Appendix B

Analysis to Identify Freezing Regions and Evaluate Impacts of Expanding Type “A” Areas

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This appendix presents the data sources and methodology staff used to evaluate areas experience freezing temperatures in the winter months to determine whether, and to what extent, additional areas of California should be added to Type "A" areas.

A. Data Sources

To identify areas experiencing freezing temperatures, staff used average monthly minimum temperature data from the Parameter-elevation Regressions on Independent Slopes Model (PRISM) developed by Dr. Christopher Daly of the PRISM Climate Group at Oregon State University. PRISM is a hybrid statistical-geographic approach to mapping climate, using discrete point measurements of climatic elements such as precipitation and temperature, with a digital elevation model and knowledge of climatic extremes to generate continuous, gridded estimates of monthly, annual, and event-based climatic parameters (PRISM, 2012).

PRISM data sets are recognized world-wide as the highest-quality spatial climate data sets currently available and are widely accepted by the meteorological community. PRISM climatologies are used in a variety of weather and climate related projects such as the 2012 United States Department of Agriculture's (U.S.D.A.) Plant Hardiness Zone Map; the official U.S.D.A. precipitation and temperature maps for all 50 states and Caribbean and Pacific Islands; the official climate atlas for the U.S.D.A.; a 112-year series of monthly temperature, precipitation, and dew point maps for the conterminous 48 states; National Weather Service Forecasts; and several climate change research efforts; to name a few. PRISM data sets are the official spatial climate data (Daly et al., 2008).

PRISM generated gridded average monthly minimum temperature data for the climatological period 1971-2000 were obtained and used in this analysis. These gridded data sets are 30-year climatologies produced by the PRISM modeling system, by distributing the normal mean monthly minimum temperature at each discrete station to a spatial grid. A climate normal is defined as the arithmetic mean of a climatological element computed over three consecutive decades (WMO, 1989). Thus, the normal mean monthly minimum temperature for each station is the 30-year mean of the monthly means, where the monthly means are computed from the daily values for the same 30-year period. Detailed discussions on creating climate data sets using PRISM are well documented in the literature (Daly and Johnson 1998, Daly 2006, Daly et al. 2002, 2008).

PRISM generated spatially gridded average monthly minimum temperature data were specifically chosen for this analysis, because these data are representative of the average minimum temperatures in a region. Further, the PRISM data are distributed on a uniform ~800m grid, thus providing a dense coverage of the climate variable and are in a digital form that allows the data to be easily incorporated in calculations and analysis using a Geographic Information System (GIS) approach.

These data allowed staff to identify areas of California that experience typical freezing weather (*i.e.*, temperatures less than 32 degrees Fahrenheit) during the winter. To encompass all of winter, staff selected the average monthly minimum temperature of the months of December to March. Areas that fell into these typically freezing areas were referred to as “freezing zones.” These areas are shown in blue in Figure B-1. Existing Type “A” areas are shown in gray.

To translate the identified “freezing zones” to a list of recognizable spatial entities, staff used existing United States (U.S.) Postal Service ZIP code boundaries to identify specific ZIP codes having typical freezing weather in winter. The U.S. ZIP code boundary along with 2010 Census population dataset developed by the Environmental Systems Research Institute (ESRI) were also used (ArcGIS, 2012).

Staff used a GIS approach for the analysis, from processing and averaging of the datasets, to overlay and statistical analyses, to the identification and mapping of “freezing zones” and ZIP codes. ESRI designs and develops the world’s leading GIS technology. GIS is an important tool used by national mapping agencies, aeronautical and nautical organizations, and commercial map and chart publishers around the world.

A. Methodology

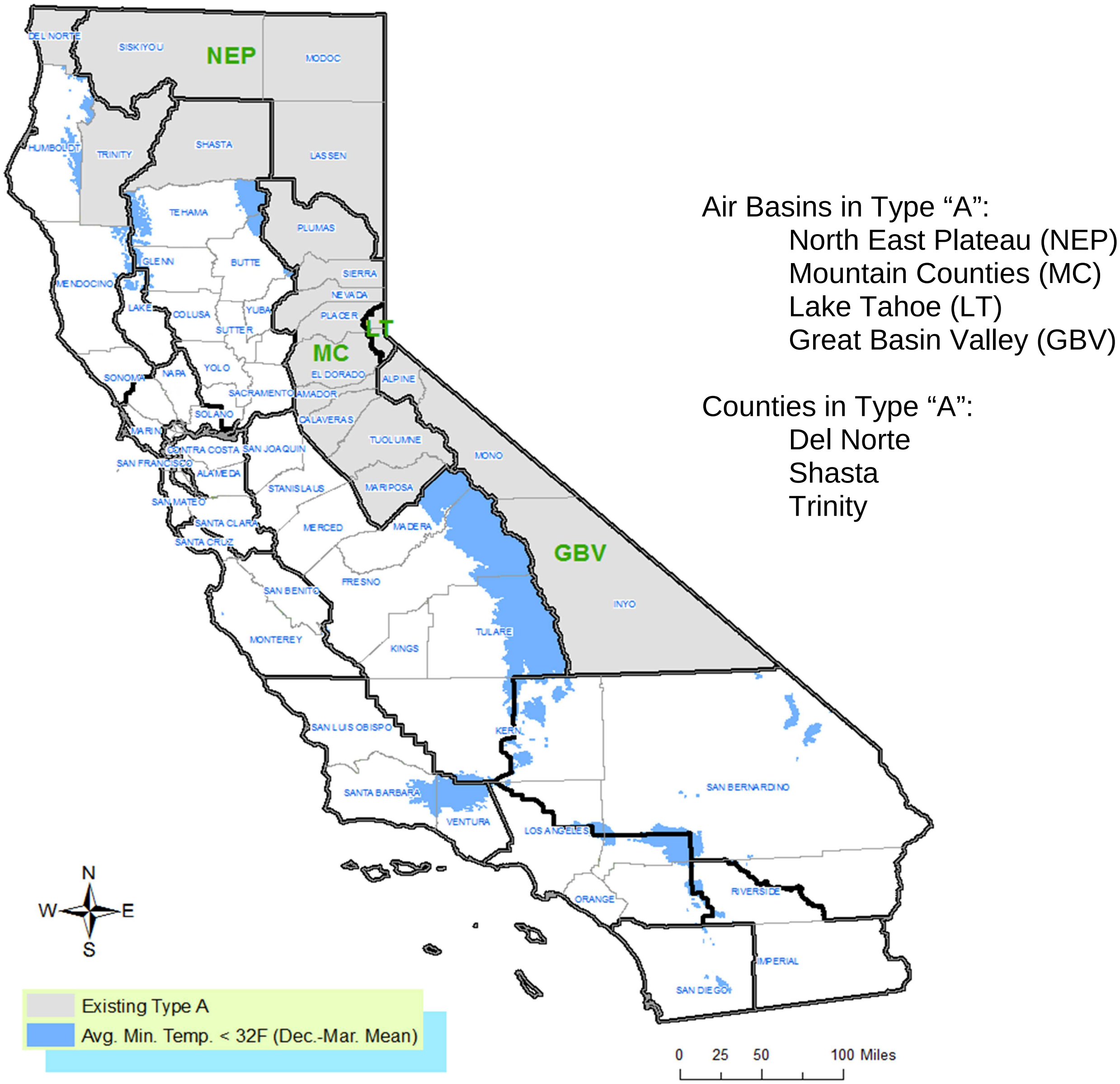
Determining Freezing Zones

PRISM 30-arcsec (~800m) 1971-2000 average monthly minimum temperature data for December through March were obtained from the PRISM Climate Group for the entire United States (PRISM, 2012). Using GIS, the data were clipped to the California extent, reprojected, and converted from a floating point grid to an integer grid. The individual monthly grids were then averaged to generate a seasonal average monthly minimum temperature grid (Dec.-Mar. average) within GIS. Regions experiencing temperatures below 32 degrees Fahrenheit (“freezing zones”) were then identified and a shapefile was generated for mapping and further analysis.

Existing Type A

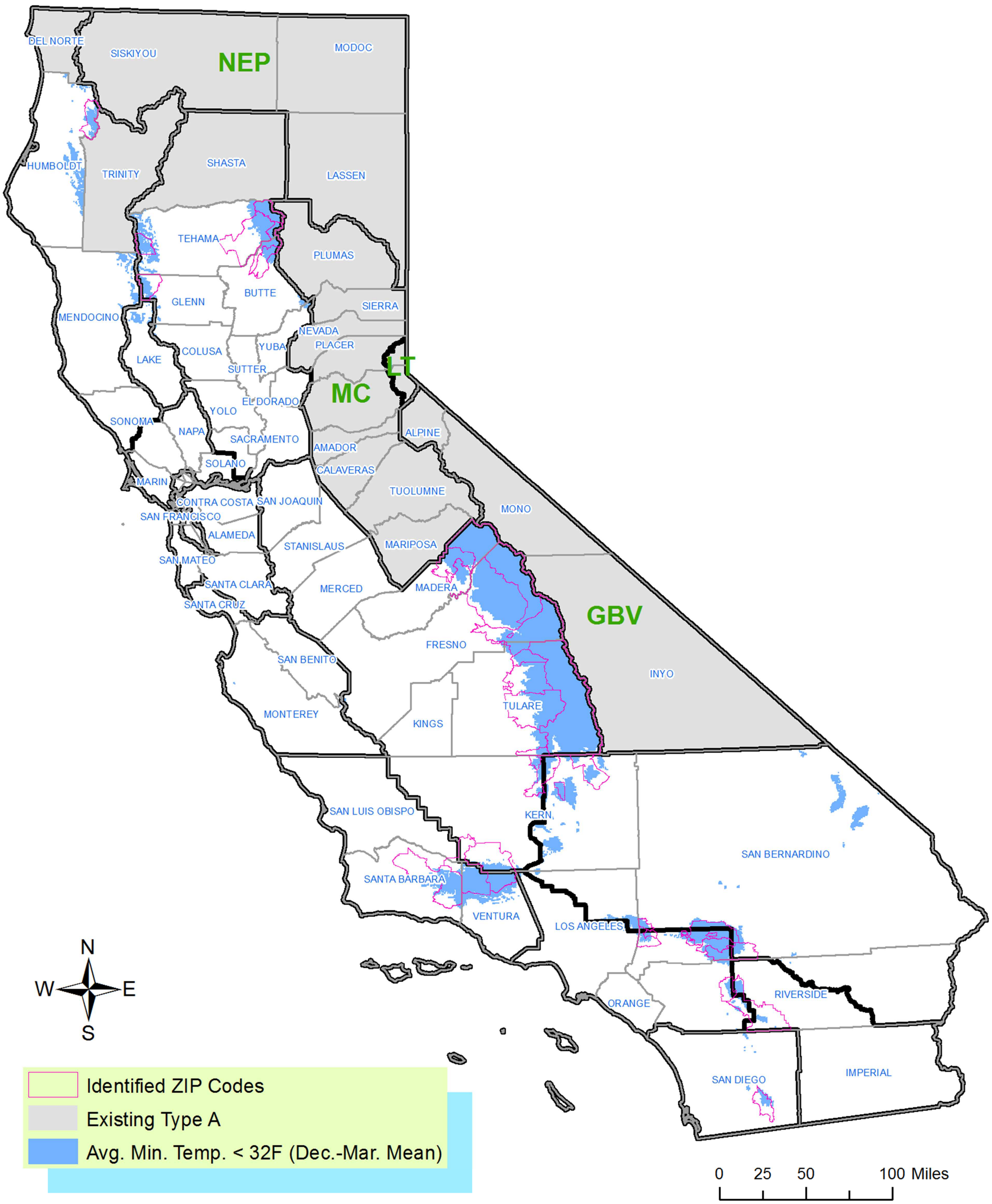
The existing Type “A” areas that cover 18 counties were also identified and mapped. Portions of the “freezing zones” that are outside of the existing Type “A” were separated and used in the identification of ZIP codes experiencing freezing temperatures through a GIS overlay approach. Staff is proposing to expand Type “A” areas with these identified ZIP codes.

Figure B-1. Areas Outside of Existing Type "A" with Freezing Temperatures



Existing Type "A" areas are identified by either county or air basin boundaries. The additional areas identified as having freezing zones in the current analysis encompass parts of several counties. Staff evaluated various approaches to describe the areas being considered, while minimizing the potential emission impact of allowing the higher VOC products to be sold. ZIP codes appear to be the best descriptor of these areas; they closely match the freezing zones. Figure B-2 shows the ZIP codes to be added to describe the additional Type "A" areas as a pink line.

Figure B-2. Zip Codes that Would Describe Additional Type "A" Areas



B. Results

Through a GIS based approach, staff identified the ZIP codes, along with their respective populations, that would be added to Type “A” areas. Forty-three ZIP codes were identified from this analysis as having freezing conditions outside of the existing Type “A” areas (Figure B-2). Staff is proposing to add these ZIP codes for Type “A” areas into the definition for Automotive Windshield Washer Fluid (AWWF) in section 94508(a).

C. Emissions Impact

The estimated total population (2010 census based) in the new proposed Type “A” (*i.e*. identified ZIP codes), was used to estimate the potential VOC emissions that may result from allowing the higher VOC products to be sold in these areas. Staff calculated the estimated emission increase by taking the *per capita* use of AWWF products and applying it to the population that would be added to Type “A” area. The *per capita* use was calculated by taking sales information, for AWWF, from the Initial Statement of Reasons for Proposed Amendments to the California Consumer Products Regulation (ISOR), released on September 29, 2006 (ARB, 2006).

In that staff report, the sales and emissions of Automotive Windshield Washer Fluid, for Type “A” areas, are based on the results of the 2003 Consumer and Commercial Products Survey. These data showed that, in 2003, 10,982 pounds of AWWF was sold in Type “A” areas.

In order to calculate a *per capita* use, staff grew the sales data by the population of the State in 2010, as obtained by ESRI. Dividing this sales number by our modeled population number for Type “A” area in 2010 (848, 244) yields the *per capita* use of 0.01 pounds (lbs) of product per day.

Multiplying our per capita use rate by the estimated population in the new Type “A” areas, we estimate the total volume of 25 percent by weight VOC product that would be sold in these new areas. Multiplying sales data by 24 percent yields the estimated increase in VOC emissions resulting from the proposal.

Lastly, the data were grown to representative 2012 numbers using population data from the California Department of Finance webpage (CADOF, 2012). Using the ZIP code data, the population added to Type “A” areas would be approximately 101,000 people. These calculations yield an increase in VOC emissions of 0.12 tons per day (tpd). In the context of having reduced VOC emissions by over 25 tpd from this category, staff believes the increase to be quite small. Table B-1 presents the estimated emission increase by air basin.

Table B-1
Estimated Increase in VOC emissions by Air Basin

Air Basin	**Emission (TPD)***
Mojave Desert	0.02
San Joaquin Valley	0.03
South Coast	0.04
Northern Air Basins**	0.02
San Diego	< 0.01
Total	0.12

* Values are rounded

** Northern Air Basins include Sacramento Valley, North Coast, and Lake County Air Basin

The estimated statewide total emissions increase of 0.12 tpd is conservative. To the extent that dilutable AWWF is used at a concentration greater than 1 percent by weight VOC in the areas proposed for addition to Type "A," as allowed by regulation, the emissions increase would be lower.

References for Appendix B

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