

Mendocino County Zero Emission Vehicle (ZEV) Regional Readiness Plan



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**Mendocino County
Air Quality Management District**

with

Mendocino Council of Governments
www.mendocinocog.org



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Introduction

Purpose of the Plan

Since 2011 Californians have bought more than 35,000 electric plug-in vehicles – more than a third of all the plug-ins in the US. As of early 2013, California was home to 1,276 publicly accessible charging stations, or more than one-fifth of the country's total, according to the US Energy Department. With the increasing demand for electric charging stations, the Mendocino County Air Quality Management District, in partnership with the Mendocino Council of Governments (MCOG), has developed these guidelines for creating electric charging stations to serve the Zero Emission Vehicle (ZEV) and Plug-in Electric Vehicle (PEV) demand.

The purpose of this effort is to provide regional transportation planning to build on previous work and participate in ongoing statewide and nationwide transitions to new vehicle technologies and renewable energy infrastructure in response to health and environmental impacts, energy issues, and climate change. The goal of Mendocino County regional readiness is to implement appropriate plug-in electric vehicle (PEV) charging infrastructure for public use as part of a network of neighboring regions and beyond, supporting regional and interregional use of electric and plug in hybrid vehicles.

While private PEV charging networks are becoming more available, it is a responsibility of appropriate public agencies to ensure that infrastructure is provided to all feasible, prioritized locations in the region. Many parts of Mendocino County are remote and sparsely populated, unlikely to attract comparable investment in charging stations by private companies. It is recommended that Mendocino County establish a basic public network, encourage private networks to add density of PEV charging infrastructure, and invite partnership opportunities wherever beneficial to the public interest.

This plan focuses on stations for “opportunity charging” as opposed to “primary charging” locations. Opportunity charging stations are generally available to the public and not as the primary location for individual owners while primary charging locations would be at an EV owner’s home. Although there may be efforts to develop electric fueling stations by private interests to serve opportunity charging, the focus of this effort is on public sites to ensure an initial network of charging stations becomes available.

This project responds to Goals, Objectives and Policies on Climate Change & the Environment in the *2010 Mendocino County Regional Transportation Plan*, including the following:

Objective: “invest in transportation projects that will help Mendocino County residents to proportionately contribute to the California greenhouse gas reduction targets established by Assembly Bill 32 and Senate Bill 375.”

California Sustainable Communities Policy Objectives addressed include:

- Quantifiable reduction in greenhouse gas emissions
- Transportation/transit improvements
- Reduce fuel consumption
- Energy efficiency, conservation or renewable energy
- Protection of natural resources
- Reduction in toxic threats
- Creation of green jobs and/or industries
- Efficient use of existing infrastructure
- Promote public health and healthy communities

This project is consistent with at least five of the six Livability Principles of the Federal Partnership for Sustainable Communities: 1) Provide More Transportation Choices, 2) Enhance Economic Competitiveness, 3) Support Existing Communities, 4) Coordinate Policies & Leverage Investment, and 5) Value Communities & Neighborhoods.

Previous Efforts

MCOG previously completed Zero Emission Vehicle (ZEV) Demonstration Projects in 1997 and 1999 that led to the development of two charging station locations in Ukiah and Willits. Following is a summary of those efforts:

Zero Emission Vehicle (ZEV) Demonstration Project, Phase I Final Report (MCOG, 1997): The purpose of this project was to conduct a feasibility study for the Zero Emission Vehicle (ZEV) Demonstration Project. The first phase focused on evaluating and comparing production ZEV's availability on the consumer market, specifically for performance in the Mendocino County region. Study results were intended to provide a recommendation for Phase II. This study concluded that use of an electric vehicle (EV) for commuting and across-county travel is feasible in Mendocino County, especially utilizing advanced EVs entering the market. Other EVs may have uses in towns and municipal fleets. It is to the County's advantage to begin to plan for and construct EV infrastructure, since it is likely that some EVs will be acquired and used within the county. The usefulness of EVs is enhanced by construction of charging stations throughout the county, such that more travel by EVs around the county is possible. It was recommended that appropriate entities begin planning for safe, code-compliant charging infrastructure. It was also recommended that planners responsible for traffic and roads become familiar with EVs through hands-on experience.

Zero Emission Vehicle (ZEV) Demonstration Project, Phase II Final Report (MCOG, 1999): The two-year ZEV Demonstration Project, an element in MCOG's Overall Work Program, evaluated the practicality of using commercially produced zero emission vehicles in the rural setting of Mendocino County. The project addressed infrastructure issues by installing charging stations to provide hands-on experience for local government agency and planning personnel. Use of renewable energy was demonstrated through solar net metering, which directly interfaces with power grids to produce electricity locally. This rural demonstration dealt with pollution prevention in a relatively pristine environment, and with the challenges of rugged and mountainous terrain, a somewhat colder climate, and remote locations.

EVs for Education Program sponsored by Mendocino County Air Quality Management District and State of California Air Resources Board, assisted by Mendocino Clean Air Transportation Coalition, 2000-2001.

Other Guidelines

Mendocino County is not alone in its efforts to serve the demand for electric vehicles. The County of Sonoma has developed an *Electric Vehicle Charging Station Program and Installation Guidelines*, July 2011, http://www.sonoma-county.org/prmd/docs/misc/ev_prog_guidelines.pdf. Humboldt County is also in the process of developing a plan to serve the Eureka Bay Area. Mendocino County should follow the lead of other ZEV plans, especially related to installation standards. The State of California has recently published its *2013 ZEV Action Plan*, February 2013, [http://opr.ca.gov/docs/Governor's_Office_ZEV_Action_Plan_\(02-13\).pdf](http://opr.ca.gov/docs/Governor's_Office_ZEV_Action_Plan_(02-13).pdf), which identifies specific strategies and actions needed to establish a roadmap towards a goal of serving 1.5 million zero-emission vehicles on California roadways by 2025.

Plan Components

Existing Infrastructure: Existing electric vehicle charging facilities in the County, both public and private, are summarized.

Travel Characteristics: Mendocino County resident and work travel characteristics, trip travel purposes, traffic volumes on State Highways, connections to neighboring counties, and the potential connection with tourism travel are discussed.

Recommended Charging Station Sites: Criteria for station site selection was developed and specific sites were identified throughout the County.

Phasing Plan: A priority ranking score for each potential station was developed and a recommended phasing plan is presented should funding not allow for full system development.

Technical Station Issues: The array of technical issues and details at a ZEV charging station are summarized including the types of charging equipment, required power sources, tracking usage data, payment methods, cost to users, installation, monitoring and maintenance, impact to the power grid, signage, installation standards and costs.

Implementation Plan: The next steps in developing a network of ZEV charging stations are presented.

Travel Characteristics

Conditions in the Region

Mendocino County, on the north coast of California, is a rural county noted for its distinctive Pacific Ocean coastline, Redwood forests and wine growing region within an area of approximately 3,500 square miles. It is bordered by Sonoma County on the south, Lake County to the east, Humboldt County on the north and the Pacific Ocean to the west. Transportation within and through the County is constrained by the mountainous terrain and limited highways. US 101 and State Route (SR) 1 are the only continuous north-south corridors, and SR 20 and SR 128 are major east-west corridors. The majority of residents live within the communities of Ukiah, Willits and Fort Bragg; however, there are numerous residents who live in smaller towns and remote locations with transportation needs and a desire to utilize alternative fuels. Over the past four decades, Mendocino County residents have been leaders in renewable energy and alternate-fuel transport, with a spirit of innovation and self reliance, local community identities, and strong environmental values. The Mendocino County State Highway system is shown in Figure 1.

Mendocino County Residents and Workers

The *Wine Country Travel Demand Model Project Model Development Report (WCTDM)*, 2011, prepared by Parsons Brinckerhoff for Caltrans and the Wine Country Interregional Partnership, includes summaries of Mendocino County travel characteristics that are relevant to understanding the potential for ZEV usage at both the local and regional levels. Following are several key travel characteristics for Mendocino County residents and workers that were identified in the WCTDM through reference to the *2000-2001 California Statewide Household Travel Survey* and Journey-to-Work data obtained and analyzed during the 2000 Census.

- 62 percent of trips made by Mendocino County households originate at home, with the remaining 38 percent of trips being non-home based
- 12 percent of all trips originate or end at a school
- 94 percent of employed Mendocino County residents also work in the County; nearly 3 percent work in Sonoma County, and the remaining 3 percent are split among neighboring counties and beyond
- 94 percent of all employees in Mendocino County also live in the County
- 38 percent of home-based commute trips in Mendocino County are less than 10 minutes long, and 63 percent of trips are less than 20 minutes long

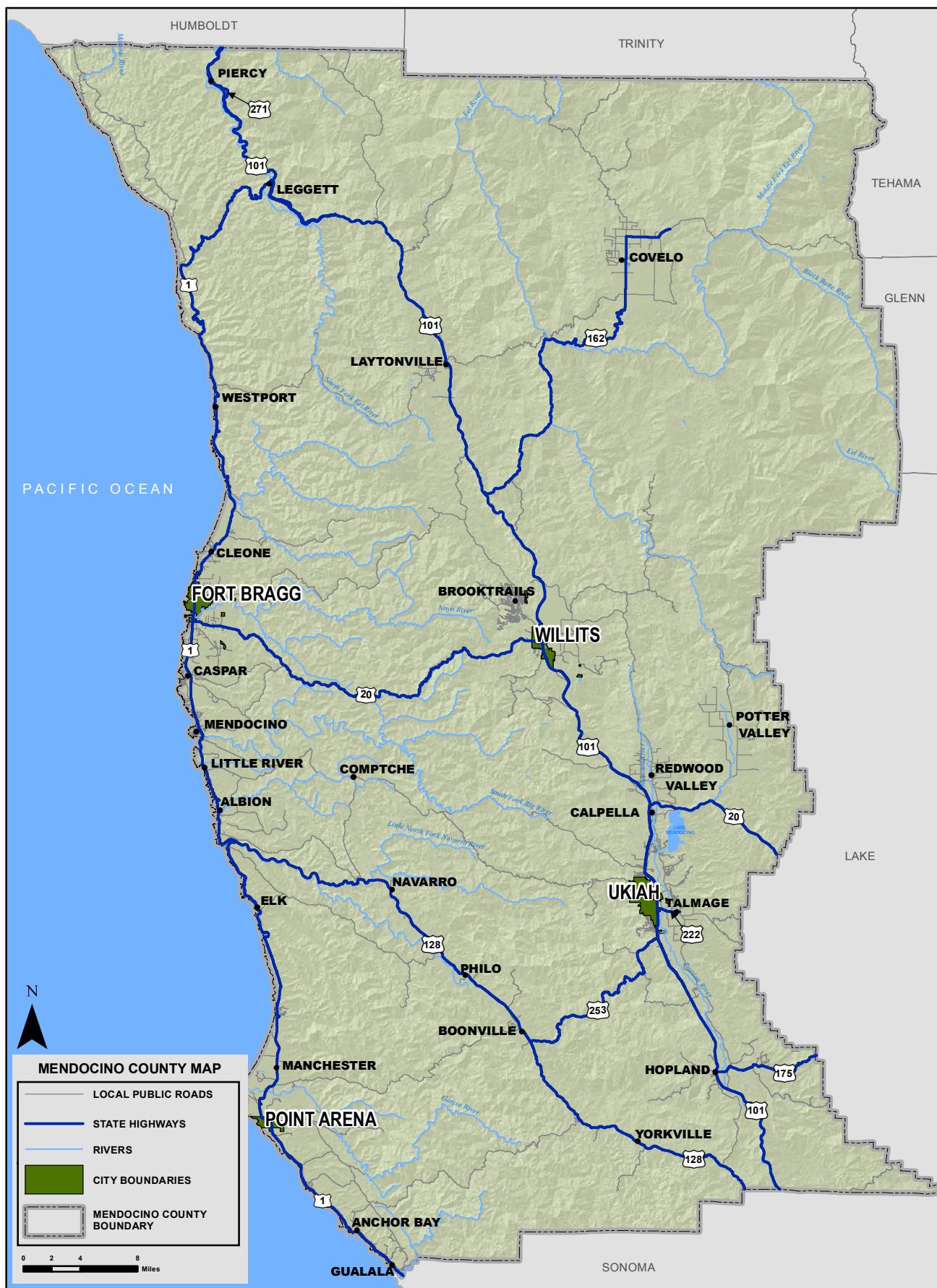
These statistics confirm that a substantial amount of the traffic on the regional roadway network begins and ends within Mendocino County, and that many of these trips are short in nature. The provision of electric vehicle charging stations at major employment centers and near schools could potentially increase the convenience and attractiveness of ZEV usage by the County's residents.

Regional Travel Purposes

The WCTDM obtained trip purpose surveys in 2005 and 2009 at four major gateways to Mendocino County: SR 20 and SR 175 near the Lake County line, and SR 128 and US 101 near the Sonoma County line. A summary of the trip purpose results obtained at each of the surveyed County line locations is shown in Table I.

Figure #1

MENDOCINO COUNTY ROAD AND STATE HIGHWAY SYSTEM



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Table I
WCTDM Trip Purpose Results at Regional Gateways

Gateway (County Line)	Commute	School	Personal Errands	Shopping	Recreation/ Tourism
SR 20 (Lake)	22%	45%	21%	2%	10%
SR 175 (Lake)	75%	0%	17%	0%	8%
SR 128 (Sonoma)	44%	6%	13%	6%	31%
US 101 (Sonoma)	63%	1%	15%	6%	15%

Following are several key findings from the WCTDM regional trip surveys that may provide relevant insight to the potential for regional ZEV travel.

- Ukiah is likely providing urban services to residents of northern Lake County, many of whom are within a 35-mile distance of the City.
- Commute traffic comprises a substantial portion of regional peak period traffic, particularly on SR 175 and US 101.
- A substantial component of school-related traffic occurs during peak periods on SR 20, potentially related to the proximity of Mendocino College to northern Lake County.
- Recreational and tourism based traffic comprises 15 percent of traffic on US 101 and 31 percent on SR 128 at the Sonoma County line during peak periods, and 20 percent of traffic on a daily basis.
- On a regional basis, traffic originating from outside the four-county WCTDM region is much higher on Friday afternoons than on typical weekdays.

Traffic Volumes

Existing traffic volumes on State Highways in Mendocino County were obtained from Caltrans. As shown in Table 2, US 101 carries the highest average traffic volumes of any road in the County with peak volumes of 36,000 vehicles per day in the City of Ukiah. SR 1 serves approximately 21,000 vehicles per day in Fort Bragg while SR 20 east of Highway 101 in Redwood Valley carries 12,400 vehicles per day.

Table 2
Existing Traffic Volumes on State Highways

Community	Highway	Postmile	Peak Month ADT
Hopland	101	11.0	16,300
Ukiah	101	25.7	36,000
Willits	101	47.0	25,500
Laytonville	101	69.5	7,200
Leggett	101	91.1	7,500
Confusion Hill	101	99.7	7,500
Gualala	I	0.7	5,200
Point Arena	I	15.1	4,000
Elk	I	34.1	1,300
Mendocino	I	50.9	8,800
Fort Bragg	I	61.6	21,200
Westport	I	77.4	1,200
Jackson State Forest	20	17.2	3,200
Redwood Valley	20	35.3	12,400
Navarro	128	14.2	2,400
Boonville	128	29.1	6,000
Yorkville	128	40.3	2,200

Note: ADT = Average Daily Traffic

Source: Caltrans

These volumes indicate that the most significant corridors which could benefit from ZEV stations include:

- US 101 between the Sonoma County line and Willits
- SR I between Fort Bragg and Mendocino
- SR 20 between US 101 and the Lake County line

Neighboring Jurisdictions

Sonoma County

Sonoma County is an important anchor for connecting ZEV opportunities. Both US 101 and SR 128 generate a substantial amount of both commute and tourism traffic to Mendocino County.

Sonoma County's *Electric Vehicle Charging Station Program and Installation Guidelines*, released in July 2011, envision a network of electric vehicle charging stations throughout the County. Currently, there are charging stations at the Charles M. Schulz – Sonoma County Airport as well as almost every city in the County. The most northern ZEV station is located in the City of Healdsburg. Plans call for the installation of ChargePoint America stations in Cloverdale, located along the US 101 Corridor, and Sea Ranch, located along SR I. These two ZEV stations would be logical connection points to the Mendocino County system.

The Sonoma County plan recommends that the business community and Tourism Bureau come together and create a theme or brand involving EV tourism in Sonoma County. Expanding upon the “Historic Trail” or “Wine Road,” local chambers of commerce, grape growers and wineries associations, the Wine Road and Visitors and Tourism Bureaus could create an “Electric Trail” theme. A map showing the location, charger levels and hours of operation and any associated costs or incentives could be included in the existing Wine & Visitors Map produced by the Tourism Bureau or could be a separate brochure in print and electronic form.

Lake County

There are no current plans for ZEV charging stations in Lake County, nor are there any documented stations currently existing. There is at least one active EV club in Lake County, the Konocti Electric Auto Association. Given the commute traffic on the SR 20 corridor between Lake County and Mendocino County, a station location in proximity to the US 101/SR 20 interchange would be appropriate.

Humboldt County

The Redwood Coast Energy Authority in Eureka is leading a plug-in electric vehicle planning study for Humboldt County. The purpose of the study, with an expected release in 2014, is to prepare Humboldt County for the broad scale adoption of electric vehicles. The study is examining the feasibility of installing public charging stations around Humboldt County. The County's existing charging locations include one station in Arcata and one in Eureka. Additional locations likely to be considered include public and private parking areas in high traffic locations where people are likely to park for extended periods. This can include shopping areas, places of employment, and school campuses like Humboldt State. However, the study is focusing on the deployment of charging stations in the Eureka Bay Area, but not currently on the US 101 corridor connecting Mendocino County. Based on discussions with their staff, future expansion of this network may include consideration for connections to the south on the US 101 corridor. The most southern location in Humboldt County which would be an appropriate location for a charging station is Garberville.

Tourism

Given the volume of tourism-related traffic generated through Sonoma County via US 101, with lower volumes on the SR 1 and SR 128 corridors, this trip purpose should be a consideration in locating charging stations in and around Mendocino County. Tourists could be encouraged to use their electric vehicles as a means of touring Mendocino County and in particular, attracting them to the bicycle, wine, and coastal tourism industries. Many Mendocino County wineries are located along major routes SR 128 and US 101. By providing charging stations along these routes, EV and PEV users will be able to access these industries. In addition, these facilities would provide connectivity to the Bay Area via the Electric Trail in Sonoma County. Recreational facilities such as camp sites also provide the opportunity for EV and PEV users to charge their vehicles using RV/Campground hookups, which utilize a standard 240V connector. These locations should be considered for a secondary charging location for users.

Implications to ZEV Infrastructure Planning

ZEV infrastructure should be provided to reach the maximum number of users and trip purposes. A core network of major routes would capture these users, specifically along SR 1, SR 20, SR 128 and US 101. Shorter-length trips may also be accommodated within the County, specifically with charging stations in major urban areas where residents may charge their vehicles while working or shopping. Lastly, tourism-related ZEV travel would also be accommodated and encouraged via the core network.

Existing Infrastructure

Existing Charging Facilities in Mendocino County

There are only two existing electric vehicle charging sites in Mendocino County in public locations as of 2013, not including private residences and businesses. These two EV charging stations along with two provided at businesses are described below and either provide Level 1 (120-volt) or Level 2 (240-volt) charging.

Available for Public Use

Public Parking Lot

Oak Street/Standley Street (SW Corner), Ukiah



The fully-equipped charging station is located in a public parking lot in Ukiah, three-quarters of a mile away from US 101, and provides Level 2 charging cords. The charging station's centralized location in downtown Ukiah offers users with access to retail and restaurants. The station was installed as part of the previous ZEV Demonstration Project between 1997 and 1999.

City of Willits Parking Lot

111 East Commercial Street, Willits



This charging station is located in the Willits City Hall parking lot and provides charging at Levels 1 and 2, but users must provide connection cords. It is located within one block of US 101. The station was installed as part of the previous ZEV Demonstration Project between 1997 and 1999.

Private Business Locations

Real Goods – Solar Living Institute

13771 South Highway 101, Hopland



The charging station is located in the parking lot of a retail store and provides charging at Levels 1 and 2. It is located in southeast Mendocino County along US 101. Users must provide connection cords.

Super 8 Motel

693 South Orchard Avenue, Ukiah



The fully-equipped charging station is located in the motel parking lot and provides charging at Level 2.

Another more recent installation was at the Beachcomber Motel in Fort Bragg. Additional information on these existing facilities can be found in Appendix A.

It should be noted that a charging station was previously in operation within a City of Fort Bragg parking lot. The unit, which had been installed at the request of an electric car club more than 15 years ago, became inoperable and was removed.

Based on providing the minimum standard features discussed later in this document, the following upgrades should be considered at the existing public charging sites:

- *Ukiah* – Signage should be upgraded to current *California Manual on Uniform Traffic Control Devices* (CA MUTCD) standards. Obsolete equipment should be removed and replaced. The area for charging should be expanded from one to two parking spaces.
- *Willits* – Signage should be upgraded to current CA MUTCD standards. Also, cords for both Level 1 and 2 should be provided.

Additional Charging Opportunities

Campgrounds offer charging opportunities by providing hookups for recreational vehicles. These should be considered as supplemental facilities for electric vehicle users and though these would not serve as primary charging locations, they can increase electric vehicle user confidence for longer distance trips. A list of campground locations throughout Mendocino County with charging facilities for recreational vehicles is provided in Appendix B.

Recommended Charging Station Sites

A list of criteria was developed to select station sites throughout Mendocino County, including:

- Located on the US 101, SR 128, SR 1 or SR 20 corridors
- A standard of 25 miles or less between potential charging site locations, if achievable
- Non-residential locations since EV automakers generally deploy chargers for use at owner's homes as part of their program.
- Located on City, School District, County, State or Federal land such as a Post Office or other publicly owned property
- Located within walking distance ($\frac{1}{4}$ -mile) of a commercial or recreational activity area
- County road right of way if other options infeasible
- Connectivity to other jurisdiction station sites
- Number of facilities to be provided based on population
- Availability of dedicated parking spaces

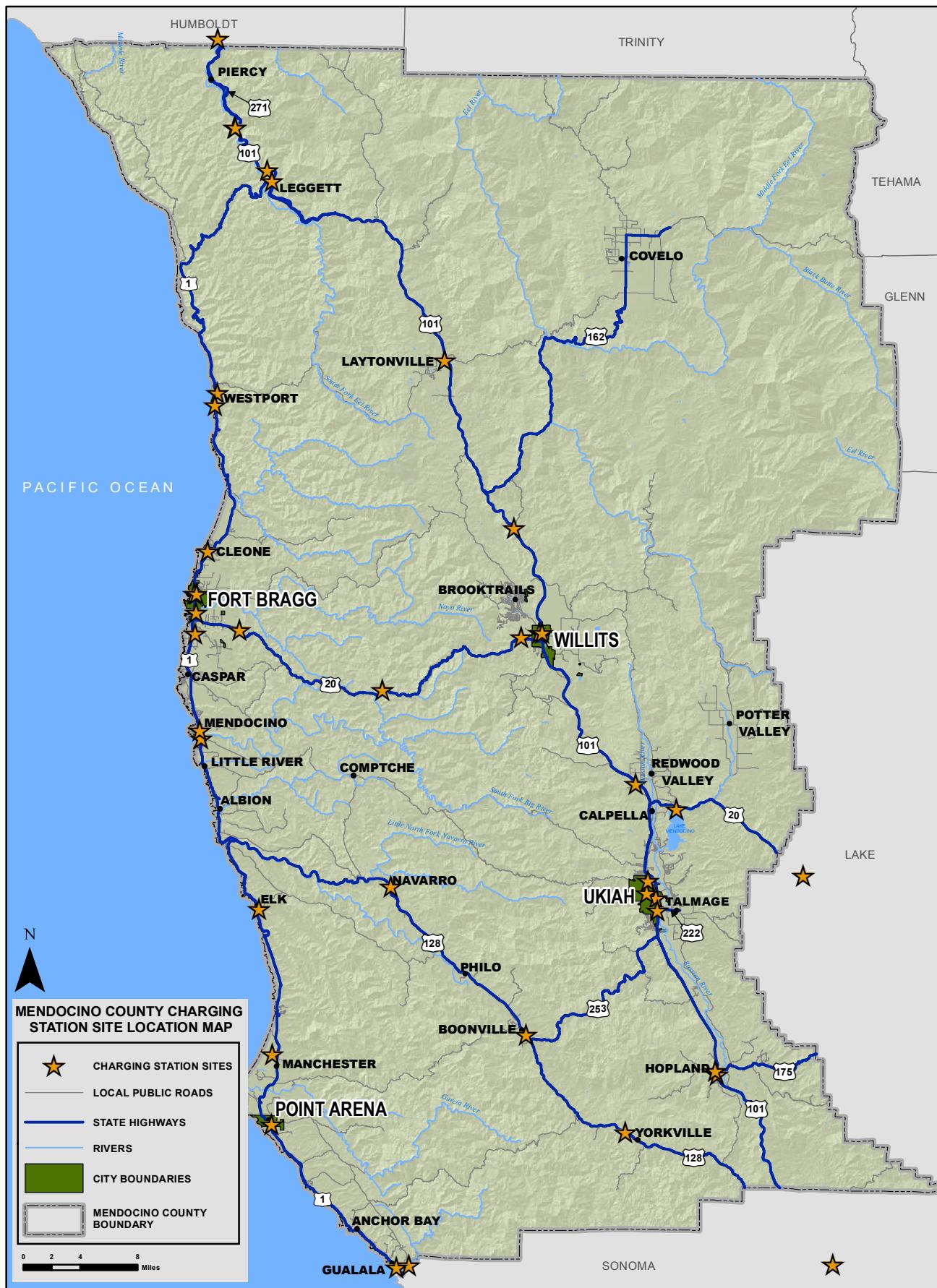
Charging Stations sites were selected throughout the County based on this criteria and other local factors and conditions in each of the communities. These sites are shown in Figure 2. The recommended charging station sites were surveyed for the following:

- Type of parking, whether it was on-street, off-street or undeveloped
- Potential type of charging service that can be made available on the site
- Times and dates available for users to charge their vehicles
- Ease for electric vehicles users to access the site because of visibility and/or signage with recommended access improvements
- Benefits of the location based on ease of access and nearby activities
- Whether or not the zoning of the site is compatible or difficult to re-zone
- Communication availability including cell phone reception, land line or other
- Activities in the vicinity that would allow users to spend their time shopping, eating, hiking, etc. while their vehicles charges
- Safety of parking space location
- Risk of flooding at the site

The information collected on the recommended charging station sites can be found in Appendix C along with photos of the recommended sites. Table 3 describes the locations of recommended charging stations and their proximity to other recommended charging stations within the County.

Figure #2

RECOMMENDED CHARGING STATION SITES



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Table 3
Recommended Charging Station Sites and Distance to Closest Station Sites

Route Recommended Station	Distance to	Nearest Charging Station
US 101		
Veterans Memorial Building 110 Feliz Creek Road, Hopland	14 mi	Commerce Drive Cul-de-Sac
Commerce Drive Cul-de-Sac Ukiah	4 mi	Twelfth District Fairgrounds
Twelfth District Fairgrounds Ukiah	22 mi	Willits Skunk Train Depot & Chamber of Commerce
	8 mi	Lake Mendocino Parking Lot
Willits Skunk Train Depot & Chamber of Commerce 299 E Commercial Street, Willits	23 mi	Laytonville Fire House
Laytonville Fire House 44761 US 101, Laytonville	22 mi	Leggett Valley High School/Caltrans Corp Yard
Leggett Valley High School/Caltrans Corp Yard 1 School Way, Leggett	7 mi	Confusion Hill Gravity House
Confusion Hill Gravity House 75001 US 101, Leggett		North County Line (limit of plan)
SR 128		
Yorkville Post Office & Fire Station 25400 California 128, Yorkville	11 mi	Mendocino County Fairgrounds
Mendocino County Fairgrounds Boonville	15 mi	Navarro General Store/Fire House
Navarro General Store/Fire House 231 Wendling Street, Navarro	21 mi	Greenwood Community Center
	25 mi	Mendocino Recreation & Community Center
SR 1		
Gualala Community Center 47950 Center Street, Gualala	14 mi	200-214 Main Street, Point Arena
200-214 Main Street, Point Arena	18 mi	Greenwood Community Center
Greenwood Community Center 6075 S Highway 1, Elk	17 mi	Mendocino Recreation & Community Center
Mendocino Recreation & Community Center 10525 School Street, Mendocino	10 miles	Fort Bragg Skunk Train
Skunk Train 100 West Laurel Street, Fort Bragg	<1 mi	Fort Bragg City Hall
Fort Bragg City Hall 416 N Franklin Street, Fort Bragg	16 mi	Westport
Westport Abalone Street, Westport	28 mi	Leggett Valley High School
SR 20		
Lake Mendocino Parking Lot (North Lake Boat Ramp) Redwood Valley	19 mi	Willits Skunk Train Depot & Chamber of Commerce
Chamberlain Creek/Jackson State Forest Fort Bragg	17 mi	Willits Skunk Train Depot & Chamber of Commerce
	19 mi	Fort Bragg Skunk Train

Proximity to Adjacent Counties

Following are the resulting separations between sites in adjacent Counties and the potential sites in Mendocino County:

- Hopland to Cloverdale (Charge Point America station) – 15 miles
- Yorkville to Cloverdale (Charge Point America station) – 16 miles
- Gualala to Sea Ranch (Charge Point America station) – 6 miles
- Redwood Valley to Upper Lake (Station TBD) – 24 miles
- Leggett to Garberville (station TBD) – 23 miles

Additional Station Considerations

This Plan has been the initial effort in identifying specific station sites in developing an initial “skeletal” network for Mendocino County. There are many other sites which could become viable and useful to the citizens of the County. Following is a list of sites and other considerations which were mentioned through comments on the draft document:

- An additional station may be needed near the northern county line as this is an interregional corridor and rising elevation presents challenges for EVs.
- Local airports might be able to access federal grants for charging stations, supporting interregional connections and national linkage. These locations would cover Covelo, Brooktrails, Anderson Valley, north and south coastal areas, and Ukiah.
- Consider a future phase that considers possible sites at Covelo and Dos Rios.
- A second station in Point Arena was recommended at the Wharf.
- Consider a station at the Caltrans Rest Stop at Hwy 101/SR 162 for access to Covelo.
- School sites are generally not recommended due to public safety concerns.
- ADA accessibility should be a consideration in evaluating station locations.

Phasing for Implementation of New Stations

Determining Priority for Stations

A priority ranking was developed in order to guide the process of determining the priority for station installation. The priority ranking process took into account the following factors:

- *Highway Traffic Volume* – Average Daily Traffic volume on the State Highway for the peak month as reported by Caltrans.
- *Community Population* – estimated population of the community reported in the 2010 census.
- *Tourism Connection* – number of miles to the Sonoma County line.

Table 4 shows the resulting rankings based on the prioritization calculations provided in Appendix D.

Table 4
Potential Charging Station Priority Rankings

Priority Ranking	City	Location	Highway
1	Ukiah	Commerce Drive Cul-de-sac	101
2	Ukiah	Fairgrounds	101
3	Willits	Skunk Train Depot and Chamber of Commerce	101
4	Hopland	Center Drive	101
5	Fort Bragg	Skunk Train Depot	1
5	Fort Bragg	City Hall	1
6	Gualala	Community Center	1
7	Redwood Valley	Lake Mendocino Parking Lot	101
8	Boonville	Mendocino County Fairgrounds	128
9	Point Arena	200-214 Main Street	1
10	Laytonville	Fire House	101
11	Mendocino	Mendocino Recreation & Community Center	1
12	Elk	Greenwood Community Center	1
13	Yorkville	Post Office/Fire Station	128
14	Navarro	General Store/Fire House/Wendling Street	128
15	Leggett	Leggett Valley High School/Caltrans Corp Yard	101
16	Jackson State Forest	Jackson State Forest / Chamberlain Creek	20
17	Westport	Abalone Street	1
18	Confusion Hill	Confusion Hill	101

Recommended Phasing

It may be desirable to install the charging stations in phases where multiple charging stations along different routes are installed around the same time. Phasing may be needed if funding is constrained or if the County is unable to secure an acceptable site at key locations. Since funding is unknown at this time, it is assumed that it will be unlikely to secure funding to install all 18 stations at once.

In developing this recommended phasing plan, the following concepts were considered:

- Completion of stations along a specific State Highway
- Connections to other stations outside of the County, specifically Sonoma County
- Orientation towards tourism traffic
- Placement within the primary population center and related commute routes
- Connecting along the heaviest travelled routes
- Linking to the higher population in the Bay Area to the south
- Interregional connectively to neighboring counties

The selected phasing plan considered both the priority ranking presented above as well as these concepts and a goal of maintaining continuity within the system and the desired 25-mile separation between stations. The recommended phasing plan is shown in Table 5.

Phase I: It is recommended that the first phase consist of the US 101 corridor, including the highest traffic volume locations from the Sonoma County line north to Willits. This grouping also includes the Redwood Valley station which connects to Lake County. Additionally, given its high traffic volumes, historical charging station use, and tourism connection, the SR 1 corridor between Fort Bragg and Mendocino would be a standalone subsystem. In total, Phase I consists of seven to eight stations.

Phase II: The recommended second installation should complete the connections to Sonoma County and the tourism/wine road corridors. This phase includes three stations on SR 128 and three stations on SR 1, south of Mendocino.

Phase III: The final phase includes the remaining proposed station sites at the north end of the County. This phase includes Westport on SR 1, Jackson State Park to complete the SR 20 link and the three stations on US 101, north of Willits. It should be noted that the northern stations on US 101 were not given higher priority because Humboldt County is not currently emphasizing a regional connection to Mendocino County along the corridor, but rather focusing on the Eureka Bay Area. Should Humboldt County begin to develop charging stations along this regional corridor, it is suggested that Mendocino County then give higher priority to the northern US 101 locations.

Table 5
Charging Station Phasing Plan

Phase	City	Priority Ranking	Location
I	Ukiah	1	Commerce Drive Cul-de-sac
I	Ukiah	2	Fairgrounds
I	Willits	3	Skunk Train Depot
I	Hopland	4	Center Drive
I	Fort Bragg	5	Skunk Train Depot
I	Fort Bragg	5	City Hall
I	Redwood Valley	7	Lake Mendocino Parking Lot
I	Mendocino	11	Mendocino Recreation & Community Center
II	Gualala	6	Community Center
II	Boonville	8	Mendocino County Fairgrounds
II	Point Arena	9	200-214 Main Street
II	Elk	12	Greenwood Community Center
II	Yorkville	13	Post Office/Fire Station
II	Navarro	14	General Store/Wendling Street
III	Laytonville	10	Fire House
III	Leggett	15	Leggett Valley High School/Caltrans Corp Yard
III	Jackson State Forest	16	Jackson State Forest
III	Westport	17	Abalone Street
III	Confusion Hill	18	Confusion Hill

Technical Station Issues

Charging Equipment

Existing facilities in Mendocino County provide Level 1 and Level 2 charging to users. DC Fast Charging (Level 3) can recharge compatible electric cars to 80 percent of capacity within only 30 minutes. Mendocino County should try to maximize accessibility of electric vehicle users by ensuring charger compatibility and flexibility. A list of types of chargers with features and pricing is included in Appendix E. It is recommended that all charging units include two charging ports so that two vehicles can be charged simultaneously by one unit. Additionally, a list of electric vehicles in production at the time of this report, with features and pricing, is included in Appendix F and should be considered when maximizing charging compatibility. A standardization of chargers is being implemented throughout the state and the region in order to maintain consistency and ease for users. Many chargers now include data logging and automated billing capabilities that will assist in the Payment Method and the Tracking Usage areas. The California Governor's Office of Planning and Research has initiated a "Rural Issues Focus Group" to address the many unique aspects of electric vehicles and charging stations that rural communities face.

Power Sources

The use of alternative power sources complements electric vehicle charging stations by providing clean energy to emission-saving vehicles. PG&E provides electricity to Mendocino County for all but the City of Ukiah and uses the A-6 Rate Tariff for non-residential service connections such as electric vehicle charging. This rate has high time-of-day cost factor that could make charging expensive during high cost periods (daytime in summer and early fall). Electric vehicle planners could request a special "public electric vehicle charging rate" from the CPUC to provide a lower statewide rate for all public charging stations.

Solar power is collected by using photovoltaic panels to collect energy from the sun's rays and convert it to electricity. Station locations where sufficient room and sunlight exist should utilize the technology. Because of the frequent foggy climate of coastal Mendocino County and the forest canopy in many areas, solar power may not be practical in some proposed station locations. Solar shade structures can be installed where space and sufficient sunlight is available. Examples of solar shade structure are provided in Appendix G. As an alternative, a group of solar arrays could be provided at a focused location to power charging locations throughout the County via "aggregated net metering". Theft and vandalism should be considered in the erection and reliance of solar panels. In general, the price of solar panels increases the overall cost of a charging station by 50 percent. At the present time, PG&E's A-6 rate tariff is particularly advantageous for solar generation where Net Metering would provide a 4-to-1 pricing advantage, meaning every kilowatt-hour of Peak Summer energy receives a credit for 4 kWh of Off Peak energy. However, without solar net metering the cost for charging during peak hour (when tourist vehicle charging would likely take place) is almost \$0.50 / kWh.

Usage Tracking

Tracking usage is critical in order to determine the effectiveness of each station, frequency of usage and average connect time. This data is necessary in order to determine electricity consumption and overall utilization. Usage data can be tracked using the charging station units and/or with payment methods like smart cards that retain user information. Since the program is in its early development phase, charging stations with usage tracking capability should be selected for monitoring purposes.

Mendocino County has many areas without access to broadband internet connections, especially along the coast and in the north around Laytonville and Leggett that will inhibit utilization of the latest "smart

phone” charger features. Most potential charger locations identified do have a land line in proximity that could be used for connecting the charger to the internet for both data tracking and payment.

The PG&E A-6 electric rate tariff requires a time-of-use meter that records usage in 15-minute intervals; this information can then be used to measure charging usage over the billing period. In addition, the new “smart meters” also have an ability to log usage data and to access that data either remotely or directly from the meter.

Payment Methods

Forms of payment by users include:

- *Direct payment* – users pay a fee up front when charging through the use of a credit card or reloadable debit card
- *Voluntary payment* – users may choose to pay a fee up front when charging
- *Memberships* – users must sign up with an electric vehicle charging station monitoring company
- *Host payment* – the local jurisdiction (City, County or utility provider) chooses to cover the cost
- *Donations* – users, community members or companies sponsor the cost
- *Net-metered* – generation of solar energy that is put into the utility grid is credited to the utility account at the then current rate and usage is charged at the rate for the period of consumption. On an annual basis a net-metered interconnection accounts for the credits generated against usage to “true up” the total. If generation credits exceed usage fees a net credit is issued at “true up.”

If the host agency chooses to require payment for charging, it is recommended that a Direct payment method be used with the use of a credit card specifically for vehicle charging. This is consistent with current trends in charging stations and would provide for centralized money collection. Even if the local jurisdiction decides to provide power free of charge, the same scan card should be used for activation.

Cost to Users

Many cities that have been installing new electric vehicle charging stations are allowing users to charge their vehicles free of cost. These cities plan to monitor usage of the EV charging stations to determine whether a fee for users should be added in the future. The electricity costs for charging stations can be around \$400 annually (assuming \$0.10 per kWh, 200 charges of 20 kWh each). Various options should be considered when deciding whether users should pay, specifically when taking into account the cost to install the charging stations, which also depends on funding from grants and other sources.

Installation, Monitoring, and Maintenance

Companies exist that can provide electric vehicle charging infrastructure, including installation, monitoring, and maintenance of the charging stations. Many of these companies also collect payment and provide users with charging station details, such as availability, and some offer free installation in exchange for the “franchise” location. The State is also promoting highway corridor charging infrastructure and offering access to grants and/or group purchasing opportunities. The most active companies providing charging facilities include:

- Charge Point America
- Blink
- Plug Share
- Recargo
- Car Stations

Concerns: Impact to the Power Grid

Although none of the cities examined have experienced any issues with the EV charging stations having a negative impact on the power grid, there is much general concern that this will become an issue as the number of electric vehicles and charging stations increases throughout the US. According to AB 631, charging a PEV at Level 2 “is equivalent to adding a new house onto the distribution grid.” There seems to be general concern and desire to manage how and when vehicles charge to reduce the number of vehicles charging during peak periods of demand. While residential EV charging electricity is offered at a blended discounted rate for night-time charging to incentivize off-peak charging, non-residential charging stations in the PG&E service territory will be charged a time-of-use rate that is significantly higher, especially during peak daylight hours when much of the public chargings will occur.

Public charging stations that are discussed in this document will probably have most of the charging done during daylight hours. Private residential charging can certainly take advantage of overnight, off-peak, charging. Public charging stations that are located near restaurants or at RV campgrounds and motels will have more night time and off-peak charging that could also take advantage of the night-time “idle grid capacity.” The electric vehicles used by locals can be charged at night and off-peak times that can take advantage of the off-peak idle grid capacity. As for solar generation, a 1 kW PV array will generate about 1,500 kWh per year and that generation occurs during much of the on-peak times during the year. Through net metering, a solar generator could be used to offset charging during peak periods. Assuming a nominal charge of 30 kWh this means a 1 kW array could support about 50 charges per year.

Signage

In an effort to standardize electric vehicle charging station signage and in accordance with the *California Manual on Uniform Traffic Control Devices*, by Caltrans, the signs used should be selected from the examples shown in Table 6. Additionally, a custom sign with branding should be located at the charging station site as well as on highways. The branding can incorporate marketing by the local tourism promoters.

In order to ensure that the charging station sites are to be used for electric vehicle charging only, the sites should use the following signage:

- Regulatory Sign: “No Parking Except for Electric Vehicle Charging”
- Permissive Parking Restriction Sign
- Informational Signs concerning ADA disabled access

Below is an example of the application of the parking signs. Typically, a four-hour time limit has been applied which generally allows for adequate charge time with most vehicles using the Type 2 charge. The space on the right uses the supplemental “This Space Designated for Disabled Access. Use Last.” This space is not restricted to those with Disabled placards, but does encourage users to leave the space empty if there are other chargers available. All ZEV charging station spaces would generally be monitored and enforced by local police similar to other time restricted spaces. For some service providers, such as ChargePoint, mobile applications are available that allow the user to reserve a space in advance using a smartphone.



US 101, SR 20, SR 1 and SR 128 along with connecting roadways to the charging stations must display accurate, clear and informative signage so drivers can successfully access the electric vehicle charging facilities.

Table 6
On-Site and Roadway Electric Vehicle Signage

Sign	CA MUTCD Sign Number	Purpose
	G66-21 (CA)	Route sign to be used to inform motorists of charging station sites on highways, roadways, and charging station sites.
	D9-11b	Route sign may be used on highways to inform motorists that a charging station site is nearby. The graphic form of this sign is recommended on sections of highways with higher speeds.
	D9-11b (alternate)	This route sign provides a more accurate graphic of electric vehicle charging. It is an alternative to D9-11b used in Oregon and Washington. The County must receive approval from FHWA prior to installation and use of this sign.
	M5-1, M5-2, M6-1, M6-2, M6-3	Advance turn and directional arrow auxiliary signs shall be used with general service signs, such as D9-11bP, D9-11b, D9-11b (alternate), G66-21, G66-21A
	G66-21A (CA)	Directional arrows to provide motorists with additional information about the location of the charging site. This shall be used in conjunction with G66-21, D9-11b, or D9-11b (alternate).
	Regulatory Sign	Regulatory Sign that prohibits parking in the charging station site except for electric vehicles while charging.
	Permissive Parking Restriction Sign	Parking Restriction Sign that informs electric vehicle charging station users the number of hours permitted to charge.
"Designed for Disabled Access – Use Last"	Informational Sign	The sign is for charging station locations with multiple charging points that are striped parking spaces. To be used where ADA compliance is met in some spaces but not in others.
"Designed for Disabled Access"	Informational Sign	The sign is for charging station locations with a charging point that is a striped parking space. ADA compliance must be met for new charging stations.

Installation Standards

The Division of State Architect released the *Proposed 2013 Guidelines for Electric Vehicle Charging Stations*, March 2013, containing accessibility standards and design guidelines for the installation of electric vehicle charging stations in California, with best practices and particular design guidelines for parking space design and signage. A copy of this document is included in Appendix H.

At a minimum, charging stations should include:

- public parking space(s)
- signage with 4-hour time limits
- charging unit with cords
- method of payment and activation

Station Security

Public safety should always be considered in the siting and design of a charging station. Consideration should be given both in terms of preventing abuse and providing for the comfort of users. Proximity to other activity and lighting would be examples of siting measures to ensure public safety.

ADA design criteria should be included in the siting and station design process for each station.

Cost Estimates

Costs to develop and maintain a charging station generally include:

- Right-of-Way Costs if not a public parking space
- Installation of infrastructure, such as charging equipment and cords
- Potential structures and safety equipment such as lighting
- Striping and signage
- Connection to power and communication source
- Permitting for construction
- Maintenance of site and equipment
- Data collection and analysis
- Payment processing and accounting
- Operation, such as electricity and communication costs
- On-going enforcement of parking activity
- Marketing and public outreach

Based on the experiences of other jurisdictions in the North Bay and San Francisco Bay Area and potential challenges of sites within Mendocino County, the estimated cost of equipment and installation of an EV charging station could range between \$10,000 and \$25,000 per station. They also estimate the ongoing cost of electricity for the station to be around \$400 per year¹. In addition, some Cities pay an annual subscription to the vendors such as ChargePoint Network, which in some cases install and operate those stations.

¹ Assuming electricity at \$0.10 / kWh a \$400 annual bill provides 4,000 kWh – enough for about 130 charges of 30 kWh – a little over 10 charges per month per station. If power costs using the A-6 rate tariff are used average power is closer to \$0.20 to \$0.50 / kWh reducing the charges from 65 to as little as 26 per year for the same \$400.

Implementation Plan

Step 1 – Accept Readiness Plan

Step 2 – Adopt Community Station Locations

- Determination of appropriate entity to lead effort
- Gain acceptance from communities to locate charging station.
- Determine feasibility and costs for each station location
- Determine acceptability by appropriate jurisdictions

Step 3 – Determine Construction Costs

- Finalize exact location of stations in Phase I
- Determine equipment type
- Determine power sources
- Prepare design plans for equipment installation
- Determine installation costs

Step 4 – Seek Funding for Phase I Implementation

- Identify appropriate entities to apply for and manage funds, oversee installation projects (e.g. regional agency or local governments)
- Apply for appropriate grants and other funding sources (see below)
- Determine potential to partner with neighboring jurisdictions
- Recommend approaches to tourism marketing (including outreach to wineries)

Step 5 – Implementation of Phase I

- Finalize pay methods
- Prepare marketing and outreach materials
- Implement Phase I Station Sites
- Plan for Phase II implementation

Grants and Funding Sources

Many cities have relied on grants to fund the infrastructure for the EV charging stations as well CMAQ (Congestion Mitigation and Air Quality Improvement Program) regional apportionment. The charging station network in the San Francisco Bay Area is funded in part by grants from California and regional agencies, including the Bay Area Air Quality Management District (BAAQMD), and the California Energy Commission (CEC). However, it should be noted that CMAQ and BAAQMD are not available to Mendocino County. Other charging equipment was provided by a grant from the US Department of Energy (funded by the American Recovery and Reinvestment Act through the Transportation Electrification Initiative); however, those funds are no longer available.

There is still a wide range of financing and funding options for local governments including grants and financing strategies to further zero-emission vehicle readiness:

- *Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Grants* – The Motor Vehicle Registration Fee Program provides funding for projects that reduce air pollution from on- and off-road vehicles. Eligible projects include purchasing AFVs and developing alternative fueling infrastructure. Contact local air districts for more information about available grant funding and distribution from the Motor Vehicle Registration Fee Program. (California Health and Safety Code 44220 (b))

- *California Air Resources Board* – The Air Quality Improvement Program funds clean vehicle and equipment projects, research on biofuels production and the air quality impacts of alternative fuels, and workforce training.
- *FundingWizard* – Search this funding aggregator website for ZEV funding opportunities.
<http://www.coolcalifornia.org/funding-wizard-home>
- *Public/Private Partnerships* – With both private and government funding, there are many vendors that will facilitate the installation of public and private electric vehicle chargers.
- *Public/Nonprofit Partnerships* – Nonprofits such as Adopt-A-Charger work with organizations and the public to donate funds to install fee-free public EV chargers. Nonprofits can also help with outreach and consumer awareness. Adopt a Charger, a nonprofit organization, accelerates the widespread adoption of plug-in vehicles through the proliferation of public, fee-free electric car chargers which are “adopted” by sponsors. These sponsors, corporations, organizations and individuals, donate funds used to install and maintain EV chargers in parks, museums, beaches and other widely used public places.
- *Electric Vehicle Charging Infrastructure Funding* – The California Energy Commission (CEC) currently administers grant funding for alternative fuels and vehicles through its Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP). Under the ARFVTP, the CEC has funded charging infrastructure for electric vehicles since 2009. Four solicitations for electric vehicle infrastructure and related planning activities will provide over 7,000 new chargers in California. There is \$6.6 million (FY 2012-13) and \$7 million (FY 2013-14) identified in the Investment Plan for additional electric vehicle charging infrastructure.