Smith, Claudia

From: Jeremy Nichols <jnichols@wildearthguardians.org>
Sent: Wednesday, February 7, 2018 4:38 PM
To: R8AirPermitting
Subject: Comments on Anadarko Minor Source NSR Permits
Attachments: 2018-2-7 WG Anadarko Permit Comments.pdf; Exhibit 1 - Uinta Basin ozone TSD.pdf

Attached, please find comments from WildEarth Guardians on the EPA's proposal to issue the following minor source NSR permits for Anadarko facilities within the Uintah and Ouray Indian Reservation:

- East Bench Compressor Station, Proposed Permit Number SMNSR-UO-000824-2016.001;
- Sage Grouse Compressor Station, Proposed Permit Number SMNSR-UO-001875-2016.001;
- North East Compressor Station, Proposed Permit Number SMNSR-UO-001874-2016.001;
- North Compressor Station, Proposed Permit Number SMNSR-UO-000071-2016.01;
- Archie Bench Compressor Station, Proposed Permit Number SMNSR-UO-000817-2016.001; and
- Bitter Creek Compressor Station, Proposed Permit Number SMNSR-UO-000818-2016.001.

As set forth in the attached comments, we object to the EPA's proposal to issue the aforementioned permits. Thank you.

Sincerely,

Jeremy Nichols

WildEarth Guardians
A Force for Nature

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February 7, 2018

BY ELECTRONIC MAIL

U.S. EPA Region 8
Air Program
8P-AR
Attn: Federal Minor NSR Coordinator
1595 Wynkoop St.
Denver, CO 80202
R8AirPermitting@epa.gov

Re: Comments on Proposed Minor Source New Source Review Permits to Construct for Six Facilities Operated by Anadarko Uintah Midstream, LLC

To Whom It May Concern:

WildEarth Guardians submits the following comments on the U.S. Environmental Protection Agency's ("EPA's") proposal to issue six new minor source new source review permits to construct for six natural gas production facilities operated by Anadarko Uintah Midstream, LLC (hereafter, "Anadarko") within the Uintah and Ouray Indian Reservation in Uintah County, Utah. These proposed permits relate to the following sources of air pollution:

- East Bench Compressor Station, Proposed Permit Number SMNSR-UO-000824-2016.001;
- Sage Grouse Compressor Station, Proposed Permit Number SMNSR-UO-001875-2016.001;
- North East Compressor Station, Proposed Permit Number SMNSR-UO-001874-2016.001;
- North Compressor Station, Proposed Permit Number SMNSR-UO-000071-2016.01;
- Archie Bench Compressor Station, Proposed Permit Number SMNSR-UO-000817-2016.001; and
- Bitter Creek Compressor Station, Proposed Permit Number SMNSR-UO-000818-2016.001.

These facilities are located and operate within the Uinta Basin, an area that the EPA has acknowledged is currently in violation of National Ambient Air Quality Standards ("NAAQS") for ground-level ozone.

We object to the EPA's proposal to approve these air pollution permits. The agency has failed to demonstrate that approval of the permits will not lead to emissions that will cause or

contribute to violations of National Ambient Air Quality Standards NAAQS and Prevention of Significant Deterioration ("PSD") increments under the Clean Air Act.

The EPA acknowledges in the technical support documents ("TSDs") prepared for each permit that regulations at 40 C.F.R. § 49.154(d) "require that an Air Quality Impact Assessment (AQIA) modeling analysis be performed if there is reason to be concerned that new construction would cause or contribute to a National Ambient Air Quality Standard (NAAQS) or PSD increment violation." *See e.g.*, TSD for Anadarko Uintah Midstream, LLC, Sage Grouse Compressor Station, Proposed Permit #SMNSR-UO-001875-2016.001 at 7. Here, there are major reasons to be concerned that the Anadarko facilities proposed for permitting by the EPA would cause or contribute to a violation of the NAAQS.

First and foremost, the Anadarko facilities will contribute to emissions that will undoubtedly cause or contribute to violations of NAAQS for ground-level ozone. According to the EPA, air quality in the Uinta Basin is so bad that that it violates NAAQS established in 2008 and 2015 for ground-level ozone. The EPA has even recommended that a portion of the Uinta Basin, including the areas where the Anadarko facilities are located, be designated as nonattainment due to ongoing violations of the 2015 ozone NAAQS. *See* Exhibit 1, EPA, "Utah: Northern Wasatch Front, Southern Wasatch Front, and Uinta Basin, Intended Area Designations for the 2015 Ozone National Ambient Air Quality Standards, Technical Support Document" (Dec. 20, 2017) at 49-50. According to the EPA, while the 2015 ozone NAAQS limit concentrations of ground-level ozone to no more than 0.070 parts per million, concentrations in the Uinta Basin frequently exceed this standard.

Given that the Anadarko facilities will be releasing emissions that contribute to the formation of ground-level ozone, namely volatile organic compounds ("VOCs"), nitrogen oxide ("NOx"), and carbon monoxide emissions, there is no doubt that the facilities will contribute to emissions that will cause or contribute to violations of the ozone NAAQS.

Furthermore, we are very concerned that EPA has failed to demonstrate that emissions of NOx will not cause or contribute to violations of the 1-hour nitrogen dioxide ("NO_2") NAAQS. Our concerns are underscored by the fact that EPA, to our knowledge, has never assessed the impact that emissions from the Anadarko facilities, particularly from compressor engines, have on ambient concentrations of NO_2. We are very concerned given the short-term nature of the NAAQS, given the level of emissions, and given that the exhaust stacks at the Anadarko facility are relatively near ground-level, that emissions are very likely to cause or contribute to violations of the 1-hour NO_2 NAAQS.

In the TSDs for the proposed permits, EPA asserts that an air quality impacts analysis is not required because, in the agency's words, "The emissions at this existing facility will not be increasing due to this permit action[,] the emissions will continue to be well-controlled at all times[,] [and] this permit action does not authorize the construction of any new emission sources, or emissions increases from existing units, nor does it otherwise authorize any other physical modifications to the facility[.]" *See e.g.*, TSD for Anadarko Uintah Midstream, LLC, Sage Grouse Compressor Station, Proposed Permit #SMNSR-UO-001875-2016.001 at 7. Accordingly, the EPA claims its permitting actions "will have no adverse air quality impacts."

Id. The EPA's claims, however, defy its own regulations, deny the real impact of its permitting actions, and fundamentally are completely unsupported.

To begin with, we are greatly concerned the EPA is misstating the impacts of proposed permitting actions. While the agency asserts that the Anadarko facilities are "existing," they are not existing facilities that have been permitted by the EPA. Thus, while the facilities may physically "exist," they do not physically exist as facilities that have been subject to air quality scrutiny, permitting, and any air quality analysis. In this sense, these facilities and their emissions are being newly constructed and the EPA must analyze them accordingly.

Furthermore, regardless of whether emissions will be increasing or will be "well controlled," as the EPA asserts, the agency's duty to analyze air quality impacts applies whenever there is "reason to be concerned" that emissions would cause or contribute to a violation of the NAAQS. 40 C.F.R. § 49.154(d). Here, even if emissions may not increase and there is still reason to be concerned that emissions would cause or contribute to a violation of the NAAQS. Accordingly, EPA's assertions are unsupported and contrary to its regulations.

Finally, EPA is simply incorrect that its permitting actions will have no impact on emissions. The proposed permits will impose enforceable emission limitations that will make the Andarko facilities synthetic minor sources of air pollution. In doing so, the permits will ensure that emissions remain below certain rates, effectively limiting the sources' potential to emit. Although the EPA asserts that no "construction" will be authorized, construction will, in fact, occur. Construction is defined as, "any physical change or change in the method of operation (including fabrication, erection, installation, demolition, or modification of an emissions unit) that would result in a change in emissions." 40 C.F.R. § 51.166(b)(8). Here, the permits will ensure Anadarko facilities are operated in such a manner and under such enforceable emissions limitations that there will result in a change in potential emissions. There is simply no support for EPA's claim that the permits are *pro forma* and have no practical impact on air quality at the end of the day.

Again, we object to the issuance of the aforementioned proposed permits for the Anadarko facilities. EPA cannot approve the proposed permits unless and until the agency demonstrates that emissions will not cause or contribute to violations of the ground-level ozone and 1-hour NO_2 NAAQS.

Sincerely,

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Utah:

Northern Wasatch Front, Southern Wasatch Front, and Uinta Basin

Intended Area Designations for the 2015 Ozone National Ambient Air Quality Standards Technical Support Document (TSD)

1.0 Summary

This technical support document (TSD) describes the EPA's intent to designate the Northern Wasatch Front, Southern Wasatch Front, and Uinta Basin in Utah as nonattainment for the 2015 ozone National Ambient Air Quality Standards (NAAQS).

On October 1, 2015, the EPA promulgated revised primary and secondary ozone NAAQS (80 FR 65292; October 26, 2015). The EPA strengthened both standards to a level of 0.070 parts per million (ppm). In accordance with Section 107(d) of the Clean Air Act (CAA), whenever the EPA establishes a new or revised NAAQS, the EPA must promulgate designations for all areas of the country for that NAAQS. The EPA must complete this process within 2 years of promulgating the NAAQS, unless the Administrator has insufficient information to make the initial designations decisions in that time frame. In such circumstances, the EPA may take up to 1 additional year to complete the designations.

Under section 107(d), states were required to submit area designation recommendations to the EPA for the 2015 ozone NAAQS no later than 1 year following promulgation of the standards, i.e., by October 1, 2016.

On September 29, 2016, the State of Utah made designation recommendations for counties in Utah based on air quality data from 2013-2015. The State recommended that Salt Lake and Davis counties, and portions of Weber and Tooele Counties be designated as nonattainment for the 2015 ozone NAAQS. The State also recommended a designation of nonattainment for a portion of Utah County. Additionally, the State of Utah recommended a designation of nonattainment for townships in the counties of Duchesne and Uintah under state air jurisdiction, that are at and below the 6,000-ft elevation.

Tribes were also invited to submit area designation recommendations. On September 27, 2016, the Ute Indian Tribe of the Uintah and Ouray Reservation recommended that the area of tribal land at an unspecified distance around the Ouray ozone monitor in the Uinta Basin be designated as nonattainment for the 2015 ozone NAAQS based on air quality data from 2013-2015. However, the Tribe also recommended that if the EPA concurs on an exceptional event package submitted for two days in June 2015, the Tribe recommends attainment for all tribal land in the Uinta Basin. After considering these recommendations and based on the EPA's technical analysis as described in this TSD, the EPA intends to designate the areas listed in Table 1 as nonattainment for the 2015 ozone NAAQS. The EPA must designate an area nonattainment if it has an air quality monitor that is violating the standard or if it has sources of emissions that are contributing to a

violation of the NAAQS in a nearby area. Detailed descriptions of the intended nonattainment boundaries for these areas are found in the supporting technical analysis for each area in Section 3.

Table 1. Utah's Recommended Nonattainment Areas and the EPA's Intended Designated Nonattainment Areas for the 2015 Ozone NAAQS

Area	Utah's Recommended Nonattainment Counties	EPA's Intended Nonattainment Counties
Northern Wasatch Front, Utah	Salt Lake County Davis County Weber County (partial) Tooele County (partial)	Salt Lake County Davis County Weber County (partial) Tooele County (partial)
Southern Wasatch Front, Utah	Utah County (partial)	Utah County (partial)
Uinta Basin*	Duchesne County (partial) Uintah County (partial)	Duchesne County (partial) Uintah County (partial)

*Uinta Basin is a multi-jurisdictional nonattainment area that includes areas of Indian country of Federally-recognized tribes. The areas of Indian country that the EPA intends to designate as part of the nonattainment area are discussed in Section 3.2, Technical Analysis for the Uinta Basin. The Ute Tribe recommended an unspecified nonattainment boundary around the Ouray monitor in Uintah County. The EPA's intended nonattainment area for the Uinta Basin includes both state and tribal land within the specified boundary.

In their letter, Utah recommended that the EPA designate as "attainment" or "unclassifiable/attainment" all other counties and partial counties not identified in the State's Recommended Nonattainment Counties column of Table 1. On November 6, 2017 (82 FR 54232; November 16, 2017), the EPA signed a final rule designating eleven counties (Beaver, Emery, Garfield, Iron, Kane, Millard, Piute, San Juan, Sevier, Washington, and Wayne) in the southern half of the State as attainment/unclassifiable for the 2015 ozone NAAQS. The EPA explains in section 2.0 the approach it is now taking to designate the remaining areas in the State.

The EPA does not intend to modify the State's recommendation for the Northern and Southern Wasatch Front nonattainment areas. However, the EPA does intend to modify the State's recommendations for the Uinta Basin Area.

The EPA also disagrees with Tribe's recommendation, and EPA intends to designate the Tribal area within parts of Uintah County and Duchesne County as nonattainment based on ambient monitoring data collected at Tribal monitors during the 2014-2016 period, where available, showing non-compliance with the 2015 ozone NAAQS. Although the EPA has approved the Tribe's exceptional events demonstration, three monitors included in the demonstration are still showing violations of the 2015 NAAQS, as discussed further in Section 3 – Factor 1.

The EPA will designate all tribes in accordance with two guidance documents issued in December 2011 by the EPA Office of Air Quality Planning and Standards titled, "Guidance to Regions for Working with Tribes

during the National Ambient Air Quality Standards (NAAQS)) Designations Process,"[1] and "Policy for Establishing Separate Air Quality Designations for Areas of Indian Country."[2]

2.0 Nonattainment Area Analyses and Intended Boundary Determination

The EPA evaluated and determined the intended boundaries for each nonattainment area on a case-by-case basis, considering the specific facts and circumstances of the area. In accordance with the CAA section 107(d), the EPA intends to designate as nonattainment the areas with monitors that are violating the 2015 ozone NAAQS and nearby areas with emissions sources (i.e., stationary, mobile, and/or area sources) that contribute to the violations. As described in the EPA's designations guidance for the 2015 NAAQS (hereafter referred to as the "ozone designations guidance"),[3] after identifying each monitor indicating a violation of the ozone NAAQS in an area, the EPA analyzed those nearby areas with emissions potentially contributing to the violating area. The EPA believes that using the Core Based Statistical Area (CBSA) or Combined Statistical Area (CSA)[4] as a starting point for the contribution analysis is a reasonable approach to ensure that the nearby areas most likely to contribute to a violating area are evaluated. The area-specific analyses may support nonattainment boundaries that are smaller or larger than the CBSA or CSA. The EPA's analytical approach is described in Section 3 of this technical support document.

On November 6, 2017, the EPA issued attainment/unclassifiable designations for approximately 85% of the United States and one unclassifiable area designation.[5] At that time, consistent with statements in the designations guidance regarding the scope of the area the EPA would analyze in determining nonattainment boundaries, EPA deferred designation for any counties in the larger of a CSA or CBSA where one or more counties in the CSA or CBSA was violating the standard and any counties with a violating monitor not located in a CSA or CBSA. In addition, the EPA deferred designation for any other counties adjacent to a county with a violating monitor. The EPA also deferred designation for any county that had incomplete monitoring data, any county in the larger of the CSA or CBSA where such a county was located, and any county located adjacent to a county with incomplete monitoring data.

The EPA is proceeding to complete the remaining designations consistent with the designations guidance (and EPA's past practice) regarding the scope of the area the EPA would analyze in determining nonattainment boundaries for the ozone NAAQS as outlined above. For those deferred areas where one or more counties violating the ozone NAAQS or with incomplete data are located in a CSA or CBSA, in most cases the technical analysis for the nonattainment area includes any counties in the larger of the relevant

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[1] https://www.epa.gov/sites/production/files/2016-02/documents/ozone-designation-tribes.pdf

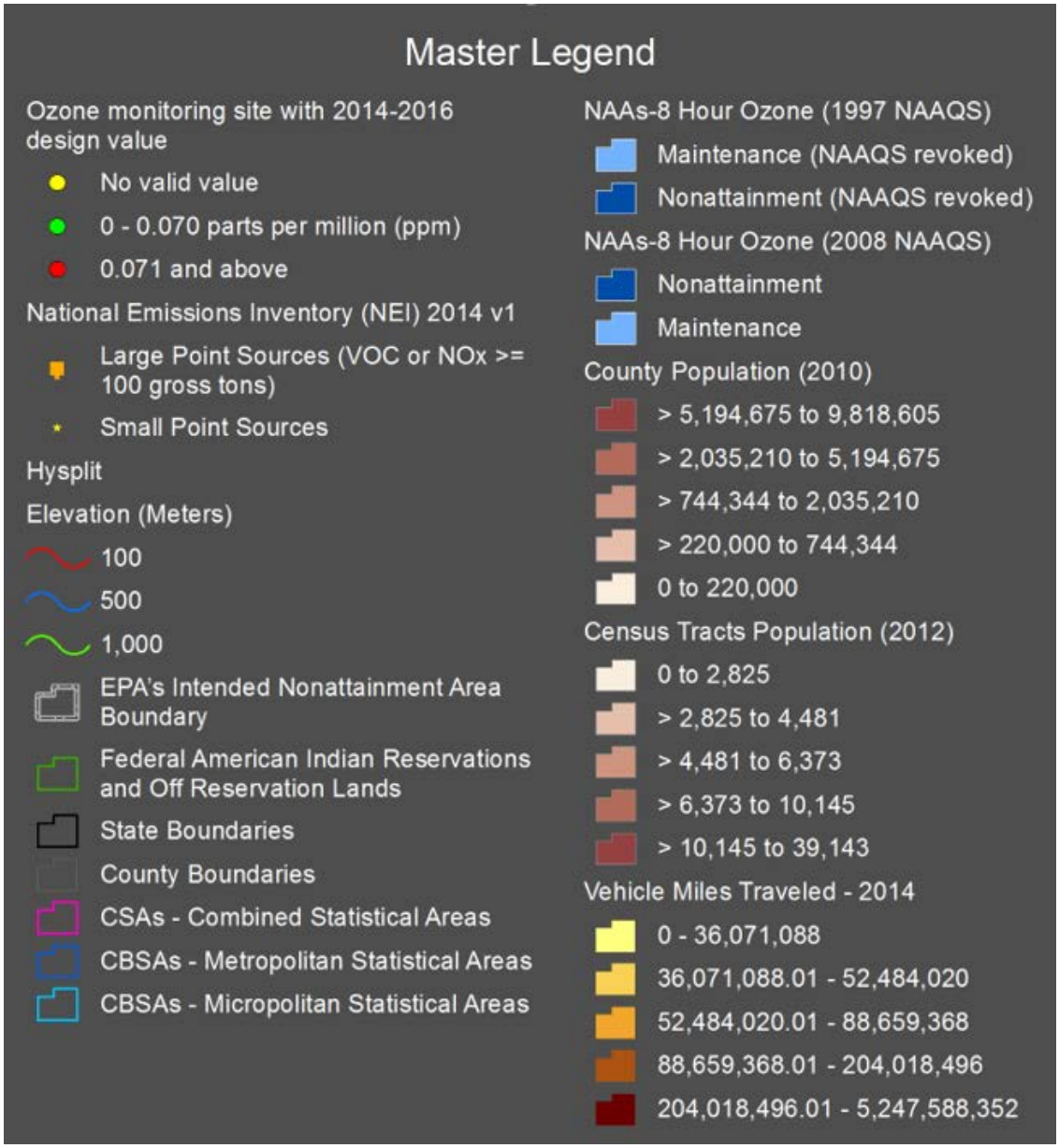
[2] https://www.epa.gov/sites/production/files/2016-02/documents/indian-country-separate-area.pdf

[3] The EPA issued guidance on February 25, 2016 that identified important factors that the EPA intends to evaluate in determining appropriate area designations and nonattainment boundaries for the 2015 ozone NAAQS. Available at *https://www.epa.gov/ozone-designations/epa-guidance-area-designations-2015-ozone-naaqs*

[4] Lists of CBSAs and CSAs and their geographic components are provided at www.census.gov/population/www/metroareas/metrodef.html. The Office of Management and Budget (OMB) adopts standards for defining statistical areas. The statistical areas are delineated based on U.S. Census Bureau data. The lists are periodically updated by the OMB. The EPA used the most recent July 2015 update (OMB Bulletin No. 15-01), which is based on application of the 2010 OMB standards to the 2010 Census, 2006-2010 American Community Survey, as well as 2013 Population Estimates Program data.

[5] Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards published on November 16, 2017(82 FR 54232).

CSA or CBSA. For counties with a violating monitor not located in a CSA or CBSA, the EPA explains in the 3.0 Technical Analysis section, its decision whether to consider in the five-factor analysis for each area any other adjacent counties for which the EPA previously deferred action. We intend to designate all counties not included in five-factor analyses for a specific nonattainment or unclassifiable area analyses, as attainment/unclassifiable. These deferred areas are identified in a separate document entitled "Intended Designations for Deferred Counties and Partial Counties Not Addressed in the Technical Analyses." which is available in the docket.



Figures in the remainder of the document refer to the master legend above

3.0 Technical Analyses for Intended Nonattainment Areas

3.1 Technical Analysis for Northern Wasatch Front and Southern Wasatch Front Areas

This technical analysis identifies the areas with monitors that violate the 2015 ozone NAAQS. It also provides EPA's evaluation of these areas and any nearby areas to determine whether those nearby areas have emissions sources that potentially contribute to ambient ozone concentrations at the violating monitors in the area, based on the weight-of-evidence of the five factors recommended in the EPA's ozone designations guidance and any other relevant information. In developing this technical analysis, the EPA used the latest data and information available to the EPA (and to the states and tribes through the Ozone Designations Mapping Tool and the EPA Ozone Designations Guidance and Data web page).[6] In addition, the EPA considered any additional data or information provided to the EPA by states or tribes.

The area of analysis for the Northern Wasatch Front and Southern Wasatch Front areas is the Salt Lake City-Provo-Orem CSA. The CSA is comprised of three Metropolitan Statistical Areas (MSAs) and two Micropolitan Statistical Areas. Because of the size of the counties involved, the Salt Lake City-Provo-Orem CSA is a very large analysis area. It is about the size of the State of West Virginia, and larger than nine other states. The counties that are included in these areas are as follows:

- Ogden-Clearfield MSA: Box Elder County, Davis County, Morgan County, Weber County
- Salt Lake City MSA: Salt Lake County, Tooele County
- Provo-Orem MSA: Juab County, Utah County
- Summit Park Micropolitan Statistical Area: Summit County
- Heber Micropolitan Statistical Area: Wasatch County

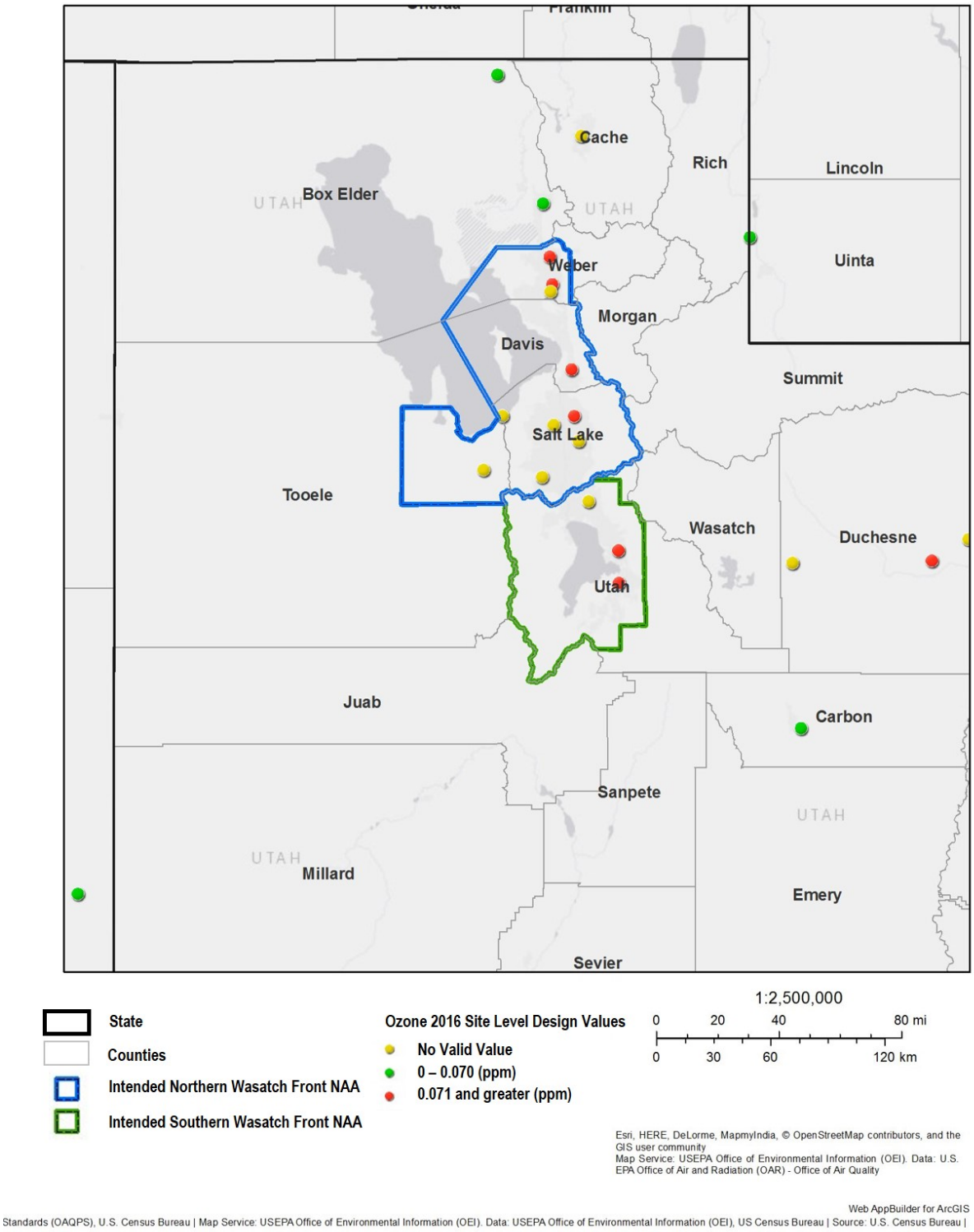
The five factors recommended in the EPA's guidance are:

1. Air Quality Data (including the design value calculated for each Federal Reference Method (FRM) or Federal Equivalent Method (FEM) monitor;
2. Emissions and Emissions-Related Data (including locations of sources, population, amount of emissions, and urban growth patterns);
3. Meteorology (weather/transport patterns);
4. Geography/Topography (including mountain ranges or other physical features that may influence the fate and transport of emissions and ozone concentrations); and
5. Jurisdictional Boundaries (e.g., counties, air districts, existing nonattainment areas, areas of Indian country, Metropolitan Planning Organizations (MPOs)).

Figure 1 is a map of the EPA's intended nonattainment boundaries for the Northern Wasatch Front and Southern Wasatch Front areas. The map shows the location of the ambient air quality monitors, county, and other jurisdictional boundaries.

[6] The EPA's Ozone Designations Guidance and Data web page can be found at *https://www.epa.gov/ozone-designations/ozone-designations-guidance-and-data.*

Figure 1. EPA's Intended Nonattainment Boundaries for the Northern Wasatch Front and Southern Wasatch Front Areas



The State recommended that EPA designate two separate nonattainment areas for counties in this CSA – the Northern Wasatch Front and the Southern Wasatch Front. The EPA is analyzing all of the counties in the

CSA together in this TSD, but, as provided in the conclusion, the EPA does not intend to modify the State's recommendation to designate two separate nonattainment areas.

The EPA must designate as nonattainment any area that violates the NAAQS and any nearby areas that contribute to the violation in the violating area. Davis, Salt Lake, Utah, and Weber Counties have monitors in violation of the 2015 ozone NAAQS, therefore these counties (or portions of these counties) are included in the intended nonattainment areas. Based on the analysis that follows, the EPA determined that portions of Tooele County contribute to violations of the NAAQS in the area. The following sections describe the five factor analysis supporting the intended designations for the Northern and Southern Wasatch Front areas. While the factors are presented individually, they are not independent. The five factor analysis process carefully considers the interconnections among the different factors and the dependence of each factor on one or more of the others, such as the interaction between emissions and meteorology for the area being evaluated.

Factor Assessment

Factor 1: Air Quality Data

The EPA considered 8-hour ozone design values in ppm for air quality monitors in the area of analysis based on data for the 2014-2016 period (i.e., the 2016 design value, or DV). This is the most recent three-year period with fully-certified air quality data. The design value is the 3-year average of the annual 4th highest daily maximum 8-hour average ozone concentration.[7] The 2015 NAAQS are met when the design value is 0.070 ppm or less. Only ozone measurement data collected in accordance with the quality assurance (QA) requirements using approved (FRM/FEM) monitors are used for NAAQS compliance determinations.[8] The EPA uses FRM/FEM measurement data residing in the EPA's Air Quality System (AQS) database to calculate the ozone design values. Individual violations of the 2015 ozone NAAQS that the EPA determines have been caused by an exceptional event that meets the administrative and technical criteria in the Exceptional Events Rule[9] are not included in these calculations. Whenever several monitors are located in a county (or designated nonattainment area), the design value for the county or area is determined by the monitor with the highest valid design value. The presence of one or more violating monitors (i.e. monitors with design values greater than 0.070 ppm) in a county or other geographic area forms the basis for designating that county or area as nonattainment. The remaining four factors are then used as the technical basis for determining the spatial extent of the designated nonattainment area surrounding the violating monitor(s) based on a consideration of what nearby areas are contributing to a violation of the NAAQS.

The EPA identified monitors where the most recent design values violate the NAAQS, and examined historical ozone air quality measurement data (including previous design values) to understand the nature of the ozone ambient air quality problem in the area. Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) that are operated in accordance with 40

[7] The specific methodology for calculating the ozone design values, including computational formulas and data completeness requirements, is described in 40 CFR part 50, appendix U.

[8] The QA requirements for ozone monitoring data are specified in 40 CFR part 58, appendix A. The performance test requirements for candidate FEMs are provided in 40 CFR part 53, subpart B.

[9] The EPA finalized the rule on the Treatment of Data Influenced by Exceptional Events (81 FR 68513) and the guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events in September of 2016. For more information, see *https://www.epa.gov/air-quality-analysis/exceptional-events-rule-and-guidance.*

CFR part 58, appendix A, C, D and E and operating with an FRM or FEM monitor. These requirements must be met in order to be acceptable for comparison to the 2015 ozone NAAQS for designation purposes. All data from Special Purpose Monitors (SPMs) using an FRM or FEM are eligible for comparison to the NAAQS, subject to the requirements given in the March 28, 2016 Revision to Ambient Monitoring Quality Assurance and Other Requirements Rule (81 FR 17248).

The 2014-2016 design values for counties in the area of analysis are shown in Table 2.

Table 2. Air Quality Data (all values in ppm)

County, State	State Recommended Nonattainment?	AQS Site ID	2014-2016 DV	2014 4th highest daily max value	2015 4th highest daily max value	2016 4th highest daily max value
Box Elder, UT	No	49-003-0003	**0.067**	0.067	0.068	0.067
		49-003-7001	0.059	0.061	0.067	0.051
Davis, UT	Yes	49-011-0004	**0.074**	0.074	0.073	0.076
Juab, UT	No	No monitor	N/A			
Morgan, UT	No	No monitor	N/A			
Salt Lake, UT	Yes	49-035-2004	N/A	0.064	N/A	N/A
		49-035-3006	**0.075**	0.072	0.081	0.074
		49-035-3013	N/A	N/A	0.074	0.076
Summit, UT	No	No monitor	N/A			
Tooele, UT	Yes (partial)	49-045-0003	N/A	0.069	N/A	N/A
		49-045-0004	N/A	N/A	0.071	0.072
Utah, UT	Yes (partial)	49-049-0002	0.071	0.068	0.073	0.072
		49-049-5010	**0.073**	0.076	0.071	0.072
Wasatch, UT	No	No Monitor	N/A			
Weber, UT	Yes (partial)	49-057-0002	0.071	0.070	0.072	0.072
		49-057-1003	**0.072**	0.070	0.074	0.073

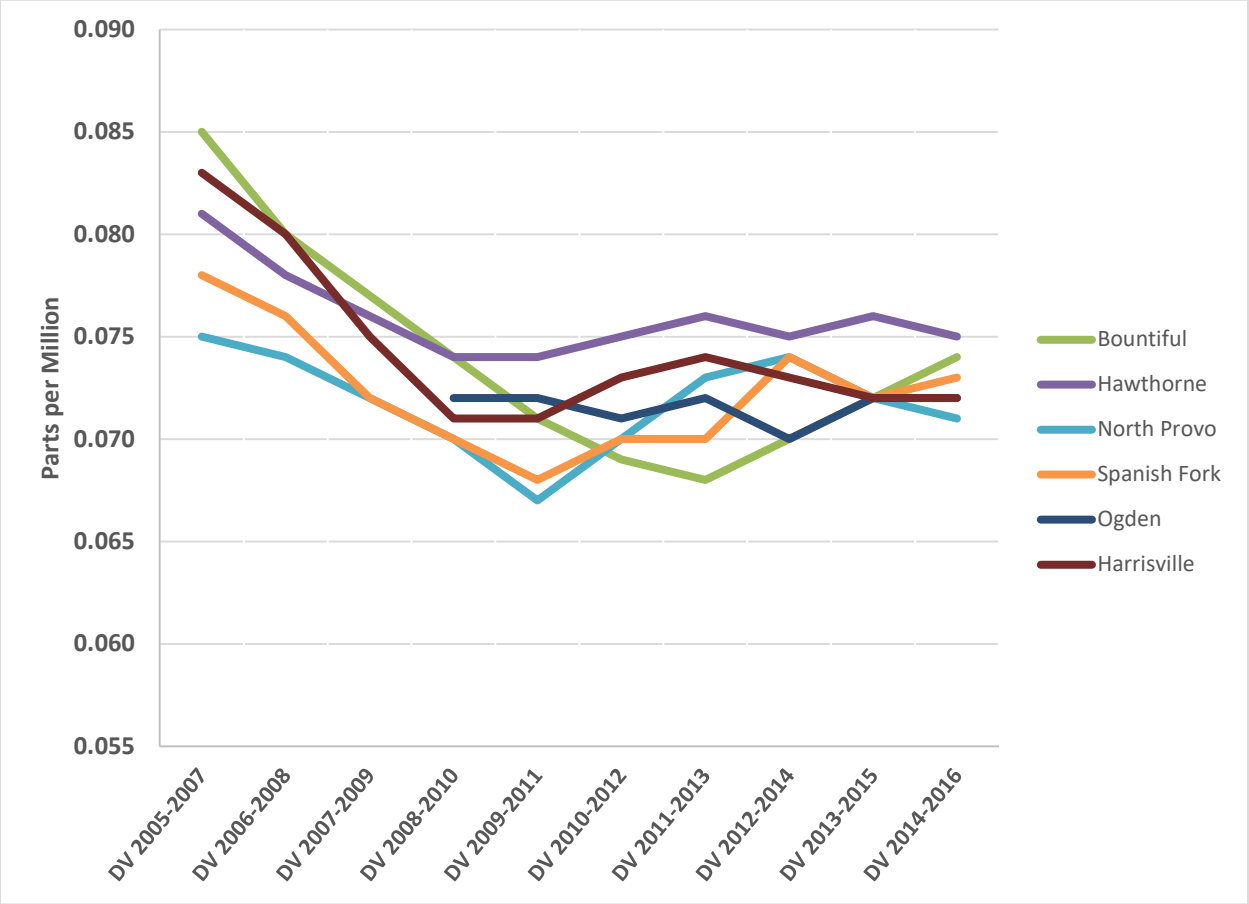
The highest design value in each county is indicated in bold type.
N/A means that the monitor did not meet the completeness criteria described in 40 CFR, part 50, Appendix U, or no data exists for the county.

Davis, Salt Lake, Utah, and Weber Counties show violations of the 2015 ozone NAAQS, therefore these counties are included in the intended nonattainment areas. A county (or partial county) must also be designated nonattainment if it contributes to a violation in a nearby area. Counties adjacent to counties with violating monitors were also evaluated. These include: Tooele, Box Elder, Summit, Juab, Morgan, and Wasatch Counties.

Figure 1, shown previously, identifies the Northern Wasatch Front and Southern Wasatch Front intended nonattainment areas, the county boundaries, and the violating monitors. Table 2 identifies the design values for all monitors in the area of analysis, and Figure 2 shows the historical trend of design values for the violating monitors. As indicated on the map, there are six violating monitors that are located in the area of analysis. Four are located in the Northern Wasatch Front area (Bountiful, located at Viewmont High School in Davis County; Hawthorne, at Hawthorne Elementary School in Salt Lake City, Ogden in Weber County; and Harrisville at Majestic Elementary School, north of Ogden, also in Weber County) and two are located in the Southern Wasatch Front area (North Provo and Spanish Fork at the Spanish Fork-Springville Airport

in Utah County). Additional monitors in the Salt Lake City-Provo-Orem CSA not violating the 2015 ozone NAAQS are in Brigham City, in Box Elder County, and the monitor of the Northwest Band of Shoshone Indian Tribe in Washakie Junction, also in Box Elder County.

Figure 2. Three-Year Design Values for Violating Monitors.



Based on Figure 2, ozone monitors in Salt Lake and Weber Counties have consistently had design values above the level of the 2015 ozone NAAQS. Monitors in Utah and Davis Counties historically were above the level of 2015 standard, then dropped below the standard based on the 2011 to 2013 DVs, but more recently have recorded new violations.

Factor 2: Emissions and Emissions-Related Data

The EPA evaluated ozone precursor emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOC) and other emissions-related data that provide information on areas contributing to violating monitors.

<u>Emissions Data</u>

The EPA reviewed data from the 2014 National Emissions Inventory (NEI). For each county in the area of analysis, the EPA examined the magnitude of large sources (NO_x or VOC emissions greater than 100 tons per year) and small point sources and the magnitude of county-level emissions reported in the NEI. These

county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, non-road mobile, on-road mobile, and fires. Emission levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations.

Table 3 provides a county-level emissions summary of NO_x and VOC (given in tons per year (tpy)) emissions for counties in the area of analysis.

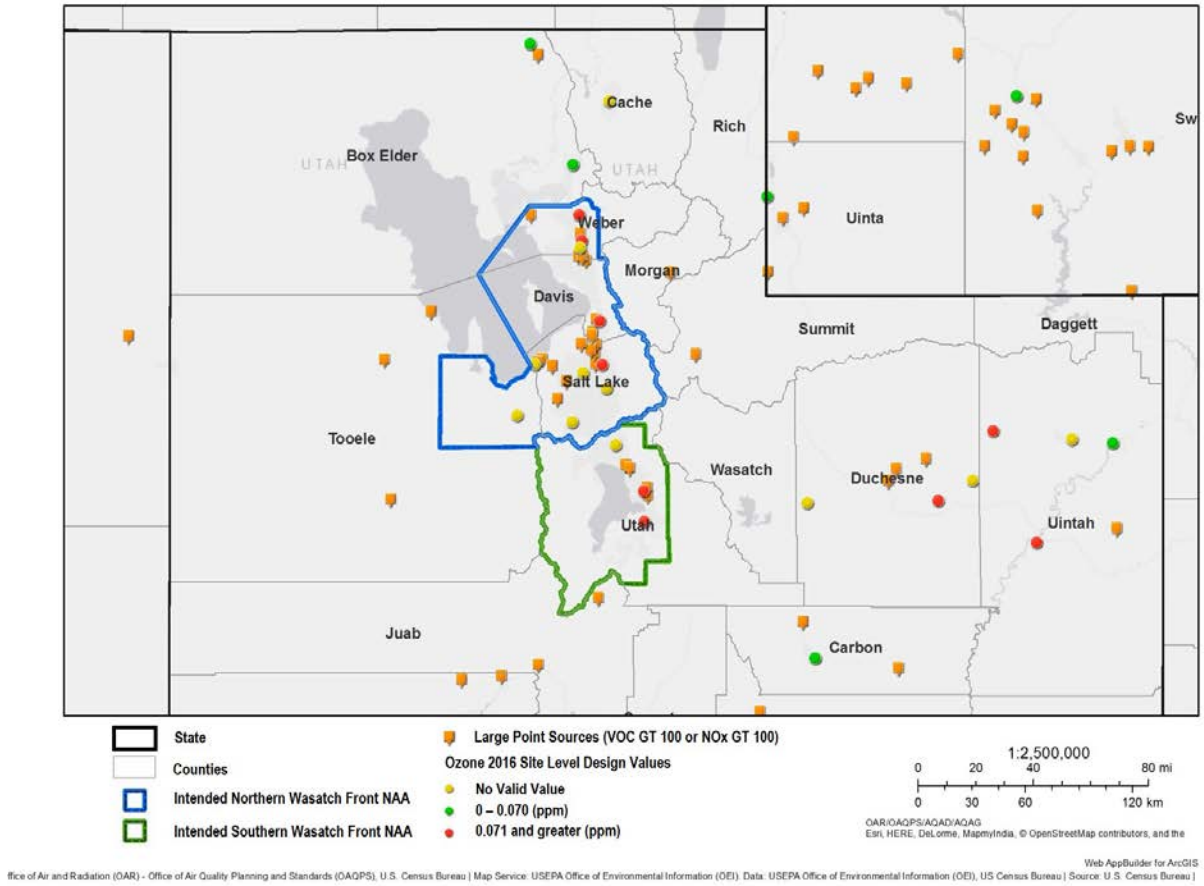
Table 3. Total County-Level NOx and VOC Emissions.

County	State Recommended Nonattainment	Total NO_x (tpy)	Total VOC (tpy)
Salt Lake	Yes	27,011	21,084
Utah	Yes (partial)*	13,208	10,219
Davis	Yes	6,623	6,801
Tooele	Yes (partial)*	5,022	3,484
Box Elder	No	4,579	4,635
Weber	Yes (partial)*	4,948	4,770
Summit	No	3,937	2,346
Juab	No	1,973	1,726
Morgan	No	2,181	1,387
Wasatch	No	1,143	1,737
	Area Wide:	70,625	58,189

* For state recommended partial counties, the emissions shown are for the entire county.

In addition to reviewing county-wide emissions of NO_x and VOC in the area of analysis, the EPA also reviewed emissions from large point sources. The location of these sources, together with the other factors, can help inform nonattainment boundaries. The locations of the large point sources are shown in Figure 3 below. The intended nonattainment boundaries are also shown.

Figure 3. Large Point Sources in the Area of Analysis



As shown in Table 3, Salt Lake County has the highest emissions of both VOC and NOx – more than double the emissions of Utah County, which has the next highest emissions. Davis County has approximately one quarter the level of emissions of Salt Lake County. Toole, Box Elder and Summit Counties have emissions that are somewhat lower than those of Davis County while Juab, Morgan and Wasatch Counties have the lowest level of emissions of the counties in the area of analysis.

Figure 3 shows that there is a heavy concentration of large point sources in Salt Lake County. Utah, Davis and Weber Counties also have several large point sources. Toole County, which is a geographically large county on the western edge of the area of analysis has three large point sources that are somewhat distant from the core metropolitan area.

<u>Population density and degree of urbanization</u>

In this part of the factor analysis, the EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. These include emissions of NO_x and VOC from on-road and non-road vehicles and engines, consumer products, residential fuel combustion, and consumer services. Areas of dense population or commercial development are an indicator of area source and mobile source NO_x and VOC emissions that may contribute to violations of the NAAQS. Table 4 shows the population, population density, and population growth information for each county in the area of analysis. Figure 4 shows the county-level population for the area of analysis, and Figure 5 shows the population density by census tract for the area of analysis.

Table 4. Population and Growth

County Name	State Recommended Nonattainment?	2010 Population	2015 Population	2015 Populations Density (per sq. mi.)	Absolute Change in Population (2010-2015)	Population % Change (2010-2015)
Salt Lake County	Yes	1,029,655	1,107,314	1,492	77,659	8
Utah County	Yes (partial)*	516,564	575,205	287	58,641	11
Davis County	Yes	306,479	336,043	1,125	29,564	10
Weber County	Yes (partial)*	231,236	243,645	423	12,409	5
Tooele County	Yes (partial)*	58,218	62,952	9	4,734	8
Box Elder County	No	49,975	52,097	9	2,122	4
Summit County	No	36,324	39,633	21	3,309	9
Wasatch County	No	23,530	29,161	25	5,631	24
Morgan County	No	9,469	11,065	18	1,596	17
Juab County	No	10,246	10,594	3	348	3
* For state recommended partial counties, the data are for the entire county.						

Source: U.S. Census Bureau population estimates for 2010 and 2015.
www.census.gov/data.html.

Figure 4. County-Level Population

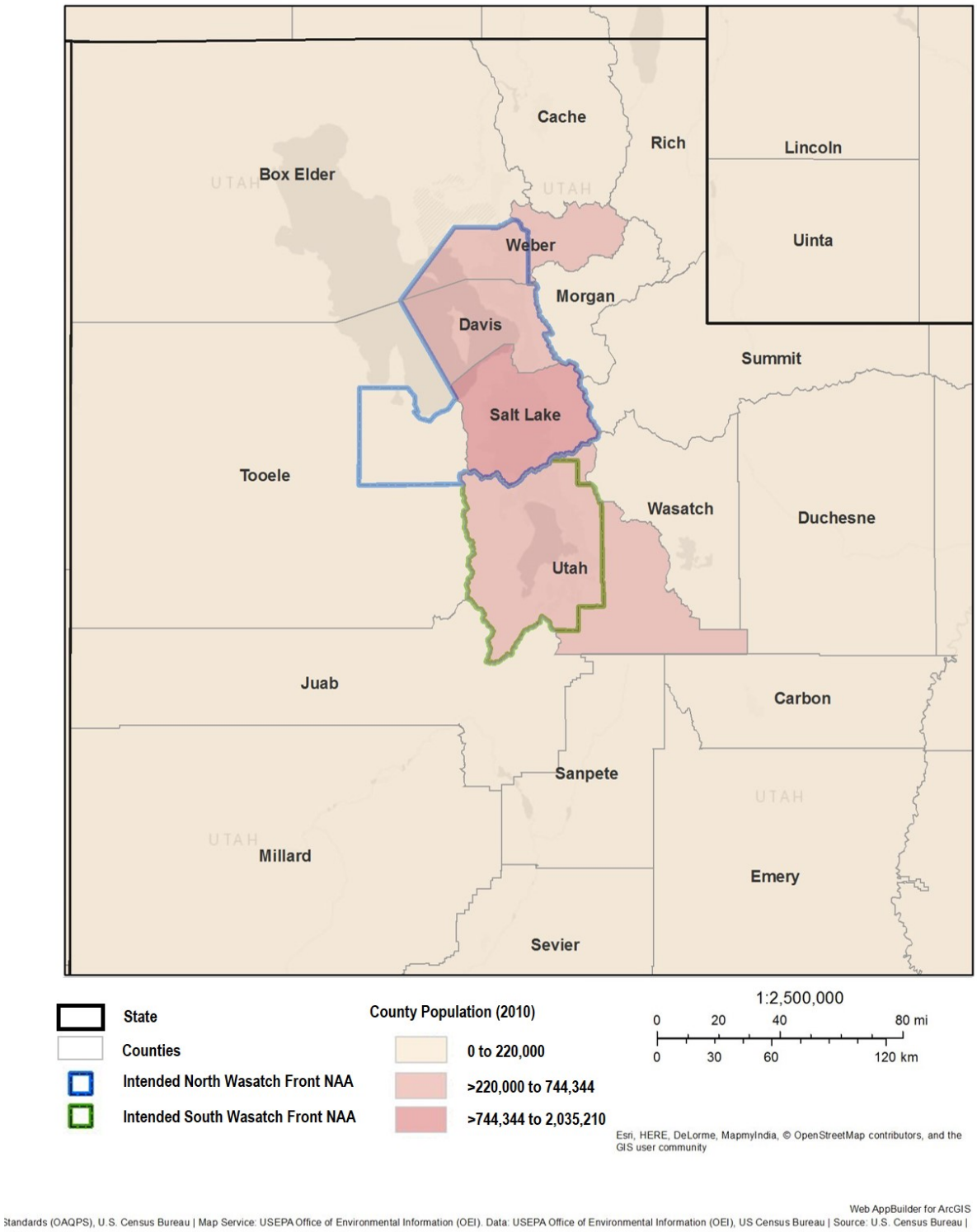


Figure 5. Population Density by Census Tract (2010)

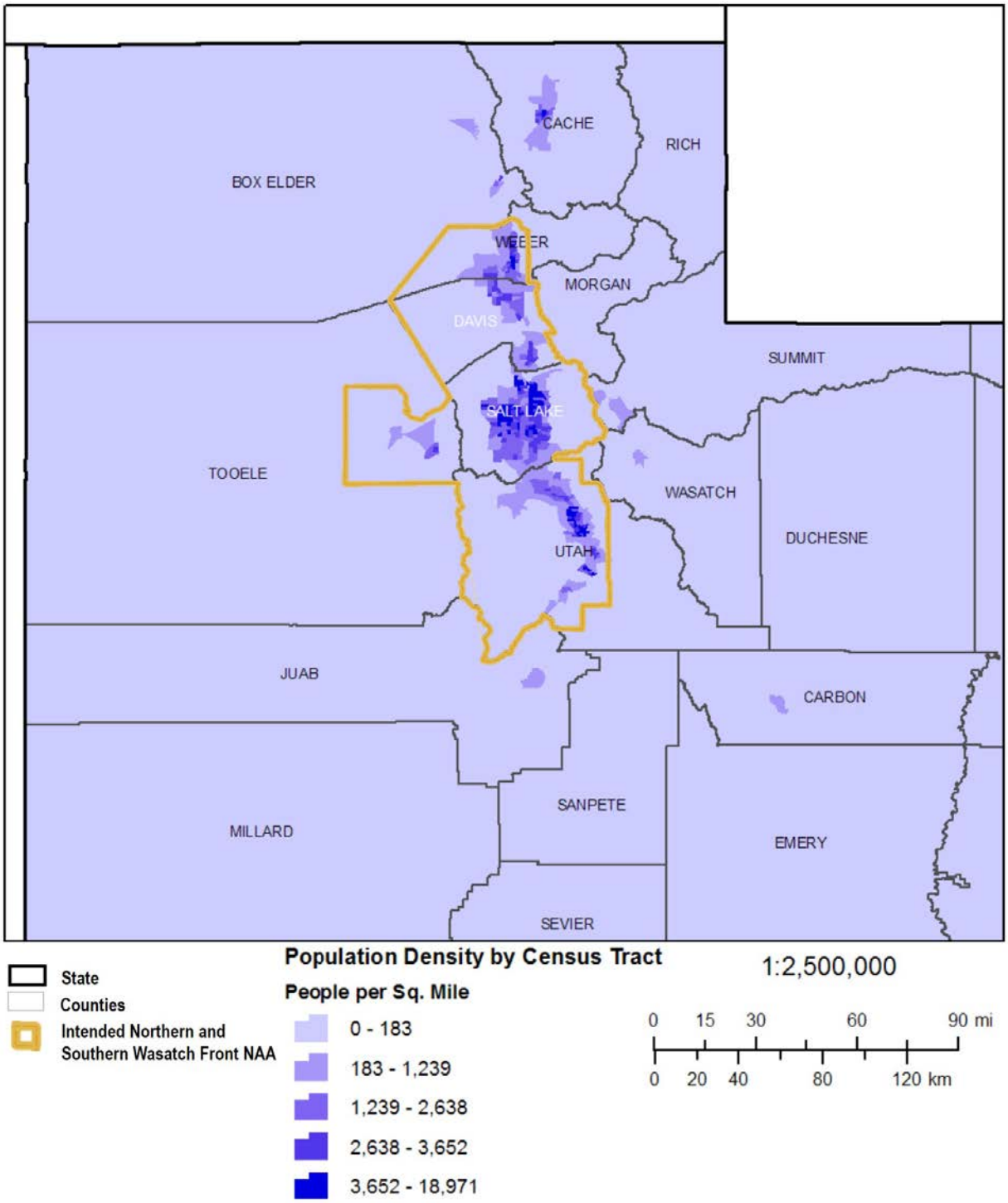


Table 4, along with Figures 4 and 5, show that the majority of the population resides in Salt Lake, Utah, Davis, and Weber Counties. Salt Lake County has a significantly higher population than the other counties – almost twice the population of Utah County, three times that of Davis County and more than four times that of Weber County. The other five counties all have much less than 10 percent of the population of Salt Lake County. Salt Lake and Davis County have the highest population densities of 1,492 and 1,125, respectively.

This is more than two to three times that of Weber County and four to five times that of Utah County. The remaining counties have significantly lower population densities of less than 25 people per square mile. As a region, the area is experiencing significant population growth, ranging from 3 to 24 percent. The two counties with the highest percentage population change are two of the least populated counties – Wasatch and Morgan. Of the four counties with the highest population and highest population density, Utah and Davis County had at or just above 10 percent growth, while Salt Lake County had 8 percent growth and Weber has 5 percent growth. As shown by Figure 5, the portions of Utah, Weber, and Tooele Counties that the State has excluded from its nonattainment area recommendation are the least populated and least densely populated areas of those counties.

The State's analysis in their TSD provided with their boundary recommendation provides an examination of population density and urbanization and is included in italicized text below.

> *There are two very noticeable features of the CSA. The first feature is the small area that is urbanized compared to the rural and uninhabited portions of the counties. The second feature is the large size of the CSA. The Salt Lake City-Provo-Orem CSA contains ten counties and covers 25,365 square miles (larger than West Virginia and nine other US states). It extends east/west from the Nevada border to the southern Wyoming border, a distance of over 220 miles, and south from the Idaho border approximately 100 miles. Each of the MSAs within the CSA includes densely populated areas, sparsely populated areas, and very large areas with no population at all. The sparse or unpopulated areas are due to extended desert in the west and extreme mountainous terrain in the east. The largest concentration of both population and industry is found in the low valleys west of, and adjacent to, the Wasatch Front. Smaller concentrations of population are also found in some of the higher valleys east of the Wasatch Range, but there are generally few or no major industrial sources located in these areas.*

Traffic and Vehicle Miles Travelled (VMT)

The EPA evaluated the commuting patterns of residents, as well as the total vehicle miles traveled (VMT) for each county in the area of analysis. In combination with the population/population density data and the location of main transportation arteries, this information helps identify the probable location of non-point source emissions. A county with high VMT and/or a high number of commuters is generally an integral part of an urban area and high VMT and/or high number of commuters indicates the presence of motor vehicle emissions that may contribute to violations of the NAAQS. Rapid population or VMT growth in a county on the urban perimeter may signify increasing integration with the core urban area, and thus could indicate that the associated area source and mobile source emissions may be appropriate to include in the nonattainment area. In addition to VMT, the EPA evaluated worker data collected by the U.S. Census Bureau[10] for the counties in the area of analysis. Table 5 shows the traffic and commuting pattern data, including total VMT for each county in the area of analysis, number of residents who work in each county, number of residents that work in counties with violating monitors, and the percent of residents working in counties with violating monitors. The values in Table 5 are 2014 data.

[10] The worker data can be accessed at: http://onthemap.ces.census.gov/.

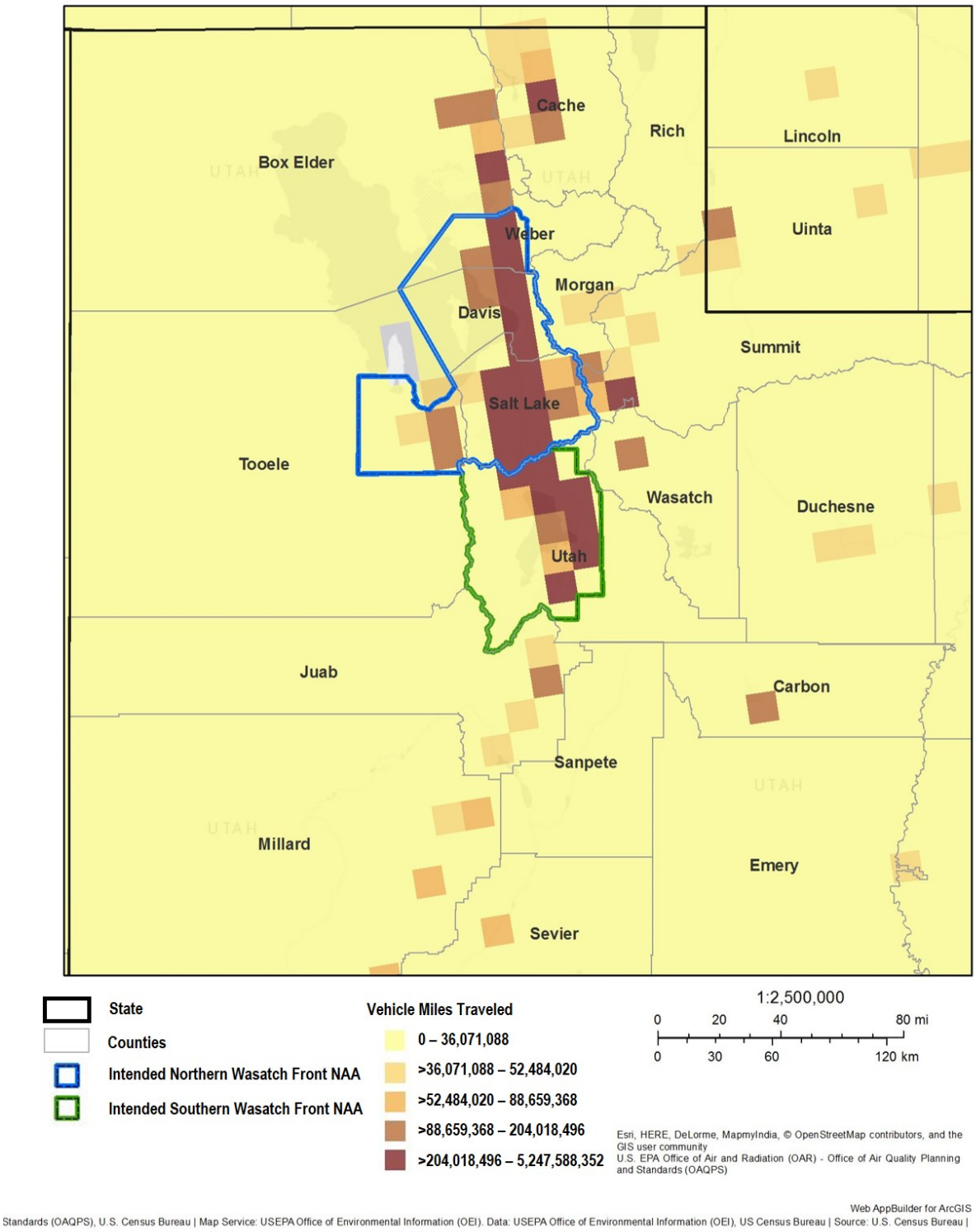
Table 5. Traffic and Commuting Patterns

County	State Recommended Nonattainment?	2014 Total VMT (Million Miles)	Number of County Residents Who Work	Number Commuting to or Within Counties with Violating Monitor(s)	Percentage Commuting to or Within Counties with Violating Monitor(s)
Salt Lake	Yes	9,079	505,823	483,032	95.5%
Utah	Yes (partial)*	4,085	218,761	204,465	93.5%
Davis	Yes	2,590	132,850	125,975	94.8%
Weber	Yes (partial)*	1,647	102,326	94,822	92.7%
Box Elder	No	911	24,932	11,335	45.5%
Tooele	Yes (partial)*	822	26,570	17,098	64.4%
Summit	No	763	21,640	9,345	43.2%
Juab	No	369	4,346	1,795	41.3%
Wasatch	No	353	12,577	5,502	43.8%
Morgan	No	133	4,671	3,134	67.1%
Total		20,752	1,054,496	956,503	90.7%

* For state recommended partial counties, the data provided are for the entire county. Counties with a monitors violating the NAAQS are indicated in bold.

To show traffic and commuting patterns, Figure 6 overlays twelve-kilometer gridded VMT from the 2014 NEI with a map of the transportation arteries.

Figure 6. Twelve Kilometer Gridded VMT (Miles) Overlaid with Transportation Arteries



The 2014 VMT in Table 5 illustrates that the vast majority of vehicle trips occur in four counties. Weber, Davis, Salt Lake, and Utah Counties; which have VMT levels ranging from just over 1,600 in Weber County to just over 9000 in Salt Lake County. Figure 6 illustrates that traffic patterns are heaviest on a

north-south axis through the area of analysis. This corresponds with the major traffic corridor of Interstate 15. In addition, the heavier traffic areas shown in Figure 6 largely correspond with the more densely populated areas as shown in Figure 5, above – including the counties of Weber, Davis, Salt Lake, and Utah. Average daily traffic rapidly diminishes beyond this central core as indicated by the lower VMT values for the other five counties in the area of analysis and by Figure 6. The commuting information indicates that the number of commuters traveling to or within a county with a violating monitor is more than twice as high for the four counties with violating monitors (each over 90%) than for the other counties - with the exception of Tooele and Morgan Counties. These two counties have approximately 65% of commuters traveling to a county with a violating monitor. As noted previously, Tooele County is relatively sparsely populated except for a small area close to the border of Salt Lake County.

Factor 3: Meteorology

Evaluation of meteorological data helps to assess the fate and transport of emissions contributing to ozone concentrations and to identify areas potentially contributing to the monitored violations. Results of meteorological data analysis may inform the determination of nonattainment area boundaries. In order to determine how meteorological conditions, including, but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of ozone and precursor emissions from sources in the area, the EPA evaluated 2014-2016 HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) trajectories at 100, 500, and 1000 meters above ground level (AGL) that illustrate the three-dimensional paths traveled by air parcels to a violating monitor. Figures 7 through 12 show the 24-hour HYSPLIT back trajectories for each exceedance day (i.e., daily maximum 8 hour values that exceed the 2015 ozone NAAQS) for the violating monitors.

Figure 7. HYSPLIT Back Trajectories for Hawthorne

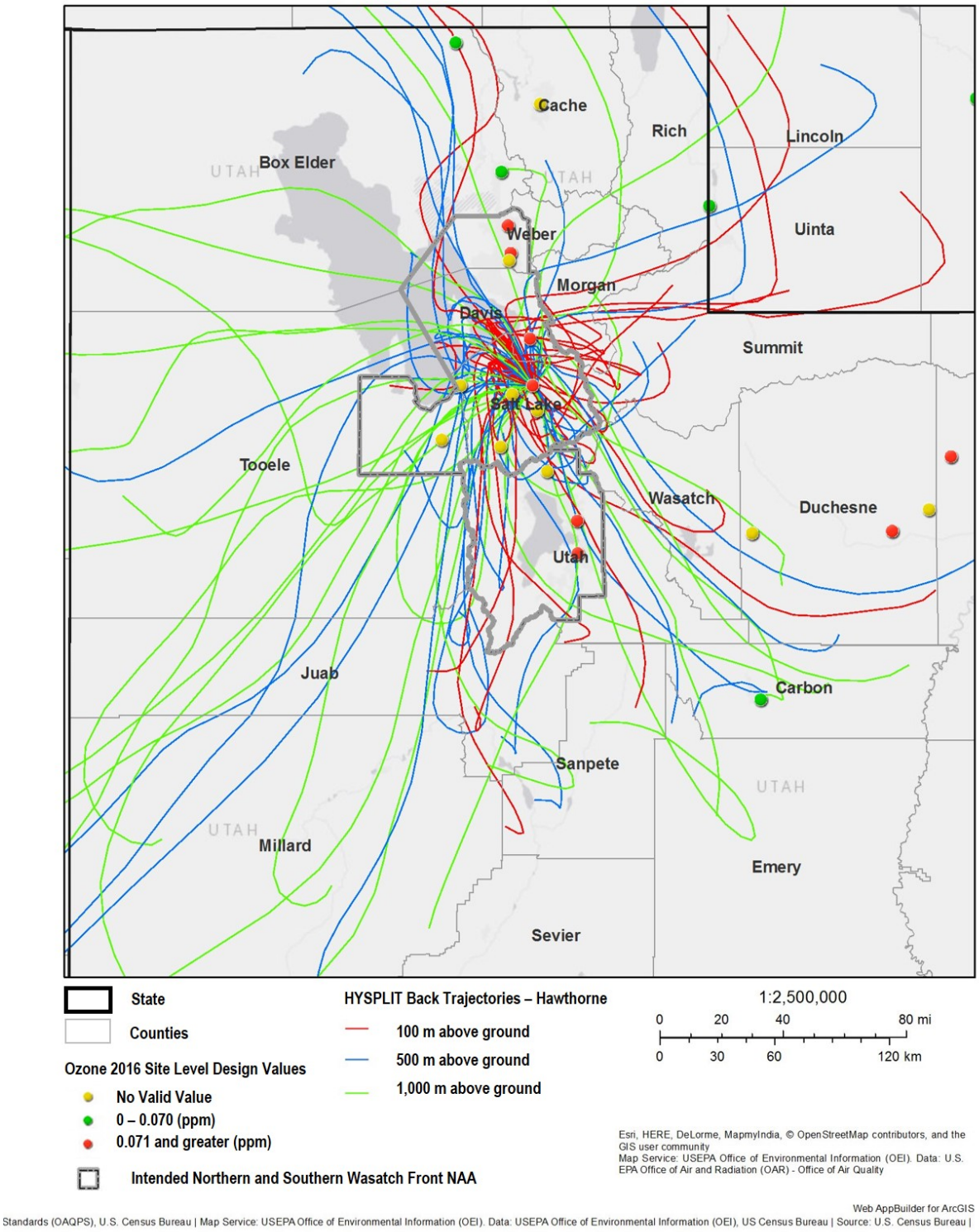


Figure 8. HYSPLIT Back Trajectories for Ogden

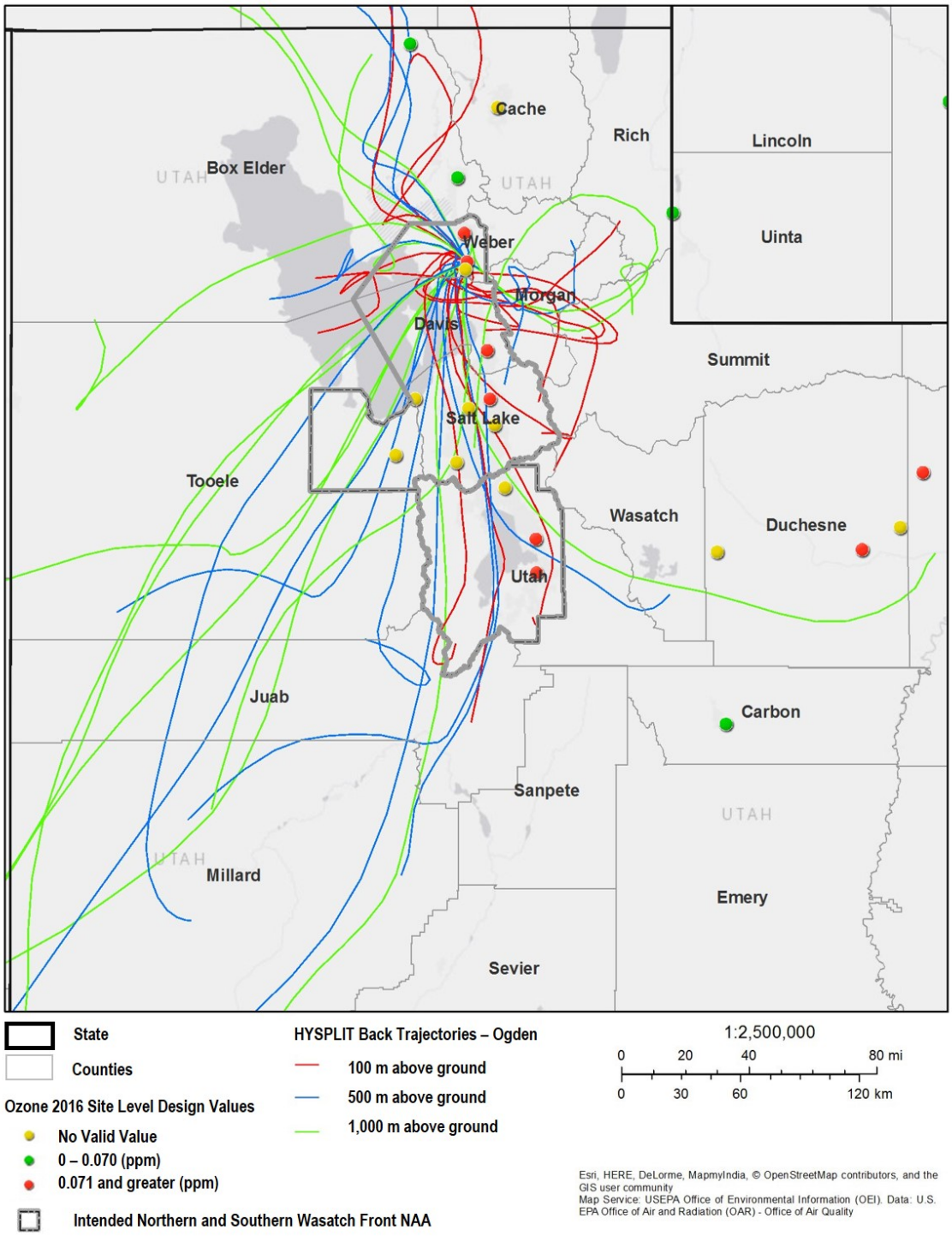


Figure 9. HYSPLIT Back Trajectories for Bountiful

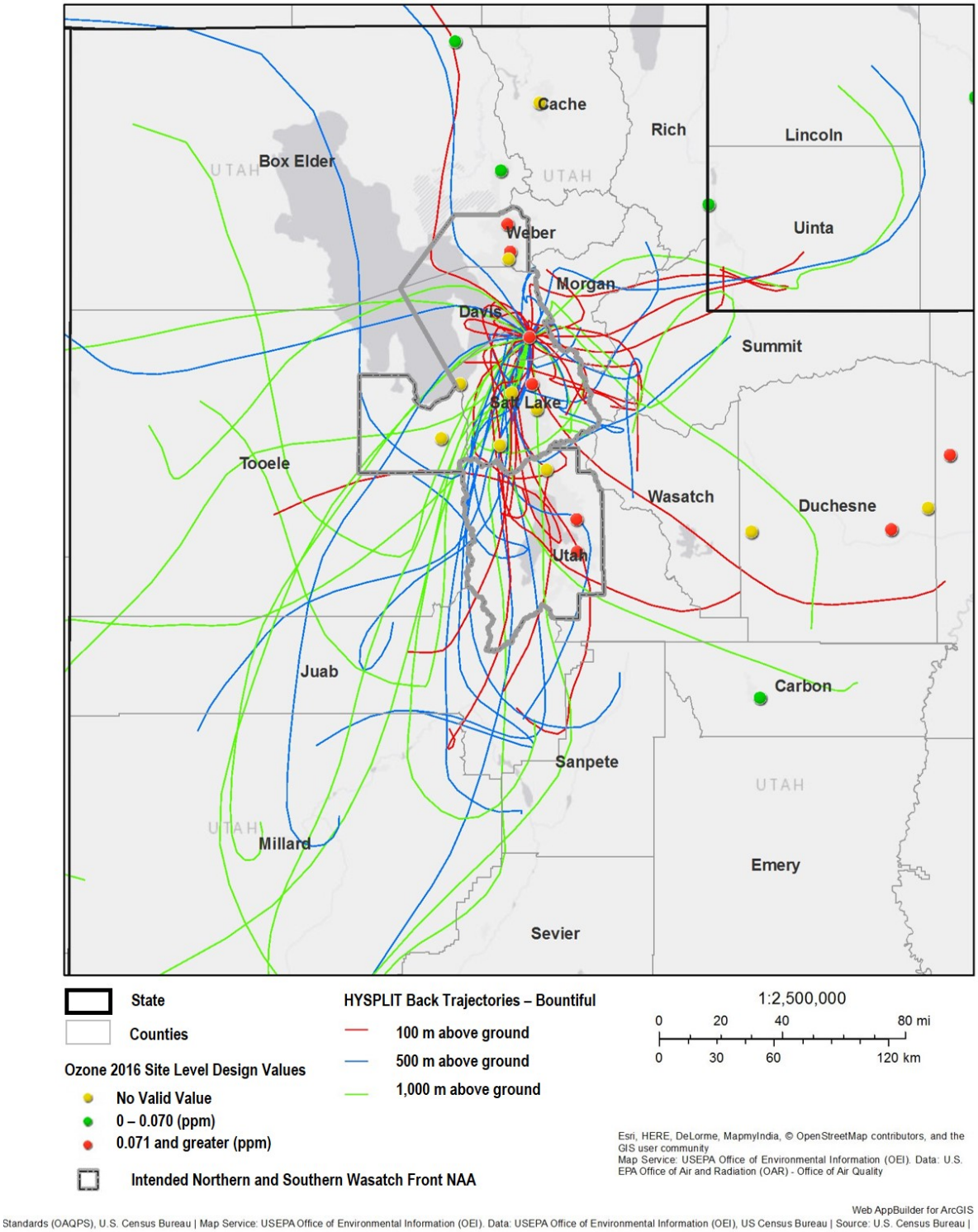


Figure 10. HYSPLIT Back Trajectories for Harrisville

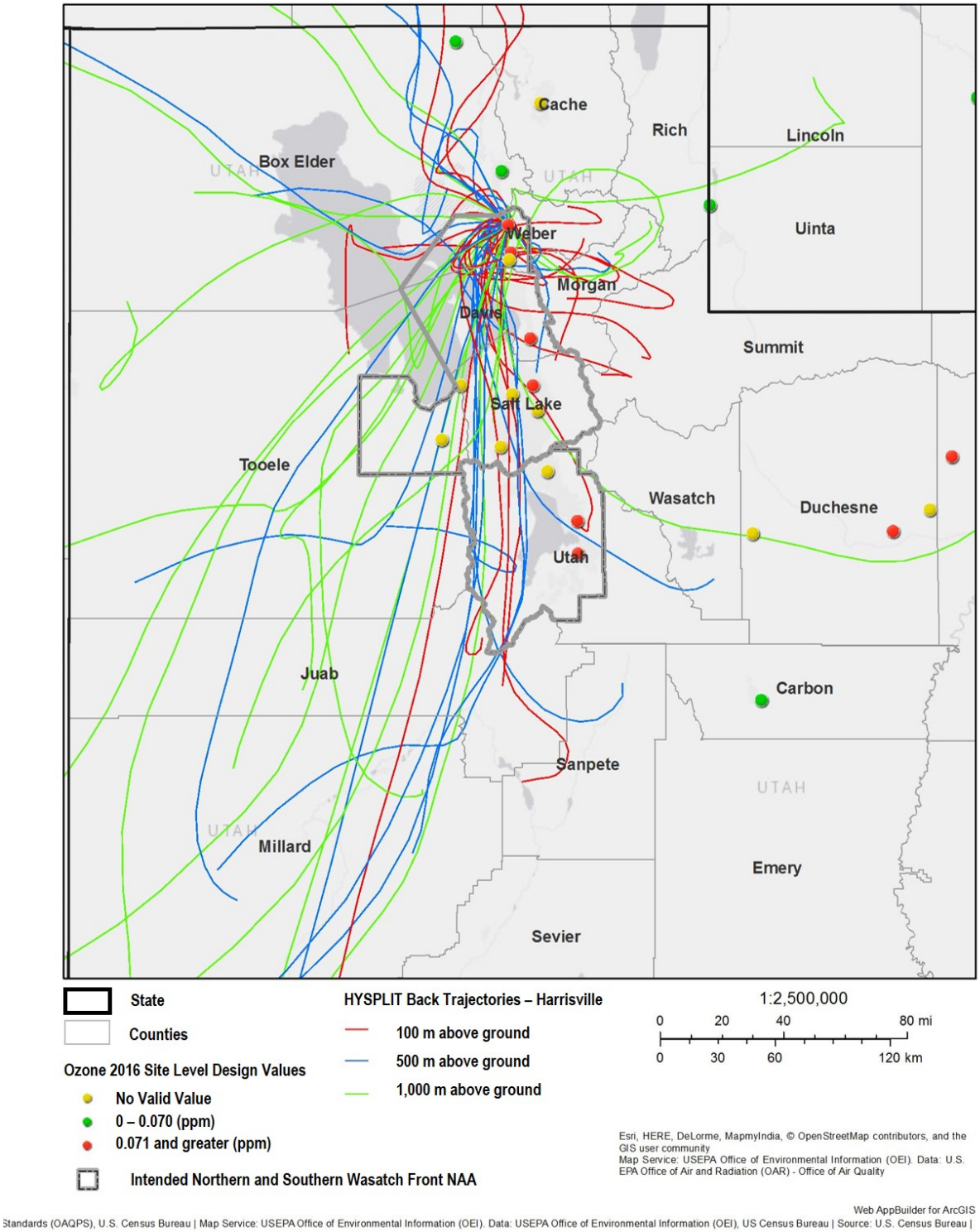


Figure 11. HYSPLIT Back Trajectories for North Provo

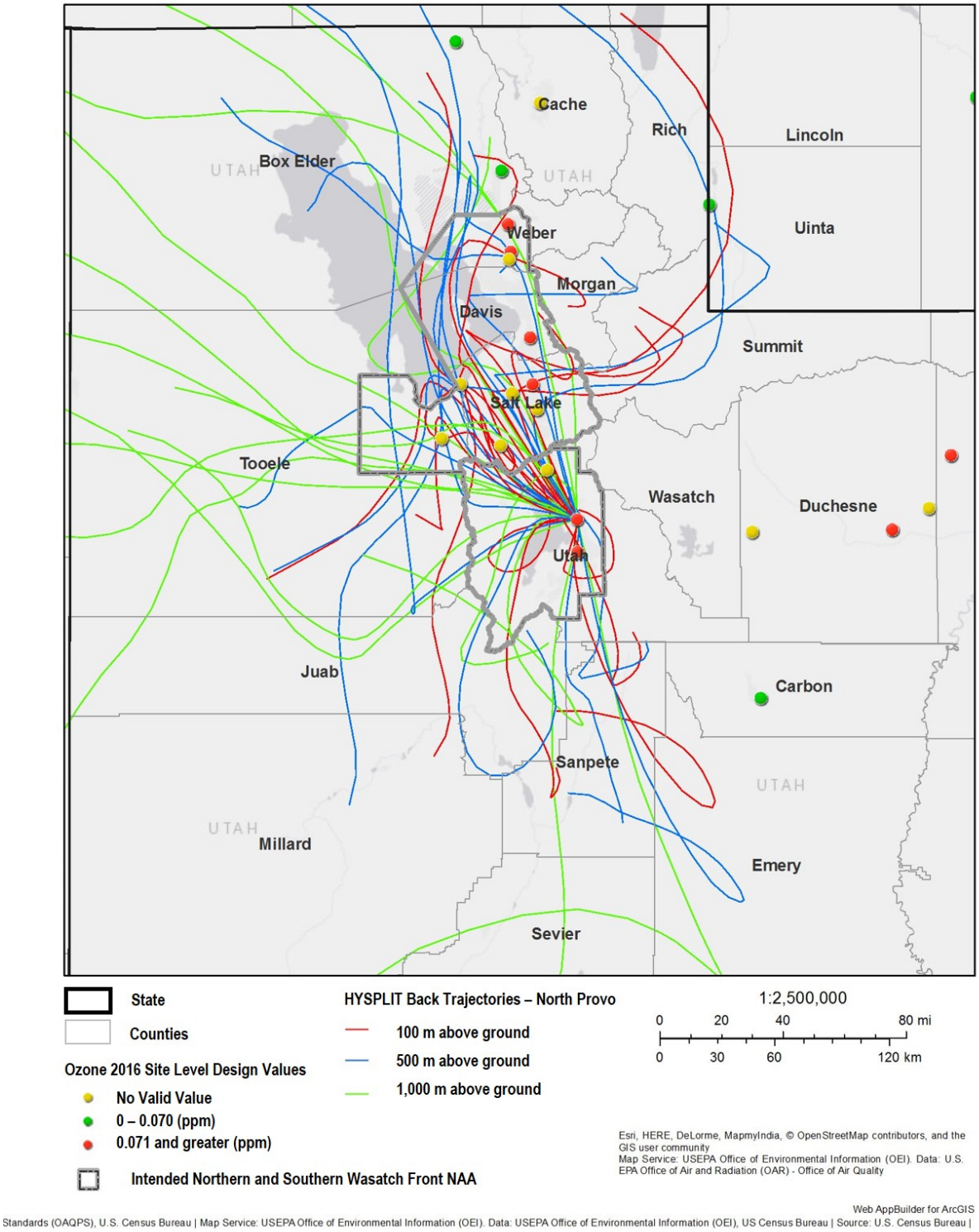
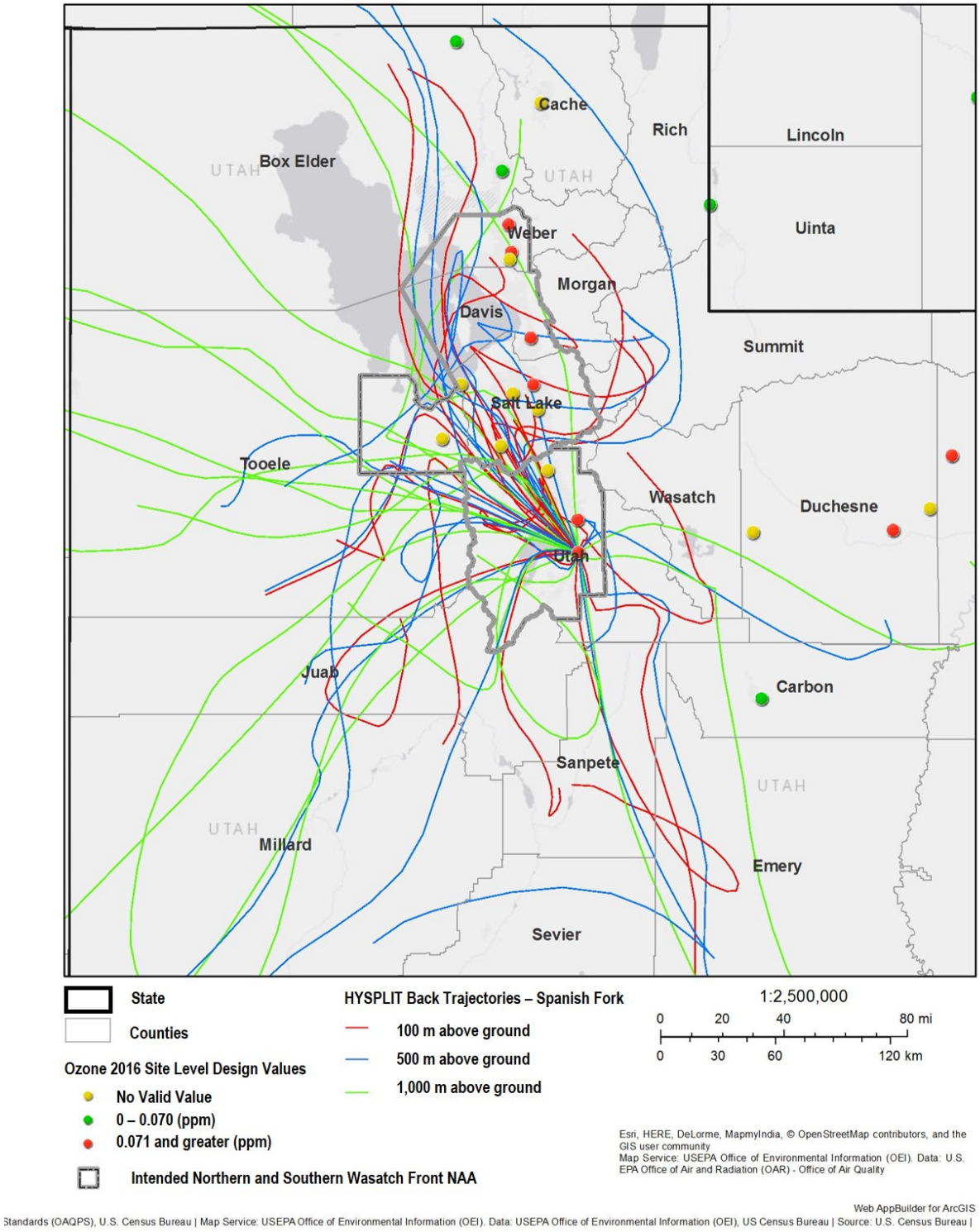


Figure 12. HYSPLIT Back Trajectories for Spanish Fork



The meteorology of the urbanized Wasatch Front is strongly influenced by the Wasatch mountain range to the east of the urban corridor and the Great Salt Lake and Utah Lake, generally to the west of the urbanized area. High ozone levels in the Wasatch front area usually occur in association with a semi-permanent high pressure ridge stationary over the intermountain region, along with clear skies, intense direct sunlight, and

stagnant air with very light surface winds. When these meteorological conditions occur together, they aid in the formation of ozone while at the same time providing minimal vertical mixing.

Day-to-day transport of the ozone along the Wasatch Front is mainly influenced by the diurnal effects of the local lake on-shore/off-shore flow coupled with up-slope/down-slope airflow in the mountains. General westward movement occurs during the late evening and nighttime hours and eastward movement occurs during the daylight hours. This is a typical mountain/valley flow.

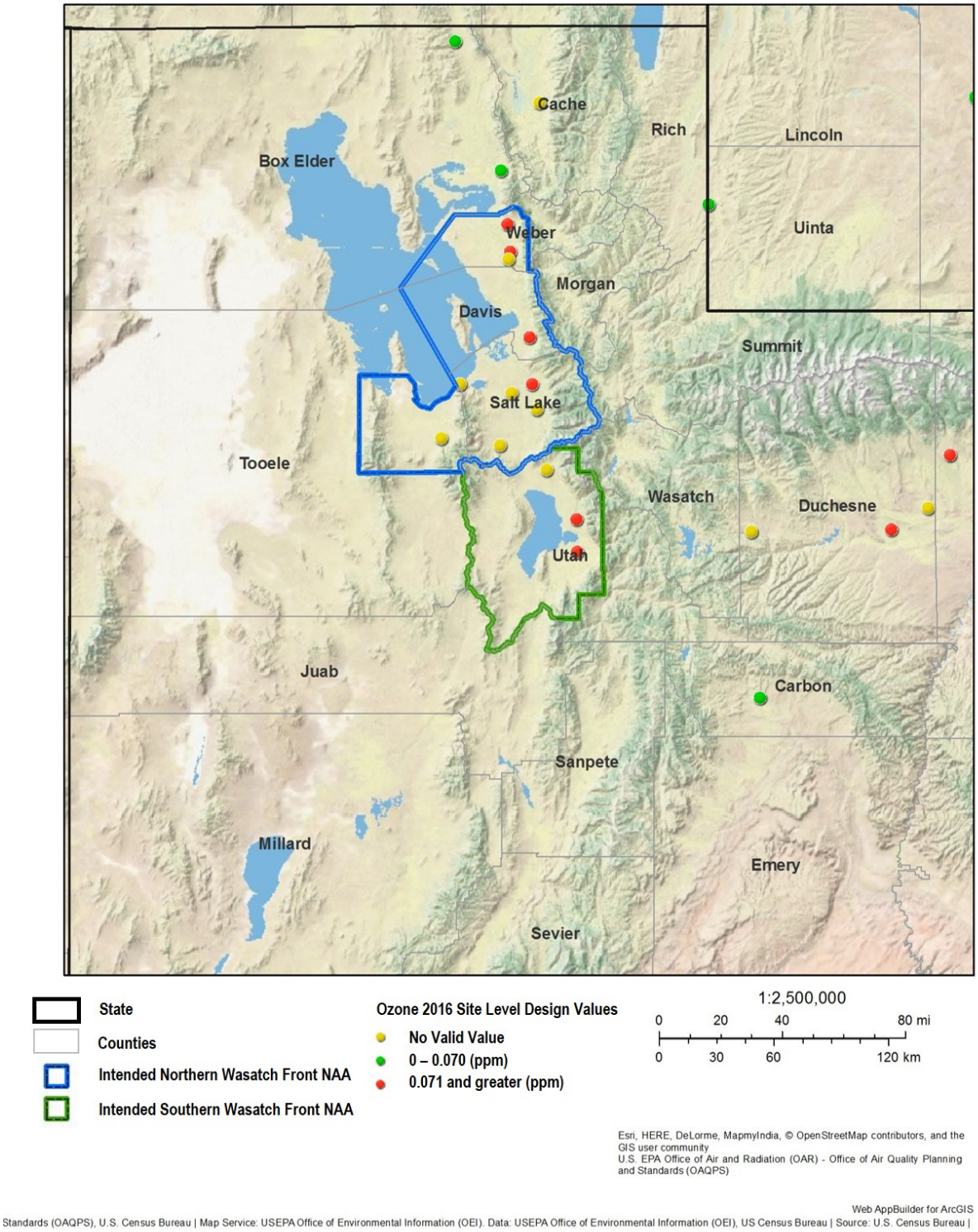
The above meteorological conditions, when combined with topography and other factors, help to define the airsheds of the northern and southern Wasatch Front areas. The back trajectory analysis done with HYSPLIT (Figures 7 through 12) indicates that emissions originating within Davis and Salt Lake Counties as well as the southern portion of Weber County, the northern portion of Utah County, and the eastern portion of Tooele County, appear to be the primary influencer on violating monitors. The EPA notes that a high frequency of days show parcels of air passing through the urbanized eastern portion of Tooele County that influence violating monitors. Additionally, very few days show parcels of air originating in both western Tooele County and Box Elder County that influence violating monitors. In general, the HYSPLIT analysis shows wind patterns predominantly from the south and from the north with the heaviest concentration of trajectories traveling through Salt Lake, Weber, Davis, and Utah Counties. This is consistent with the meteorological pattern discussed earlier, given that some local topographical influence on meteorology occurs on scales smaller than the HYSPLIT gridded meteorology.

Factor 4: Geography/topography

Consideration of geography or topography can provide additional information relevant to defining nonattainment area boundaries. Analyses should examine the physical features of the land that might define the airshed. Mountains or other physical features may influence the fate and transport of emissions as well as the formation and distribution of ozone concentrations. The absence of any such geographic or topographic features may also be a relevant consideration in selecting boundaries for a given area.

The EPA used geography/topography analysis to evaluate the physical features of the land that might affect the airshed and, therefore, the distribution of ozone over the area. Figure 13 provides an illustration of the topographical features in the area of analysis.

Figure 13. Topographic illustration of the physical features



There are two geographic features of this region that can affect airflow in the air of analysis. The impact of the Utah and Great Salt Lakes to the west and northwest of the urban centers are discussed in the previous section on meteorology. The impact of the mountain ranges is also briefly discussed on that section. The

State's analysis in their TSD provided with their boundary recommendation provides a thorough discussion of the impact of the mountain ranges and is included in italicized text below.

> *The Wasatch Front is located along the eastern edge of the Great Basin. The Wasatch Range, extending from near the Idaho border to Mt. Nebo at the southern tip of the Northern Rocky Mountains, is a formidable obstacle to surface air mass movement to and from the east. The Wasatch Mountains rise abruptly to elevations of between 4,000 to 6,000 feet above the valley floor and help to define the Wasatch Front urban areas from Brigham City on the north to the numerous metropolitan areas in Utah County on the south. These valleys are bound on the West by the Great Salt Lake in the north and the Oquirrh Mountains, which also rise 4,000 to 5,000 feet above the valley floor, in the south. In an area of flat terrain one would expect an air mass to gradually be transported in a direction consistent with the prevailing air flow. Conversely, in an area of mountainous terrain, as is the case of the valleys along the Wasatch Front, one would expect the terrain to define the air mass boundaries and movement. With prevailing winds from the west through the north, the high terrain with its bowl shaped valleys that open to the north and west routinely functions to block any eastward horizontal movement of a stagnant air mass. In effect, the local topography actually contains stagnant air masses within these valleys.*
>
> *As discussed in the meteorology section, it has been found in several studies that concentrations of ozone trapped in large mountain valleys along the Wasatch Front, such as the Salt Lake Valley and Utah Valley, actually move horizontally within or in and out of the valleys with the diurnal mountain-valley flow. In the Salt Lake Valley, for instance, the nighttime flow generally moves the air to the northwest over the eastern portion of the Great Salt Lake while the daytime flow moves the same air back southeastward into the valley where it is contained by the Wasatch Range. In Utah Valley, the air is more contained and generally moves westward over Utah Lake in the evening and eastward during the day. In some instances, however, the air mass in either the Salt Lake Valley or Utah Valley has moved north or south to affect the other valley. In the region north of Salt Lake City, air masses have a tendency to move both north and south along the Wasatch Front, as well as east and west with the diurnal flow.*
>
> *… much of the eastern area of the Wasatch Front counties is at a much higher elevation than the adjacent western valleys, and should generally not experience the high concentrations of ozone produced in these urban valleys.*

The EPA agrees with Utah's assessment that the geography of the region makes trapping of local pollutants likely under summer stagnation events. Notably, the Wasatch mountain range prevents ozone from impacting the higher elevation, eastern portions of Weber and Utah Counties. The Traverse Range mountains divide the Salt Lake Valley and Utah Valley; which roughly corresponds with the boundary between the proposed Northern and Southern Wasatch front nonattainment areas.

Factor 5: Jurisdictional boundaries

Once the geographic extent of the violating area and the nearby area contributing to violations is determined, the EPA considered existing jurisdictional boundaries for the purposes of providing a clearly

defined legal boundary to carry out the air quality planning and enforcement functions for nonattainment areas. In defining the boundaries of the intended nonattainment areas, the EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS. Examples of jurisdictional boundaries include, but are not limited to: counties, air districts, areas of Indian country, metropolitan planning organizations, and existing nonattainment areas. If an existing jurisdictional boundary is used to help define the nonattainment area, it must encompass all of the area that has been identified as meeting the nonattainment definition. Where existing jurisdictional boundaries are not adequate or appropriate to describe the nonattainment area, the EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the intended designated areas.

The State's analysis in their TSD provided with their boundary recommendation provides an explanation of why jurisdiction supports the State's recommendation that the Wasatch Front be designated as two separate nonattainment areas.

> *Within the Salt Lake City-Provo-Orem CSA there are three MSAs and two distinct metropolitan planning organizations (MPO) that carry out transportation planning for those MSAs. Wasatch Front Regional Council is the MPO that carries out regional transportation planning in Salt Lake, Tooele, Davis, Weber, Morgan, and Box Elder counties. The Mountainland Association of Governments (MAG) is the MPO responsible for transportation planning in Utah County. These two areas are also designated as two separate nonattainment areas for $PM_{2.5}$. Designating all of these counties as one nonattainment area would create major hurdles for MAG and WFRC within the transportation planning and conformity requirements and obligations under the Act.*

Conclusion for Wasatch Front Area

Based on the assessment of factors described above, the EPA does not intend to modify Utah's recommendation to designate two separate areas with the boundaries recommended by the state: The Northern Wasatch Front area and the Southern Wasatch Front area. The EPA has concluded that the following counties meet the CAA criteria for inclusion in the intended Northern Wasatch Front nonattainment area: all of Davis and Salt Lake Counties, and portions of Weber and Tooele Counties. The EPA has also concluded that a portion of Utah County meets the criteria for inclusion in the intended Southern Wasatch front nonattainment area. These are the same counties included in, and the same boundaries for the Northern Wasatch Front and Southern Wasatch Front nonattainment areas for the 2006 $PM_{2.5}$ NAAQS - with the exception that no portion of Box Elder County would be included as part of the Northern Wasatch Front area for the 2015 ozone NAAQS.

The air quality monitors in Salt Lake, Davis, Utah, and Weber Counties indicate violations of the 2015 ozone NAAQS based on the 2016 design values, therefore all or portions of these counties are included in the intended nonattainment areas. Tooele County does not have a monitor with complete 2014-2016 data, but the EPA has concluded that a portion of the county contributes to the ozone concentrations measured at monitors in violation of the 2015 ozone NAAQS. This conclusion is reached based on the significant number of back trajectories from that area to downwind violating monitors on days that those monitors are exceeding the NAAQS. On-road mobile and area sources from that area in Tooele County account for much of the VOCs and NO_x emitted in the County. That area also includes the more densely populated urban area of the county which is well integrated with the counties with violating monitors based on commuting

patterns. The great majority (more than 85%) of Tooele County's population is contained within the area EPA intends to include in the Northern Wasatch Front nonattainment area. All of the areas the state has recommended and that the EPA intends to include in the two designated nonattainment areas are within Utah Valley and the valleys along the eastern and southern shores of the Great Salt Lake. The EPA does not intend to modify the State's recommendation not to include the portions of Utah and Weber County that are at higher elevations in the Wasatch Mountain range. As discussed, high ozone concentrations are generally found at the lower elevations while the mountain range prevents ozone, and ozone precursors from moving into eastern, higher elevation portions of counties. Moreover, we note that these portions of the counties are relatively rural, have low VMT, and do not contain any major sources.

Although Box Elder County was included within the 2006 $PM_{2.5}$ nonattainment boundary, the EPA finds sufficient evidence to exclude Box Elder from the 2015 ozone nonattainment boundary. The county includes two monitors that are attaining the 2015 ozone NAAQS. Although the EPA finds that the county contains emissions of ozone precursors from point, area, and mobile sources, the back trajectory analysis indicates that meteorological conditions result in these emissions infrequently influencing violating monitors within the proposed nonattainment area. Furthermore, commuting information shows that relatively few (approximately 11,000) people commute from Box Elder County into a county with a violating monitor.

Finally, the EPA does not intend to include Summit, Juab, Wasatch, and Morgan Counties. All of these areas have low populations (less than 40,000) and population densities less than 25 per square mile. They also have significantly lower emissions than the counties and partial counties EPA intends to include in the nonattainment area. Furthermore, topographic obstacles (Wasatch Mountains), as well as meteorology, prevent emissions in these areas from influencing violating monitors.

The EPA finds that the weight-of-evidence presented through the five-factor analysis supports the State's recommended boundaries for the Southern Wasatch Front and Northern Wasatch Front nonattainment areas for the 2015 ozone NAAQS. The EPA concludes that designating the nonattainment boundaries as proposed will support Utah's ability to focus resources on the emission sources and areas that most strongly contribute to the ozone problem along the Wasatch Front.

3.2 Technical Analysis for Uinta Basin

This technical analysis identifies the areas with monitors that violate the 2015 ozone NAAQS. It also provides EPA's evaluation of these areas and any nearby areas to determine whether those nearby areas have emissions sources that potentially contribute to ambient ozone concentrations at the violating monitors in the area, based on the weight-of-evidence of the five factors recommended in the EPA's ozone designations guidance and any other relevant information. In developing this technical analysis, the EPA used the latest data and information available to the EPA (and to the states and tribes through the Ozone Designations Mapping Tool and the EPA Ozone Designations Guidance and Data web page).[11] In addition, the EPA considered any additional data or information provided to the EPA by states or tribes.

The EPA evaluated emissions, air quality, and other information for counties in the Uinta Basin in Utah. Based on existing air quality studies (discussed later) – ozone production in the basin is a highly localized phenomenon. The Uinta basin is a winter ozone area, where violating ozone concentrations are dependent

[11] The EPA's Ozone Designations Guidance and Data web page can be found at *https://www.epa.gov/ozone-designations/ozone-designations-guidance-and-data.*

on stagnant winter conditions associated with strong temperature inversions. These conditions limit the influence of areas outside the topographic Uinta Basin. The Uinta Basin lies primarily within Uintah and Duchesne counties of Utah. The role of winter temperature inversions in producing ozone near the basin floor means that contributing emission sources are those at relatively low elevations within the basin. The only low elevation portion of the basin outside Uintah and Duchesne counties lies along the White River in Rio Blanco County, Colorado. The area of analysis was determined to be Uintah County and Duchesne County in Utah, and the White River valley in Rio Blanco County, Colorado. Uintah County is in the Vernal CBSA, while Duchesne and Rio Blanco Counties are not in CBSAs.

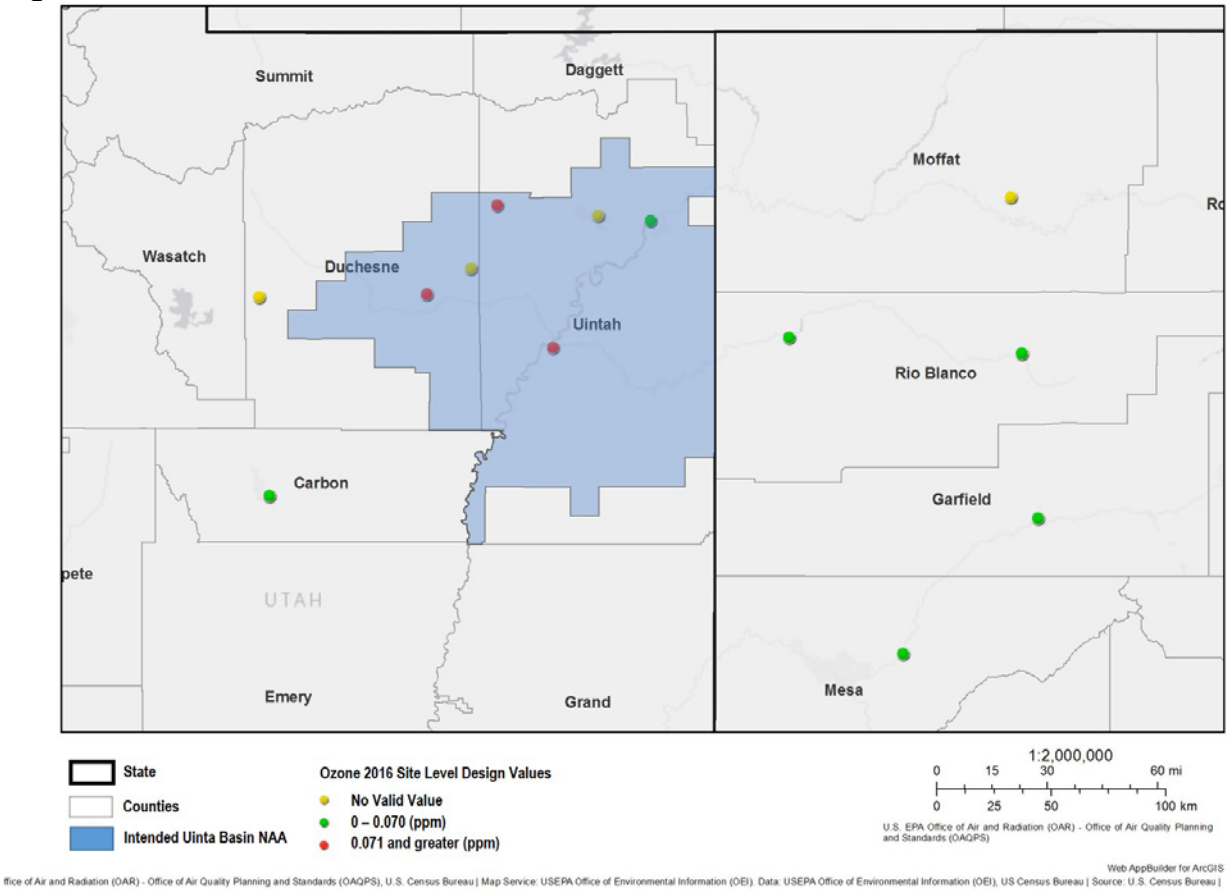
The five factors recommended in the EPA's guidance are:

1. Air Quality Data (including the design value calculated for each Federal Reference Method (FRM) or Federal Equivalent Method (FEM) monitor;
2. Emissions and Emissions-Related Data (including locations of sources, population, amount of emissions, and urban growth patterns);
3. Meteorology (weather/transport patterns);
4. Geography/Topography (including mountain ranges or other physical features that may influence the fate and transport of emissions and ozone concentrations); and
5. Jurisdictional Boundaries (e.g., counties, air districts, existing nonattainment areas, areas of Indian country, Metropolitan Planning Organizations (MPOs)).

As described in Section 1, the state of Utah recommended that only the portion of the Uinta Basin in townships at elevations below 6,000 feet be designated nonattainment, while the Ute Indian Tribe recommended that only the portion of the Uinta Basin around the Ouray monitor be designated nonattainment.

Figure 14 is a map of the EPA's intended nonattainment boundary for the Uinta Basin area. The map shows the location of the ambient air quality monitors, county, and other jurisdictional boundaries.

Figure 14. EPA's Intended Nonattainment Boundaries for the Uinta Basin



The EPA must designate as nonattainment any area that violates the NAAQS and any nearby areas that contribute to the violation in the violating area. Uintah and Duchesne Counties have monitors in violation of the 2015 ozone NAAQS, therefore these counties (or portions of these counties) are included in the intended nonattainment area. As previously noted and as explained in more detail in the section discussing meteorology, the EPA determined based on existing air quality studies completed in the Uinta Basin, that sources in surrounding counties do not contribute to the violating area because of the unique geographic features of the area and the winter temperature inversion meteorology. The following sections describe the five factor analysis for the area within the Uinta Basin to determine the areas within the basin that are contributing to a violation of the 2015 ozone NAAQS. While the factors are presented individually, they are not independent. The five factor analysis process carefully considers the interconnections among the different factors and the dependence of each factor on one or more of the others, such as the interaction between emissions and meteorology for the area being evaluated.

Factor Assessment

Factor 1: Air Quality Data

The EPA considered 8-hour ozone design values in ppm for air quality monitors in the area of analysis based on data for the 2014-2016 period (i.e., the 2016 design value, or DV). This is the most recent three-year period with fully-certified air quality data. The design value is the 3-year average of the annual 4th

highest daily maximum 8-hour average ozone concentration.[12] The 2015 NAAQS are met when the design value is 0.070 ppm or less. Only ozone measurement data collected in accordance with the quality assurance (QA) requirements using approved (FRM/FEM) monitors are used for NAAQS compliance determinations.[13] The EPA uses FRM/FEM measurement data residing in the EPA's Air Quality System (AQS) database to calculate the ozone design values. Individual exceedances of the 2015 ozone NAAQS that the EPA determines have been caused by an exceptional event that meets the administrative and technical criteria in the Exceptional Events Rule[14] are not included in these calculations. Whenever several monitors are located in a county (or designated nonattainment area), the design value for the county or area is determined by the monitor with the highest valid design value. The presence of one or more violating monitors (i.e. monitors with design values greater than 0.070 ppm) in a county or other geographic area forms the basis for designating that county or area as nonattainment. The remaining four factors are then used as the technical basis for determining the spatial extent of the designated nonattainment area surrounding the violating monitor(s) based on a consideration of what nearby areas are contributing to a violation of the NAAQS.

The EPA identified monitors where the most recent design values violate the NAAQS, and examined historical ozone air quality measurement data (including previous design values) to understand the nature of the ozone ambient air quality problem in the area. Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) and tribal air monitoring stations that are operated in accordance with 40 CFR part 58, appendix A, C, D and E and operating with an FRM or FEM monitor. These requirements must be met in order to be acceptable for comparison to the 2015 ozone NAAQS for designation purposes. All data from Special Purpose Monitors (SPMs) using an FRM or FEM are eligible for comparison to the NAAQS, subject to the requirements given in the March 28, 2016 Revision to Ambient Monitoring Quality Assurance and Other Requirements Rule (81 FR 17248).

The 2014-2016 design values for counties in the Uinta Basin are shown in Tables 6 and 7 (State and Tribal jurisdiction). The design values shown reflect the concurrence on an exceptional event demonstration made by the Ute Indian Tribe of the Uintah and Ouray Reservation impacting ozone data collected on June 8 and 9, 2015. The Ute Tribe successfully showed that the ozone exceedances at tribal monitors on those days were caused by a stratospheric intrusion exceptional event.[15]

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[12] The specific methodology for calculating the ozone design values, including computational formulas and data completeness requirements, is described in 40 CFR part 50, appendix U.

[13] The QA requirements for ozone monitoring data are specified in 40 CFR part 58, appendix A. The performance test requirements for candidate FEMs are provided in 40 CFR part 53, subpart B.

[14] The EPA finalized the rule on the Treatment of Data Influenced by Exceptional Events (81 FR 68513) and the guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events in September of 2016. For more information, see *https://www.epa.gov/air-quality-analysis/exceptional-events-rule-and-guidance.*

[15] The EE was acted on by EPA on June 7, 2017 with concurrence from Sarah Dunham, Acting Assistant Administrator for the Office of Air and Radiation.

Table 6. Air Quality Data – Utah and Colorado State Land (all values in ppm)

County, State	State Recommended Nonattainment?	AQS Site ID	2014-2016 DV	2014 4th highest daily max value	2015 4th highest daily max value	2016 4th highest daily max value
Rio Blanco, CO	No	08-103-0006 (Rangely)	**0.063**	0.062	0.066	0.061
Duchesne, UT	Yes (partial)	49-013-0002 (Roosevelt)	N/A	0.062	0.060	0.081
Uintah, UT	Yes (partial)	49-047-1002 (Dinosaur NM)	0.068	0.064	0.067	0.075
		49-047-1003 (Old Vernal)	N/A	0.062	N/A	N/A
		49-047-1004 (New Vernal)	N/A	N/A	0.064	0.073

The highest design value in each county is indicated in bold type.
N/A means that the monitor did not meet the completeness criteria described in 40 CFR, part 50, Appendix U, or no data exists for the county.

Table 7. Air Quality Data – Ute Indian Tribal Land (all values in ppm)

County, State	Tribe Recommended Nonattainment?	AQS Site ID	2014-2016 DV	2014 4th highest daily max value	2015 4th highest daily max value	2016 4th highest daily max value
Duchesne, UT	No	49-013-7011 (Myton)	**0.072**	0.067	0.065	0.085
Uintah, UT	No (or partial)	49-047-2002 (Redwash)	N/A	0.061	0.066	0.083
		49-047-2003 (Ouray)	**0.080**	0.079	0.067	0.096
		49-047-7022 (Whiterocks)	0.071	0.064	0.068	0.081

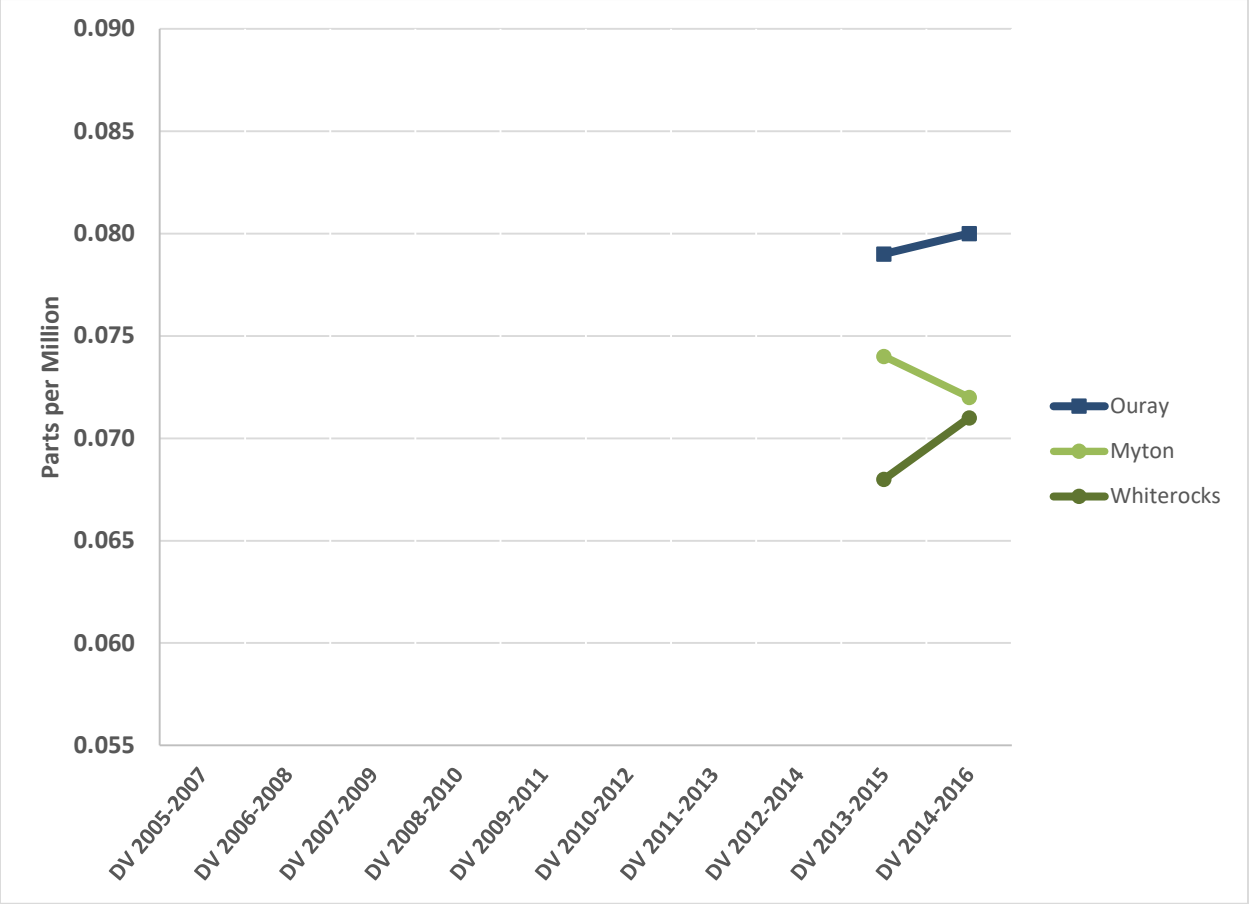
The highest design value in each county is indicated in bold type.
N/A means that the monitor did not meet the completeness criteria described in 40 CFR, part 50, Appendix U, or no data exists for the county.

Monitors within Uintah and Duchesne Counties on tribal land show violations of the 2015 ozone NAAQS; therefore, these counties with violating monitors are included in whole or in part in the intended nonattainment area. The Rangely monitor in Rio Blanco County is well below the NAAQS with a design value of 0.063 ppm.

Figure 14, shown previously, identifies the Uinta Basin intended nonattainment area and the violating monitors. Tables 6 and 7 identify the design values for all monitors in the area of analysis and Figure 15 shows the historical trend of design values for the violating monitors. Regulatory data collection in the Uinta Basin has only occurred since 2011. As indicated on the map, there are three violating monitors that are located at 1) the Myton site in Duchesne County, about six miles west of the community of Myton; 2) the Ouray site in Uintah County near the confluence of the Green and White Rivers, about 24 miles southeast of the town of Roosevelt; and 3) the Whiterocks site in Uintah County, twenty miles west of the town of Vernal and 1.5 miles northeast of the community of Whiterocks. Other monitors within Uintah and

Duchesne Counties have incomplete data for 2014-2016, so the EPA cannot calculate valid design values in accordance with 40 CFR part 50, appendix U.

Figure 15. Three-Year Design Values for Uinta Basin Monitors (2007-2016)



Regulatory ozone measurements showing recurring exceedances have been conducted at two monitoring sites above 6,000 feet in the Uinta Basin. The Whiterocks monitoring station of the Ute Indian Tribe of the Uintah and Ouray Reservation is at an elevation of 6,216 feet,[16] and the Rabbit Mountain/Dragon Road Prevention of Significant Deterioration (PSD) monitoring station operated by ENEFIT was at an elevation of 6,165 feet. Both have recorded exceedances of the 70 ppb ozone standard. Whiterocks recorded two exceedances in 2011 and thirteen exceedances in 2013 prior to becoming a regulatory monitor (highest recorded 8-hour average was 107 ppb on January 22, 2013). Whiterocks then recorded four regulatory exceedances in December 2013, and seven in February 2016 (highest regulatory value 86 ppb on February 12, 2016) leading to a NAAQS violation. The Rabbit Mountain/Dragon Road monitor was a regulatory PSD monitor that operated throughout 2012 and for the first half of 2013. It recorded five non-winter ozone exceedances in April-August 2012 (with a highest value of 77 ppb), and 11 exceedances in January and February of 2013 (with a high of 107 ppb on January 26, 2013).

[16] Monitor site data in the AQS database shows an elevation of 1,893 meters, or 6,211 feet. Examination of the station siting on GIS maps gives an elevation of 6,216 feet.

Based on the EPA's review of regulatory monitors in the Uinta Basin, the data shows that an elevation of 6,000 feet does not include all portions of the area violating the NAAQS and based on EPA's analysis here, it does not include all of the portions of the area contributing to violations of the NAAQS. Thus, it is not a practical upper boundary for the Uinta Basin ozone nonattainment area. Table 8 shows the elevation of the regulatory monitors in the Uinta basin, with summaries of their ozone measurements during the 2013 winter ozone study in the basin. The elevation of the highest monitor is 6,216 feet.

Table 8. Winter 2013 Ozone Monitors

Site Name	Latitude	Longitude	Elevation	Number of Daily Winter 2013 Values over 70 ppb	Winter 2013 4th High (ppb)
Dinosaur N. M.	40.4372	-109.3047	1463 m (4,800 ft)	34	113
Ouray	40.05671	-109.688108	1467 m (4,813 ft)	39	132
Myton	40.216779	-110.182742	1606 m (5,269 ft)	27	97
Roosevelt	40.2942178	-110.009732	1596 m (5,236 ft)	32	104
Vernal	40.452267	-109.510393	1605 m (5,265 ft)	23	102
Rangely, CO	40.086944	-108.761389	1655 m (5,430 ft)	13	91
Redwash	40.206291	-109.353932	1702 m (5,584 ft)	36	114
Rabbit Mountain	39.868622	-109.097302	1879 m (6,165 ft)	11	82
Whiterocks	40.483598	-109.906796	1895 m (6,216 ft)[17]	13	86

Unlike most areas where photochemical ozone production is a summertime phenomenon, the Uinta Basin is a winter ozone area. For 2013-2015, regulatory monitors in the Uinta Basin recorded 54 days above the level of the 2015 NAAQS in the months of December through March, and only four days above that level in other months (including June 8-9, 2015 mentioned earlier as stratospheric intrusion exceptional event days). For 2014-2016, regulatory monitors recorded 19 days above the standard December through March, and only those two days in June 2015 were above the standard in other months. The causes of winter ozone formation will be discussed under factor 3 (Meteorology). Overall, the air quality data support designating all or portions of Duchesne and Uintah County (including tribal lands) as nonattainment of the 2015 ozone NAAQS.

[17] Latitude, longitude and elevation are as shown in the AQS database with the exception of the elevation of the Whiterocks station, which is taken from digital map data.

Factor 2: Emissions and Emissions-Related Data

The EPA evaluated ozone precursor emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOC) and other emissions-related data that provide information on areas contributing to violating monitors.

Emissions Data

The EPA reviewed data from the 2014 National Emissions Inventory (NEI). For each county in the area of analysis, the EPA examined the magnitude of large sources (NO_x or VOC emissions greater than 100 tons per year) and small point sources and the magnitude of county-level emissions reported in the NEI. These county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, non-road mobile, on-road mobile, and fires. Emissions levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations.

Table 9 provides a county-level emissions summary of NO_x and VOC (given in tons per year (tpy)) emissions for the area of analysis considered for inclusion in the intended Uinta Basin nonattainment area. As shown in the table, Uintah County contributes the majority of VOC emissions – approximately 58% of the area of analysis. Duchesne County contributes approximately 36% of the total, while Rio Blanco's county-wide VOC emissions account for about 6% of the area-wide VOC emissions. Uintah and Duchesne Counties each contribute similar amounts to the NOx emissions in the area while Rio Blanco in Colorado contributes roughly 2,500 tpy less than either of the Utah Counties.

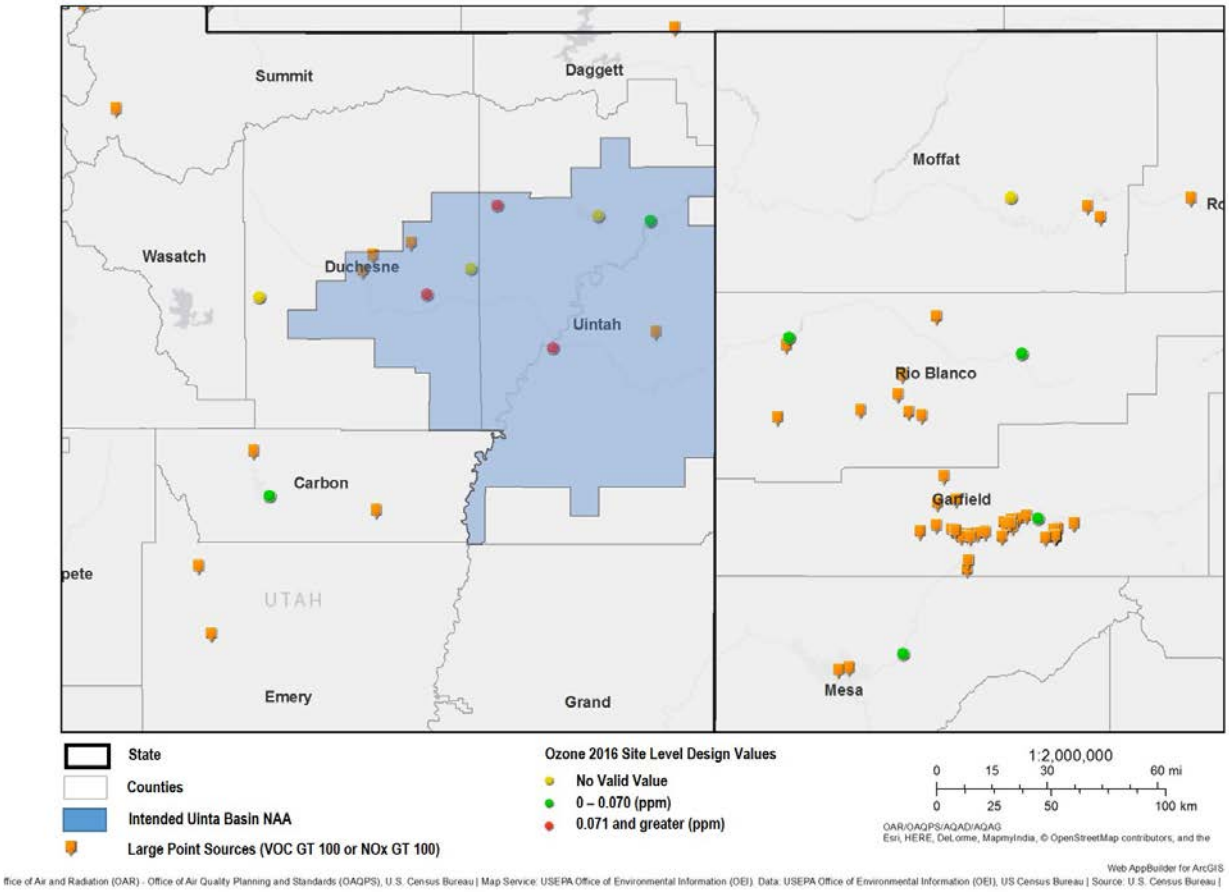
Table 9. Total County-Level NOx and VOC Emissions.

County	State Recommended Nonattainment	Total NOx (tpy)	Total VOC (tpy)
Duchesne	Yes (partial)*	9,352	55,880
Uintah	Yes (partial)*	9,116	88,592
Rio Blanco	No	6,746	9,330
	Area Wide:	25,214	153,802

* For state recommended partial counties, the emissions shown are for the entire county.

In addition to reviewing county-wide emissions of NO_x and VOC in the area of analysis, the EPA also reviewed emissions from large point sources. The location of these sources, together with the other factors, can help inform nonattainment boundaries. The locations of the large point sources are shown in Figure 16 below. The intended nonattainment boundary is also shown. In Utah, two of the four large point sources (natural gas compressor stations around Altamont in Duchesne County) are located outside the boundary recommended by the State, which includes only townships below 6,000-ft elevation. If townships below 6,250 ft are included, a third compressor station near Altamont would be within the nonattainment area. Two other large sources are within the state-recommended boundary: a compressor station at 5,870 feet; and the Bonanza power station at 5,935 feet elevation on Indian country in Uintah County. In Colorado, there are two large point sources in the western portion of Rio Blanco county which could be considered to be within the Uinta Basin (a compressor station and an oil and gas processing facility). These two facilities contribute approximately 9% and 1% of the Rio Blanco county-level NOx and VOC emissions, respectively.

Figure 16. Large Point Sources in the Area of Analysis



In addition to looking at total overall emissions and large point source emissions for the county, we also reviewed the VOC and NO_X emissions by source sector in the Uinta Basin from the 2014 National Emissions Inventory, which shows that emissions from the production segment of the oil and natural gas sector were estimated to be the largest anthropogenic contributor of VOC and NO_X emissions in the area of analysis. These sources are located on both state and tribal land. As indicated by Utah in their TSD, approximately 80 percent of oil and gas production occurs on tribal land. As shown in Figure 17 (from Utah's TSD), oil and gas development is prevalent in most of central and southern Uintah County. In Duchesne County, oil and gas development has occurred mostly in the eastern 2/3 of the county. For both Uintah and Duchesne Counties, the northern portions of the counties are undeveloped and lack any significant emission sources; and include large areas of U. S. Forest Service land.

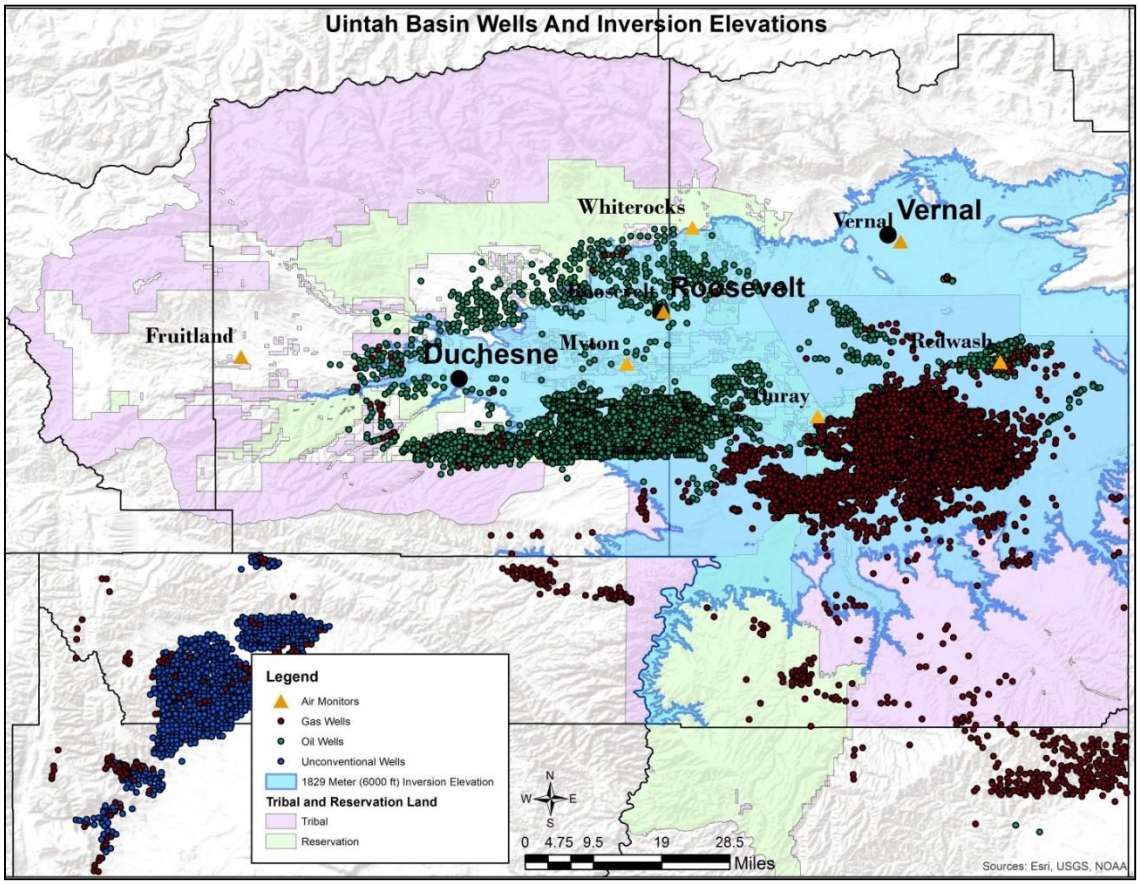
While most of these sources are located at the lower elevations in the basin, based on the information from the Utah Department of Oil, Gas, and Mining[18] and data submitted by operators in the 2014 Uinta Basin Emissions Inventory[19] (included in Version 2 of the 2014 NEI), 85 percent of facilities representing 88 percent of emissions in Uintah and Duchesne Counties are in townships below 6,000 ft in elevation. If

[18] Based on wells included in the EPA's intended boundary compared with all wells in Uintah and Duchesne Counties. The well locations were obtained from the Utah Department of Oil, Gas, and Mining

[19] Emissions information was obtained from the 2014 Uinta Basin Emissions Inventory for all sources located below 6,250 ft.

townships below 6,250 feet are included, 93 percent of all wells and 92 percent of all oil and natural gas emissions would be within the boundary.

Figure 17. Uinta Basin oil and gas wells and the State-recommended 6,000-ft elevation (blue)



Population density and degree of urbanization

In this part of the factor analysis, the EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. These include emissions of NO_x and VOC from on-road and non-road vehicles and engines, consumer products, residential fuel combustion, and consumer services. Areas of dense population or commercial development are an indicator of area source and mobile source NO_x and VOC emissions that may contribute to violations of the NAAQS. Table 10 shows the population, population density, and population growth information for each county in the area of analysis.

Table 10. Population and Growth

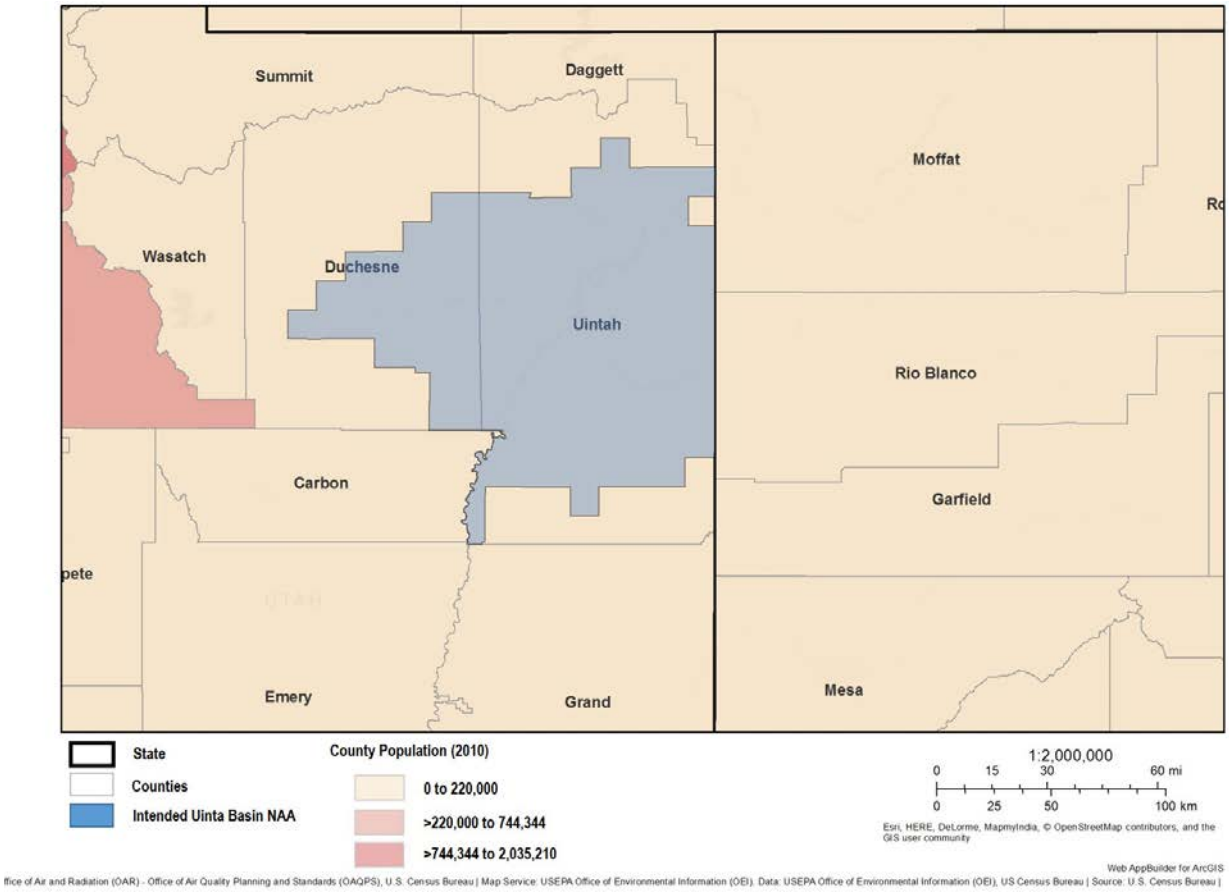
County Name	State Recommended Nonattainment	2010 Population	2015 Population	2015 Populations Density (per sq. mi.)	Absolute Change in Population (2010-2015)	Population % Change (2010-2015)
Uintah County	Yes (partial)*	32,588	37,928	8	5,340	16
Duchesne County	Yes (partial)*	18,607	20,862	6	2,255	12
Rio Blanco	No	6,666	6,571	2	-95	-1

* For state recommended partial counties, the data are for the entire county.

Source: U.S. Census Bureau population estimates for 2010 and 2015.
www.census.gov/data.html.

The Uinta Basin is predominantly rural and contains a sparse population (see Figure 18). Although there has been a significant population change for Uintah and Duchesne counties, because of the sparse population, the absolute change in population is relatively small. Rio Blanco County has seen a one percent decline in population between 2010 and 2015. Most of the largest population centers are located in the basin at the lower elevations: Myton, Roosevelt, Duchesne, Fort Duchesne, and Rangely.

Figure 18. County-Level Population



Traffic and Vehicle Miles Travelled (VMT)

The EPA evaluated the commuting patterns of residents, as well as the total vehicle miles traveled (VMT) for the area of analysis. In combination with the population/population density data and the location of main transportation arteries, this information helps identify the probable location of non-point source emissions. A county with high VMT and/or a high number of commuters is generally an integral part of an urban area and high VMT and/or high number of commuters indicates the presence of motor vehicle emissions that may contribute to violations of the NAAQS. Rapid population or VMT growth in a county on the urban perimeter may signify increasing integration with the core urban area, and thus could indicate that the associated area source and mobile source emissions may be appropriate to include in the nonattainment area. In addition to VMT, the EPA evaluated worker data collected by the U.S. Census Bureau[20] for the counties in the area of analysis. Table 11 shows the traffic and commuting pattern data, including total VMT for each county in the area of analysis, number of residents who work in each county, number of residents that work in counties with violating monitor(s), and the percent of residents working in counties with violating monitor(s). The data in Table 11 are from 2014.

[20] The worker data can be accessed at: http://onthemap.ces.census.gov/.

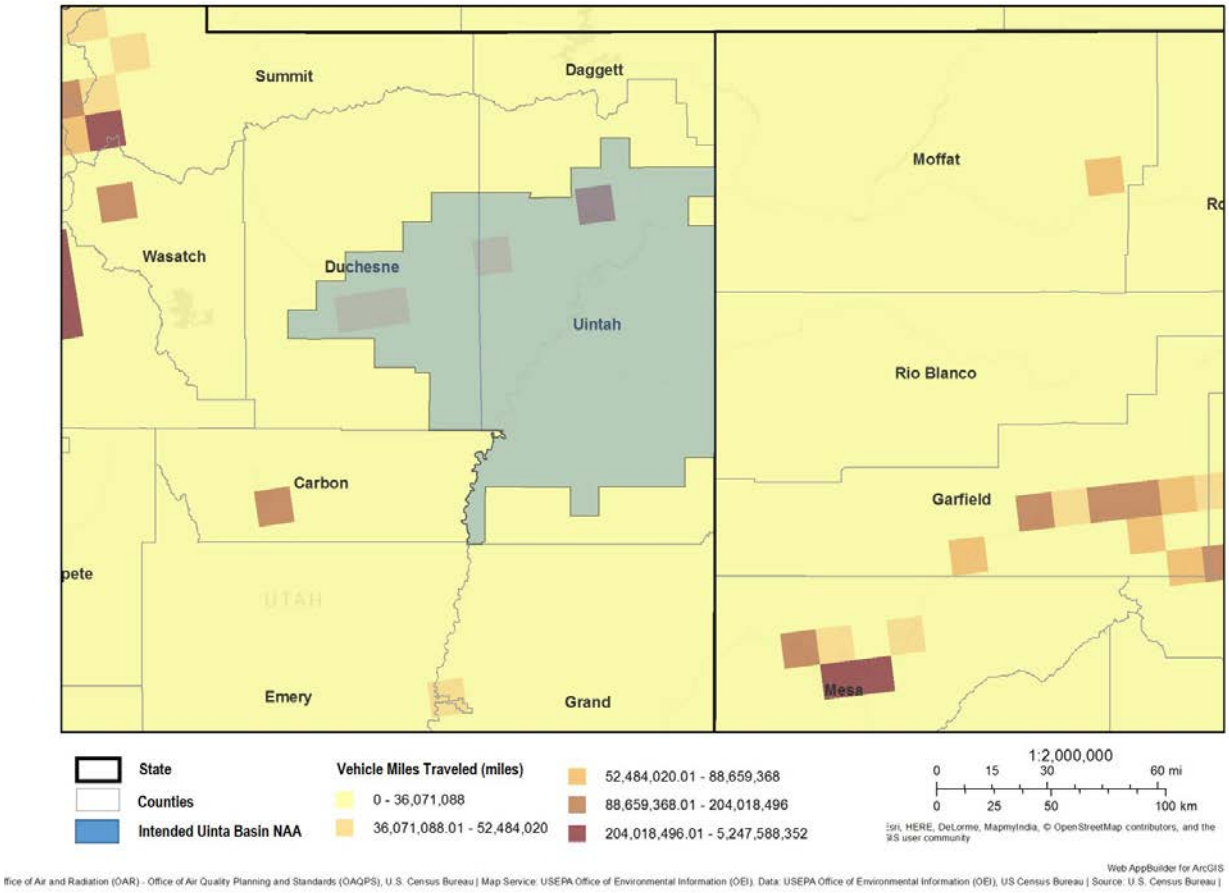
Table 11. Traffic and Commuting Patterns.

County	State Recommended Nonattainment?	2014 Total VMT (Million Miles)	Number of County Residents Who Work	Number Commuting to or Within Counties with Violating Monitor(s)	Percentage Commuting to or Within Counties with Violating Monitor(s)
Uintah	Yes (partial)*	428	16,723	11,710	70.0%
Duchesne	Yes (partial)*	283	8,981	5,789	64.5%
Rio Blanco	No	138	2,985	63	2.1%
	Total:	849	28,689	17,562	61.2

* For state recommended partial counties, the data provided are for the entire county.
Counties with a monitor(s) violating the NAAQS are indicated in bold.

To show traffic and commuting patterns, Figure 19 overlays twelve-kilometer gridded VMT from the 2014 NEI with a map of the transportation arteries.

Figure 19. Twelve Kilometer Gridded VMT (Miles) Overlaid with Transportation Arteries



As shown in Figure 19 and Table 11, commuting patterns and mobile source emissions are not large components of the VOC and NO_x emissions inventory (0.2 percent and 10 percent, respectively) in the basin and are consistent with the rural character of the region.

Factor 3: Meteorology

Evaluation of meteorological data helps to assess the fate and transport of emissions contributing to ozone concentrations and to identify areas potentially contributing to the monitored violations. Results of meteorological data analysis may inform the determination of nonattainment area boundaries.

The Uinta Basin winter meteorology combines with the basin's topography to create elevated ozone concentrations. The bowl shaped basin is surrounded on each side by much larger mountain ranges with varying heights from over 7,500 to 13,000 feet. In environments such as this one, cooler, denser air becomes trapped in the basin when warmer air overrides the area during high pressure events. Subsidence from high pressure ridges and low surface winds in a stable environment do not allow for the normal atmospheric mixing (that would occur with positive lapse rates) during these events; only cooler temperatures aloft, high winds, or surface warming can break down an inversion and allow pollutants to mix out of the basin.

The ground level inversion in the Uinta Basin is persistent with snow cover. The sun's rays cannot reach the ground covered by snow to warm the surface. At night, cold, downsloping winds from the surrounding mountains can strengthen the inversion. The super-stable atmosphere allows emissions to accumulate, and the sunny conditions during the daytime let photochemical reactions take place. Only emissions with enough heat, plume velocity, or stack height can escape the inversion, depending on the boundary layer height, and enter the unstable atmosphere above the inversion. Many sources in the Uinta Basin emit VOC's with low heat, velocity, and stack heights, and a large portion of VOC emissions come from fugitive emissions and leaks. Taking into account atmospheric dispersion and turbulent flow plume dynamics for the majority of sources in the Uinta Basin, emissions do not have an opportunity to escape the boundary layer under the temperature inversion. Because of the meteorological factors that cause the boundary layer height to oscillate, and nighttime downslope winds, no static altitude of an inversion height throughout the basin always applies, and emissions above a given elevation can descend to lower elevations with nighttime orographic (downslope) flow.

Unique meteorological and topographic features result in the winter conditions that lead to ozone violations in the Uinta Basin. These unique features are strong and persistent temperature inversions forming over snow covered ground, elevated terrain completely surrounding a low basin, and abundant ground level emissions of ozone precursors from widely dispersed oil and gas production emission sources. Data from recent wintertime research campaigns was evaluated to determine how meteorology impacts the geographic extent of high ozone concentrations and the ability of emissions at a given elevation to migrate and produce ozone at other elevations (higher or lower than the emission point).

As noted in the Wasatch Front discussion, the HYSPLIT model is traditionally used to evaluate the impact of meteorology on sources and impacted monitors. However, in the case of the Uinta Basin, the complex metrological events that result in high ozone events are beyond the capabilities of the HYSPLIT tool. Uinta Basin winter ozone forms under strong, shallow temperature inversions. The strong temperature inversions decouple surface winds, which control movement of locally emitted ozone precursors and ozone from the regional meteorology present above the inversion level. HYSPLIT relies on generalized, gridded meteorological data, and the gridded data files HYSPLIT relies upon to predict air movement are unable to accurately represent the local surface winds measured by weather stations. Consequently, the EPA relied on

air quality studies completed in the Uinta Basin to determine the effect of meteorology in determining an appropriate nonattainment area boundary, rather than HYSPLIT trajectories.

Wintertime ozone is formed in cold periods, generally with snow cover and under clear skies. Utah described the impact of winter weather on ozone formation.[21]

> *The wintertime photochemical ozone production in the Basin requires snow on the ground, a shallow boundary layer, stagnation and a persistent temperature inversion capping the shallow ozone production layer. The snow helps to keep the surface cold, reinforcing the production and maintenance of the temperature inversion. Snow also reflects daytime solar radiation that enhances photochemical ozone production. The inversion layer traps the emissions from the wells, pipelines, and compressor stations in a shallow layer where the rapid photochemical ozone production occurs.*

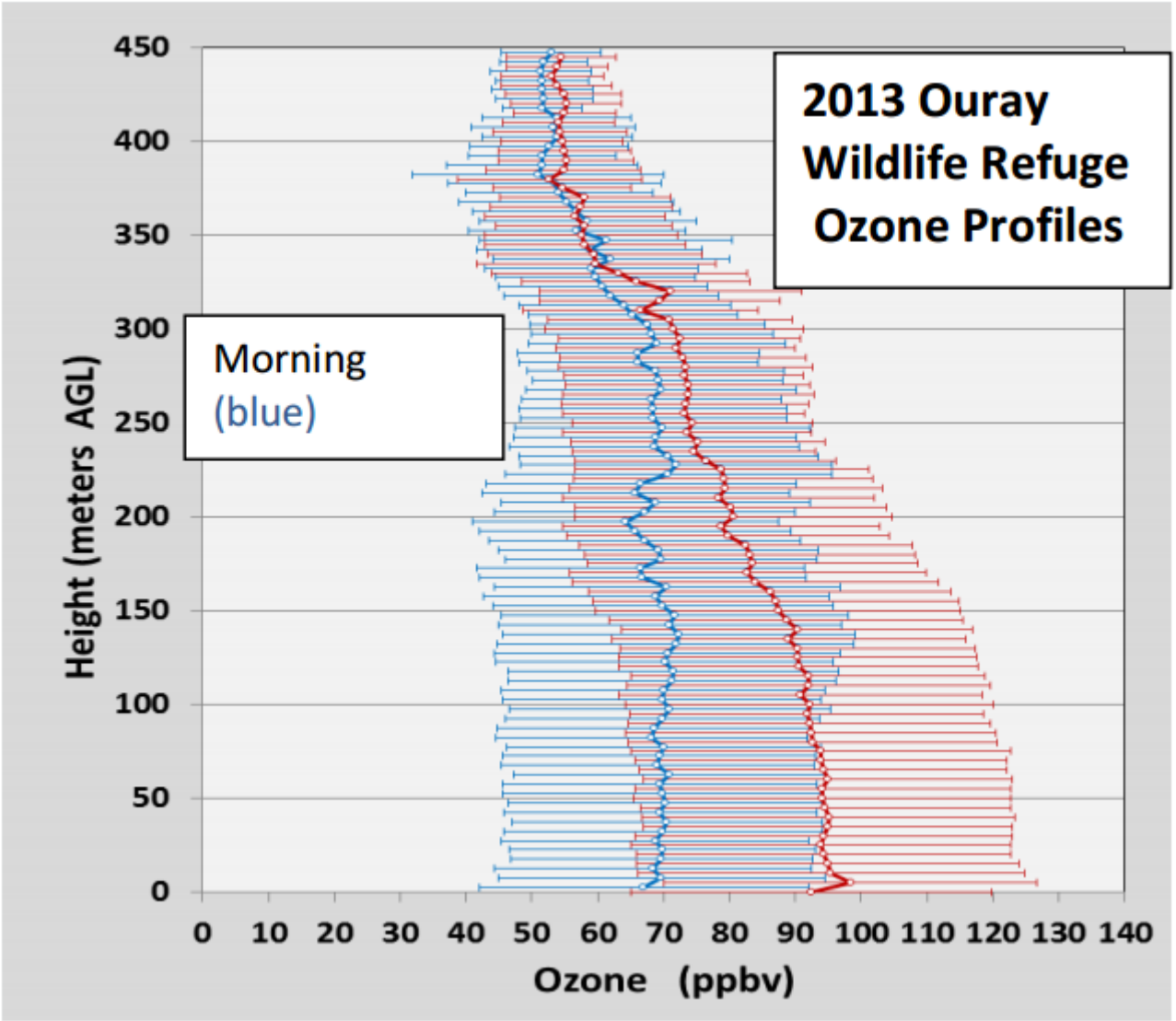
Utah bases its recommendation for an upper elevation limit on results from the 2013 Uinta Basin Winter Ozone Study.

> *This vertical limit to the high ozone and the chemistry that forms high ozone was observed at 1,700 meters (5,577 feet) during one of the strongest winter inversions studied and experienced the highest ozone values recorded (UBOS 2013*).

Ozonesondes were launched primarily from the Ouray National Wildlife Refuge, at 1,430-meter elevation (4,692 feet) and from Fantasy Canyon, at 1,470 meters (4,823 feet). A few sondes were launched from the Horsepool site, at 1,569 meters (5,148 feet). In general, the ozonesondes found surface ozone was elevated through the lower 300 meters (984 feet) of the atmosphere on high ozone days. Averages and extremes of ozone concentration as a function of ozonesonde height at the Ouray National Wildlife Refuge site from the 2013 winter study are shown in Figure 20.

[21] UT TSD, p. 48-49.

Figure 20. Summary plot of the 2013 average ozone mixing ratio and standard deviations measured at all sites during morning (between sunrise and local noon, in blue) and afternoon (noon to sunset, in red). Note the large range of ozone concentrations in 2013 and the large photochemical production of ozone in the afternoons.[22]

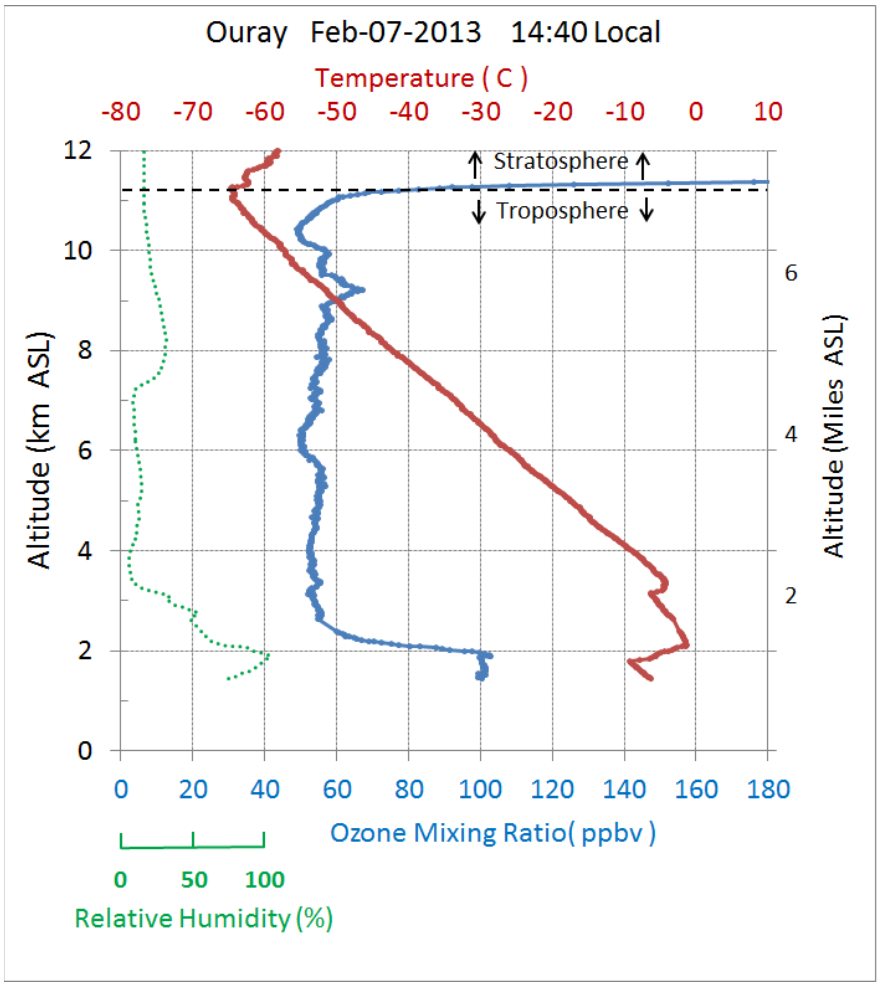


The dominant meteorological feature influencing the frequency and severity of ozone exceedances in the Uinta Basin are persistent wintertime temperature inversions. Figure 21 shows a typical ozonesonde sounding, from 2:40 pm on February 7, 2013 at the Ouray National Wildlife Refuge site (surface elevation of 1,430 m, or 4,692 feet). It shows a surface temperature of about -7 °C (19.4 °F), with temperature decreasing to about -9 °C (15.8 °F) at the top of the temperature inversion. Air temperature then increases above the top of the inversion layer to a high of about -2 °C (28.4 °F) at an altitude of about 2,100 m (6,890

[22] Final Report, 2013 Uinta Basin Winter Ozone Study, March 2014, ENVIRON (ed.), Section 8, Tethered Ozonesonde and Surface Ozone Measurements in the Uinta Basin, Winter 2013, p. 8-9; https://deq.utah.gov/locations/U/uintahbasin/ozone/docs/2014/06Jun/UBOS2013FinalReport/UBOS_2013Sec_8_NOAAsondes.pdf.

feet). Above that peak temperature, temperatures decrease, until the surface temperature of -7 ° is reached again at an altitude of about 3,200 m (10,500 feet) at the base of a second weak temperature inversion. The temperature inversions, with colder air below warmer air, limit the vertical transport of pollutants, trapping pollutants below the inversion, and preventing transported pollutants above the inversion from mixing downward to the surface. The ozonesonde also shows elevated ozone at 100 ppb extending from the surface to the top of the surface temperature inversion at about 1,900 m (6,234 feet), and then shows well mixed tropospheric background ozone at 50 to 55 ppb from an altitude of 2,500 m (8,200 feet) to the tropopause at about 10,500 m (34,450 feet).

Figure 21. Free Flying Ozonesonde Data, Tropospheric Portion, Ouray, 2:40 pm MST, February 7, 2013[23]



The Whiterocks monitor, which is in violation of the ozone standard using 2014-2016 data, is a good indicator for transportation and meteorological factors that affect ozone readings at ground levels above

[23] NOAA Earth Systems Research Laboratory, Global Monitoring Division, Ozonesonde Archive, Field Projects, Uintah 2013, Ouray_Feb07_2013_FreeFlyingBalloon_Troposphere.png, ftp://ftp.cmdl.noaa.gov/ozwv/Ozonesonde/Field%20Projects/Uintah/UINTAH%202013/4_OzoneSonde_FreeFlight_Balloons/

6,000 feet. Because of the site location at the north of the basin, closer to the Uinta mountain range, a diurnal orographic wind pattern of upsloping winds during the daytime, and downslope winds at night are prevalent at this site. Establishing a partial county designation based on a 6,000 feet level is not supported by the data from the 6,216 foot Whiterocks monitor.

In Rio Blanco County, Colorado, along the White River valley, winds under winter temperature inversions are often light and variable. This means that winds speeds are extremely low (often under 1 mph) and sometimes do not show a consistent wind direction from hour to hour. On temperature inversion days when a consistent wind direction is seen, the wind pattern is a downvalley flow (from Colorado towards Utah) during nighttime hours, with a reversal to upvalley winds (from Utah toward Colorado) during daylight and evening hours. The EPA evaluated days in 2013-2016 where the Redwash monitor (the nearest Utah monitor to Rio Blanco County) exceeded the NAAQS. On those exceedance days with directional winds at the Rangely monitor in Rio Blanco County, winds were down-valley toward Utah generally from 1:00 am to about 8:00 am, and then up-valley, from Utah toward Colorado from about 10:00 am until midnight. Average down-valley winds at night were 1.6 mph, while average up-valley winds during the day and evening were 0.8 mph. Net transport for this diurnal pattern (8 hours at 1.6 mph followed by 14 hours in the opposite direction at 0.8 mph) is 1.6 miles of east to west transport per day. The nearest monitor in Utah to Rio Blanco County is the Redwash monitor. Redwash is 16 miles west of Rio Blanco County, and 20 miles west of the oil and gas emission sources in Rio Blanco County. Redwash, however, lacks complete data showing a 2014-2016 NAAQS violation. The nearest violating monitor to Rio Blanco County is the Ouray monitor, 34 miles west of Rio Blanco County, and 40 miles west of the Rio Blanco County emission sources.

Factor 4: Geography/topography

Consideration of geography or topography can provide additional information relevant to defining nonattainment area boundaries. Analyses should examine the physical features of the land that might define the airshed. Mountains or other physical features may influence the fate and transport of emissions as well as the formation and distribution of ozone concentrations. The absence of any such geographic or topographic features may also be a relevant consideration in selecting boundaries for a given area.

The EPA used geography/topography analysis to evaluate the physical features of the land that might affect the airshed and, therefore, the distribution of ozone over the area. Figure 22 shows the region of northern Utah which includes the Uinta Basin (primarily in Uintah and Duchesne Counties) and the small portion of the basin in western Rio Blanco County, Colorado. Figure 23, from the Utah designation recommendation[24] more clearly shows the topography of the basin and the physical features surrounding it. The Uinta Basin is entirely enclosed by higher level terrain on all sides which prevents transport of emissions into the basin from surrounding counties. The only low elevation breaks in the surrounding higher terrain are the incoming Green and White River Valleys (entering the basin at elevations of 4,800 and 5,600 feet, respectively) and the outlet to the south along the Green River (at 4,625 feet). Under wintertime temperature inversion conditions, cold air pools at the lower elevations in the basin, and pollutants are trapped in the pooled air under the temperature inversion. As long as snow cover is present, inversions can persist for periods longer than a week, until energetic weather systems break the temperature inversion and sweep out trapped pollutants. While trapping locally emitted pollutants under an inversion layer within the basin, the inversion

[24] UT TSD, p. 50.

layer also prevents transported pollutants from outside the basin from entering the basin and contributing to ozone formation, as warmer air aloft carrying upwind emissions tends to float across the colder air trapped below. As long as a temperature inversion is present, resulting in the coldest air lying at or near the surface, and with warmer air above the inversion, transported pollutants arriving aloft at higher temperatures than the surface are prevented from descending through the inversion layer and impacting the local photochemistry.

Figure 22. Topographic Illustration of the Physical Features

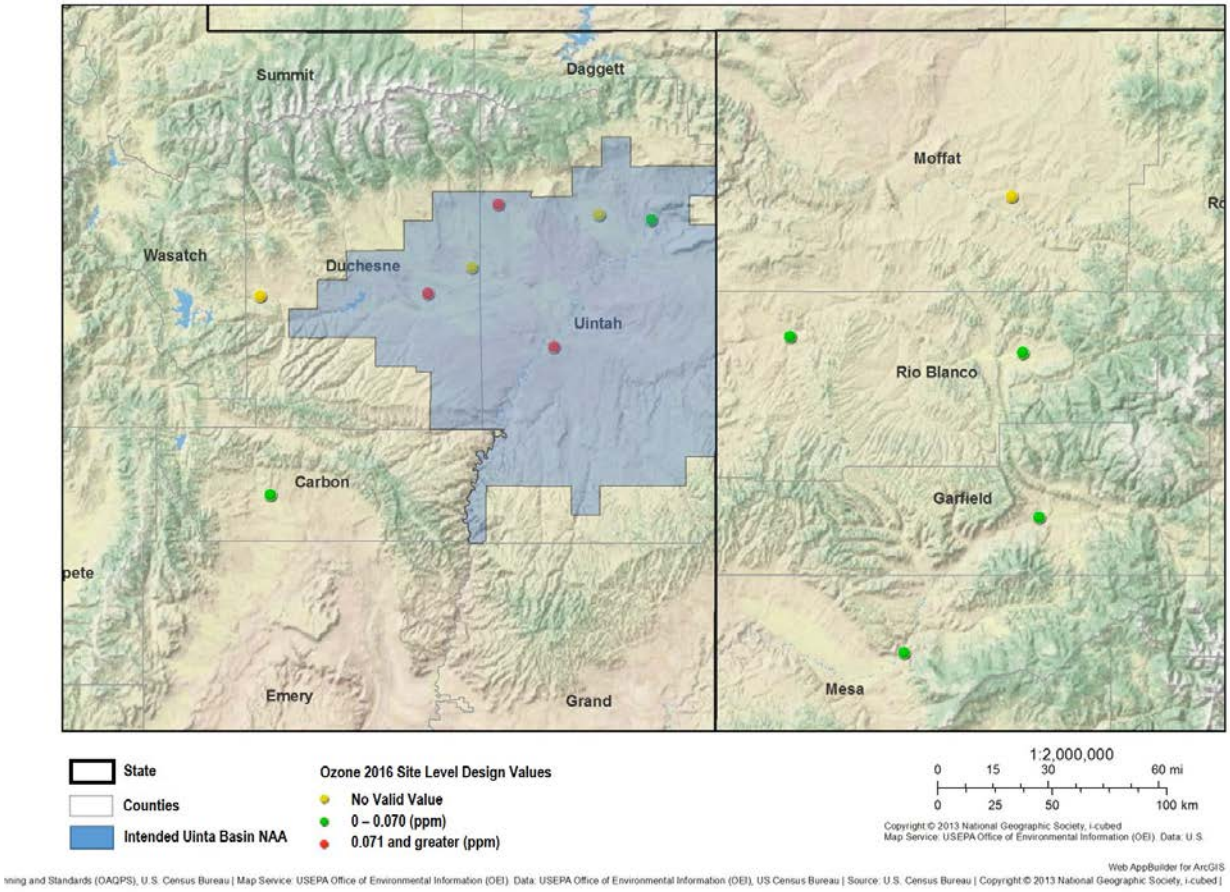
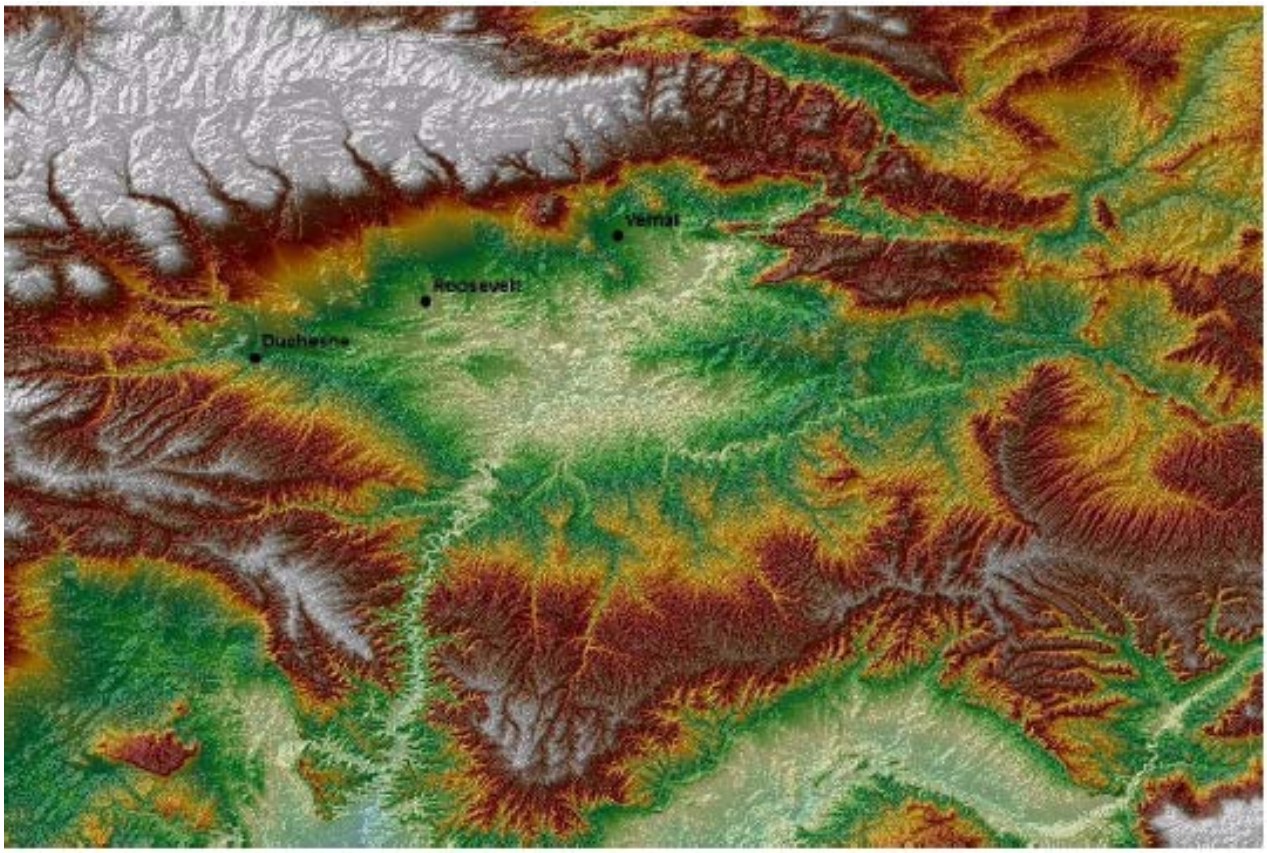


Figure 23. Topography of the Uinta Basin of Utah.



Factor 5: Jurisdictional boundaries

Once the geographic extent of the violating area and the nearby area contributing to violations is determined, the EPA considered existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary to carry out the air quality planning and enforcement functions for nonattainment areas. In defining the boundaries of the intended Uinta Basin nonattainment area, the EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS. Examples of jurisdictional boundaries include, but are not limited to: states, counties, air districts, areas of Indian country, metropolitan planning organizations, and existing nonattainment areas. If an existing jurisdictional boundary is used to help define the nonattainment area, it must encompass all of the area that has been identified as meeting the nonattainment definition. Where existing jurisdictional boundaries are not adequate or appropriate to describe the nonattainment area, the EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the intended designated areas.

The EPA evaluated the existing county jurisdictional boundaries in determining an appropriate nonattainment boundary for the Uinta Basin. For Uintah County, oil and gas development is prevalent throughout the county with the exception of the mountainous northern portion, and those sources contribute to violating monitors. For Duchesne County, significant oil and gas development has occurred in the eastern and southern portion of the county. However, much of the county to the west of the town of Duchesne does not have any oil and gas development or other sources of ozone precursors emissions that could contribute

to violating monitors in the Uinta Basin. As noted earlier, for both Uintah and Duchesne Counties, the northern portions of the counties are undeveloped and include large areas of U. S. Forest Service land. For Rio Blanco County, emission sources lie within the Uinta Basin portion of the county, but are remote from violating monitors.

The Uinta Basin also includes portions of Indian country. As defined at 18 U.S.C. 1151, "Indian country" refers to: "(a) all land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation, (b) all dependent Indian communities within the borders of the United States whether within the original or subsequently acquired territory thereof, and whether within or without the limits of a state, and (c) all Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same." The EPA recognizes the sovereignty of tribal governments, and has attempted to take the input of the tribes into account in establishing appropriate nonattainment area boundaries.

As noted earlier, the Ute Indian Tribe provided the EPA with a recommendation of attainment for the entire tribal area within the Uinta Basin – assuming the EPA concurs on an exceptional events demonstration for two days in June 2015. If the EPA disagrees with the exceptional event package, the Ute Tribe requests that an unspecified area around the Ouray monitor be designated nonattainment. Regardless of whether there was an exceptional event on the two days in June 2015, the 2014-2016 monitoring data still shows violations at three tribal monitors within the basin. The Clean Air Act requires that any area containing a violating monitor must be designated nonattainment. The majority (80 percent) of oil and gas sources in the Uinta Basin are located on tribal land. As discussed earlier, when inversions occur and air is uniformly mixed below the inversion, sources throughout the basin contribute to violations at both state and tribal monitors.

Conclusion for Uinta Basin

The EPA intends to designate portions of Duchesne and Uintah Counties, including both state and tribal lands located in those portions of the county, as nonattainment for the 2015 ozone standard. The EPA intends to modify the State's recommendation that the boundary for the nonattainment area be established at an elevation of 6,000 feet. The EPA also intends to modify the recommendation provided by the Ute Tribe – specifically, the recommendation to designate an area of nonattainment only surrounding the Ouray monitor. Two other monitors at Whiterocks (Uintah County) and Myton (Duchesne County) are also measuring violations of the NAAQS and the tribe's recommended boundary would not include those violating monitors. VOC emissions from oil and gas sources are the primary contributors to elevated ozone in the Uinta Basin. As discussed in the five-factor analysis, these precursor emissions originate from oil and gas operations on both state and tribal land. Additionally, The EPA finds that designating townships below 6,000 feet, as proposed by Utah, does not sufficiently include all violating monitors and contributing sources. The Whiterocks regulatory monitor is measuring a 2016 design value in violation of the 2015 ozone NAAQS and is located at 6,216 ft. Subsequently, the EPA concludes that areas above 6,000 ft. are violating the NAAQS, and sources above 6,000 ft are contributing to the formation of ozone in excess of the NAAQS. Based on Clean Air Act requirements, nonattainment boundaries must be defined to adequately capture all violating monitors. The EPA intends to modify the State's recommendation to include all townships below 6,250 ft to ensure that the Whiterocks monitor is included in the nonattainment boundary. The EPA's

intended boundary would include 93 percent[25] of all oil and natural gas wells and 92 percent[26] of all oil and natural gas emissions, as well as most major sources and populated areas. Consistent with Utah's methodology, the EPA intends to include all townships with greater than 10 percent of land below 6,250 ft in the nonattainment area. A list of the affected townships is presented in Table 12.

Table 12. List of Townships Included in the Uinta Basin Nonattainment Area.

Duchesne County - Salt Lake Meridian
Township 8 South Range 15 East
Township 8 South Range 16 East
Township 8 South Range 17 East
Township 9 South Range 15 East
Township 9 South Range 16 East
Township 9 South Range 17 East
Township 10 South Range 16 East
Township 10 South Range 17 East
Township 11 South Range 16 East
Township 11 South Range 17 East
Township 12 South Range 17 East
Duchesne County - Uintah Meridian
Township 1 North Range 1 West
Township 1 North Range 2 West
Township 1 South Range 1 West
Township 1 South Range 2 West
Township 1 South Range 3 West
Township 2 South Range 1 West
Township 2 South Range 2 West
Township 2 South Range 3 West
Township 2 South Range 4 West
Township 2 South Range 5 West
Township 3 South Range 1 West
Township 3 South Range 2 West
Township 3 South Range 3 West
Township 3 South Range 4 West
Township 3 South Range 5 West
Township 3 South Range 6 West
Township 4 South Range 1 West

[25] Based on wells included in the EPA's intended boundary compared with all wells in Uintah and Duchesne Counties. The well locations were obtained from the Utah Department of Oil, Gas, and Mining

[26] Emissions information was obtained from the 2014 Uinta Basin Emissions Inventory for all sources located below 6,250 ft.

Township 4 South Range 2 West
Township 4 South Range 3 West
Township 4 South Range 4 West
Township 4 South Range 5 West
Township 4 South Range 6 West
Township 4 South Range 7 West
Township 5 South Range 3 West
Township 5 South Range 4 West
Uintah County - Salt Lake Meridian
Township 2 South Range 22 East
Township 3 South Range 21 East
Township 3 South Range 22 East
Township 3 South Range 23 East
Township 3 South Range 24 East
Township 3 South Range 25 East
Township 4 South Range 19 East
Township 4 South Range 20 East
Township 4 South Range 21 East
Township 4 South Range 22 East
Township 4 South Range 23 East
Township 4 South Range 24 East
Township 5 South Range 19 East
Township 5 South Range 20 East
Township 5 South Range 21 East
Township 5 South Range 22 East
Township 5 South Range 23 East
Township 5 South Range 24 East
Township 5 South Range 25 East
Township 6 South Range 19 East
Township 6 South Range 20 East
Township 6 South Range 21 East
Township 6 South Range 22 East
Township 6 South Range 23 East
Township 6 South Range 24 East
Township 6 South Range 25 East
Township 7 South Range 19 East
Township 7 South Range 20 East
Township 7 South Range 21 East
Township 7 South Range 22 East
Township 7 South Range 23 East
Township 7 South Range 24 East

Township 7 South Range 25 East
Township 8 South Range 17 East
Township 8 South Range 18 East
Township 8 South Range 19 East
Township 8 South Range 20 East
Township 8 South Range 21 East
Township 8 South Range 22 East
Township 8 South Range 23 East
Township 8 South Range 24 East
Township 8 South Range 25 East
Township 9 South Range 17 East
Township 9 South Range 18 East
Township 9 South Range 19 East
Township 9 South Range 20 East
Township 9 South Range 21 East
Township 9 South Range 22 East
Township 9 South Range 23 East
Township 9 South Range 24 East
Township 9 South Range 25 East
Township 10 South Range 17 East
Township 10 South Range 18 East
Township 10 South Range 19 East
Township 10 South Range 20 East
Township 10 South Range 21 East
Township 10 South Range 22 East
Township 10 South Range 23 East
Township 10 South Range 24 East
Township 10 South Range 25 East
Township 11 South Range 17 East
Township 11 South Range 18 East
Township 11 South Range 19 East
Township 11 South Range 20 East
Township 11 South Range 21 East
Township 11 South Range 22 East
Township 11 South Range 23 East
Township 11 South Range 24 East
Township 11 South Range 25 East
Township 12 South Range 17 East
Township 12 South Range 18 East
Township 12 South Range 19 East
Township 12 South Range 20 East
Township 12 South Range 21 East

Township 12 South Range 22 East
Township 12 South Range 23 East
Township 12 South Range 24 East
Township 12 South Range 25 East
Township 13 South Range 17 East
Township 13 South Range 18 East
Township 13 South Range 19 East
Township 13 South Range 20 East
Township 13 South Range 21 East
Township 13 South Range 22 East
Township 13 South Range 23 East
Township 13 South Range 24 East
Township 14 South Range 17 East
Township 14 South Range 21 East
Township 15 South Range 17 East
Township 16 South Range 17 East
Uintah County - Uintah Meridian
Township 1 North Range 1 East
Township 1 North Range 1 West
Township 1 North Range 2 East
Township 1 South Range 1 East
Township 1 South Range 1 West
Township 1 South Range 2 East
Township 2 South Range 1 East
Township 2 South Range 1 West
Township 2 South Range 2 East
Township 3 South Range 1 East
Township 3 South Range 1 West
Township 3 South Range 2 East
Township 4 South Range 1 East
Township 4 South Range 1 West
Township 4 South Range 2 East
Township 4 South Range 3 East
Township 5 South Range 1 East
Township 5 South Range 2 East
Township 5 South Range 3 East

Although a portion of Rio Blanco County is within the Uinta Basin, the EPA does not intend to include it in the nonattainment area and intends to designate all of Rio Blanco County as attainment/unclassifiable for the 2015 ozone NAAQS. As provided above, the emissions in Rio Blanco County are small in comparison to the emissions from oil and gas operations in the two Utah Counties and on tribal land, and it is those emissions that are driving the unique wintertime ozone violations in area. In addition, Rio Blanco County emissions sources are located far from violating monitors, and the extremely low transport wind speeds recorded in Rangely, Colorado, show insufficient transport to violating monitors to allow these emissions to contribute to violations.

The EPA concludes that designating a boundary that includes portions of Duchesne and Uintah Counties in townships below 6,250 ft will support Utah and the Ute Tribe's ability to focus resources on the emission sources and areas that most strongly contribute to the ozone problem in the Uinta Basin.