area within each substation buffer, CEC staff calculates the raw acreage of intersection and the percent of intersection by each of these variables:

- Biodiversity Rank 5

- Connectivity Ranks 4 and 5

- Irreplaceability Ranks 4 and 5

- Wetlands

- Combined High ACE Variables
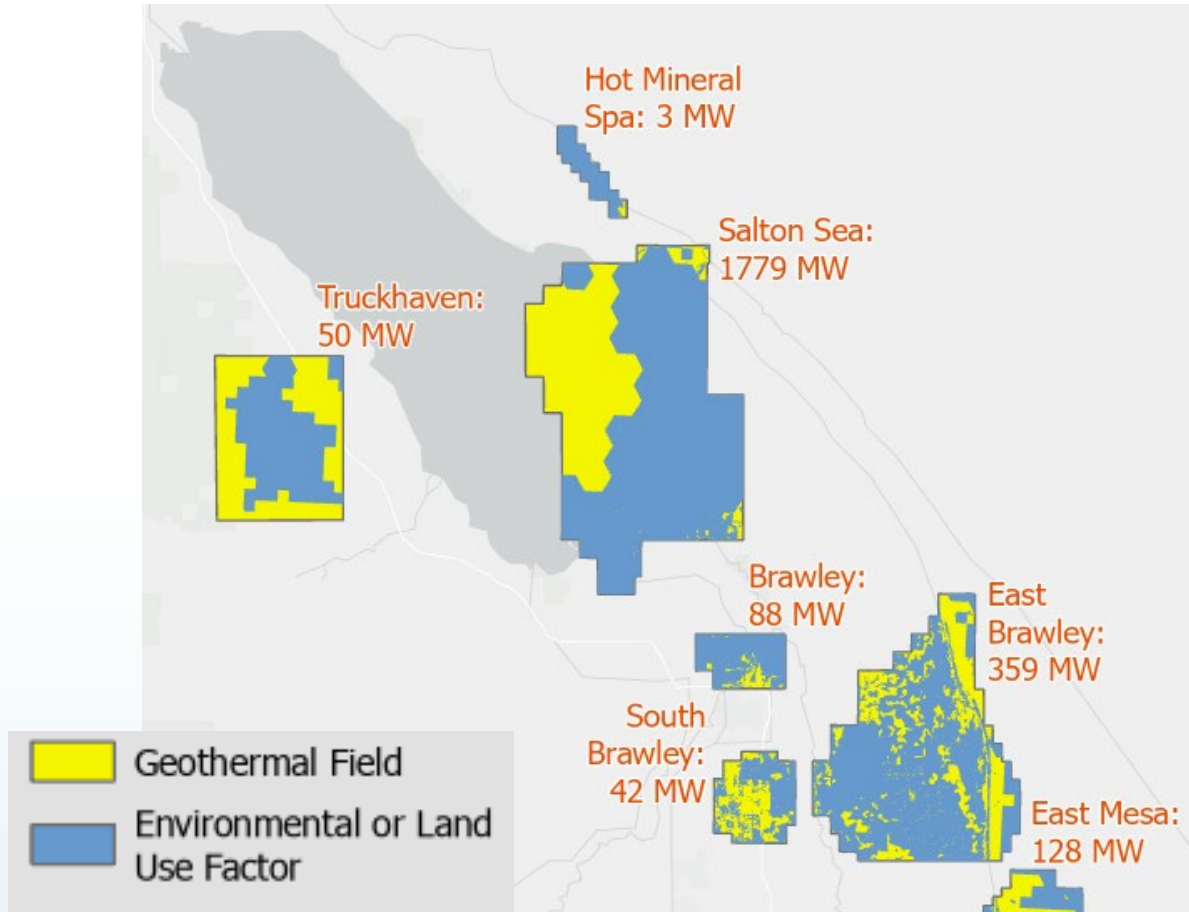
- High Landscape Intactness

Data Sources for Metrics

- ACE Biodiversity Rank 5
  https://caenergy.maps.arcgis.com/home/item.html?id=d0bf5ee8dd0945f4aaaa98c5d8b3ecb5

- ACE Connectivity Ranks 4 and 5
  https://caenergy.maps.arcgis.com/home/item.html?id=6379aba13aa5405b86ea4bb8de0e0abb

- ACE Irreplaceability Ranks 4 and 5
  https://caenergy.maps.arcgis.com/home/item.html?id=3f94d0384f7542dcba2216635e8d103e

- CDFW Wetlands
  https://caenergy.maps.arcgis.com/home/item.html?id=fe5a4336db404333887c3b54a3985ece

- CBI Landscape Intactness (>Mean)
  https://caenergy.maps.arcgis.com/home/item.html?id=4311305423d847189205b8245dd435fb

- CEC Cropland Index Model (>Mean)
  https://caenergy.maps.arcgis.com/home/item.html?id=83d4c6a2e9b04c0a925d5aa61d235437

- CPUC Fire-Threat Map
  https://www.cpuc.ca.gov/industries-and-topics/wildfires/fire-threat-maps-and-fire-safety-rulemaking

- Base Exclusions (to derive total resource potential area):
  https://caenergy.maps.arcgis.com/home/item.html?id=5648df9222964820a2431ffc897da5a3 and
  https://caenergy.maps.arcgis.com/home/item.html?id=d57834feacea4606b1dc6ac8dc5f72d5

- Parcelization:
  Calculating Parcelization for Electric System Planning | California Energy Commission

Geothermal Resources

Map legend:
- **Geothermal Field** (yellow)
- **Environmental or Land Use Factor** (blue)

Labels on map:
- Hot Mineral Spa: 3 MW
- Truckhaven: 50 MW
- Salton Sea: 1779 MW
- Brawley: 88 MW
- East Brawley: 359 MW
- South Brawley: 42 MW
- East Mesa: 128 MW

- Geospatial land use and environmental metrics are calculated for the entire geothermal field
  - Core Land Use Screen (for solar resources) adopted as the environmental variables
- This information is applied on all substations within a reasonable distance

Detailed Criteria Alignment on Selected Substations

(Proposed 24-25 TPP 2039 Base Case Portfolio)

Complete results that are presented upon in the following slides are given in sheet *LandUse_Env_Summary_2039* of the
Dashboard_PrelimMapping_10-26-23.xlsx.

Land_EnvAnalysis_Solar_2039 and *Land_EnvAnalysis_Wind_2039* sheets detail the logic behind determining the criteria alignment levels.
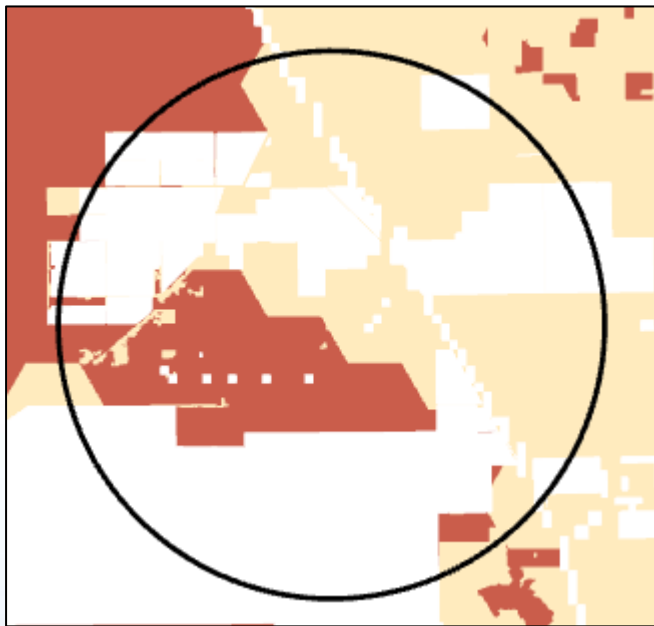
Raw Land Use and Environmental analysis provided by the CEC are given in sheets *LandEnv_Solar_Data_5mi, LandEnv_Solar_Data_10mi, LandEnv_Solar_Data_15mi, LandEnv_Solar_Data_20mi* and *LandEnv_Wind_Data_10mi, LandEnv_Wind_Data_15mi, LandEnv_Wind_Data_20mi and LandEnv_Solar_Data_30mi*

Solar: Olive Substation (5 miles)

Core Screen Criteria Alignment Level	Parcelization Criteria Alignment Level	Cropland Index Criteria Alignment Level	Overdrafted Basin Criteria Alignment Level	Fire Threat Criteria Alignment Level	ACE Connectivity Criteria Alignmen	ACE Biodiversity Criteria Alignmen	ACE Irreplaceabili ty Criteria Alignmen	All ACE Criteria Alignmen	Intactness Criteria Alignmen	Wetlands Criteria Alignmen
1	2	1	2	1	1	1	1	2	1	1

Core Screen Criteria Alignment

Allocated Capacity*: 40 MW (400 acres)

Low Implication Acres	8,815
Total Resource Potential Acres	25,681
High Connectivity Acres	12,596

Total Resource Potential Area
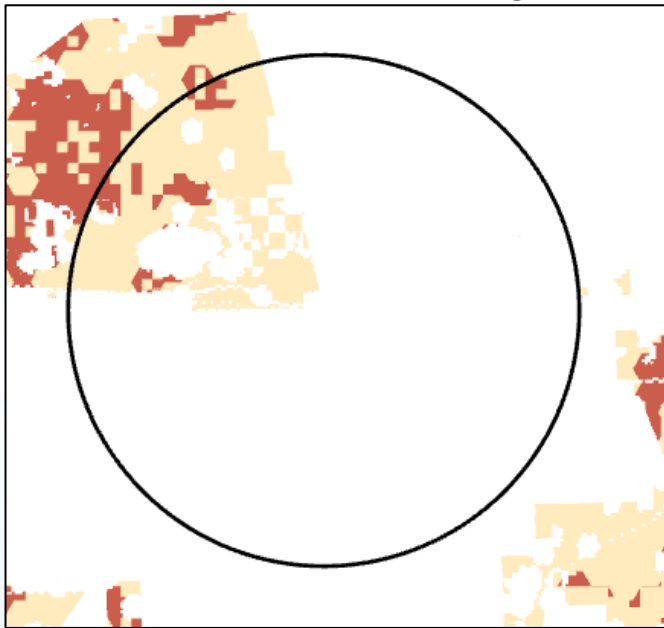
Low Implication Land

*Preliminary busbar mapping results for the proposed 24-25 TPP 2039 base case portfolio.

Solar: Kramer Substation (15 miles)

Core Screen Criteria Alignment Level	Parcelization Criteria Alignment Level	Cropland Index Criteria Alignment Level	Overdrafted Basin Criteria Alignment Level	Fire Threat Criteria Alignment Level	ACE Connectivity Criteria Alignment	ACE Biodiversity Criteria Alignment	ACE Irreplaceability Criteria Alignment	All ACE Criteria Alignment	Intactness Criteria Alignment	Wetlands Criteria Alignment
4	3	1	2	1	2	2	1	3	2	3

Core Screen Criteria Alignment

ACE Connectivity Criteria Alignment

Allocated Capacity*: 1,276 MW (12,760 acres)

Low Implication Acres	**7,334**
Total Resource Potential Acres	**66,912**
High Connectivity Acres	**36,768**
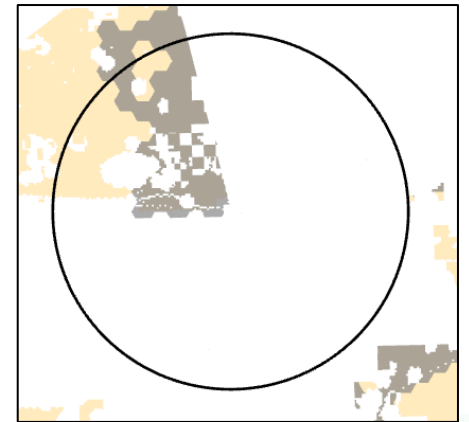
Total Resource Potential Area
Low Implication Land

Total Resource Potential Area
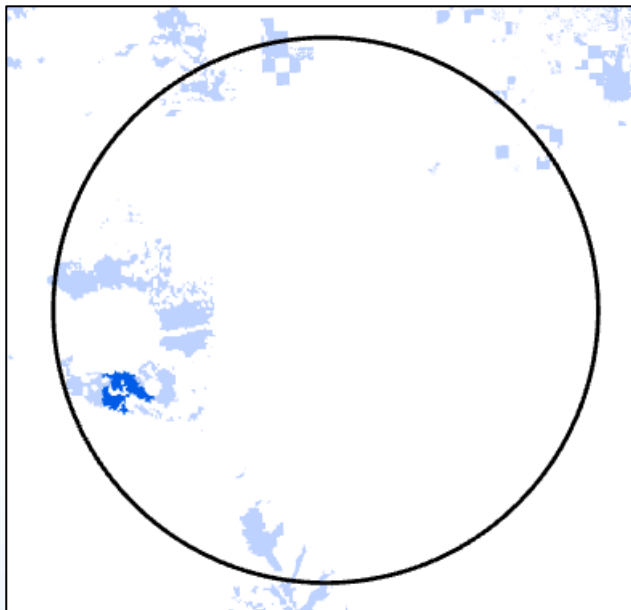High Connectivity Area (Ranks 4 and 5)

*Preliminary busbar mapping results for the proposed 24-25 TPP 2039 base case portfolio.

12

Wind: Devers Substation (20 miles)

Core Screen Criteria Alignment Level	Fire Threat Criteria Alignment Level	ACE Connectivity Criteria Alignment	ACE Biodiversity Criteria Alignment	ACE Irreplaceability Criteria Alignment	All ACE Criteria Alignment	Intactness Criteria Alignment	Wetlands Criteria Alignment
5	5	4	3	4	5	4	5

Core Screen Criteria Alignment

Allocated Capacity*: 492.6 MW (19,704 acres)

Low Implication Acres	3,431
Total Resource Potential Acres	45,105
High Connectivity Acres	19,932
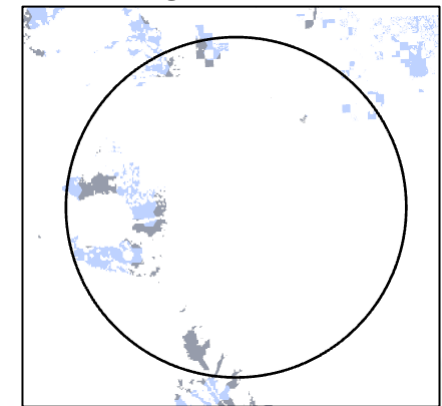
■ Total Resource Potential Area

■ Low Implication Land

ACE Connectivity Criteria Alignment

■ Total Resource Potential Area

■ High Connectivity Area (Ranks 4 and 5)

*Preliminary busbar mapping results for the proposed 24-25 TPP 2039 base case portfolio.

Summary of Raw Results – Solar and Wind

Draws upon results from the geospatial land use evaluation and allocated capacity mapped in the <u>preliminary dashboard results</u>.

Note: For wind resources, the dashboard uses a 20% capacity factor (CF) threshold for defining the total potential area and a 28% CF threshold for defining the low implication land area. Results shown in the following section use a 28% CF threshold for both variables.
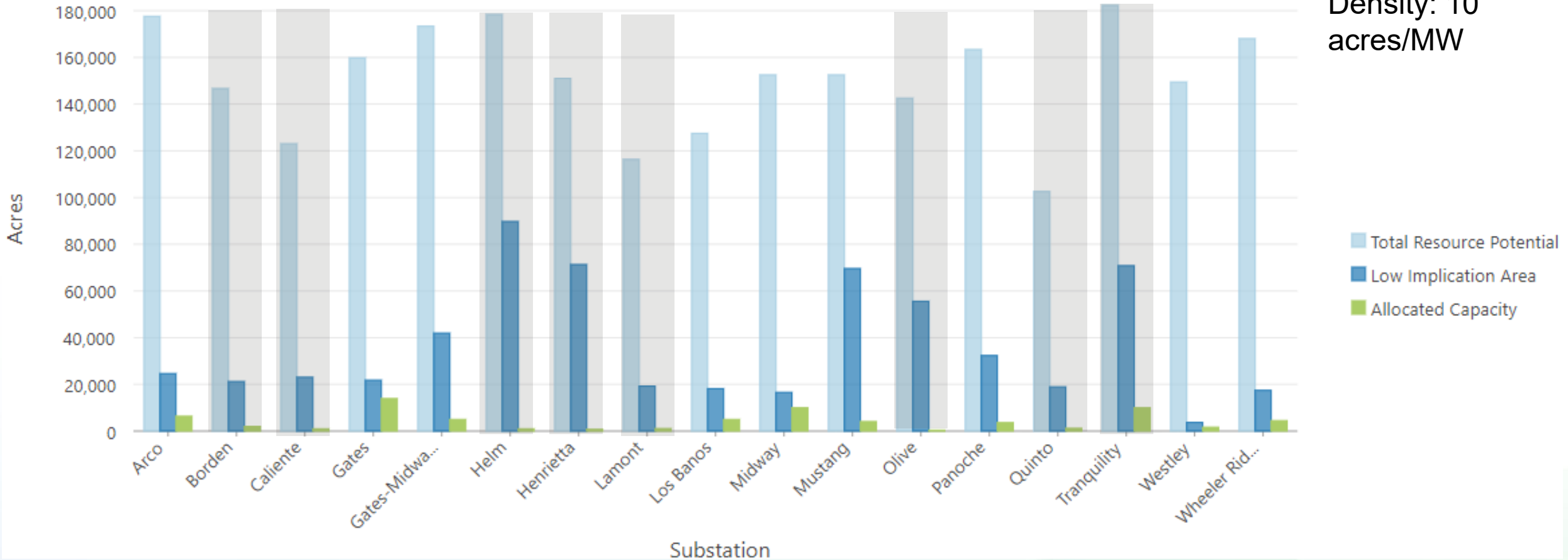
Summary of Results (Solar, SPGE, 10 miles)

*Preliminary busbar mapping results for the proposed 24-25 TPP 2039 base case portfolio.

Main Land Use Feasibility Factors

Capacity Density: 10 acres/MW

Legend:
- Total Resource Potential
- Low Implication Area
- Allocated Capacity

Note: Columns highlighted in grey indicate substations where a final land use evaluation area is set to a 5-mile buffer area rather than a 10-mile buffer area.

Note: Land-use evaluations for Westley and Wheeler Ridge is listed as Fink Proposed) and Lakeview, respectively, in the Dashboard_PrelimMapping_10-26-23.xlsx. Pastoria Substation is not included in this chart.

Environmental Impact Factors (Solar, SPGE, 10 miles)

*Preliminary busbar mapping results for the proposed 24-25 TPP 2039 base case portfolio.
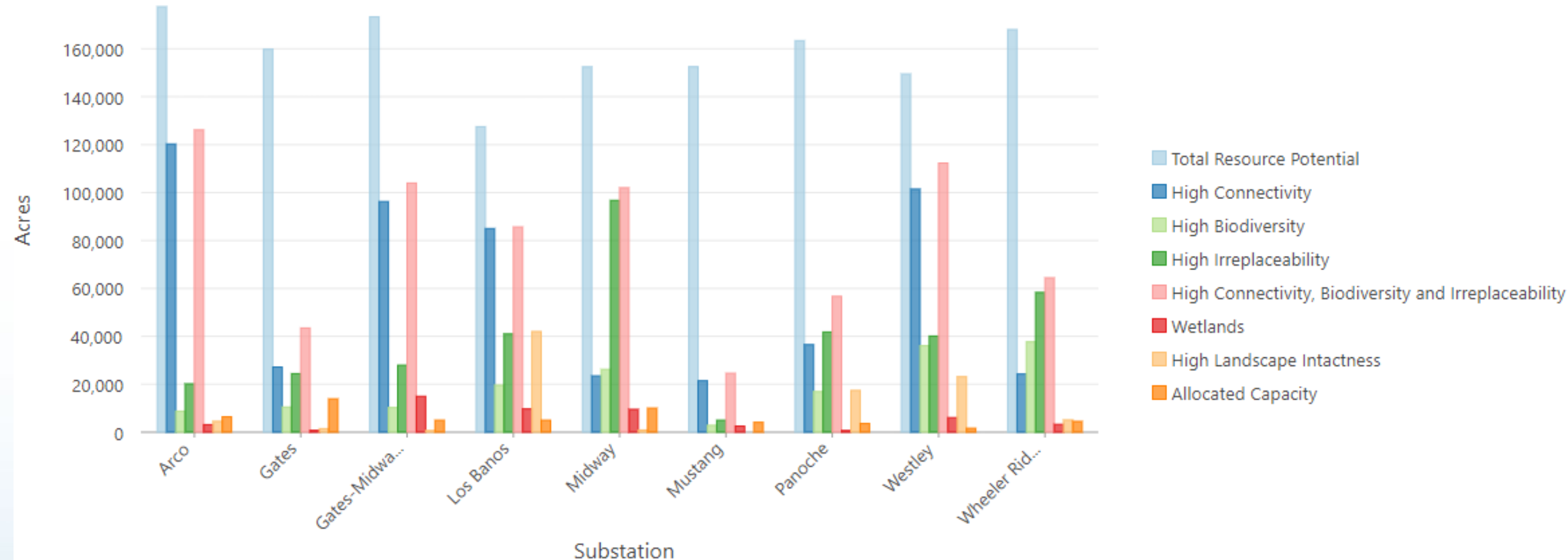
Note: Land-use evaluations for Westley and Wheeler Ridge is listed as Fink Proposed) and Lakeview, respectively, in the Dashboard_PrelimMapping_10-26-23.xlsx

Summary

Solar

- Areas of intersection of land use and environmental characteristics generally don't conflict with the allocated capacity
  - Greater Tehachapi, Greater Kramer are exceptions

Wind

- Higher tendency of allocated capacity to conflict with land use and environmental characteristics.

- Lower implication land very limited, especially with respect to total capacity selected in proposed 24-25 portfolio.

Geothermal

- Land use and environmental evaluation occurs within the geothermal fields only. Core Land Use Screen components are adopted for partitioning into high and low implication areas, and the assessment of the individual environmental factors.

Thank you!

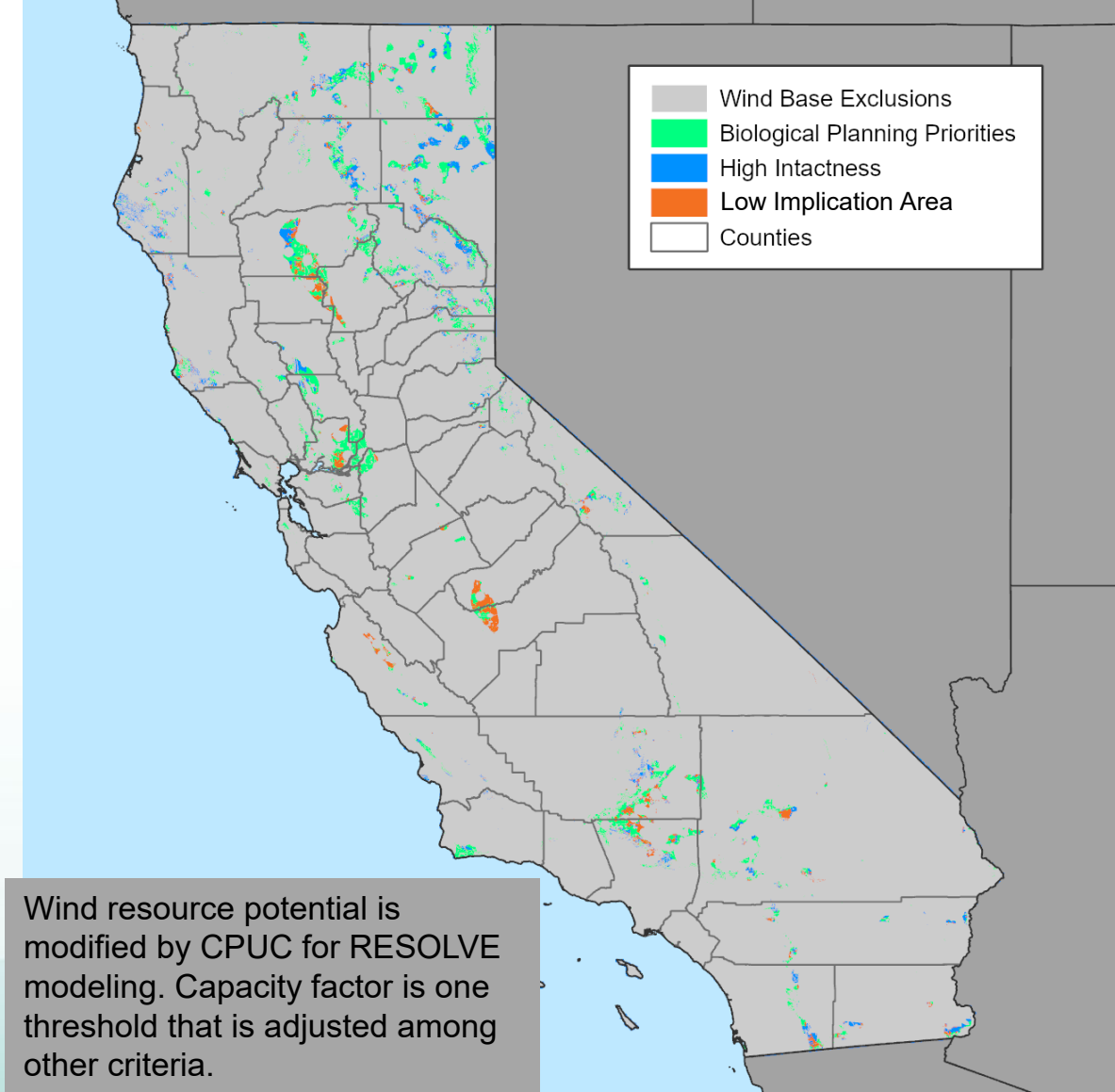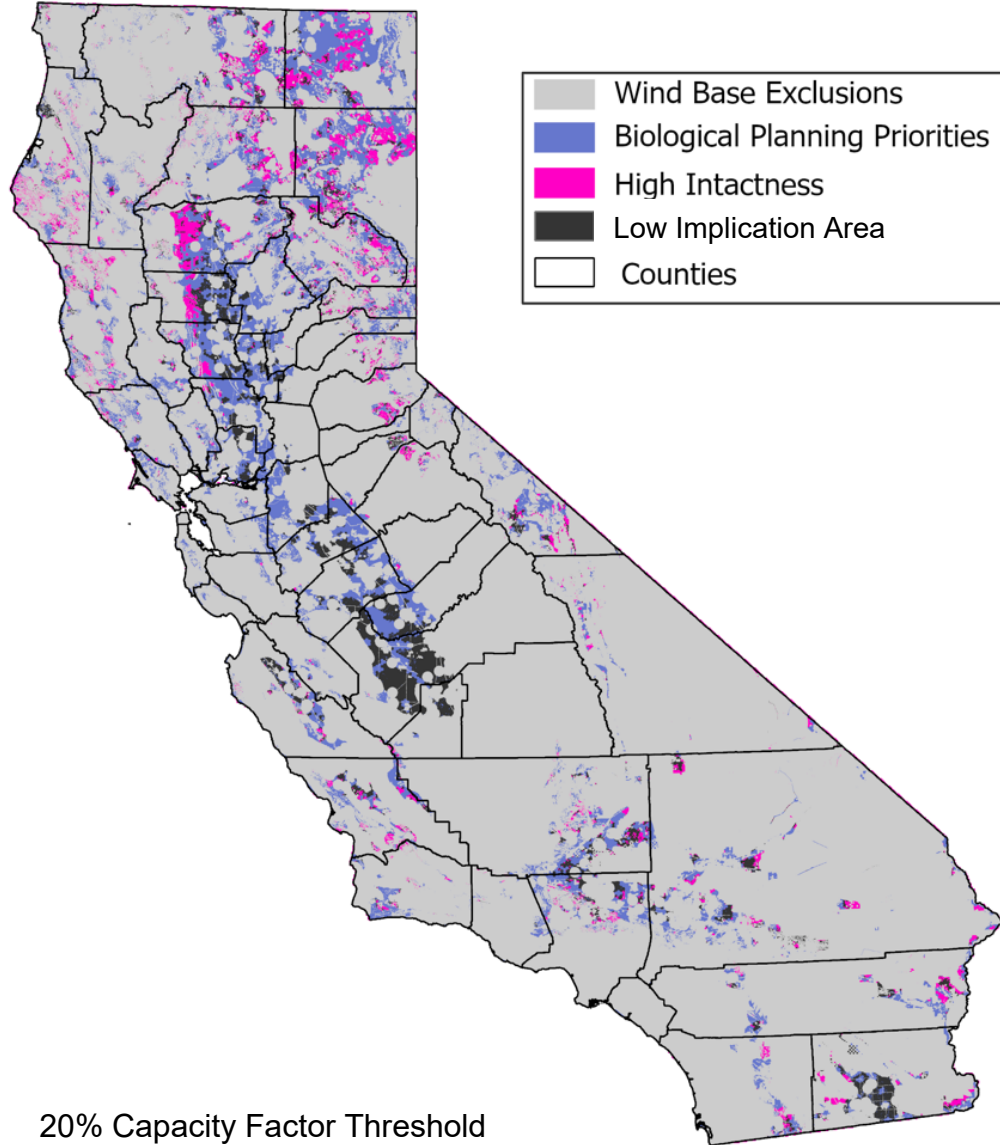Saffia.Hossainzadeh@energy.ca.gov
Erica.Brand@energy.ca.gov

RESOLVE Regions
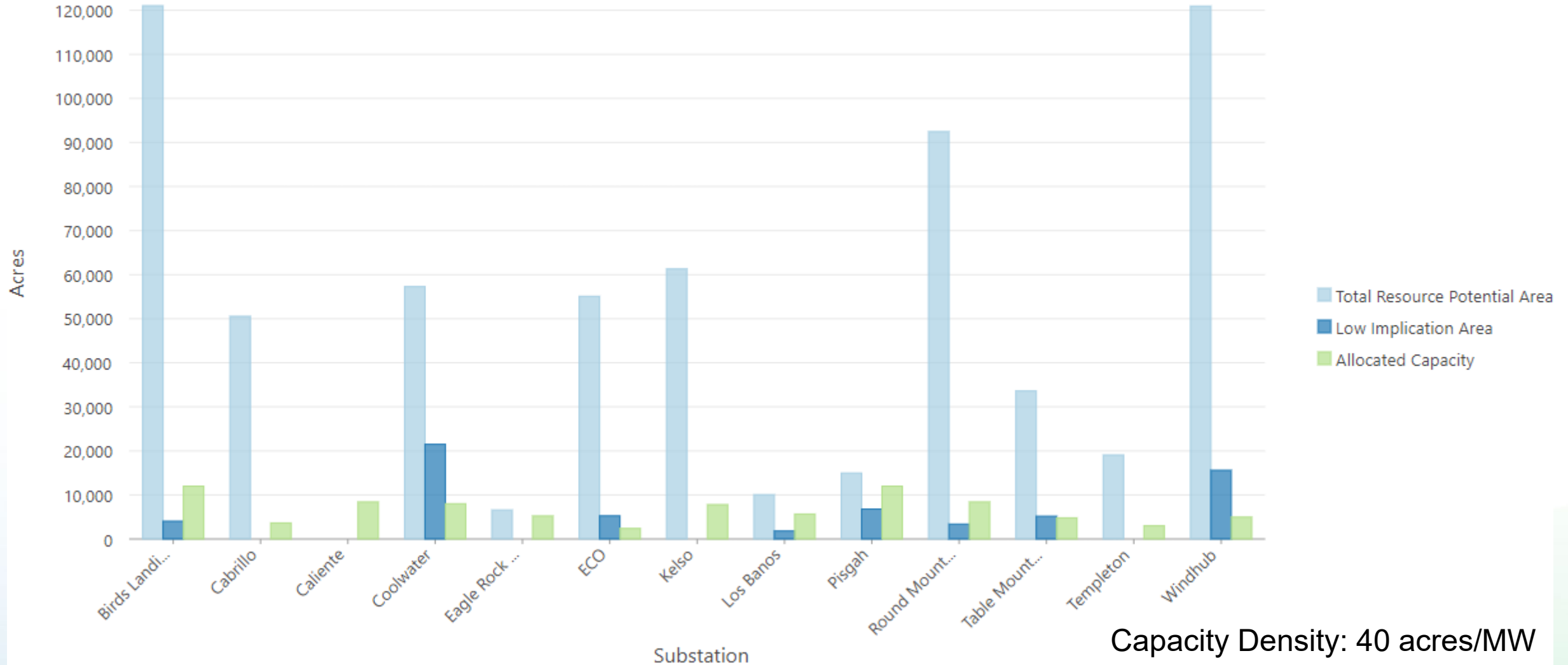
Core Land Use Screen (Wind)

Core Land Use Screen (CPUC Adjusted with 28% Capacity Factor Threshold)

Legend:
- Wind Base Exclusions
- Biological Planning Priorities
- High Intactness
- Low Implication Area
- Counties

20% Capacity Factor Threshold

Wind resource potential is modified by CPUC for RESOLVE modeling. Capacity factor is one threshold that is adjusted among other criteria.

Summary of Results
(Wind 28% CF, 15 miles)

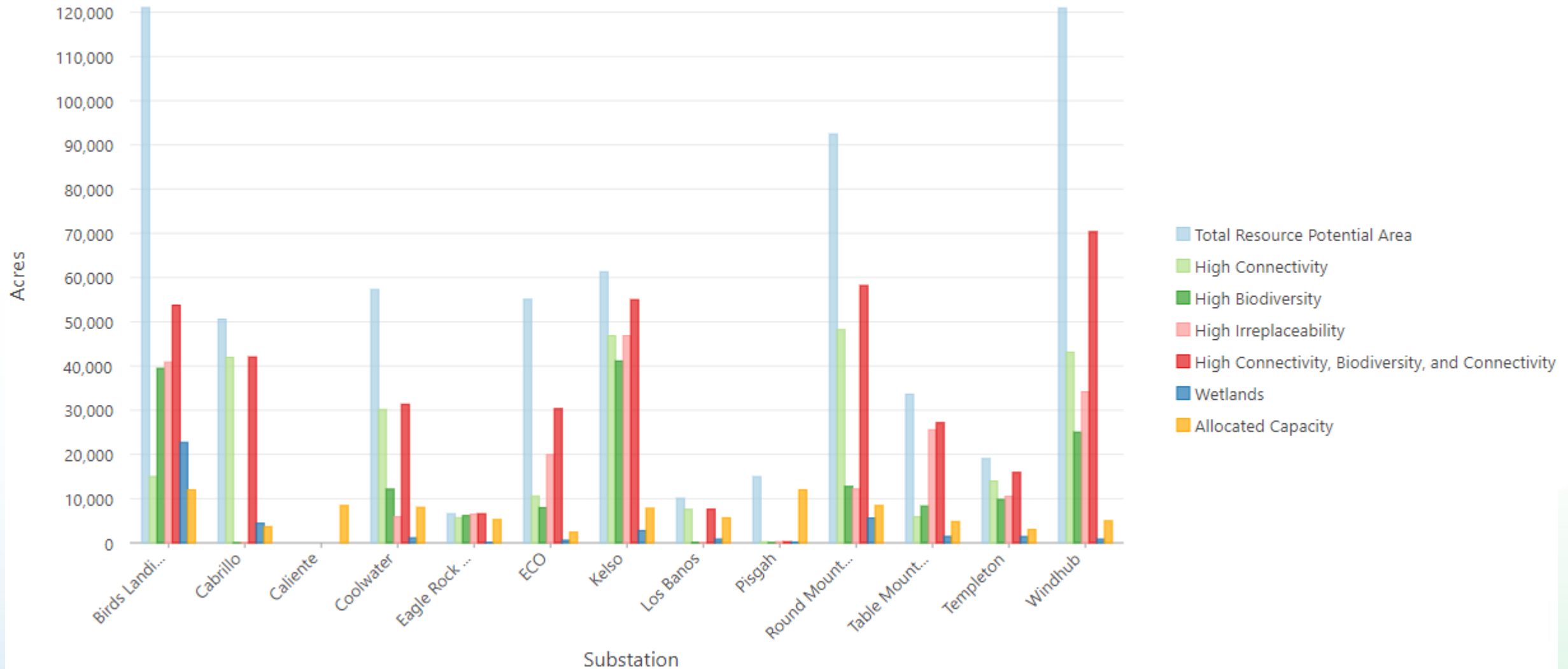Main Land Use Feasibility Evaluation - 15 Miles

Capacity Density: 40 acres/MW

Note: Land-use evaluations for Round Mountain is listed as New Sub – Pit 1 – Cottonwood (Proposed) in the Dashboard_PrelimMapping_10-26-23.xlsx

Environmental Impact Factors
(Wind, 28% CF, 15 miles)

Environmental (Conservation and Biological) Impact Factors

Note: Land-use evaluations for Round Mountain is listed as New Sub – Pit 1 – Cottonwood (Proposed) in the Dashboard_PrelimMapping_10-26-23.xlsx