

Public Electric Vehicle Charging Location Recommendations for Sonoma County
North Bay Electric Auto Association
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1. Overview

The North Bay chapter of the Electric Auto Association (NBEAA) advocates placing ample public Electric Vehicle (EV) charging stations offset by renewable energy such as Photovoltaics (PVs) throughout Northern California to accelerate the increase of use of Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs). Given that over 40% of energy use is in the transportation sector, we believe that such a transformation can greatly increase our energy independence, reduce our greenhouse gas production, and improve our air quality.

There are three types of EV charging -- "Fast", "Medium Rate" and "Slow" -- all of which we advocate being installed for public use:

"Fast" charging requires 480 Volt, 250 Amp, specialized off-board charging equipment for high power EV battery packs such as lithium nanotechnology that can charge up 80% in approximately 10 minutes. Placing some of these chargers along freeways accompanied with conventional fueling station services such as restrooms and food services would greatly improve the utility of limited range EVs, with minimal impact to the driver when compared to using a petroleum fueled car for those occasional long trips that even energy conscious drivers still want their vehicle to be able to be utilized for.

"Medium Rate" charging requires a 208 to 240 Volt, 50 to 80 Amp outlet to charge a variety of EV battery chemistries within a few hours via common on-board EV chargers. Placing large banks of these chargers in heavily visited locations where people tend to regularly drive to for long distances and then park for a while such as downtown areas, shopping centers, commuter schools and transit hubs, would extend the utility of limited range EVs.

"Slow" charging requires a standard 120 Volt, 15 Amp outlet and can charge short range EVs up overnight, as well as provide opportunity charging for PHEVs. Given the low cost to install and the ubiquity of these outlets, they should be installed wherever possible, particularly where "Medium Rate" charging banks are installed.

All types of public chargers need to be reliable and available in order to be depended upon and hence increase the utility of a limited range EV. Henceforth all stations need to be built with highly reliable equipment, have a regular testing and maintenance plan, and have a real time repair plan with alternative charging locations within a short distance. If

this requires charging money for the electricity, it is expected that most EV drivers would pay more than the provider's electricity cost to be able to extend the utility of their vehicle. However, given the growing popularity of EVs, it could increase other forms of income if charging was made available in a particular area that could be far greater than the electricity and maintenance cost.

Charging installations can cost a lot of precious money if trenching and parking surface modification is required, which could limit the number of installations and hence the effectiveness of extending the utility of limited range EVs within the area. So although location is critical, most EV drivers are expected to be willing to walk short distances from lower cost installations in exchange for gaining access to more charging locations given limited funding sources. And medium rate charging on existing street lamp poles and parking meter poles could utilize existing conduit to route new wires and mount new outlets, hence reducing costs. Whenever possible, charging stations close to heavily traveled route intersections should be prioritized, since they will benefit more people and hence be more cost effective per charging unit.

Considering most EV drivers do so to reduce their energy use, public charging stations should be located near transit hubs, and offset with renewable fuel whenever possible. The future SMART train park-and-ride lots are prime locations, reducing the need for a longer range vehicle altogether once the passenger rail service network fills out and EV rentals are available at destinations. Parking lots offering EV charging should be covered with PV carports, such as the City of Vacaville who installed a PV carport charging station at their Bella Vista Park-and-Ride lot along highway 80. Ed Huestis, Vacaville Transportation Systems Manager, can provide more detailed information. Ed's email is ehuestis@cityofvacaville.com.

Standardizing on safe, simple, robust and common charging interfaces is critical for the success of widespread use of EV public charging. Retrofitting or adapting an EV to a new charging facility should not be cost prohibitive, nor cumbersome. The Society of Automotive Engineers (SAE) is actively working with the Electric Auto Association (EAA), Tesla Motors and other EV manufacturers to update their medium rate EV charging standard, SAE J1772. It is due to be published shortly. We recommend working with Tom Dowling, our EAA charging infrastructure officer, to make sure these new standards are implemented in the new charging facilities, along with standard 120V outlets and future fast charging standards. Tom also has a lot of experience with installing, tracking, maintaining and repairing EV chargers in the area. Tom's email is charging@eaaev.org.

2. Recommendations

Our priority for the first phase is to install fast charging approximately every 20 miles along the major highways, and medium rate and slow charging in the 9 Sonoma County cities first. See Sonoma County map Figure 1 below with numbers that correspond with the recommended locations listed in Table 1.

Table 1. Recommended EV Charging Locations in Sonoma County, Listed by Descending Latitude

<u>City</u>	<u>A. Proposed Fast Charging</u>	<u>B. Proposed Medium Rate and Slow Charging</u>	<u>C. Existing Medium Rate and Slow Charging</u>
Cloverdale	A1. Close to a highway 101 exit	B1. SMART Train Park-and-Ride (also serves downtown)	
Healdsburg	A2. Close to a highway 101 exit	B2. SMART Train Park-and-Ride (also serves downtown Square)	
Windsor		B3. SMART Train Park-and-Ride (also serves downtown Town Green)	
Santa Rosa	A3. Close to highway 101 and 12 exits	B4. Jennings Avenue SMART Train Park-and-Ride (also serves Coddington Mall) B5. Santa Rosa Junior College, Santa Rosa Campus B6. Montgomery Village Shopping Center B7. Any one of the 5 downtown Santa Rosa city parking garages (also serves Santa Rosa Plaza Mall) B8. Santa Rosa Marketplace	C1. Oakmont Service Station C2. Thunderstruck Motors

Sebastopol		B9. Downtown	C3. Harmony Farms
Rohnert Park		B10. SMART Train Park-and-Ride B11. Sonoma State University	C4. Costco
Cotati		B12. SMART Train Park-and-Ride (expected to serve downtown via shuttle)	
Petaluma	A4. Close to a highway 101 exit	B13. Corona Road SMART Train Park-and-Ride (expected to serve Santa Rosa Junior College Petaluma Campus via shuttle) B14. Downtown SMART Train Park-and-Ride	C5. Premium Outlets
Sonoma	A5. On highway 12	B15. Sonoma State Historic Park parking lot (also serves downtown Plaza)	

To make this network truly effective to convince many people to switch to a limited range EV, we believe that fast charging needs to be installed every approximately 20 miles along all major highways in Northern California, henceforth we suggest coordinating with other counties, particularly adjacent ones such as Marin, Napa, Lake and Mendocino, to pursue similar grants for compatible fast chargers.

We eventually want at least medium rate and slow EV charging stations in every town in Sonoma County. The next phase of recommended charging locations include:

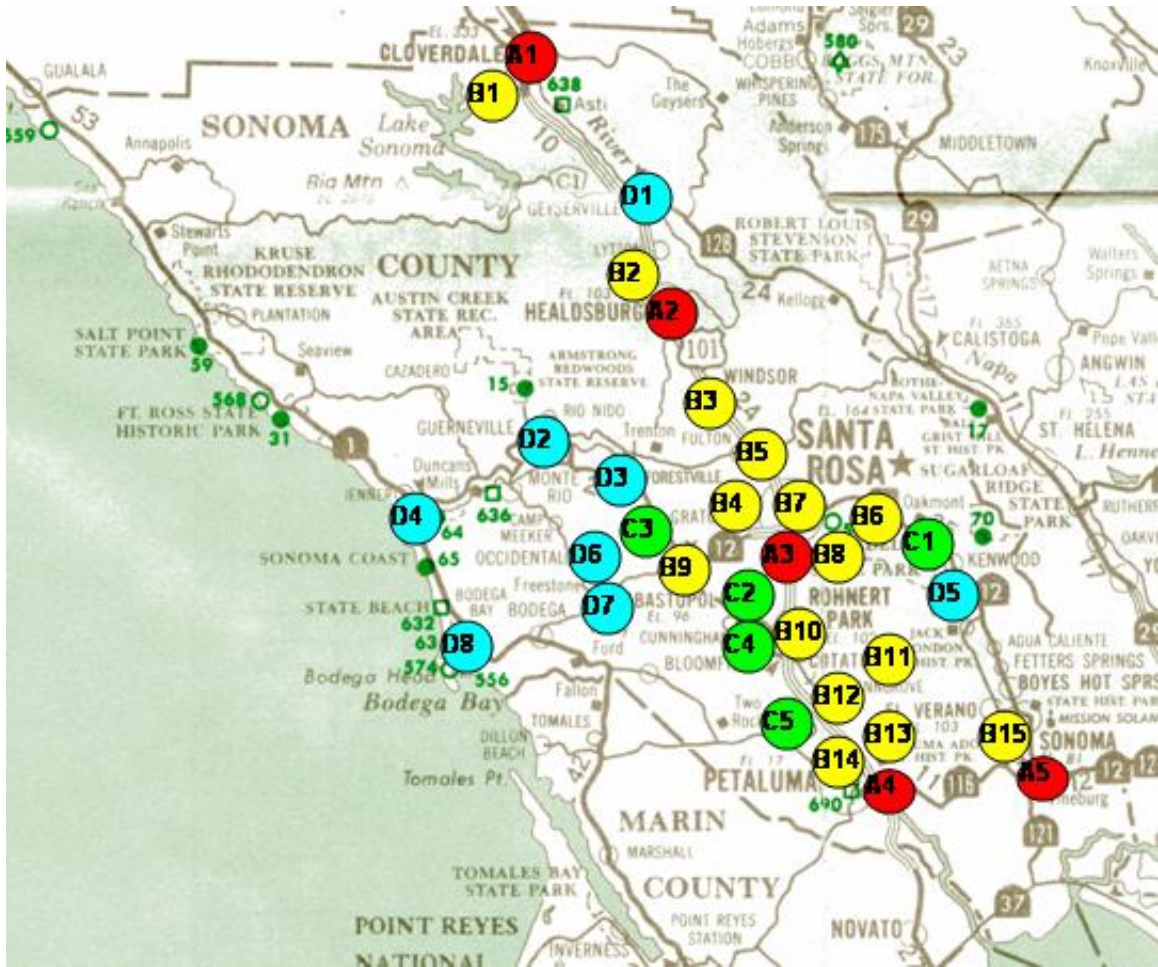
- D1. Geyserville
- D2. Guerneville
- D3. Forestville
- D4. Jenner
- D5. Kenwood
- D6. Occidental
- D7. Freestone
- D8. Bodega Bay

We believe that once a regular city and town infrastructure is in place and EVs become more commonplace, it will pay to also install chargers at public event centers and

recreation sites. Examples include the fairgrounds in Cloverdale, Santa Rosa and Petaluma; performing arts centers at Wells Fargo Center in Santa Rosa, Spreckles and the future Green Music Center in Rohnert Park; and state parks at Salt Point, Fort Ross, Armstrong Redwoods, Annadel, Sugarloaf Ridge and Jack London.

Figure 1. Map of Recommended EV Charging Locations in Sonoma County

- Legend:
- **A1** Recommended Fast
 - **B1** Recommended Medium Rate and Slow
 - **C1** Already Existing Medium Rate or Slow
 - **D1** Future Recommendations



3. Background

A Coalition of Sonoma County and City governments, larger employers and non-profit groups lead by the Sonoma County Water Agency are pursuing grants for public EV charging stations. These stations will be utilized by the 2010 Nissan pilot EV program, PHEVs and other BEVs already existing or coming on line in the future.

This coalition is pursuing three types of EV charging: 1.) government employee charging, 2.) private employee and guest charging, and 3.) public charging, either on government or private land. The NBEAA was asked to provide input, specifically on the latter, which is the focus of the preceding sections. But we also advocate all city, county, state and federal governments and private fleet vehicles be converted to or replaced by EVs, offset by renewable energy whenever possible, with charging for their fleets as well as employee's private vehicles -- particularly at large facilities. One example is Agilent Technologies in Santa Rosa. They already have 6 charging stations and has the infrastructure and plans to expand as the demand grows. They are an active part of this coalition, investigating purchasing EVs for their fleet and providing employees with the ability to purchase and charge them. They also have a 1 MW solar array covering one of their parking lots that could offset approximately half of the average commute of 14 miles round trip for all of their 1400 employees, and are investigating expanding their 3 acre PV array to more of their vast parking lot that is still uncovered. Other large businesses we advocate taking a lead role in purchasing and charging EVs include Medtronics and Kaiser in Santa Rosa, and Sonoma Mountain Village in Rohnert Park -- the latter already has a large solar array and is redeveloping their facility in a sustainable manner.

4. Who We Are

The NBEAA is a non-profit EV educational and advocacy group that consists of approximately 50 members and another 100 interested people on our mailing list. Members live primarily in Sonoma, Napa, Marin, Mendocino, Solano and Yolo Counties. Many of us drive electric vehicles, some OEM, and others which we have converted from gasoline ourselves. We show our vehicles at public events and club meetings. To learn more about the electric vehicles in the North San Francisco Bay region, please visit our website at www.nbeaa.org.