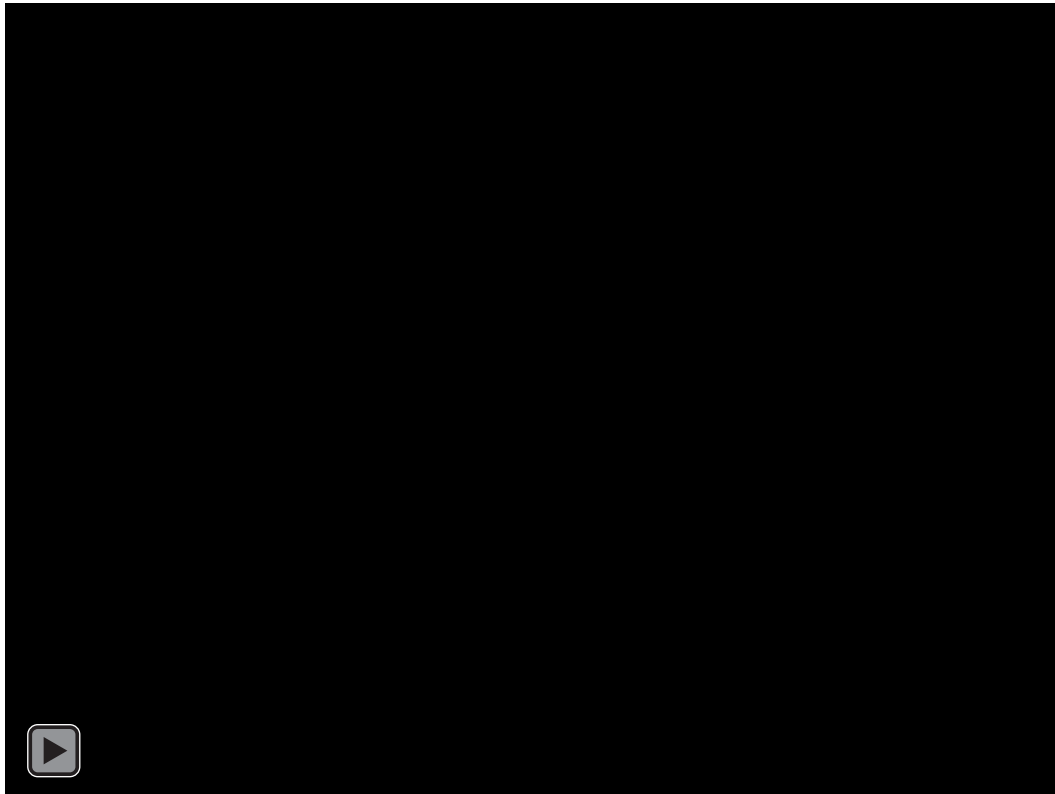
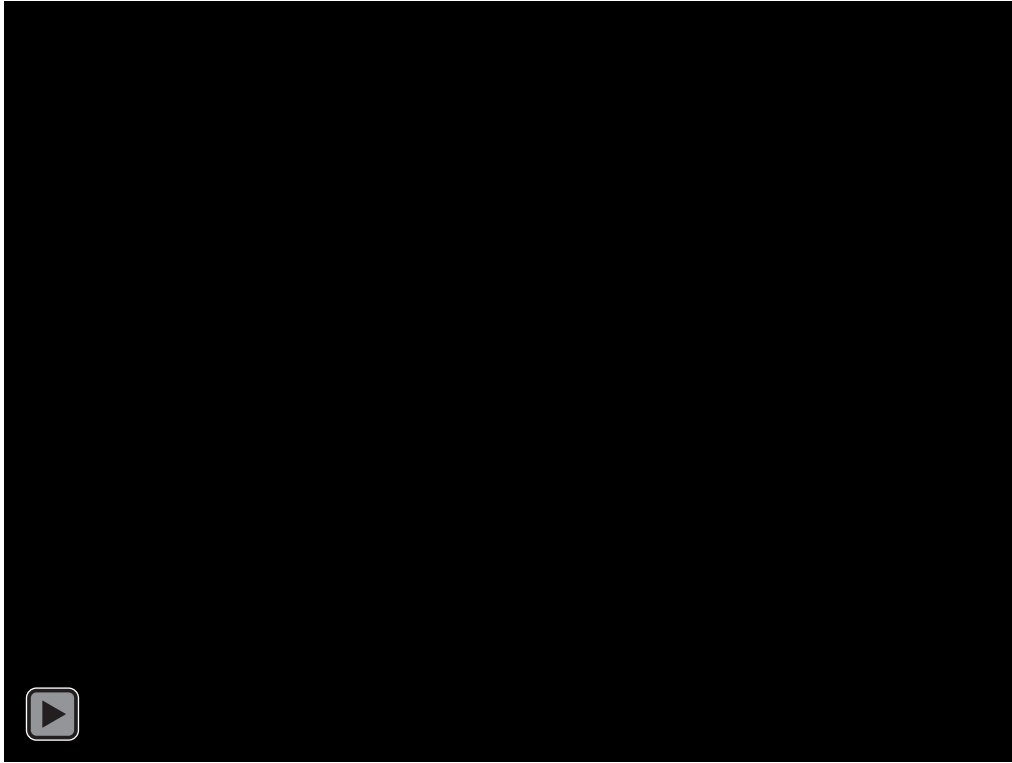


# Appendix A: Supporting Figures for Section 3.2.2 (Model Simulations)

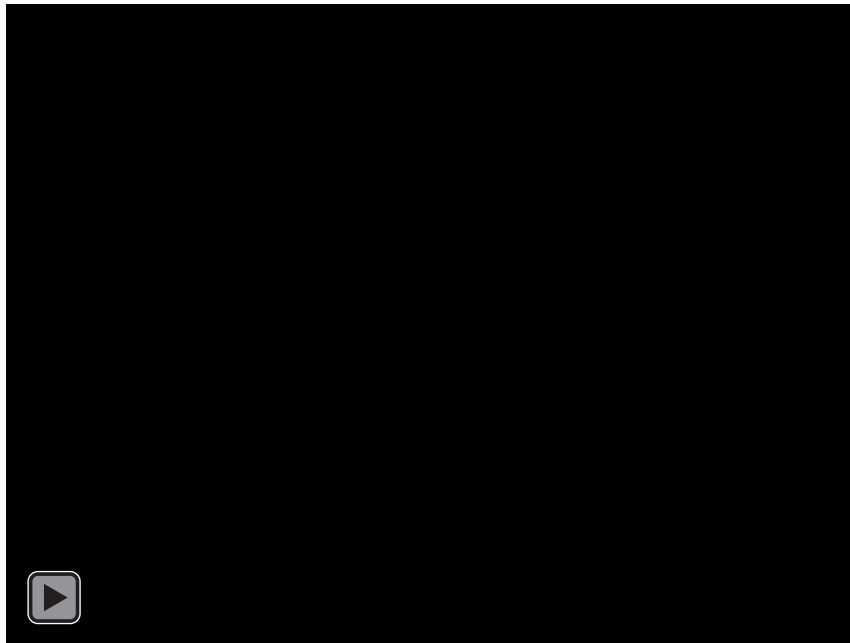
These animations (Figures A-1 through A-7) provide context for the still images shown in Section 3.2.2.



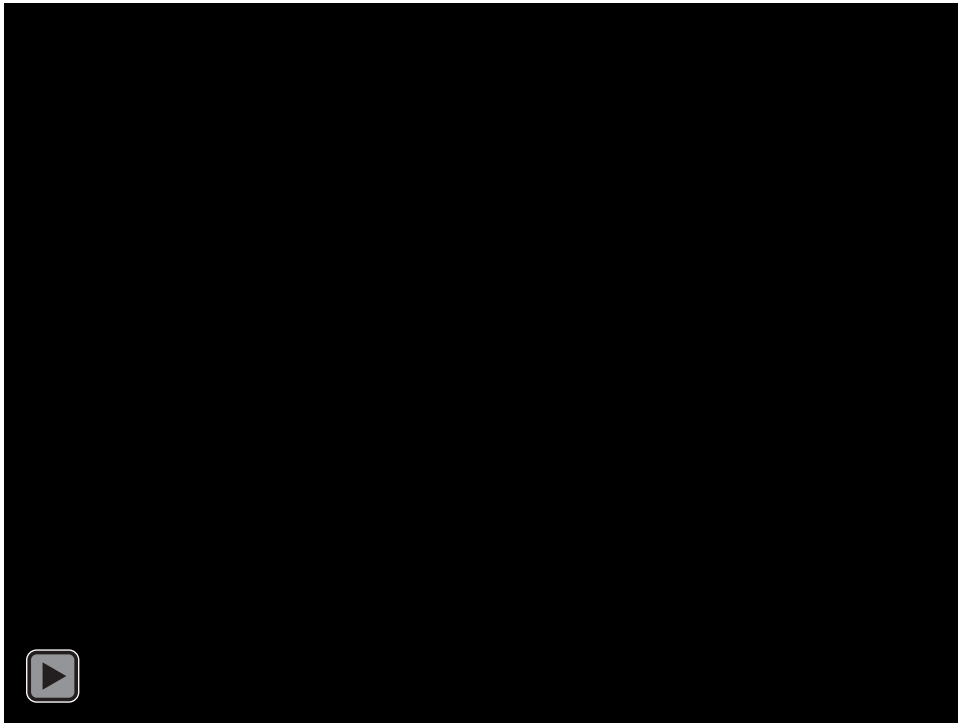
**Figure A-1.** RAQMS-modeled ozone at the 300 K isentrope-level from May 24 at 12:00 UTC to May 29 at 12:00 UTC. The model was initialized at 12:00 UTC on May 24.



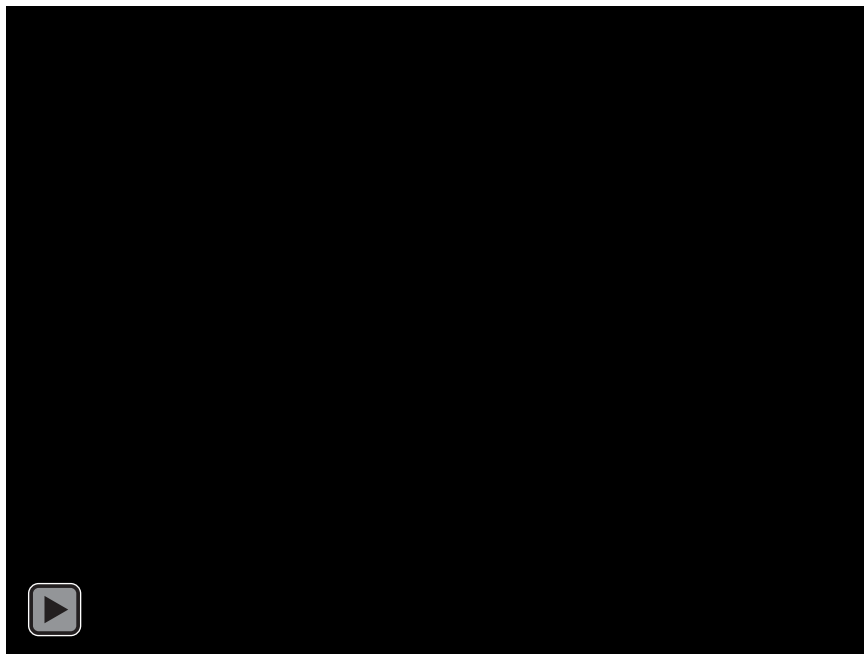
**Figure A-2.** RAQMS-modeled ozone at the 310 K isentrope-level from May 24 at 12:00 UTC to May 29 at 12:00 UTC. The model was initialized at 12:00 UTC on May 24.



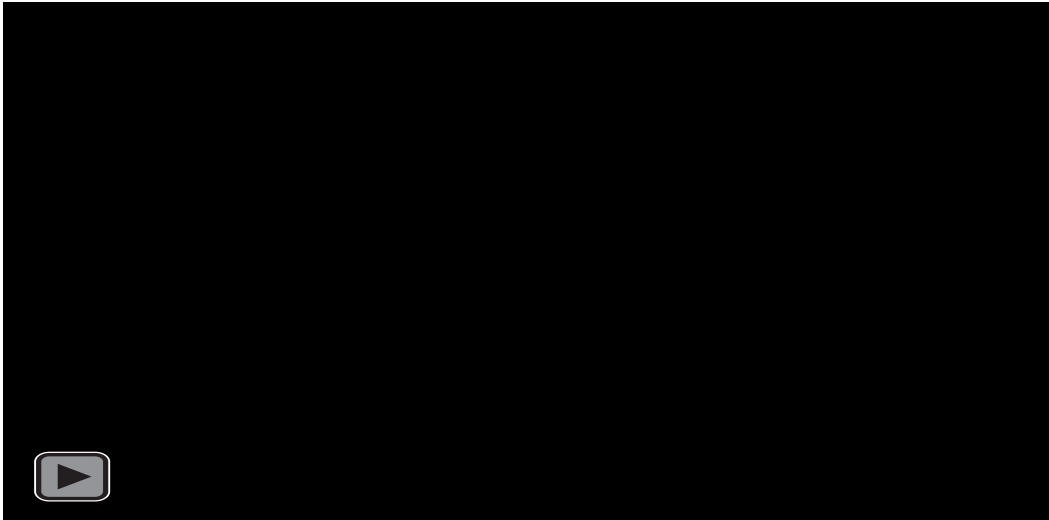
**Figure A-3.** RAQMS-modeled cross-section of ozone from May 24 at 12:00 UTC to May 29 at 12:00 UTC. The model was initialized at 12:00 UTC on May 24. The red box represents the approximate area of stratospheric intrusion.



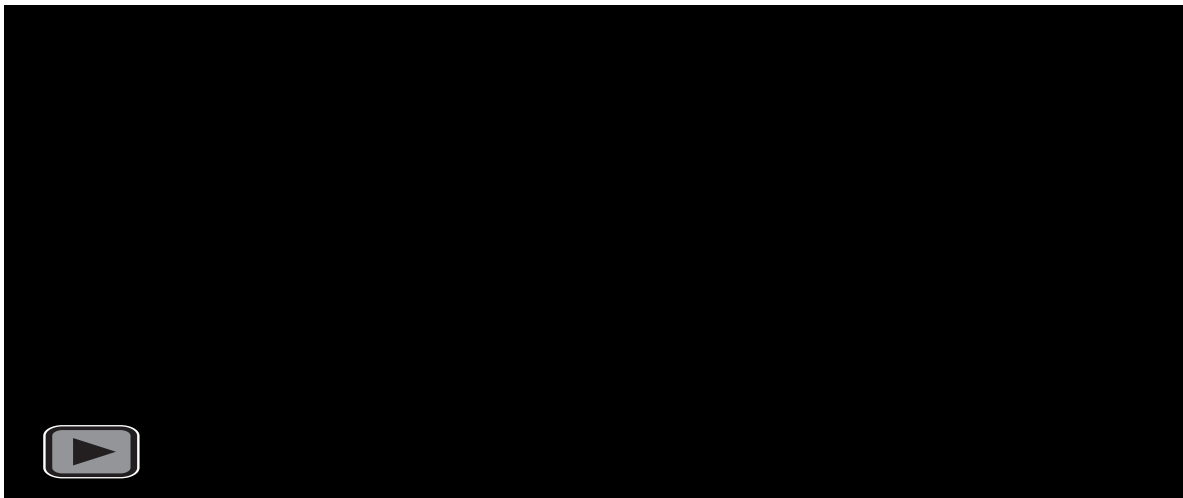
**Figure A-4.** RAQMS-modeled CO at the 310 K isentrope-level from May 24 at 12:00 UTC to May 29 at 12:00 UTC. The model was initialized at 12:00 UTC on May 24.



**Figure A-5.** RAQMS-modeled cross-section of CO from May 24 at 12:00 UTC to May 29 at 12:00 UTC. The model was initialized at 12:00 UTC on May 24.



**Figure A-6.** WACCM-modeled ozone at the 500 mb level on May 24 at 0:00 UTC to May 29 at 00:00 UTC, with a minimum contour of 60 ppb and a maximum contour of 140 ppb.

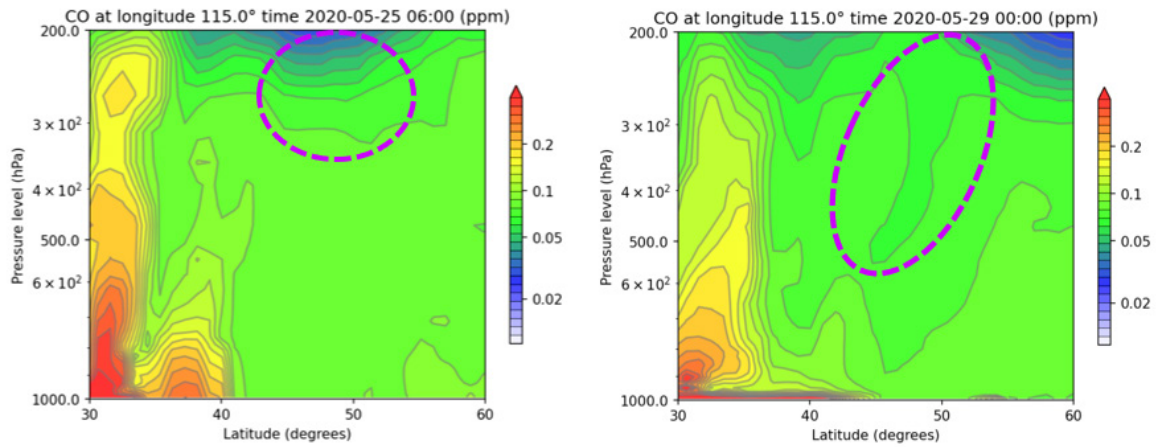


**Figure A-7.** WACCM-modeled CO at the 500 mb level on May 24 at 0:00 UTC to May 29 at 00:00 UTC, with a minimum contour of 50 ppb and a maximum contour of 150 ppb.

WACCM cross-sections of CO concentrations were mostly inconclusive near the SOI event over Idaho, Montana, and Utah on May 25 and over Clark County on May 29. The May 29 image does show low CO concentrations above 36 north latitude on the EE date.

**Figure A-8** shows two vertical WACCM cross sections for CO concentrations from the approximate time of the stratospheric intrusion on May 25 at 06:00 UTC and the event date of May 29 at 00:00 UTC (May 28 at 16:00 PST). A subtle trough of low-CO air extended into the upper troposphere near 50-degrees N on May 25 at 06:00 UTC (left, circled in purple) and extended to lower layers of the atmosphere by May 29 at 00:00 UTC. Concentrations of CO in these regions is at or below

approximately 100 ppb. The extent of these low-CO intrusions, however, is not as prominent as those of the ozone intrusions presented in the main text (Section 3.2.2).

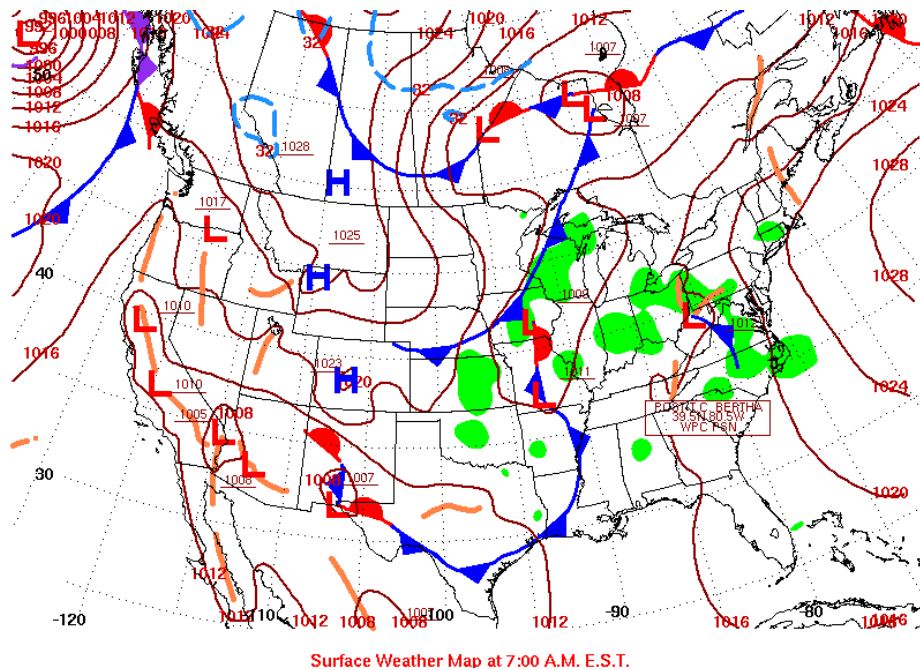


**Figure A-8.** WACCM-modeled cross-section of CO concentrations along the 115-degree W longitude line on May 25 at 06:00 UTC (left) and May 29 at 00:00 UTC (the event date–May 28 at 16:00 PST) (right). The trough of reduced CO extending from the stratosphere into the upper troposphere is circled in purple.

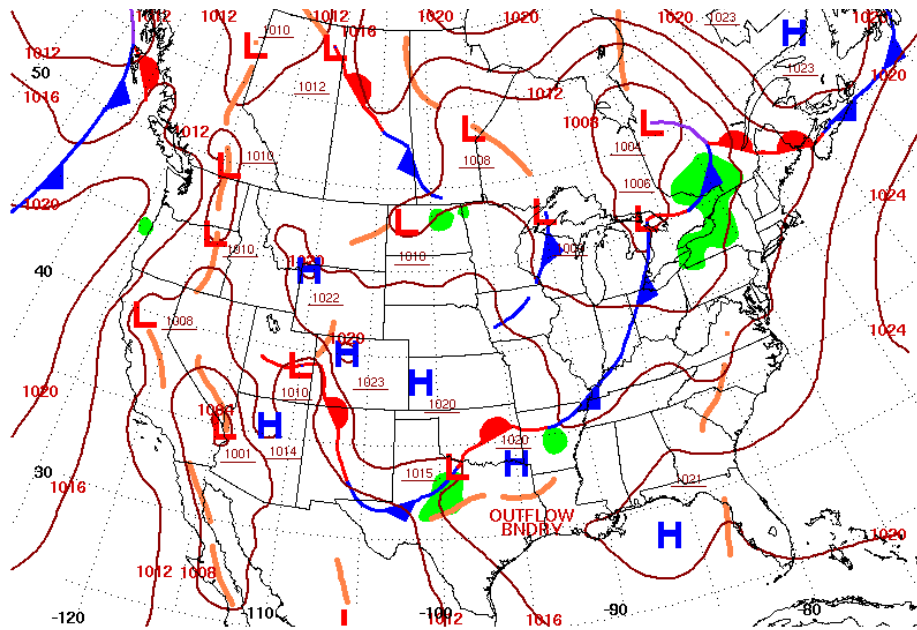
# Appendix B. Figures and Tables

## Supporting Section 3.5.1 (Matching Day Analysis)

Identification of matching (meteorologically similar) days includes a comparison of meteorology maps between May 28, 2020, and each date subset from candidate matching days. Surface and upper-level maps for May 28 and each date listed in Table 3-10 in Section 3.5.1 show highly consistent conditions. All dates show a surface low pressure system over Clark County. Surface maps for May 28 and each date in Table 3-10 are shown in **Figure B-1 through B-11**. Each upper-level map shows a region of high pressure over Clark County. The 500 mb maps for May 28 and each date in Table 3-10 are shown in **Figure B-12 through B-22**.

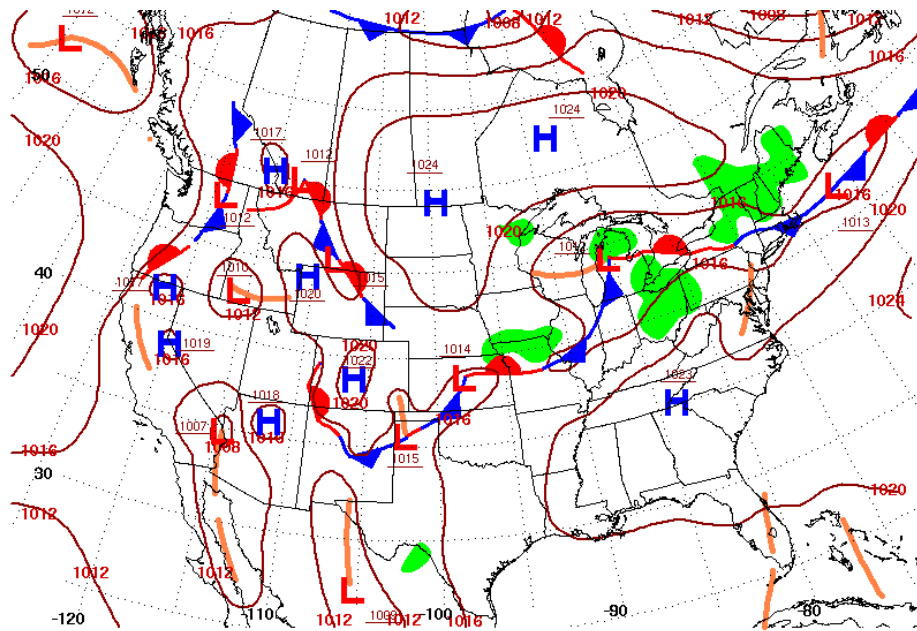


**Figure B-1.** Surface meteorology map on May 28, 2020 (the event date).



Surface Weather Map at 7:00 A.M. E.S.T.

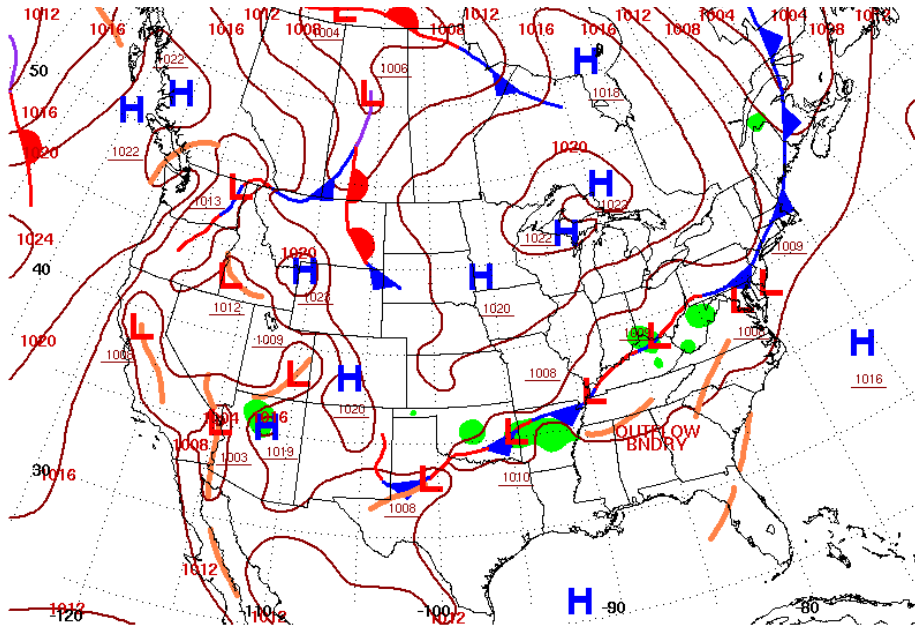
Figure B-2. Surface meteorology map on July 1, 2017.



Surface Weather Map at 7:00 A.M. E.S.T.

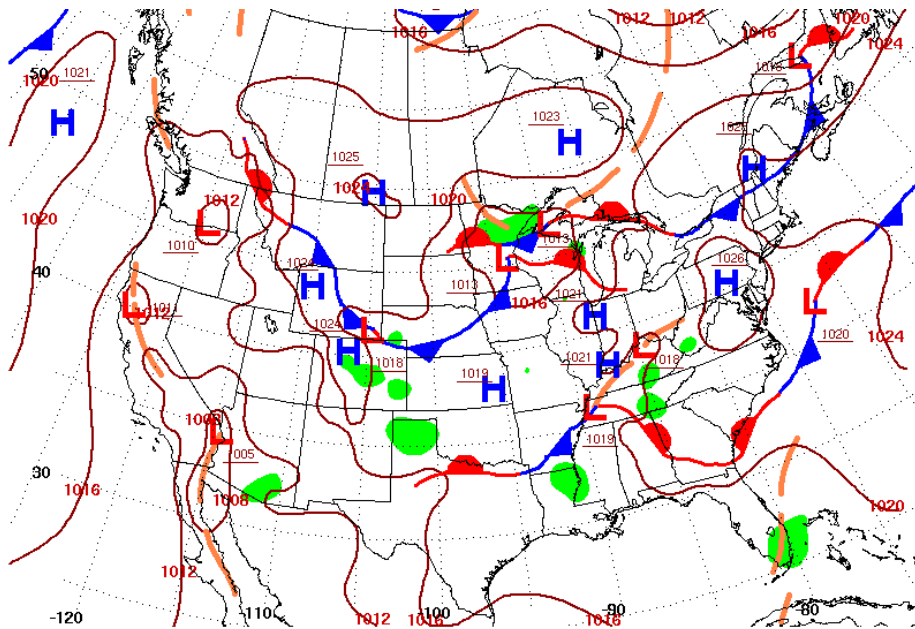
Figure B-3. Surface meteorology map on July 13, 2017.





Surface Weather Map at 7:00 A.M. E.S.T.

Figure B-4. Surface meteorology map on July 28, 2017.



Surface Weather Map at 7:00 A.M. E.S.T.

Figure B-5. Surface meteorology map on August 10, 2017.

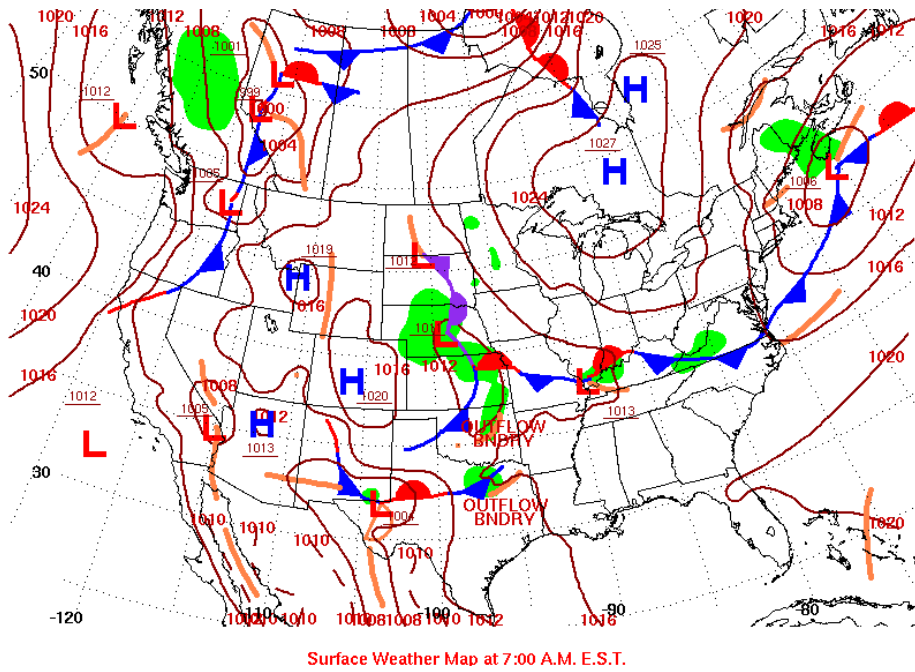


Figure B-6. Surface meteorology map on June 25, 2018.

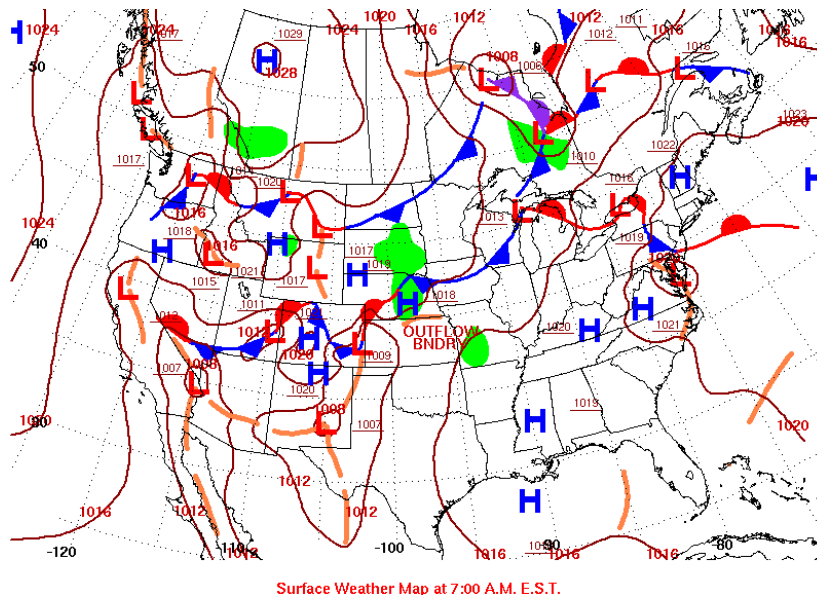
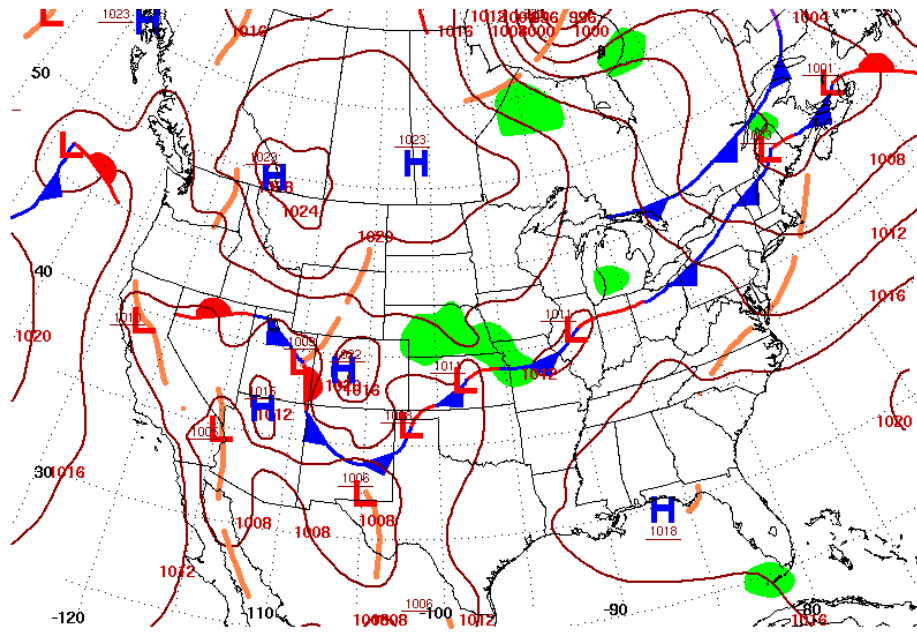
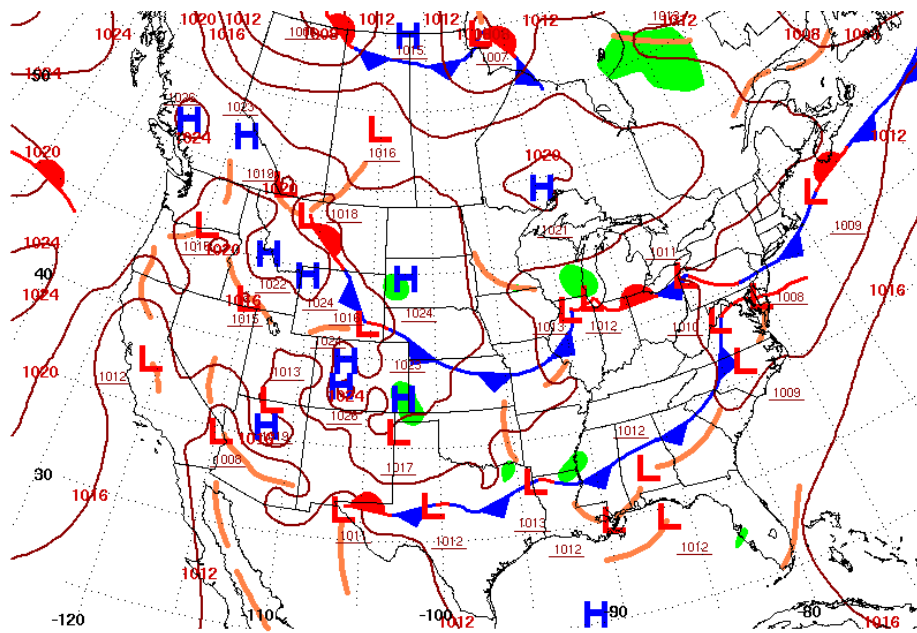


Figure B-7. Surface meteorology map on July 5, 2019.



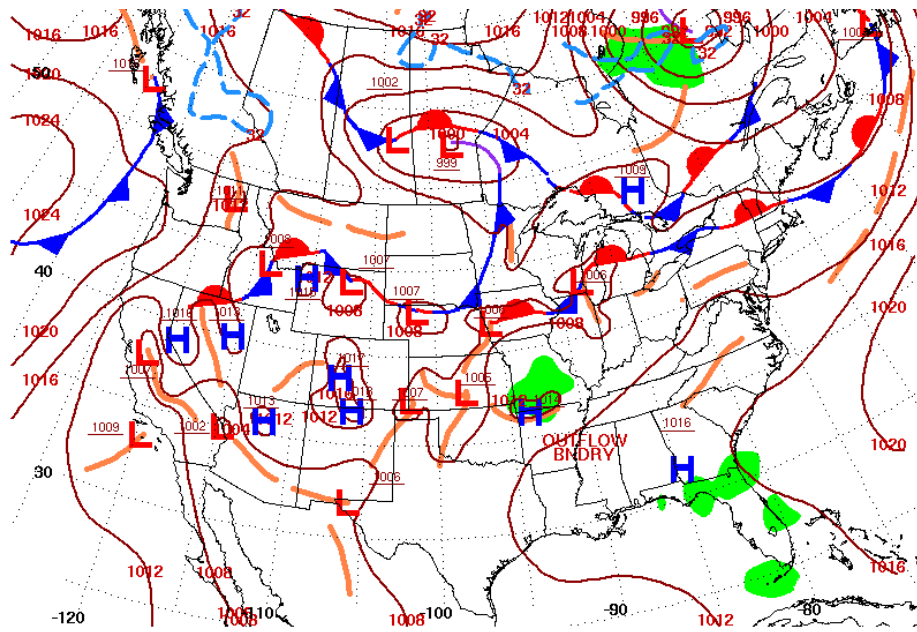
Surface Weather Map at 7:00 A.M. E.S.T.

Figure B-8. Surface meteorology map on July 21, 2019.



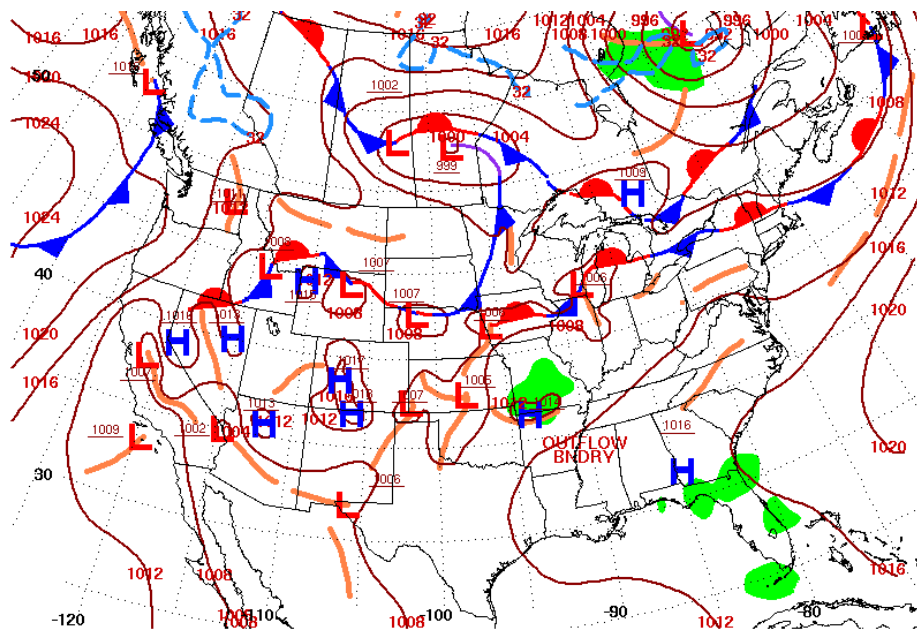
Surface Weather Map at 7:00 A.M. E.S.T.

Figure B-9. Surface meteorology map on August 14, 2019.



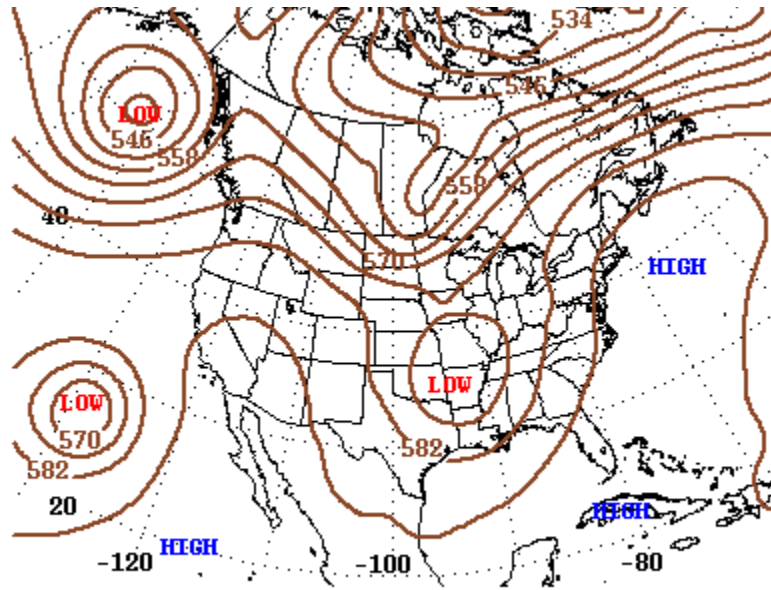
Surface Weather Map at 7:00 A.M. E.S.T.

Figure B-10. Surface meteorology map on June 4, 2020.



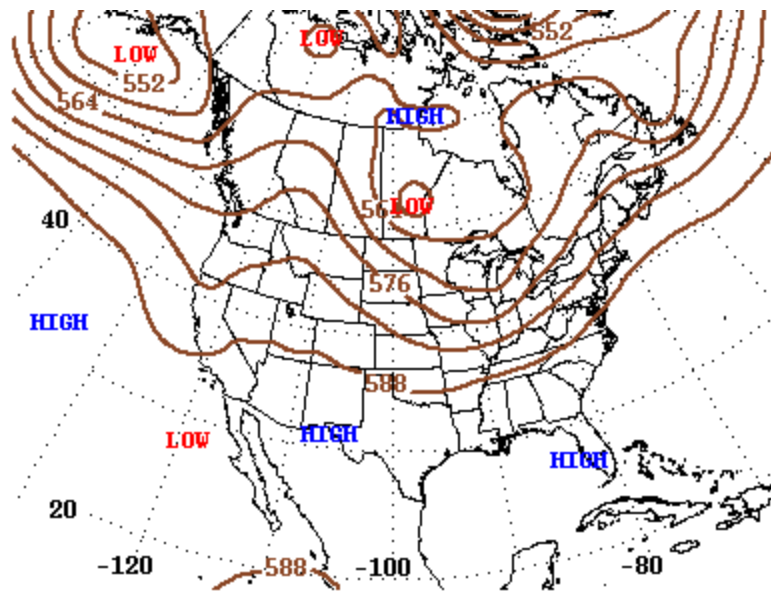
Surface Weather Map at 7:00 A.M. E.S.T.

Figure B-11. Surface meteorology map on July 11, 2020.



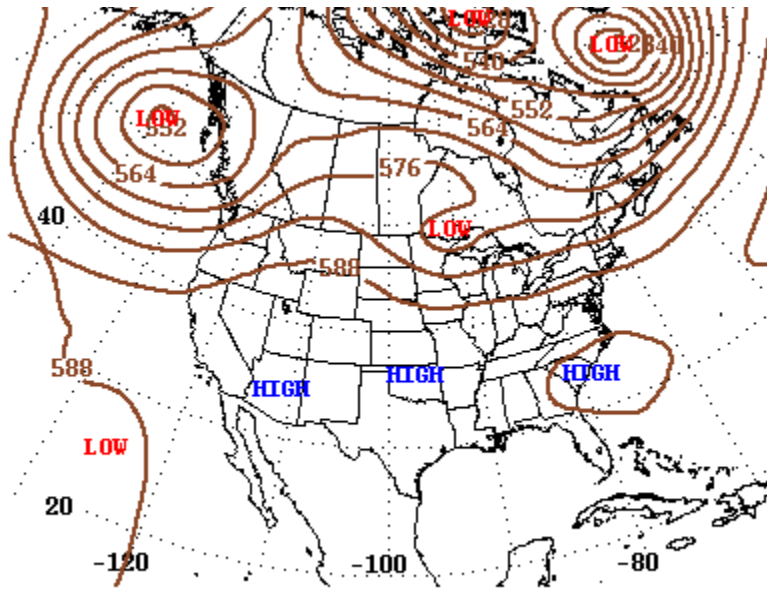
**500-Millibar Height Contour at 7:00 A.M. E.S.T.**

Figure B-12. 500 mb meteorology map on May 28, 2020 (the event date).



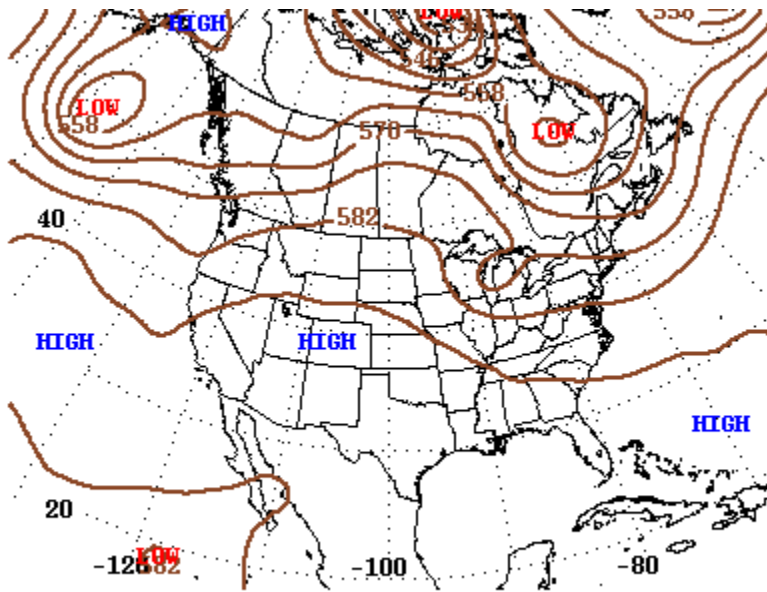
**500-Millibar Height Contour at 7:00 A.M. E.S.T.**

Figure B-13. 500 mb meteorology map on July 1, 2017.



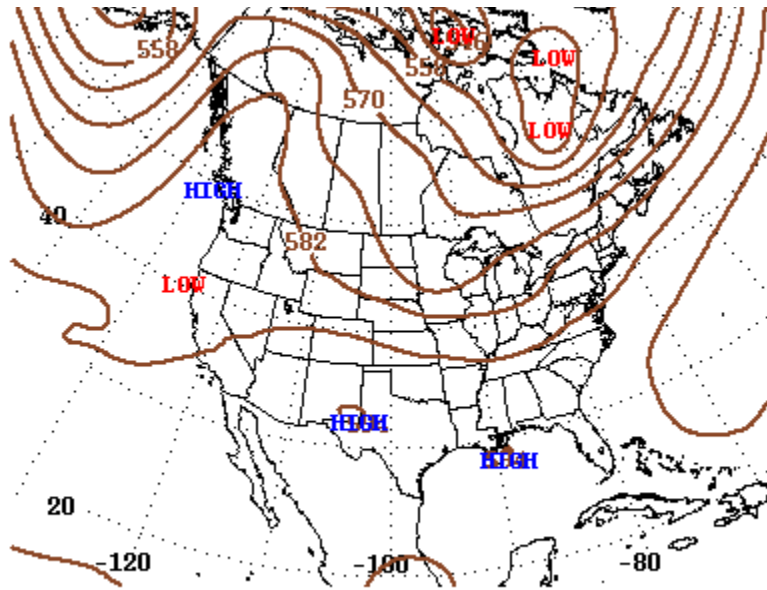
**500-Millibar Height Contour at 7:00 A.M. E.S.T.**

Figure B-14. 500 mb meteorology map on July 13, 2017.



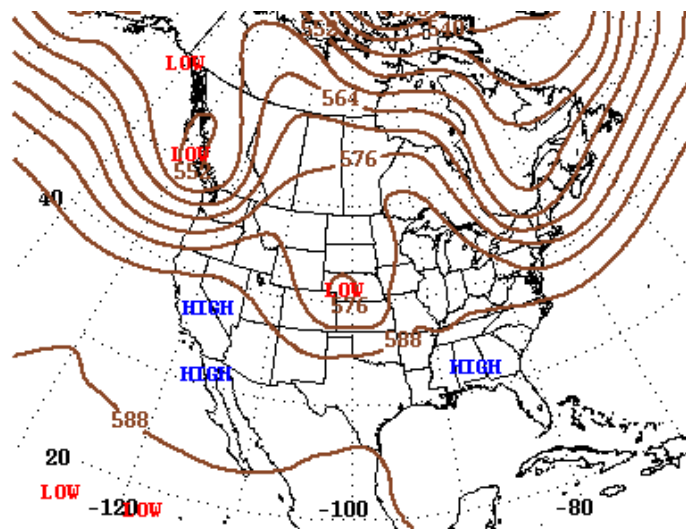
**500-Millibar Height Contour at 7:00 A.M. E.S.T.**

Figure B-15. 500 mb meteorology map on July 28, 2017.



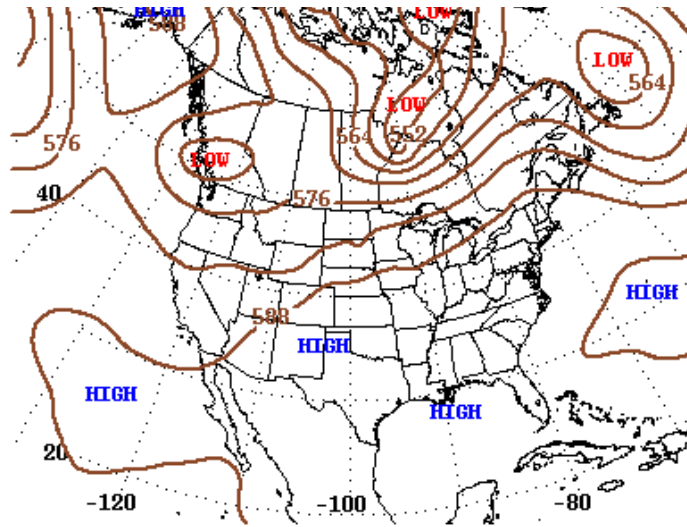
500-Millibar Height Contour at 7:00 A.M. E.S.T.

Figure B-16. 500 mb meteorology map on August 10, 2017.



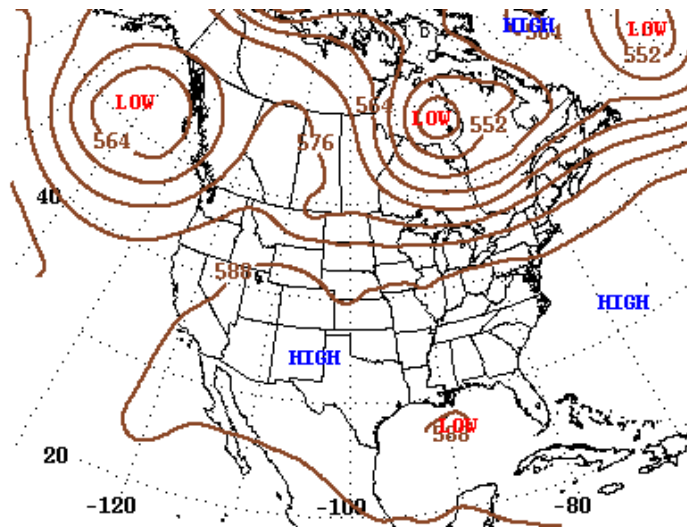
500-Millibar Height Contour at 7:00 A.M. E.S.T.

Figure B-17. 500 mb meteorology map on June 25, 2018.



500-Millibar Height Contour at 7:00 A.M. E.S.T.

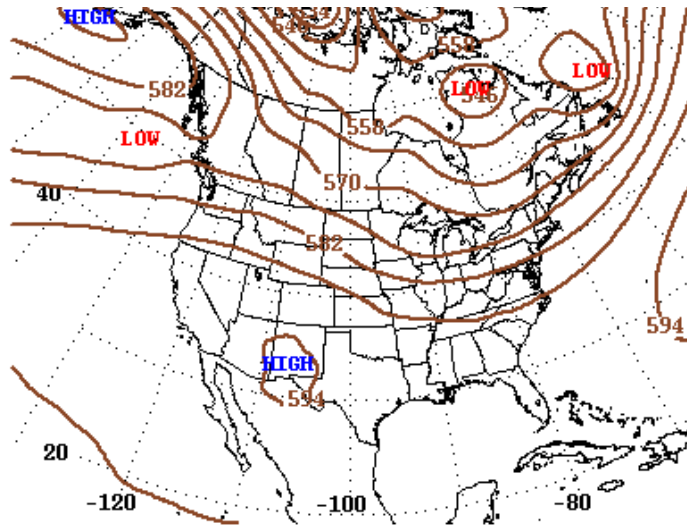
Figure B-18. 500 mb meteorology map on July 5, 2019.



500-Millibar Height Contour at 7:00 A.M. E.S.T.

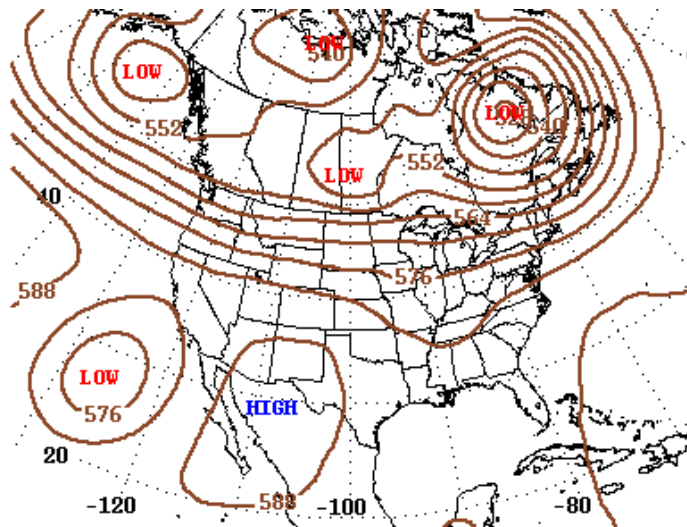
Figure B-19. 500 mb meteorology map on July 21, 2019.





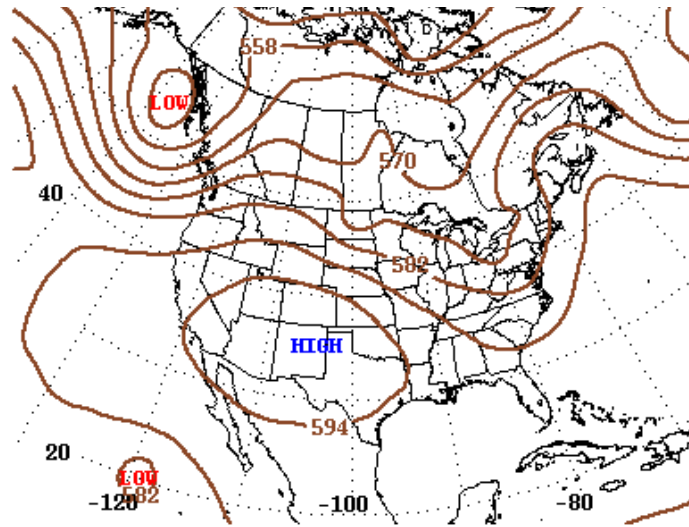
500-Millibar Height Contour at 7:00 A.M. E.S.T.

Figure B-20. 500 mb meteorology map on August 14, 2019.



500-Millibar Height Contour at 7:00 A.M. E.S.T.

Figure B-21. 500 mb meteorology map on June 4, 2020.



**500-Millibar Height Contour at 7:00 A.M. E.S.T.**

Figure B-22. 500 mb meteorology map on July 11, 2020.

# Appendix C. GAM Residual Histograms and Scatter Plots from Concurring Exceptional Event Demonstrations

The following are GAM residual histograms and scatter plots from the concurring Arizona Department of Environmental Quality demonstration (Arizona Department of Environmental Quality 2016) and the submitted Texas Commission on Environmental Quality demonstration (Texas Commission on Environmental Quality 2021) for comparison with our GAM residual analysis. The figures in this Appendix show the good residual results from concurring and currently submitted exceptional events demonstrations to which we compared our results. Based on this comparison, we suggest that our GAM results show a well-fit, unbiased model. A well-fit GAM model should show a normal distribution of residuals at all sites modeled (ADEQ example in [Figure C-1](#)) and show no pattern or bias between GAM residuals and predicted values (TCEQ example in [Figure C-2](#)). These figures compare well with our GAM results in Section 3.5.2 of the main report.

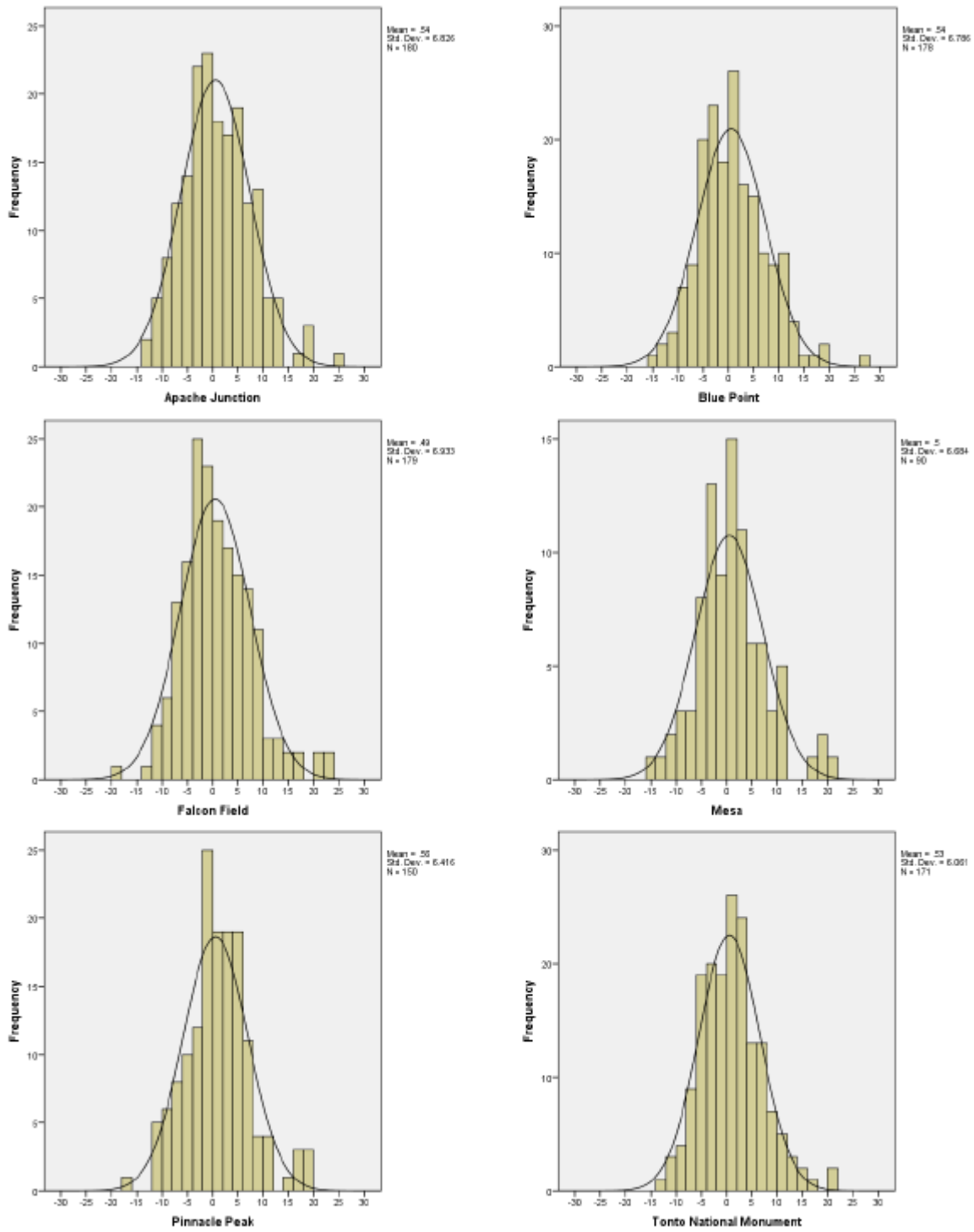
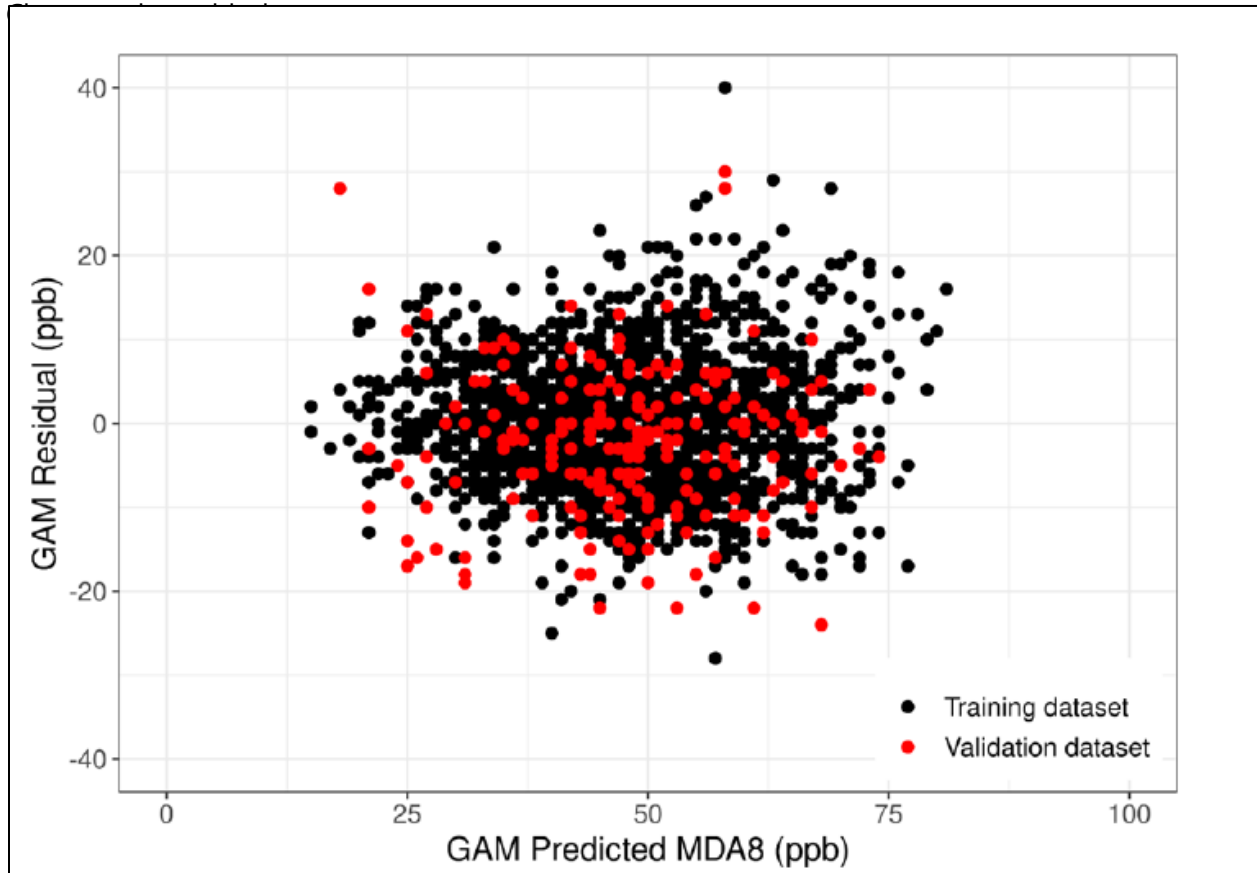


Figure C-1. Histograms of residuals results at each monitoring site from the Arizona DEQ GAM Analysis (Arizona Department of Environmental Quality 2016).



**Figure C-2.** Scatter plot of GAM residuals (observed – GAM predicted MDA8 ozone) vs. GAM predicted MDA8 ozone from the TCEQ submitted GAM analysis. Training data is shown in black and validation data is shown in red (Texas Commission on Environmental Quality 2021).

## References

- Arizona Department of Environmental Quality (2016) State of Arizona exceptional event documentation for wildfire-caused ozone exceedances on June 20, 2015 in the Maricopa nonattainment area. Final report, September. Available at [https://static.azdeq.gov/pn/1609\\_ee\\_report.pdf](https://static.azdeq.gov/pn/1609_ee_report.pdf).
- Texas Commission on Environmental Quality (2021) Dallas-Fort Worth area exceptional event demonstration for ozone on August 16, 17, and 21, 2020. April. Available at <https://www.tceq.texas.gov/assets/public/airquality/airmod/docs/ozoneExceptionalEvent/2020-DFW-EE-Ozone.pdf>.



# Appendix D. Documentation of the Public Comment Process

## May 28, 2020 Demonstration

# Notice of Public Comment

---


## NOTICE OF PUBLIC COMMENT PERIOD ON FINAL EXCEPTIONAL EVENT DEMONSTRATIONS

NOTICE IS HEREBY GIVEN of a public comment period on the final exceptional event demonstrations identified below. The Exceptional Events Rule (EER), codified at 40 CFR 50.1, 50.14, and 51.930, allows air agencies to petition the U.S. Environmental Protection Agency (EPA) to exclude air quality monitoring data influenced by exceptional events from applicable regulatory determinations. Between 2018 and 2020, Clark County recorded several exceedances of the 2015 8-hour ozone National Ambient Air Quality Standard (NAAQS) due to impacts from wildfire smoke or stratospheric intrusions. The following table details these exceedances. The Clark County Department of Environment and Sustainability (DES) developed these demonstrations to show that exceedances would not have occurred without wildfire or stratospheric intrusion impacts and requests exclusion of event-related data from use in regulatory determinations in accordance with the EER.

NOTICE IS FURTHER GIVEN that a 30-day public comment period will begin on July 1, 2021, and end at 4:00 PM on August 2, 2021, in accordance with the requirements of 40 CFR 50.14(c)(3)(v). The public may review and provide written comments on these demonstrations during this period. Copies of the demonstrations are available for review on the DES website at: [https://www.clarkcountynv.gov/government/departments/environment\\_and\\_sustainability/public\\_communications/public\\_notices.php](https://www.clarkcountynv.gov/government/departments/environment_and_sustainability/public_communications/public_notices.php) and may also be obtained by contacting Araceli Pruettt at (702) 455-3206.

Any written comments must be received by DES at 4701 W. Russell Road, Suite 200, Las Vegas, Nevada 89118, by 4:00 PM on August 2, 2021. Comments should be addressed to Araceli Pruettt at the same mailing address, emailed to [araceli.pruett@clarkcountynv.gov](mailto:araceli.pruett@clarkcountynv.gov), or faxed to (702) 383-9994. All comments will be considered and forwarded to EPA.

Published: June 30, 2021

  
Marci D. Henson, Director



**Final 2018 and 2020 Exceptional Events**

<b>Date of Event</b>	<b>Type of Event</b>	<b>Site Name</b>	<b>Exceedance Concentration (ppb)</b>
06/19/2018	Wildfire	Green Valley	77
		Paul Meyer	72
		Walter Johnson	72
06/20/2018	Wildfire	Joe Neal	72
		Paul Meyer	71
		Walter Johnson	74
05/06/2020	Stratospheric Intrusion	Green Valley	72
		Joe Neal	76
		Paul Meyer	77
		Walter Johnson	78
05/09/2020	Stratospheric Intrusion	Paul Meyer	74
		Walter Johnson	71
05/28/2020	Stratospheric Intrusion	Paul Meyer	76
		Walter Johnson	71
06/22/2020	Wildfire	Joe Neal	78
		Paul Meyer	74
		Walter Johnson	73
06/26/2020	Wildfire	Paul Meyer	73
09/02/2020	Wildfire	Paul Meyer	73
		Walter Johnson	75

# DES Website Notices

## AIR QUALITY PLANNING NOTICES

### ▼ Wed., June 30, 2021 - Public Notice for Final 2018 and 2020 Exceptional Event Demonstrations

DES welcomes comments on the final exceptional event demonstrations identified in the table below. Under the Exceptional Events Rule (EER), codified at 40 CFR 50.1, 50.14, and 51.930, air agencies are allowed to petition the U.S. Environmental Protection Agency (EPA) to exclude air quality monitoring data influenced by exceptional events from applicable regulatory determinations. Between 2018 and 2020, Clark County recorded several exceedances of the 2015 8-hour ozone National Ambient Air Quality Standard due to impacts from wildfire smoke or stratospheric intrusions. The purpose of these demonstrations is to show that the exceedances would not have occurred without wildfire or stratospheric intrusion impacts and request exclusion of event-related data from use in regulatory determinations in accordance with the EER. All comments will be considered and forwarded to EPA.

**Public Comment Period:**

July 1 through August 2, 2021

**Submit comments in writing to:**

Araceli Pruett, Senior Planner  
 Clark County Department of Environment and Sustainability  
 4701 West Russell Road, Suite 200  
 Las Vegas, NV 89118  
 Phone: (702) 455-3206  
 Email: [araceli.pruett@clarkcountynv.gov](mailto:araceli.pruett@clarkcountynv.gov)

**Review Documents**

View [Public Notice](#)

Event Dates(s)	Event Type
<a href="#">June 19-20, 2018 Demonstration</a> <a href="#">Appendices</a>	Wildfire
<a href="#">May 6, 2020 Demonstration</a> <a href="#">Appendices</a>	Stratospheric Intrusion
<a href="#">May 9, 2020 Demonstration</a> <a href="#">Appendices</a>	Stratospheric Intrusion
<a href="#">May 28, 2020 Demonstration</a> <a href="#">Appendices</a>	Stratospheric Intrusion
<a href="#">June 22, 2020 Demonstration</a> <a href="#">Appendices</a>	Wildfire
<a href="#">June 26, 2020 Demonstration</a> <a href="#">Appendices</a>	Wildfire
<a href="#">September 2, 2020 Demonstration</a> <a href="#">Appendices</a>	Wildfire



## DES Facebook Posting

---



 **Clark County Department of Environment & Sustainability**  
July 1 at 1:18 PM · 🌐

[#VegasAirQuality](#) Public Participation Notice: Comments are being accepted on 2018 & 2020 Exceptional Event Demonstrations in support of a request to exclude event-related data from use in regulatory determinations. Comment deadline is Aug. 2. For more: <https://buff.ly/3waARWC>.

# PUBLIC PARTICIPATION NOTICE



# DES Twitter Posting

**Environment & Sustainability** ✓  
2,514 Tweets Following

**Environment & Sustainability** ✓ @SustainClarkCty · Jul 1  
#VegasAirQuality Public Participation Notice: Comments ae being accepted on 2018 & 2020 Exceptional Even Demonstrations in support of a request to exclude event-related data from use in regulatory determinations. Comment deadline is Aug. 2. For more: [buff.ly/3waARWC](https://buff.ly/3waARWC).

**PUBLIC PARTICIPATION NOTICE**

CLARK COUNTY NEVADA air quality

1 retweet 1 like

# E-Notice

**Araceli Pruett**

---

**From:** Araceli Pruett  
**Sent:** Thursday, July 1, 2021 7:59 AM  
**Subject:** NOTICE OF PUBLIC COMMENT PERIOD ON FINAL EXCEPTIONAL EVENT DEMONSTRATIONS

NOTICE IS HEREBY GIVEN of a public comment period on the final exceptional event demonstrations identified below. The Exceptional Events Rule (EER), codified at 40 CFR 50.1, 50.14, and 51.930, allows air agencies to petition the U.S. Environmental Protection Agency (EPA) to exclude air quality monitoring data influenced by exceptional events from applicable regulatory determinations. Between 2018 and 2020, Clark County recorded several exceedances of the 2015 8-hour ozone National Ambient Air Quality Standard (NAAQS) due to impacts from wildfire smoke or stratospheric intrusions. The following table details these exceedances. The Clark County Department of Environment and Sustainability (DES) developed these demonstrations to show that exceedances would not have occurred without wildfire or stratospheric intrusion impacts and requests exclusion of event-related data from use in regulatory determinations in accordance with the EER.

NOTICE IS FURTHER GIVEN that a 30-day public comment period will begin on July 1, 2021, and end at 4:00 PM on August 2, 2021, in accordance with the requirements of 40 CFR 50.14(c)(3)(v). The public may review and provide written comments on these demonstrations during this period. Copies of the demonstrations are available for review on the DES website at: [https://www.clarkcountynv.gov/government/departments/environment\\_and\\_sustainability/public\\_communications/public\\_notices.php](https://www.clarkcountynv.gov/government/departments/environment_and_sustainability/public_communications/public_notices.php) and may also be obtained by contacting Araceli Pruett at (702) 455-3206.

Any written comments must be received by DES at 4701 W. Russell Road, Suite 200, Las Vegas, Nevada 89118, by 4:00 PM on August 2, 2021. Comments should be addressed to Araceli Pruett at the same mailing address, emailed to [araceli.pruett@clarkcountynv.gov](mailto:araceli.pruett@clarkcountynv.gov), or faxed to (702) 383-9994. All comments will be considered and forwarded to EPA.

Published: June 30, 2021

# E-Notice Distribution List

<b>PLANNING E-NOTICE DISTRIBUTION LIST</b>	
<b>Organization</b>	<b>Contact</b>
Air & Waste Management Association	Paul Fransioli
American Lung Association Nevada	James Martinez
Bureau of Land Management	Lisa Christianson
City of Boulder City	Michael Mays
City of Henderson	Sean Robertson
City of Las Vegas	Marco Velotta
City of Las Vegas	Milagros (Miles) Escuin
City of Las Vegas	Robert Summerfield
City of North Las Vegas	Alfredo Melesio
City of North Las Vegas	Johanna Murphy
Clark County	Daniel Kezar
Clark County	Mario Bermudez
Clark County School District	Chris Dingell
Clark County School District	Dimitrios Karapanagiotis
Las Vegas Valley Water District	Brian Bowler
Nellis Air Force Base	Shimi Mathew
Nevada Department of Environmental Protection	Sheryl Fontaine
Nevada Department of Environmental Protection	Sig Jaunarajs
Nevada Resort Association	Sabrina Santiago
Nevada Resort Association	Virginia Valentine
Regional Flood Control	Steve Parrish
Regional Transportation Commission	Beth Xie
Regional Transportation Commission	Craig Raborn
Sierra Club Toiyabe Chapter	Brian Beffort
Southern Nevada Health District	Nicole Bungum
Southern Nevada Off Road Enthusiasts	Ken Thatcher
Southern Nevada Water Authority	Ayoub Ayoub
Southern Nevada Water Authority	Keiba Crear
Southern Nevada Water Authority	Thomas Maher
Southern Nevada Home Builders	Amanda Moss
Southern Nevada Home Builders	Nat Hodgson
The Nature Conservancy	Jaina Moan
University of Nevada Las Vegas	Dave James, PhD.
Washoe County Health District	Francisco Vega
Washoe County Health District	Daniel Inouye

## Public Comment Report

---

Public Notice:	DES Website: June 30 through August 2, 2021
Public Comment Period	July 1 through August 2, 2021
Formal Comments Received:	None
DES Responses:	None