

Ambient Monitoring Section 7/01/2014
North Carolina Division of Air Quality



N.C. EXCEPTIONAL EVENT

(November 15, 2013)

The smoke from the Table Rock wildfire in the Linville Gorge Wilderness Area, North Carolina impacted measurements of a particulate matter monitor, operated by the North Carolina Division of Air Quality. The cover picture shows the Boone monitor.

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ACRONYMS

DFR	Division of Forest Resources
FRM	Federal Reference Method
GASP	GOES Aerosol Smoke Product
GIS	Geographic Information Systems
GOES	Geostationary Operational Environmental Satellite
HMS	Hazard Mapping Service
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
$\mu\text{g}/\text{m}^3$	Micrograms per cubic meter
NAAQS	National Ambient Air Quality Standard
NOAA	National Oceanic and Atmospheric Administration
NC	North Carolina
NC DAQ	North Carolina Division of Air Quality
ORD	Office of Research and Development
PM2.5	Particulate Matter with an Aerodynamic Diameter of 2.5 microns or less
%	Percent
RTP	Research Triangle Park
TEOM	Tapered Elemental Oscillating Microbalance

EXECUTIVE SUMMARY

Overview

The North Carolina Division of Air Quality (NC DAQ) presents evidence the smoke from the Table Rock wildfire in the Linville Gorge Wilderness Area, North Carolina, was responsible for elevating fine particle (PM2.5) Federal Reference Method (FRM) monitoring data above the PM2.5 daily standard of 35 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). As a result the NC DAQ asserts the data in Table 1 should be excluded from regulatory decisions. This NC DAQ report details the evidence of the Table Rock wildfire, transport of the smoke, and impacts on PM2.5 FRM concentrations with “atypical”, and “but for” analyses. The main points in the report are:

- The Table Rock Wildfire was approximately 47 kilometers south southwest from the Boone PM2.5 FRM monitor.
- News reports stated that smoke from the Table Rock Wild Fire was observed in Boone on November 15, 2013, and the airport reported hazy conditions during the early afternoon hours of November 15.
- During the early afternoon of November 15, 2013, winds at the Boone airport were blowing from the south, south southwest and southwest, the direction of the Table Rock Wildfire.
- Backward trajectories of air using the National Oceanic and Atmospheric Administration (NOAA) Hybrid Single Particle Lagrangian Integrated Trajectory Model (HYSPLIT) show air masses at the monitoring station the afternoon of November 15, 2013, came from the Table Rock Wildfire.
- The fine particle concentration measured on November 15, 2013, was the highest concentration measured at the site during fourth quarter for the last four years, the value is almost three times the second highest value measured during the same time period, and there is less than a 1 percent chance that a value greater than $20 \mu\text{g}/\text{m}^3$ would be measured at that location during 4th quarter.
- Statistical modeling predicts PM2.5 FRM concentrations below the 24-hour standard of $35 \mu\text{g}/\text{m}^3$ would have been expected on that day based on the meteorology.

Data Requested for Exclusion

The data requested for exclusion are listed in Table 1:

Table 1 NC DAQ PM 2.5 FRM sample affected by the Table Rock Wildfire Incident

Site Name	Sampling Frequency	County	Site Id.	Site Latitude	Site Longitude	Date of Exceedance	FRM-PM2.5 ($\mu\text{g m}^{-3}$)
Boone	1-in-3 day	Watauga	37-189-0003	36.214586	-81.65548	15-Nov-14	59.25

EVIDENCE THE EVENT OCCURRED

The wildfire began on November 12, 2013,¹ due to an unknown cause (as of December 4, 2013).² A passerby on Route 181 reported the fire to authorities around 8 am and by afternoon the fire had burned 40 acres.³ Overnight the fire had spread to 100 acres.⁴ By November 15, the fire had grown to 1,800 acres.⁵ The North Carolina Division of Air Quality issued an air quality warning for Alexander, Burke, Caldwell, and McDowell Counties on November 15.⁶ The fire was officially contained on December 4, 2013, after burning 2,579 acres.⁷ Figure 1 shows an enlargement of the MODIS active fire detections on November 15, 2013, as well as the relative locations of the fire and Boone monitor.

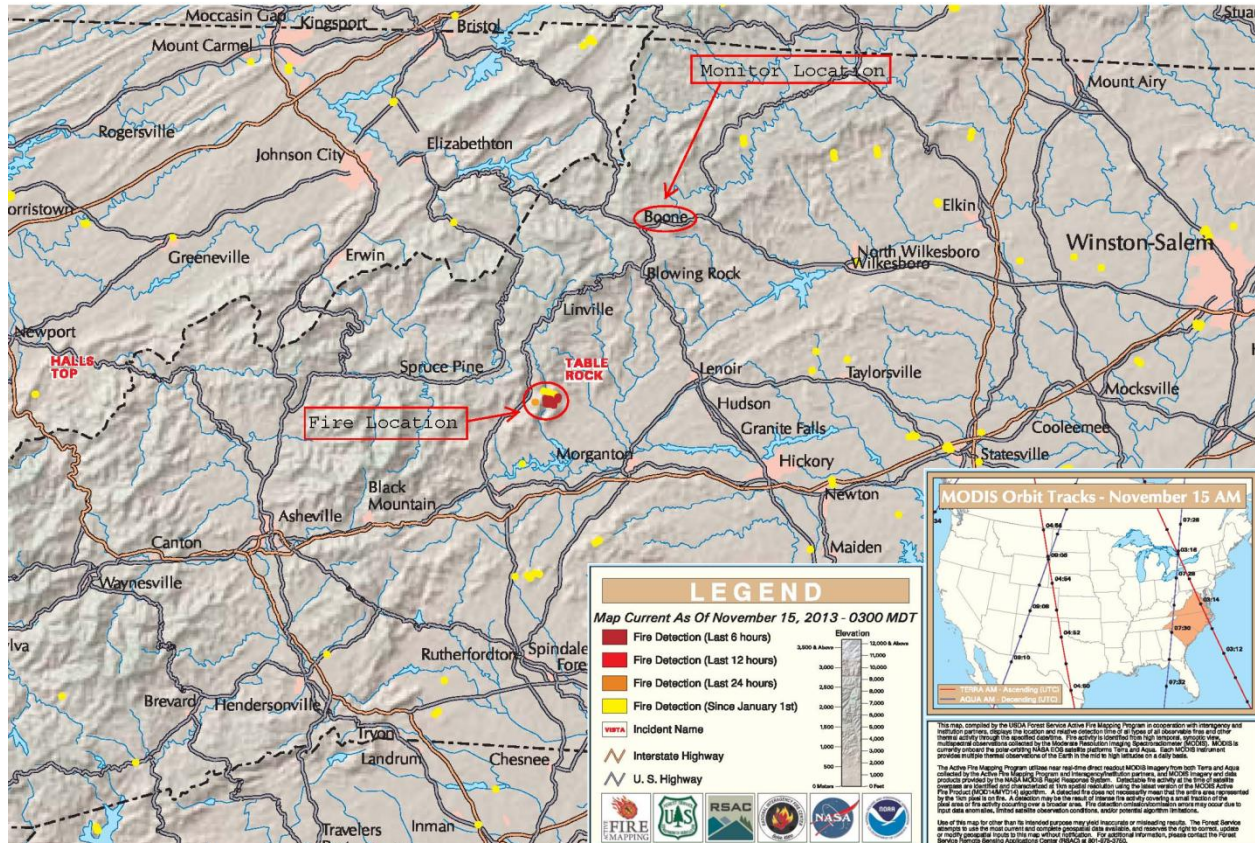


Figure 1: MODIS active fire detections on November 15, 2013. The fire location is the lower red circle and the approximate monitor location is the upper red circle. The monitor was located approximately 47 kilometers north northeast of the fire.

¹ Wood, Jesse, “‘Table Rock Fire’ in Linville Gorge Wilderness Area Spreads to 100 Acres, Zero Percent Contained, Expected to Grow,” High Country Press, November 13, 2013, available on the world wide web at <http://www.hcpress.com/news/table-rock-fire-in-linville-gorge-wilderness-area-spreads-to-100-acres-zero-percent-contained-expected-to-grow.html>, accessed November 14, 2013.

² “Table Rock Fire Officially Contained,” The News Herald, Morganton, NC, December 4, 2013. Available on the world wide web at http://www.morganton.com/news/table-rock-fire-officially-contained/article_a2dbe41a-5cf0-11e3-901b-0019bb30f31a.html, accessed May 16, 2014.

³ Wood, Jesse, *ibid*

⁴ *ibid*

⁵ The Associated Press, “Firefighters make progress on NC mountain fire,” News & Observer, November 15, 2013.

⁶ The Associated Press, “Air quality advisory issued for western NC,” News & Observer, November 15, 2013.

⁷ “Table Rock Fire Officially Contained,” *ibid*

EVIDENCE OF WILDFIRE SMOKE TRANSPORT TO THE SITE

A summary of the weather in Boone for November 15, 2013, was obtained for station KTNB (the Watauga County Hospital) from the weather underground website.⁸ The data are available in APPENDIX C. BOONE, NC, WEATHER HISTORY - NOVEMBER 15, 2013. The winds were calm throughout the morning but started blowing from the south around noon switching to south southwest in the early afternoon before becoming calm again in the evening. During the early afternoon hours when the winds were blowing from the south and south southwest, the conditions at the hospital were reported as hazy. Also, the Charlotte Observer reported the presence of smoke in parts of McDowell and Watauga Counties on November 15,⁹ and the Appalachian District Health Department issued an air quality warning for Watauga County on November 15.¹⁰

Backward trajectories for the air mass at the Boone monitor from 11 am through 4 pm were modeled using the National Oceanic and Atmospheric Administration (NOAA) Hybrid Single Particle Lagrangian Integrated Trajectory Model (HYSPLIT). The model results, shown in Figure 2 through Figure 11, clearly show the air masses at the Boone monitoring station the afternoon of November 15, 2013, came from the Table Rock Wildfire.

⁸ Weather Underground, "Weather History for Boone, NC, Friday, November 15, 2013," available on the world wide web at http://www.wunderground.com/history/airport/KTNB/2013/11/15/DailyHistory.html?req_city=NA&req_state=NA&req_statename=NA, accessed May 19, 2014.

⁹ Lyttle, Steve and Adam Bell, "Wildfire causes air quality alert in 4 N.C. counties," Charlotte Observer, published in Local News, posted Friday, November 15, 2013, available on the world wide web at <http://www.charlotteobserver.com/2013/11/15/4468246/wildfire-causes-air-quality-alert.html#.U3t3dihacQU>, accessed May 16, 2014.

¹⁰ "Public Health Advisory: Air Quality Change due to Smoke from Table Rock Fire," The Appalachian District Health Department, November 15, 2013, available on the world wide web at <http://www.apphealth.com/public-health-advisory-air-quality-change-due-smoke-table-rock-fire/>, accessed May 20, 2014.

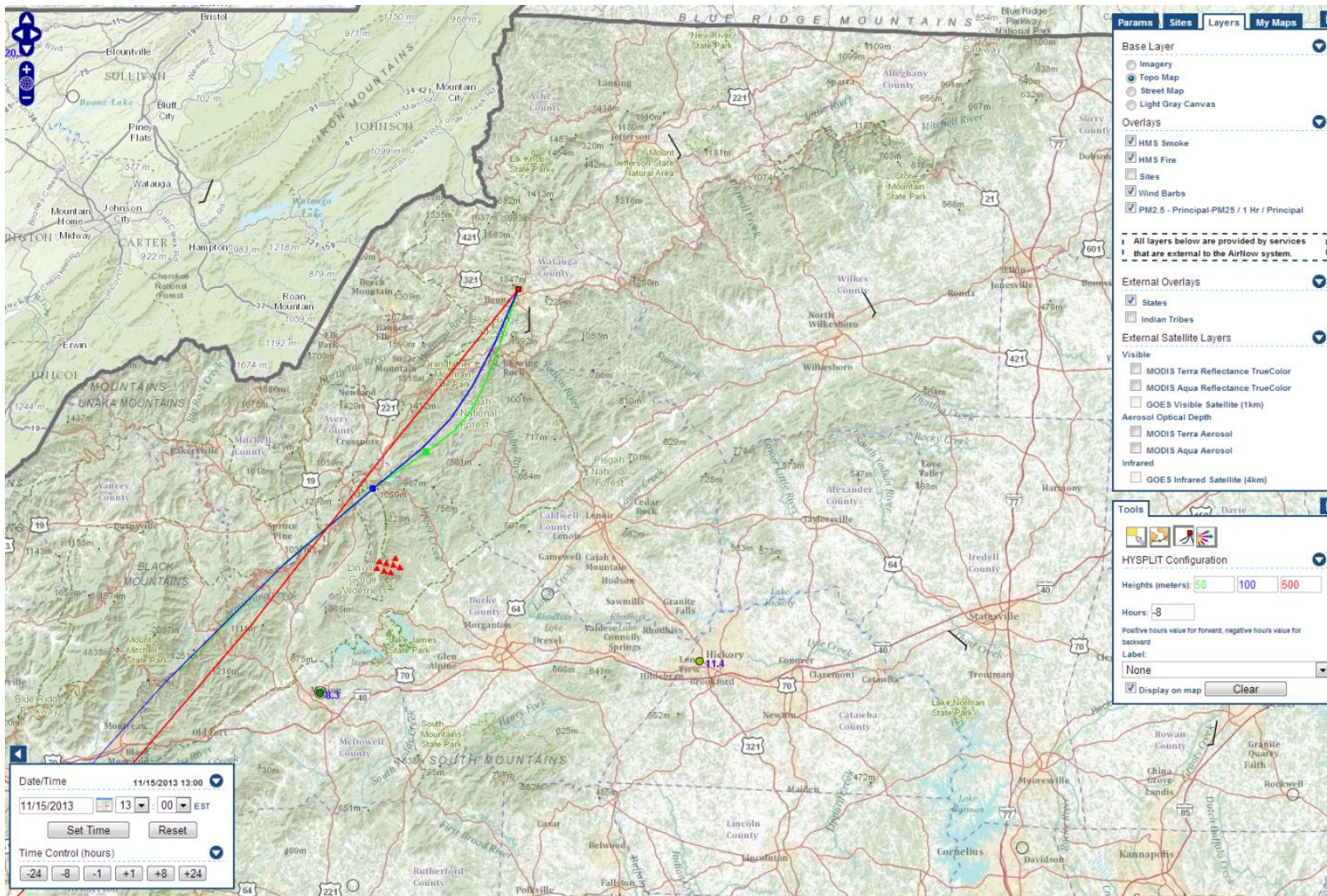


Figure 2. 8-Hour Backward Trajectories from Boone starting at 1 PM on November 15, 2013. Continuous monitors at Marion and Hickory read 8.3 and 11.4 micrograms per cubic meter of fine particle matter, respectively. The air mass at Boone came from the direction of the Table Rock Wildfire in the Linville Gorge Wilderness Area.

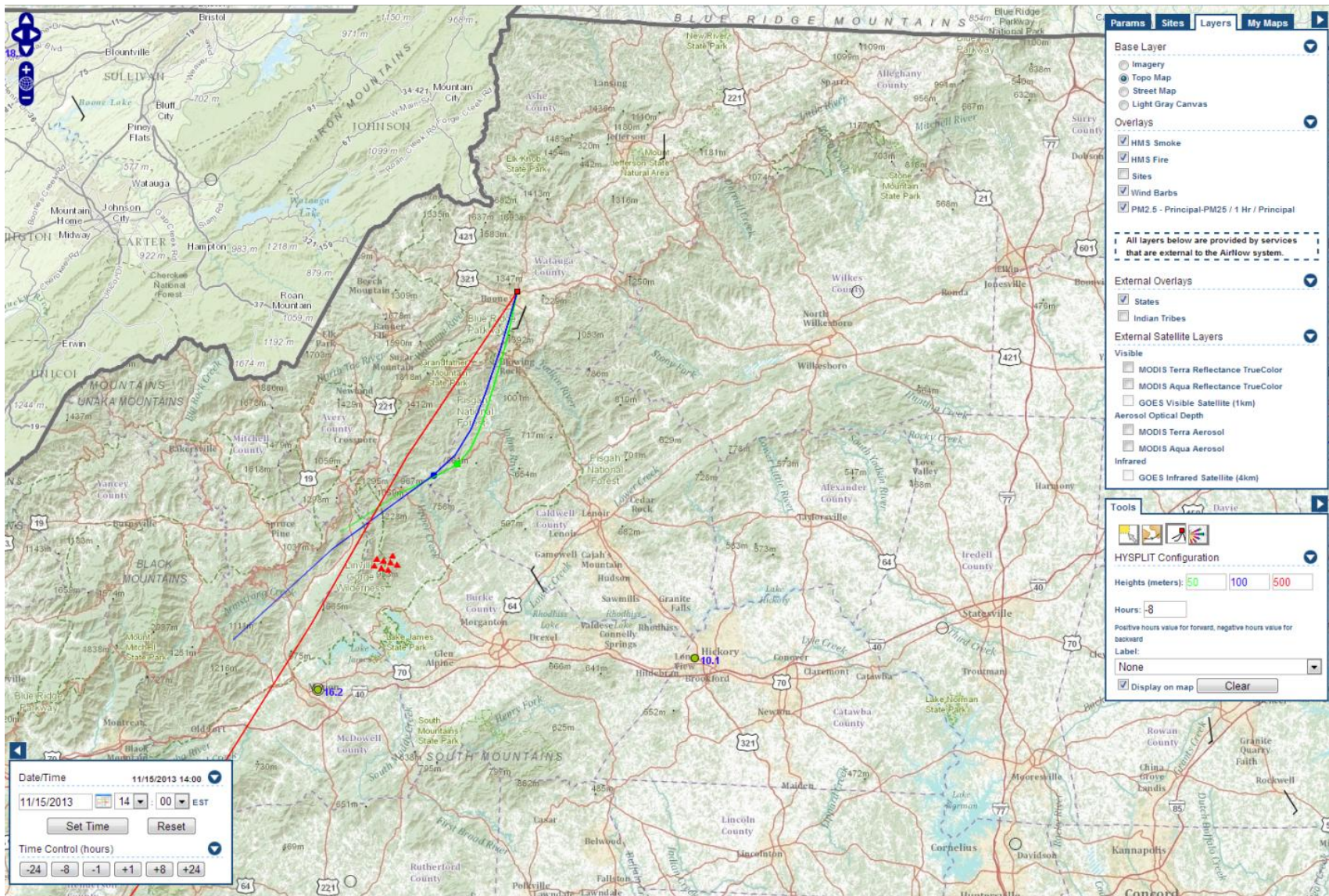


Figure 3. 8-Hour Backward Trajectories from Boone starting at 2 PM on November 15, 2013. Continuous monitors at Marion and Hickory read 16.2 and 10.1 micrograms per cubic meter of fine particle matter, respectively. The air mass at Boone came from the direction of the Table Rock Wildfire in the Linville Gorge Wilderness Area.

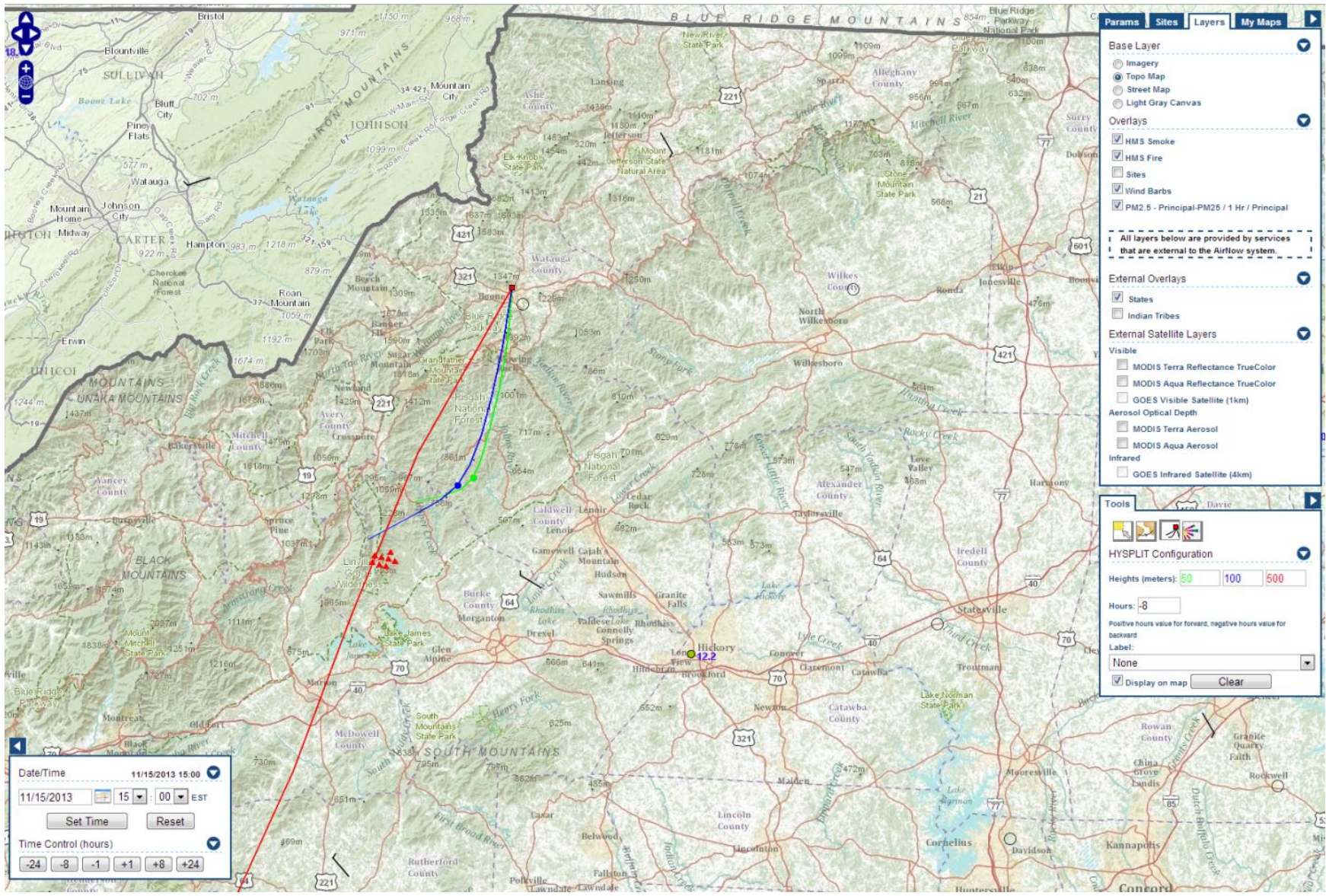


Figure 4. 8-Hour Backward Trajectories from Boone starting at 3 PM on November 15, 2013. The continuous monitor at Hickory reported 12.2 micrograms per cubic meter of fine particles. The air mass at Boone came from the Table Rock Wildfire in the Linville Gorge Wilderness Area.

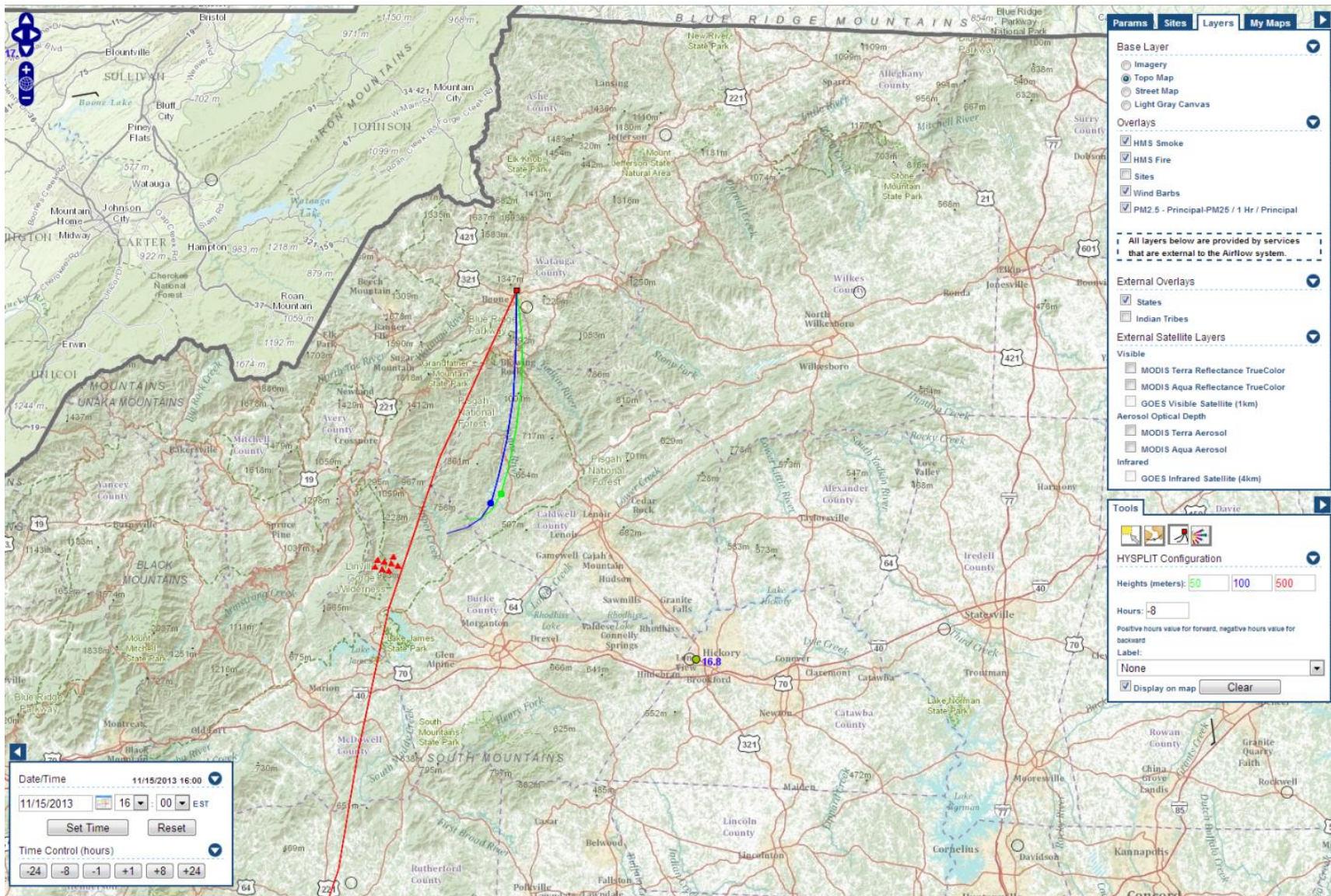


Figure 5. 8-Hour Backward Trajectories from Boone starting at 4 PM on November 15, 2013. The continuous monitor at Hickory reported 16.8 micrograms per cubic meter of fine particles. The air mass at Boone came from the Table Rock Wildfire in the Linville Gorge Wilderness Area.

NOAA HYSPLIT MODEL
 Backward trajectories ending at 1600 UTC 15 Nov 13
 NAM Meteorological Data

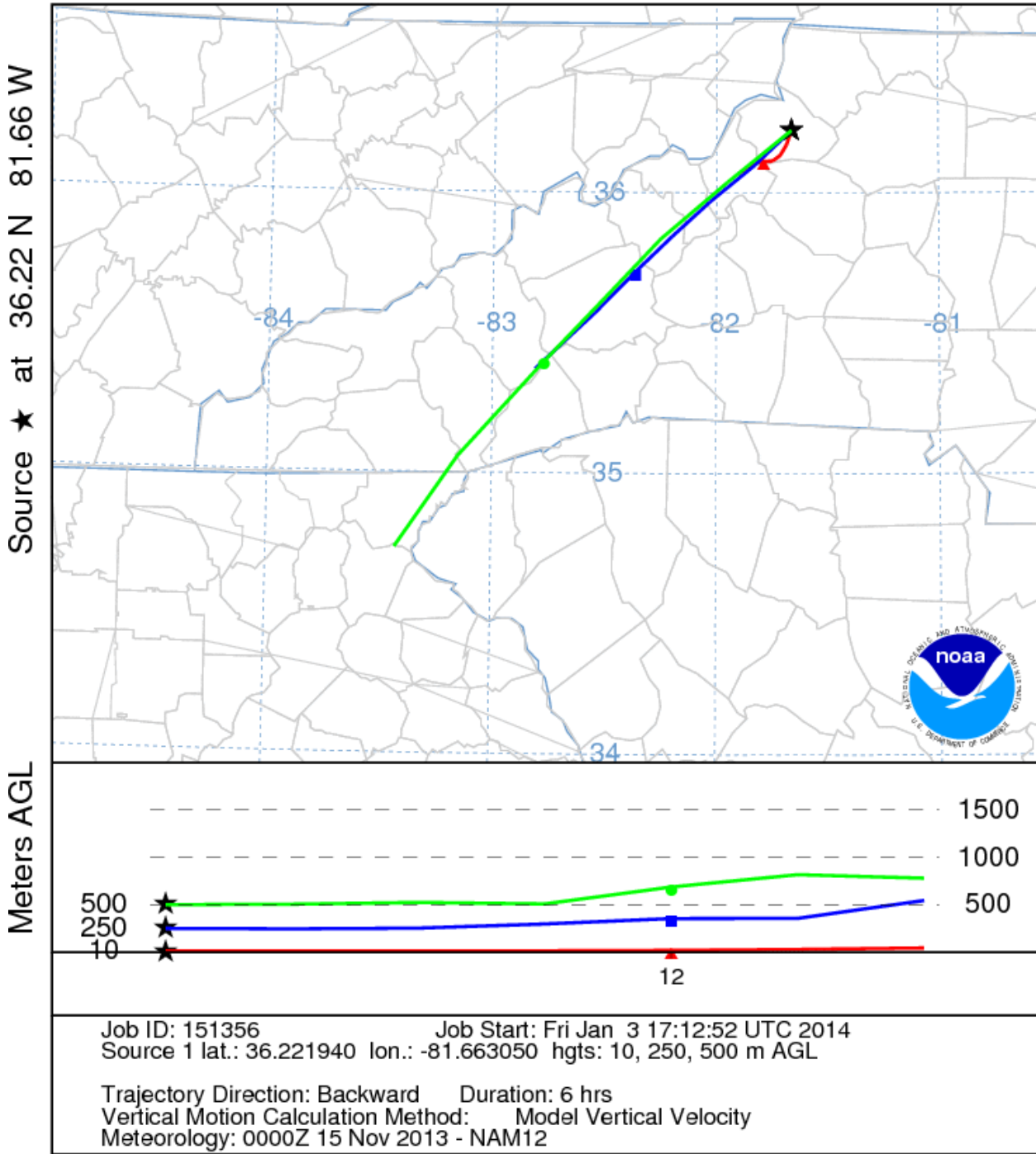


Figure 6. NOAA HYSPLIT Model 6-Hour Backward Trajectories from Boone starting at 11 AM on November 15, 2013. The Table Rock Wildfire was at latitude 35.886 and longitude -81.886.

NOAA HYSPLIT MODEL
 Backward trajectories ending at 1700 UTC 15 Nov 13
 NAM Meteorological Data

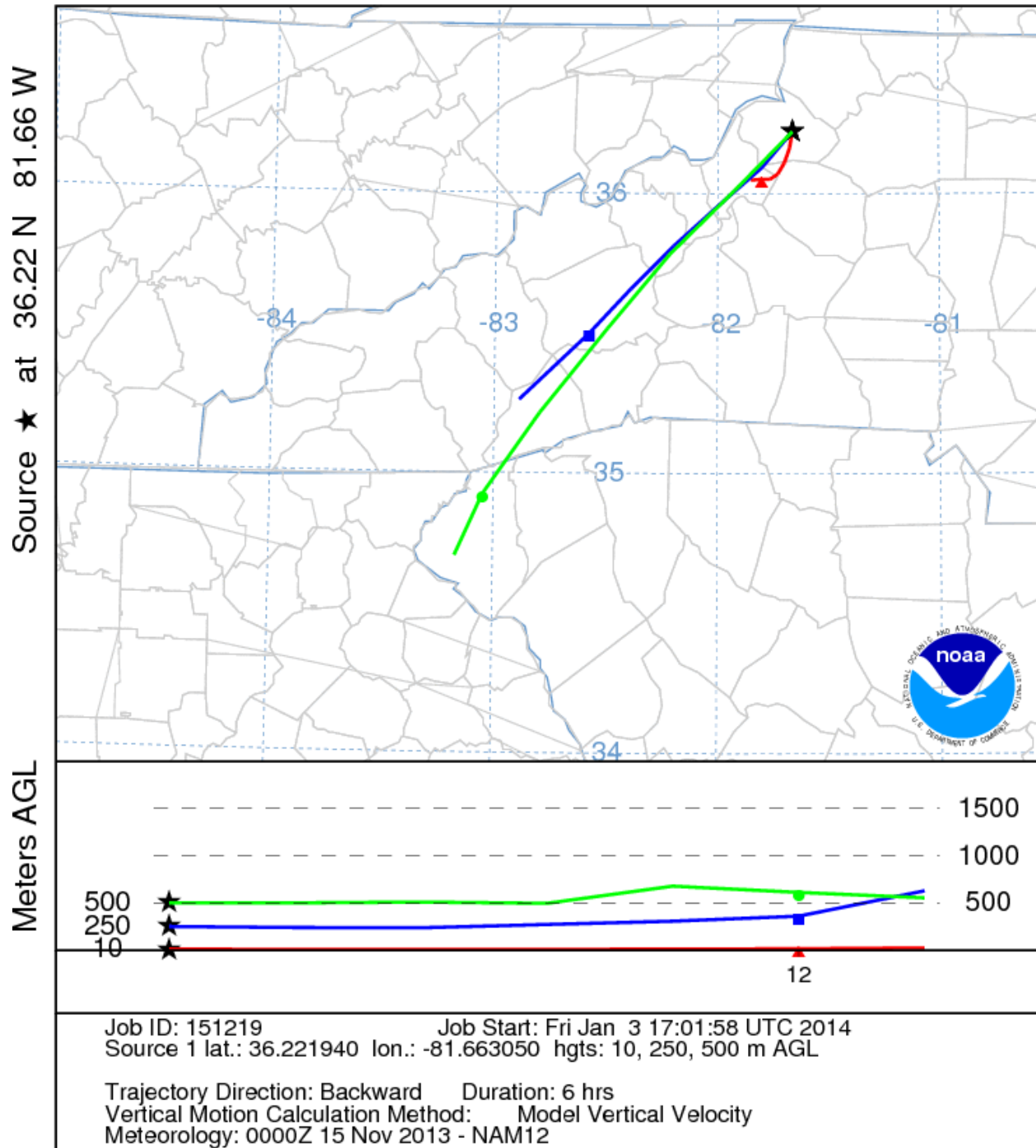


Figure 7. NOAA HYSPLIT Model 6-Hour Backward Trajectories from Boone starting at 12 PM on November 15, 2013. The Table Rock Wildfire was at latitude 35.886 and longitude -81.886.

NOAA HYSPLIT MODEL
 Backward trajectories ending at 1800 UTC 15 Nov 13
 NAM Meteorological Data

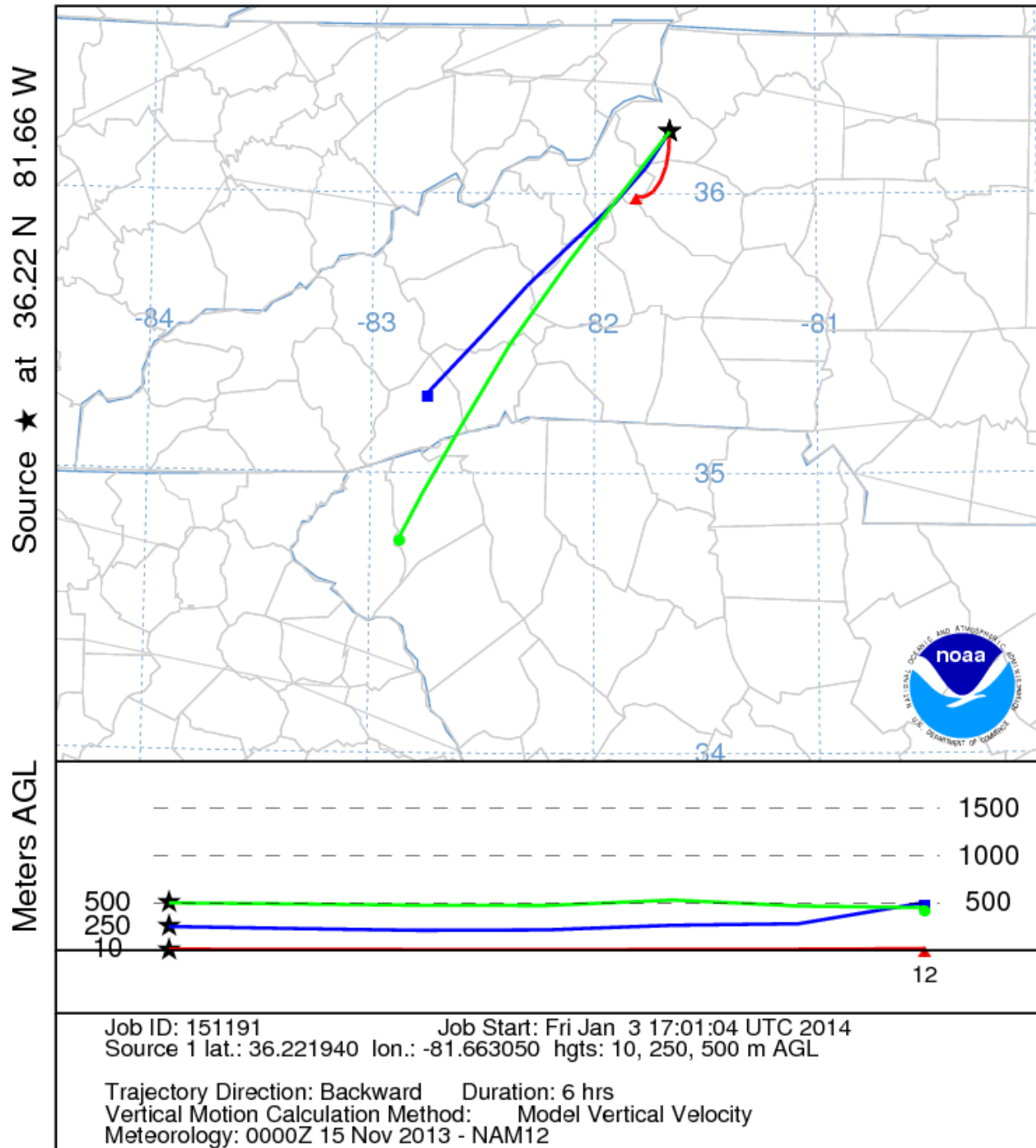


Figure 8. NOAA HYSPLIT Model 6-Hour Backward Trajectories from Boone starting at 1 PM on November 15, 2013. The Table Rock Wildfire was at latitude 35.886 and longitude -81.886.

NOAA HYSPLIT MODEL
 Backward trajectories ending at 1900 UTC 15 Nov 13
 NAM Meteorological Data

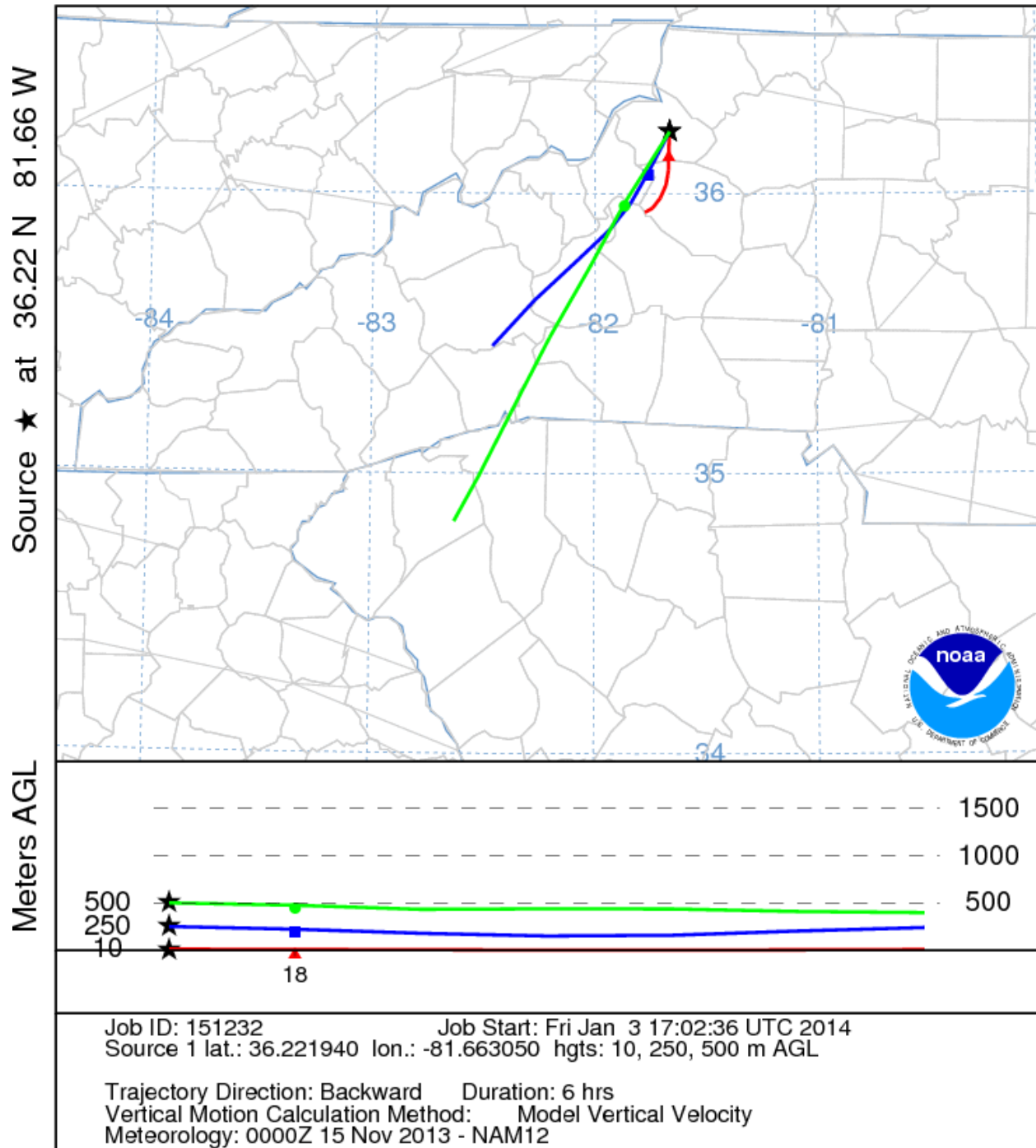


Figure 9. NOAA HYSPLIT Model 6-Hour Backward Trajectories from Boone starting at 2 PM on November 15, 2013. The Table Rock Wildfire was at latitude 35.886 and longitude -81.886.

NOAA HYSPLIT MODEL
 Backward trajectories ending at 2000 UTC 15 Nov 13
 NAM Meteorological Data

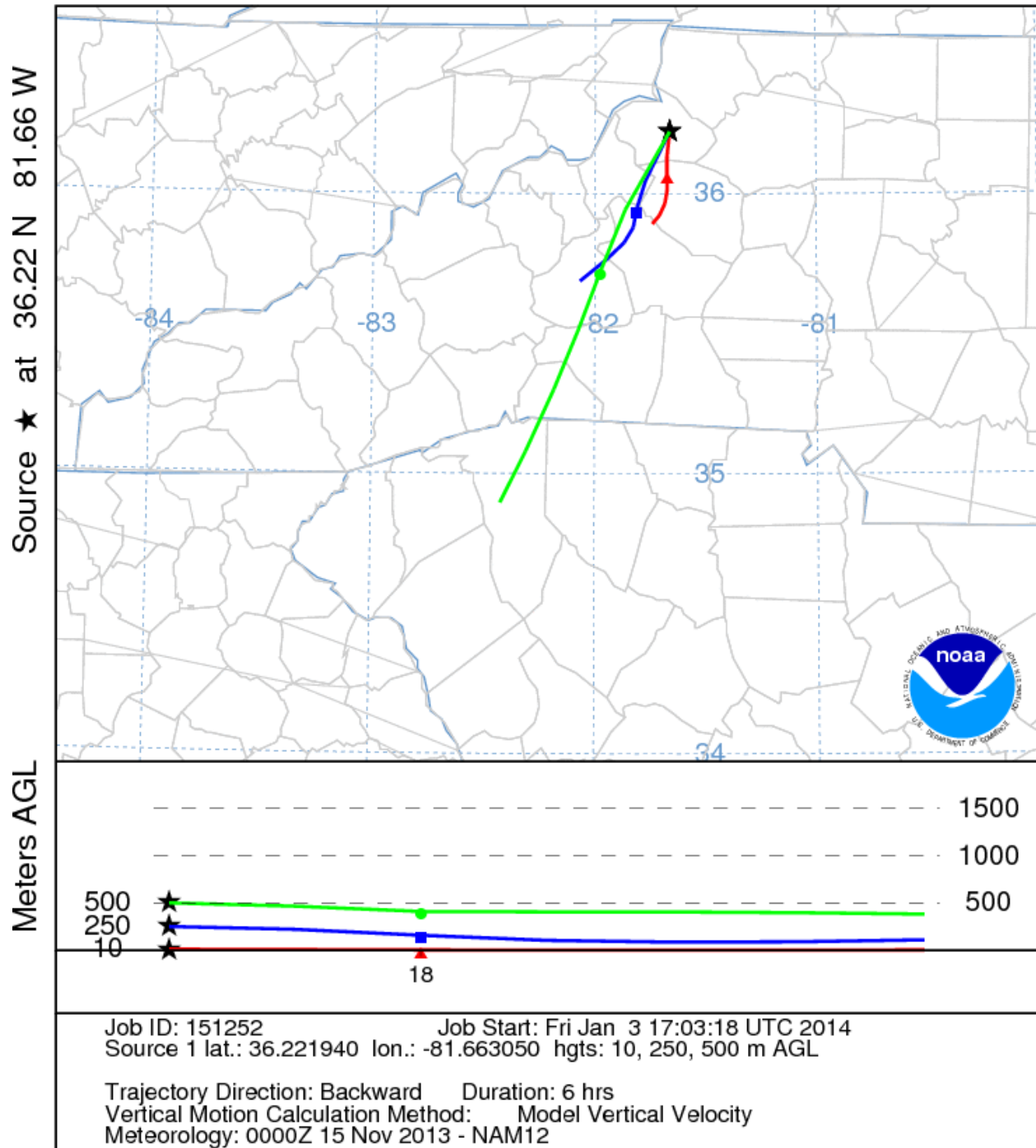


Figure 10. NOAA HYSPLIT Model 6-Hour Backward Trajectories from Boone starting at 3 PM on November 15, 2013. The Table Rock Wildfire was at latitude 35.886 and longitude -81.886.

NOAA HYSPLIT MODEL
 Backward trajectories ending at 2100 UTC 15 Nov 13
 NAM Meteorological Data

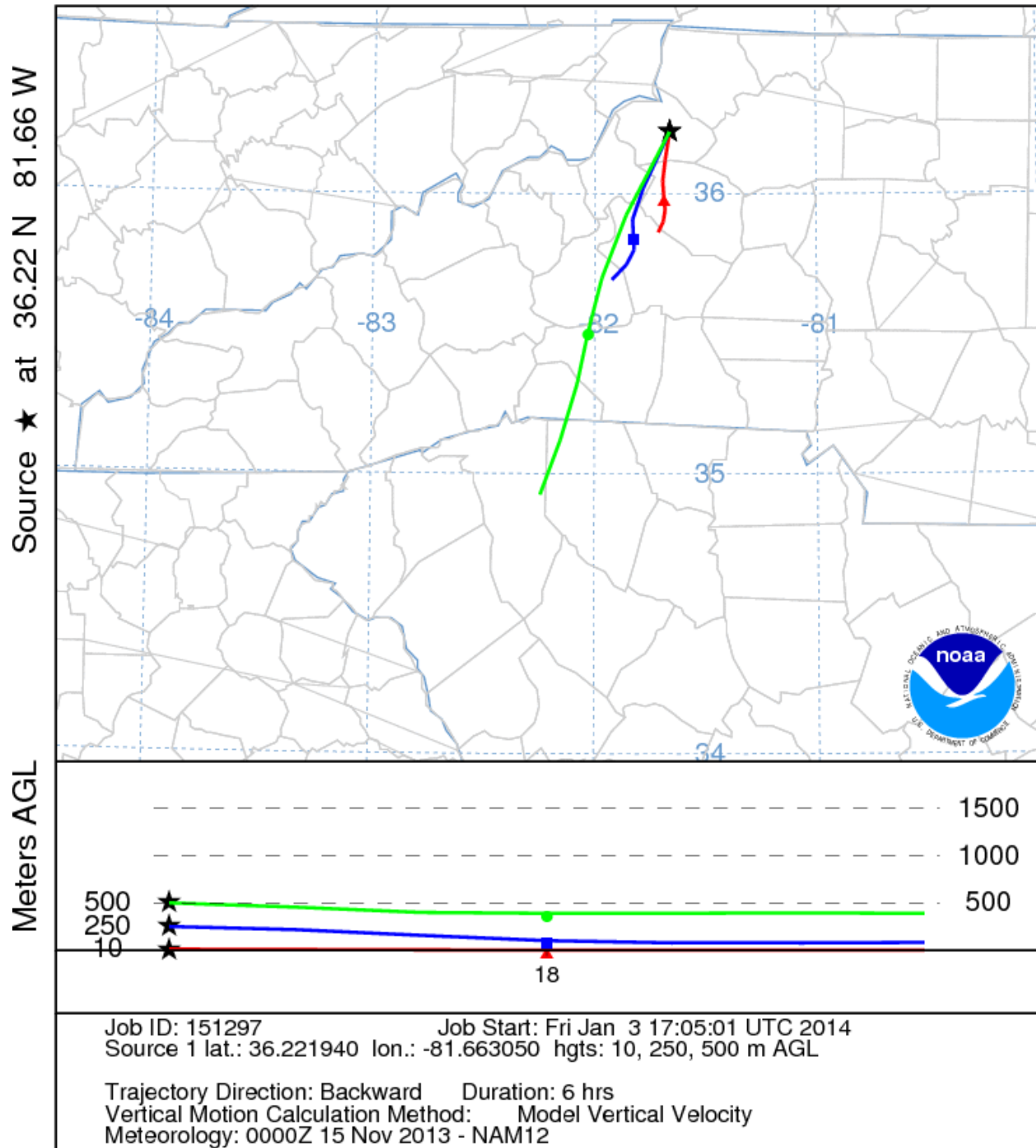


Figure 11. NOAA HYSPLIT Model 6-Hour Backward Trajectories for Boone at 4 PM on November 15, 2013. The Table Rock Wildfire was at latitude 35.886 and longitude -81.886.

ATYPICAL ANALYSIS

All valid concentrations measured at Boone during fourth quarter from 2010 through 2013 were pooled and graphed as shown in Figure 12 and Figure 13. Based on the graphs in Figure 12 and Figure 13, the fine particle concentration measured at Boone On November 15, 2013, was over twice as high as the next highest concentration of 21.83 micrograms per cubic meter measured on December 11, 2010. The median concentration measured during this time frame was 6.3, the 84th percentile concentration was 9.8, the 90th percentile concentration was 11.0, and the 95th percentile concentration was 12.3, and the 99th percentile was 20.0. There were seven values higher than the 95th percentile: 59.2 micrograms per cubic meter measured on November 15, 2013, 21.8 on December 11, 2010, 14.4 on October 12, 2010, 14.3 on November 30, 2013, 13.2 on December 18 and 31, 2010, and 12.4 on October 31, 2013.

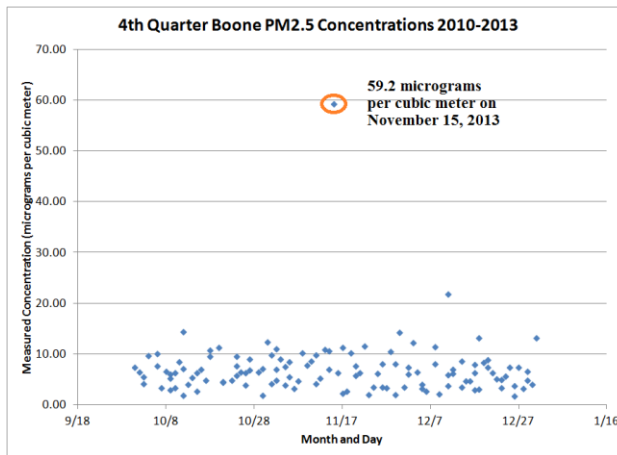


Figure 12. Comparison of Value Measured November 15, 2013, with Values Measured in 4th Quarter for 2010 through 2013

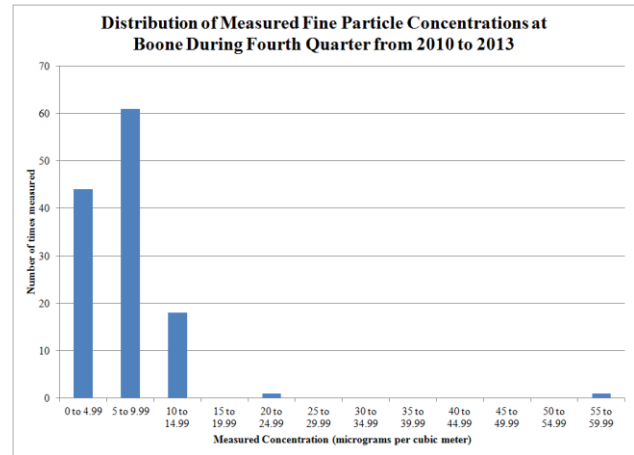


Figure 13. Distribution of Measured Fine Particle Concentrations at Boone

In comparison, at Spruce Pine, also located in the mountains, during the same time period, the 84th percentile was 12.3 and the 95th percentile was 14.7. The value on November 15, 2013, was 17.04. Based on this analysis the 59.2 micrograms per cubic meter of fine particle measured at Boone on November 15, 2013, is atypical for this location at this time of year. A list of all of the values measured at Boone used in this analysis is provided in APPENDIX B. BOONE QUARTER 4 PM2.5 CONCENTRATIONS 2010 - 13.

“BUT FOR” TEST”

The “But For Test” demonstrates there would have been no exceedance or violation of the current 24 hr particle pollution standard “but for” smoke emanating from the Table Rock Wildfire into Boone on November 15th, 2013. The “But For Test” NC DAQ used for this demonstration is described below.

Summary

In order to demonstrate that “but for” smoke emanating from the Table Rock Wildfire the Boone monitor would not have recorded a 24 hr particle pollution exceedance, NC DAQ developed a regression model to predict what particle pollution levels would have been without the influence of the fire. This model used meteorological observations from surrounding, most-representative, surface weather observing stations based on terrain and proximity to the Boone monitor in question.

The developed regression model, consisting of an array of meteorological variables, explained just over half of the variance seen in particle pollution at the Boone monitor from 2008 to 2013. *To further increase confidence, NC DAQ computed the maximum expected particle pollution level on November 15th, 2013, using a 99 percent probability. The 99th percentile particle pollution value modeled for November 15th, 2013, at the Boone monitor was 21.47 $\mu\text{g}/\text{m}^3$ – 64% lower than the observed value of 59.25 $\mu\text{g}/\text{m}^3$. These results mean there is at most a 1% probability that the concentrations at Boone could have been higher than 21.47 $\mu\text{g}/\text{m}^3$ based on the observed conditions without influence from the smoke emanating from the Table Rock wildfire.*

Data Description

Meteorological observations were obtained from the State Climate Office of North Carolina from the Boone-Watuga Hospital (KTNB) AWOS observing station in Boone, NC, and the Upper Mountain Research Stn. (LAUR) ECONet observing station in Laurel Springs, NC. Parameters used in the regression model include:

- TAVG – Daily temperature average
- TDAVG – Daily dewpoint average
- WSPD – Daily windspeed average
- Uwind – Daily u-component of wind
- RHAVG – Daily relative humidity average
- RHMIN – Daily minimum relative humidity
- PRECIP – Daily precipitation
- PRECIP_Lag1 – Previously daily precipitation
- SR – Daily solar radiation average
- Mixing Ratio – Daily mixing ratio average

Results

<i>Regression Statistics</i>	
Multiple R	0.520907041
R Square	0.271344145
Adjusted R Square	0.260964432
Standard Error	3.462350634

Observations	713
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	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Upper 99.0%</i>
Intercept	8.984898112	1.208096101	7.437237903	3.01E-13	12.10523017
TAVG	-0.064205131	0.028973901	-2.215964364	0.027014	0.010630133
TDAVG	0.132098032	0.027035067	4.886173608	1.27E-06	0.201925579
WSPD	-0.162519274	0.038640621	-4.205917709	2.94E-05	-0.062716311
Uwind	-0.028713999	0.065562957	-0.437960704	0.661549	0.140625341
RHAVG	-0.03213426	0.009586123	-3.352164236	0.000845	-0.007374733
RHMIN	-0.022182673	0.009422992	-2.354100822	0.018842	0.00215551
PRECIP	-1.235184108	0.350219309	-3.526887511	0.000448	-0.330619862
PRECIP_Lag1	-0.822133863	0.295569843	-2.781521464	0.005556	-0.058721038
SR	0.021229555	0.004998883	4.246859533	2.46E-05	0.034140925
Mixing Ratio	-0.015186292	0.003996866	-3.79954975	0.000158	-0.004862983

Using the output coefficients, the regression model predicted a 24 hr particle pollution concentration of 9.50 $\mu\text{g}/\text{m}^3$ would have occurred on November 15th, 2013. To increase confidence that the standard would not have been exceeded, NC DAQ computed the “worst case scenario” or 99th percentile value as well. When plugging in the upper 99% coefficients, the particle pollution concentration was 21.47 $\mu\text{g}/\text{m}^3$. Based on these results, there is only a 1% probability that levels would have been higher than 21.47 $\mu\text{g}/\text{m}^3$ on November 15th, 2013, and lower than 1% probability that levels would have exceeded the National Ambient Air Quality Standard.

11/15/2013 - PM prediction:	9.50
11/15/2013 - upper 99th percentile:	21.47

APPENDIX A TABLE ROCK WILDFIRE ALERTS AND NOTICES

InciWeb - Incident Information System

The URL <http://inciweb.org> used to access this site will be INACTIVE after March 1, 2014. The supported URL is <http://inciweb.nwcg.gov>.

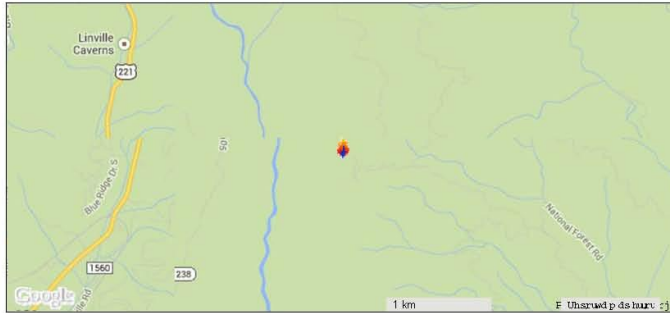
Table Rock

This incident is no longer being updated.

INCIDENT UPDATED 12/3/2013

Approximate Location

35.886 latitude, -81.886 longitude [reset view](#)



Incident Overview

The Table Rock fire will be turned back over to the local unit Pisgah National Forest Grandfather Ranger District effective tomorrow morning. Contact for fire information has changed. The fire is still at 2 579 acres but containment changed to 90% yesterday. This will be the last update from the SA Type 2 team.



Image options: [Enlarge] [Full Size]

Basic Information

Incident Type	Wildfire
Cause	Human
Date of Origin	Tuesday November 12th, 2013 approx. 09:00 AM
Location	10 miles NW of Morganton, NC
Incident Commander	Nick Larson

Current Situation

Total Personnel	5
Size	2,579 acres
Percent Contained	100%

Fuels Involved	9 hardwood litter, hardwood leaf litter with snags and dead/down material from previous wildfires
Fire Behavior	minimal activity
Significant Events	control of fire returned to District staff

Outlook

Planned Actions	monitor containment lines
Growth Potential	low
Terrain Difficulty	extreme

Current Weather

Wind Conditions	14 mph NW
Temperature	36 degrees
Humidity	20%



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Table Rock News Release

Progress Made on Table Rock Wildfire

Incident: Table Rock Wildfire
Released: 11/14/2013

National Forests in North Carolina
USDA Forest Service
160A Zillicoa St.
Asheville N.C. 28801
Online: www.fs.usda.gov/nfnc
FOREST SERVICE ALERT

Nov. 14 2013
11 a.m. update

Progress made on Table Rock Wildfire

BURKE COUNTY N.C. – Fire crews made considerable progress on line construction for the Table Rock fire yesterday even though fire activity did increase. The fire is located in the Linville Gorge on the Grandfather Ranger District Pisgah National Forest within the perimeter of the Table Rock and Chimney area. This fire was first detected on Tuesday November 12th in the Table Rock Picnic Area. Size of the wildfire increased to 300 acres yesterday as a result of westerly winds that pushed the fire to the east. Fire containment is estimated at 5 percent.

US Forest Service engine crews and the Oak Hill Volunteer Fire Department were able to reduce fuels around the Outward Bound facility by removing vegetation and burning out around the structures. There are no other homes or structures threatened at this time.

Fire fighter numbers increased to 100 personnel overnight as crews came in from surrounding states. No injuries have been reported. Additional resources will continue to arrive today as the NC Type 3 Team initiates operational tactics to slow the spread of the fire. Those tactics involve the use of fire to fight fire. A "burn out" operation will be used to expand the effectiveness of the containment lines. Crews will burn from the line with expectation that the set fire will carry to the active wildfire areas. These burned out areas will reduce the spread by removing fuels that can carry a fire.

Today the public should see an increase in the amount of smoke coming from the area. The majority of the smoke is from the wildfire itself; however some of the smoke will be a result of the burn out operations. The amount of smoke will be heaviest in the mid-afternoon and should dissipate by evening. Most of the smoke is expected to move northeast of Table Rock although some smoke will settle into Linville Gorge tonight as winds decrease and humidity increases.

The cause of the fire is under investigation. Fire investigators are asking the public to contact the Grandfather Ranger District at 828-652-2144 with any information about persons in the Table Rock picnic area on Monday Veteran's Day.

Several trails in the Table Rock Mountain and Shortoff Mountain area are closed to public access. The Table Rock Picnic Area is also closed. Visitors looking to access the Linville Gorge should check the National Forests in North Carolina website for the latest closure information.

Media Contact: Deborah Walker ph: 910-975-0803.

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USDA is an equal opportunity provider and employer. To file a complaint of discrimination write: USDA Office of the Assistant Secretary for Civil Rights Office of Adjudication 1400 Independence Ave. SW Washington DC 20250-9410 or call (866) 632-9992 (Toll-free Customer Service) (800) 877-8339 (Local or Federal relay) (866) 377-8642 (Relay voice users).



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Table Rock News Release

Additional Trails Closed Due to Table Rock Wildfire

Incident: Table Rock Wildfire
Released: 11/14/2013

National Forests in North Carolina
USDA Forest Service
160A Zillicoa St.
Asheville N.C. 28801
Online: www.fs.usda.gov/nfsc
FOREST SERVICE ALERT

Nov. 14 2013
5 p.m. update

Additional Trails Closed due to Table Rock Wildfire

BURKE COUNTY N.C. – Firefighters made progress on the Table Rock wildfire today as they concentrated their efforts on burn out tactics to reduce the spread of the active fire front. The Table Rock fire is located in the Linville Gorge on the Grandfather Ranger District Pisgah National Forest about half way down the gorge south of Spence Ridge Trail. Size of the fire increased to 1 800 acres as a result of effective burn out operations conducted yesterday and today. Fire containment has not changed from the estimated 5 percent earlier today.

Additional trails were closed today in the Linville Gorge. This includes the Conley Cove Trail (#229) the Pinch In Trail (#228) the Rock Jock Trail (#247) and parts of the Linville Gorge Trail (#231). Other trails around Table Rock Mountain and Shortoff Mountain along with the Table Rock Picnic Area are still closed to public access. Visitors looking to access the Linville Gorge should check the National Forests in North Carolina website for the latest closure information.

Several US Forest Service engines and the Oak Hill Volunteer Fire Department are standing by at the Outward Bound complex as protection resources in case the fire should cross containment lines surrounding the area. A total of 25 structures at Outward Bound were originally threatened by the fire. Dozer lines and burn out operations should provide additional protection measures for this facility. There are no other homes or structures threatened at this time.

Close to 100 firefighting personnel are assisting with suppression efforts. Federal crews from several surrounding states are providing support to this incident. Most of the operations tonight and tomorrow will be centered around burn outs between the containment lines and the active fire front. Burn out tactics will be used to reduce unburned fuels between the containment lines and the wildfire itself. Crews will burn from the line with the expectation that the set fire will carry to the active wildfire areas. These burned out areas will reduce the spread by removing fuels that can carry a fire.

The public will continue to experience smoke from the fire through the weekend. Winds from the south will push the smoke to northern communities during the day and will settle into the canyons at night.

The cause of the fire is under investigation. Fire investigators are asking the public to contact the Grandfather Ranger District at 828-652-2144 with any information about persons in the Table Rock picnic area on Monday Veteran's Day.

Media Contact: Deborah Walker ph: 910-975-0803.

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Table Rock News Release

Changing Weather Aids in Table Rock Wildfire Suppression

Incident: Table Rock Wildfire
Released: 11/15/2013

National Forests in North Carolina
USDA Forest Service
160A Zillicoa St.
Asheville N.C. 28801
Online: www.fs.usda.gov/nfsnc
TABLE ROCK WILDFIRE UPDATE

Contact: Deborah Walker 910-975-0803
11:00 a.m. November 15 2013

For Immediate Release

Changing Weather Aids in Table Rock Wildfire Suppression

BURKE COUNTY NC – Fire fighters are making progress on suppressing the Table Rock wildfire in the Linville Gorge on the Grandfather Ranger District Pisgah National Forest. A change in weather conditions today should bring some much needed rain to the area. However the rain is expected to be sparse across the Linville Gorge and will not be enough to fully suppress the fire. Total size of the fire grew to 1 800 acres yesterday with a 40% containment estimate as a result of extensive burnout operations.

Wildfire suppression efforts today will focus on additional burnouts along the southern flank of the fire. Crews have built containment lines by hand and dozer and expect to fire from these lines as they use fire to fight fire. Smoke will increase this afternoon due to the active fire and burnout operations. The public will continue to be affected by smoke in the immediate area but there should not be any serious impact beyond the Forest boundary. Federal fire fighters from 4 states have joined forces in North Carolina to suppress the Table Rock Fire with more than 100 personnel working the fire. The Cherokee Hotshot crew from Tennessee is the most recent hand crew to join forces with the North Carolina Type 3 Team.

To date the fire intensity has been moderate across the gorge. Burnout crews are seeing full consumption of fuels as the set fires move toward the active fire thus leaving few areas of unburned fuel between the fire and the containment lines. This means less potential for a re-burn later in the future.

Twenty-five structures in the Outward Bound camp area were originally threatened by the wildfire but containment lines and burnout tactics have been successfully used as protection measures. There are no additional structures threatened and no injuries to fire fighters to date.

Roads and trails in the Linville Gorge remain closed to protect the public and fire fighters who use the narrow winding roads for fire access. The public should check the National Forests in North Carolina website for the latest closure information before planning any trips into the Linville Gorge.

The cause of the fire is under investigation. However fire investigators would appreciate talking with the group who were camping at Table Rock Picnic Area last Monday Veteran's Day. Investigators believe this group has information that would aid in the investigation. A reward may be offered for substantial information regarding this investigation and persons should contact Law Enforcement Officer Jason Crisp at 828-442-2470 or the Grandfather Ranger District at 828-652-2144.

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Content posted to this website is for information purposes only.

InciWeb - Incident Information System

The URL <http://inciweb.org> used to access this site will be INACTIVE after March 1, 2014. The supported URL is <http://inciweb.nwcg.gov>.

Table Rock News Release

Table Rock Wildfire Contributing to Potential Super Fog

Incident: Table Rock Wildfire
Released: 11/15/2013

National Forests in North Carolina
USDA Forest Service
160A Zilliooa St.
Asheville N.C. 28801
Online: www.fs.usda.gov/nfsnc
LINVILLE GORGE SUPERFOG ALERT

Contact: Deborah Walker 910-975-0803
7:00 p.m. November 15 2013

For Immediate Release

Table Rock Wildfire Contributing to Potential Super Fog

BURKE COUNTY NC – U.S. Forest Service officials are predicting the potential for a super fog event tonight for the area south and east of the Table Rock fire in Burke County. A super fog occurs as a result of certain weather conditions that create dangerous driving conditions which makes it unsafe for travel. Smoke from the Linville Gorge area combined with low temperatures high humidity stagnant air and a low cloud ceiling can cause dense fog to accumulate on the ground. If this event occurs it is likely to intensify overnight tonight and worsen between the hours of 5:00 am and 7:00 am Saturday morning.

The area of greatest impact could be along the Burke/McDowell county line affecting State Highway 126. However conditions could extend to Interstate 40 between the Nebo and Glen Alpine communities. Dense fog is expected to follow the Linville River drainage into Lake James continuing into areas below the lake. Any community east and south of the Linville Gorge may experience an increase in smoke as the evening progresses. A stretch of State Highway 181 has been reported to be impacted by dense smoke and fog between Fish Hatchery Road and Jonas Ridge.

The North Carolina Department of Transportation and State Highway Patrol have been notified of this potential event and those agencies will manage all necessary road closures.

For more information about the Table Rock fire contact the Grandfather Ranger District at 828-652-2144 or the Fire Information Officer at 910-975-0803.



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InciWeb - Incident Information System

The URL <http://inciweb.org> used to access this site will be INACTIVE after March 1, 2014. The supported URL is <http://inciweb.nwcg.gov>.

Table Rock News Release

Table Rock Wildfire Jumps Southern Flank

Incident: Table Rock Wildfire
Released: 11/15/2013

National Forests in North Carolina
USDA Forest Service
160A Zillicoa St.
Asheville N.C. 28801
Online: www.fs.usda.gov/nfsnc
TABLE ROCK WILDFIRE UPDATE

Contact: Deborah Walker 910-975-0803
8:00 p.m. November 15 2013

For Immediate Release

Table Rock Wildfire Jumps Southern Flank

BURKE COUNTY NC – The Table Rock wildfire advanced south today moving across containment lines at Chimney Gap. Line construction in this area was difficult due to steep rocky terrain and inaccessible areas in the rock outcrops. A 40 acre spot fire was found during the morning reconnaissance causing the North Carolina Type 3 Team to implement contingency plans which identified new containments lines. There are no structures threatened as a result of this new development and the Team plans to bring in additional fire fighters to help in suppression efforts. Two helicopters dropped water on the spot fire most of the day and an additional helicopter (Type 1) was ordered which can drop up to 1 000 gallons at one time.

Most of the suppression activities today were focused around burn out operations along the south flank. Dozer lines held on the eastern side of the fire tying in with Forest Road 118. Agency crews and the Oak Hill Volunteer Fire Department continue to stand by at the Outward Bound camp in case the fire pushed on the northeast containment line. Fire is still backing in the southwest corner but all other areas have fully burned and fire activity is mostly out. Weather conditions worked in the crews favor with higher humidity and light winds. Most of the smoke is drifting to the east impacting mostly forest lands. Communities near the fire will continue to experience some smoke but not to a level which is considered dangerous.

Smoke dispersion is expected to be poor this evening and residents east and south of the fire may experience an increase in smoke into tomorrow morning.

Size of the fire is estimated at 2 700 acres with 40% containment. There are no additional structures threatened and no reported injuries. Just over 100 fire fighters are assisting with the suppression efforts representing North Carolina South Carolina Georgia Tennessee and Kentucky.

Roads and trails in the Linville Gorge remain closed to the public. If you have plans to access the gorge this weekend you should check the National Forests in North Carolina website for the latest closure information before leaving on your trip.

The cause of the fire is under investigation. However fire investigators would appreciate talking with the group who were camping at Table Rock Picnic Area last Monday Veteran's Day. Investigators believe this group has information that would aid in the investigation. A reward may be offered for substantial information regarding this investigation and persons should contact Law Enforcement Officer Jason Crisp at 828-442-2470 or the Grandfather Ranger District at 828-652-2144.

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Division of Air Quality



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Pat McCrory,
Governor



John E. Skvarla, III,
Secretary

N.C. Department of Environment and Natural Resources

Release: Immediate
Date: November 14, 2013

Contact: Tom Mather, PIO
Phone: 919-707-8446 (w); 919-
607-5424 (c)

Air Quality officials issue health notice for Western Piedmont

Air monitors detect increased particle pollution from wildfire smoke

RALEIGH - Air quality officials issued an advisory today for air pollution in the western Piedmont region of North Carolina as smoke from a Burke County wildfire drifts downwind. Residents in Burke, Caldwell and McDowell counties could experience unhealthy air quality, depending on wind directions.

A 300-acre wildfire in the Pisgah National Forest is producing heavy smoke that could contain high levels of particle pollution. The fire is centered in the Linville Gorge Wilderness near Table Rock Mountain, and satellite photos show a large plume of smoke drifting downwind. Smoke could reach as far as Marion and Hickory.

The N.C. Division of Air Quality, or DAQ, does not have a monitor close to the fire, but previous measurements have found very unhealthy air pollution levels in smoke directly downwind of wildfires. Some of the highest particle pollution levels that DAQ has ever measured were in smoke plumes from wildfires.

The primary pollutant of concern is fine particles, which are extremely small particles and liquid droplets in the air. Particles can be harmful to breathe and contribute to haze and other air quality problems.

http://daq.state.nc.us/news/pr/2013/health_notice_11142013.shtml

5/20/2014

The air pollution forecast for today and Friday estimates that fine particle levels could exceed the standard of 35 micrograms per cubic meter averaged over 24 hours. High particle levels can impair breathing and aggravate symptoms in people with respiratory problems, and irritate the lungs in healthy individuals. People with chronic lung ailments and children should reduce physical exertion and outdoor activity.

Residents could experience Code Orange conditions, or unhealthy for sensitive groups, Friday in Burke, Caldwell and McDowell counties. Parts of Wilkes, Surrey, and Alexander counties may also see some heavier smoke depending on the fire growth and intensity.

The forecast means people who are sensitive to air pollution should avoid or reduce prolonged or heavy exertion outdoors. Sensitive groups include the elderly, children, people who work or exercise outdoors, and those with heart conditions and respiratory ailments such as asthma, bronchitis and emphysema. Everyone else should reduce prolonged or heavy exertion.

Fine particles can penetrate deeply into the lungs and be absorbed into the bloodstream, causing or aggravating heart and lung diseases. People most susceptible to particle pollution include those with heart and respiratory conditions, the elderly and young children. Symptoms of exposure to high particle levels include: irritation of the eyes, nose and throat; coughing; phlegm; chest pain or tightness; shortness of breath; and asthma attacks. In extreme cases, particle pollution can cause premature death.

The N.C. Division of Air Quality issues daily air forecasts for the Triangle, Charlotte, Asheville, Hickory, Fayetteville and Rocky Mount metropolitan areas. In the Triad, forecasts are issued by the Forsyth County Environmental Affairs Department. For additional information, call 1-888-RU4NCAIR (1-888-784-6224) or visit the DAQ website at <http://www.ncair.org> or Forsyth County's website at <http://www.co.forsyth.nc.us/EnvAffairs/>.

###

Jamie Kritzer, Public
Information Officer
Phone (919) 707-8602
1601 Mail Service

Jamie.Kritzer@ncdenr.gov
Facebook: <http://www.facebook.com/ncdenr>
RSS Feed:
<http://portal.ncdenr.org/web/opa/news->

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Raleigh, NC 27699-1601 Twitter: <http://twitter.com/NCDENR>
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Email  Last Modified: Fri November 15 11:51:02 2013 [Top of Page](#)
US NCDENR North Carolina Department of Environment and Natural Resources (NCDENR)

North Carolina Division of Air Quality - 1641 Mail Service Center -
Raleigh, NC 27699-1641 - (919) 707-8400

From: Brown, Todd [<mailto:Todd.Brown@ncdps.gov>]
Sent: Friday, November 15, 2013 9:08 AM
To: EM Group ESG SERT Partners
Subject: Fwd: : On-Going Significant Event - Linville Gorge Fire Update

FYI. No state resources being coordinated by NCEOC at this time. No plans for increase of NCEOC activation level.

Todd Brown
NCEM/Emergency Services

Sent from handheld device, please excuse the brevity.

Begin forwarded message:

From: "Johnson, Darlene" <Darlene.Johnson@ncdps.gov>
Date: November 15, 2013 at 8:12:38 AM EST
To: "Brown, Todd" <Todd.Brown@ncdps.gov>
Subject: : On-Going Significant Event - Linville Gorge Fire Update

Update Issued by Fire Marshal/Emergency Management Director, Mike Long - 0832 Hours

- Approximately 1800 acres have burned.
- The fire is approximately 40% contained.
- Possibly a total of 2000 – 3000 acres to may burn.
- The fire line on the North end at the Spence Ridge Trail is 95% in place.
- The South side line is still open and crews are working today putting this line in.
- Approximately 70 – 80 firefighters on the ground, 10 brush trucks, 2 dozers, and 2 helicopters.

1

- Local resources being used are Oak Hill and Jonas Ridge Fire Department providing fire apparatus and man power for structure protection around the North Carolina Outward Bound Base Camp.
- Burke County EMS is providing medical support standby along
- NCHART has been written into the medical plan for the incident.
- Fire Marshal/Emergency Management Director, Mike Long, and NCEM Area Coordinator, Jeff Cardwell, will be attending the 7:00 a.m. briefing each morning over the weekend and will send out an update each day.

Public Health Advisory: Air Quality Change due to Smoke from Table Rock Fire

admin

November 15, 2013

Date: November 15, 2013

(Boone, NC) – The Appalachian District Health Department has issued a public health advisory notice about air quality in Watauga County area. Smoke that has drifted into neighboring counties from the Table Rock Fire due to wind and weather patterns has led to a Code Orange air quality index.

According to the Division of Air Quality, code orange is not likely to affect most people, but may have greater effect on people with heart and lung diseases, older adults, and children due to the increase particle pollution in the air.

"Individuals who may be at greater risk should be aware to avoid potential complications. Of course, anyone who may be concerned about any symptoms such as trouble breathing should contact their healthcare provider," said Beth Lovette, Health Director.

Breathing air with more particle pollution may place these individuals at greater risk for complications. Those who have a diagnosed condition such as asthma, COPD, chronic bronchitis, lung or heart disease, or other immune compromised condition should use caution and limit activities outdoors during this time. In addition, those who are usually working or exercising outdoors should also use caution and avoid prolonged periods outside.

You can stay connected with up-to-date information about air quality by logging on to Appalachian District Health Department on facebook or www.apphealth.com. If you have additional questions or concerns, please contact your local Appalachian District Health Department Office or log on to www.apphealth.com (Watauga County: 828-264-4995, Ashe County 336-246-9449, Alleghany 336-372-5641).

Contact: Jennifer Greene
Telephone: (828) 264-4995
Email: jen.bryan@apphealth.com

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APPENDIX B. BOONE QUARTER 4 PM2.5 CONCENTRATIONS 2010 - 13

Table B-1. 4th Quarter Concentrations Measured at Boone 2010 to 2013 Listed by Rank

Date	Concentration	Rank	Date	Concentration	Rank
12/26/2012	1.62	1	12/17/2010	6.29	64
10/12/2011	1.83	2	11/16/2010	6.33	65
10/30/2012	1.83	2	12/04/2010	6.35	66
11/23/2011	1.92	4	10/25/2013	6.38	67
11/29/2011	1.96	5	10/02/2010	6.46	68
12/09/2013	2.12	6	10/29/2010	6.46	68
11/17/2011	2.17	7	10/08/2010	6.54	70
10/15/2011	2.67	8	12/29/2011	6.58	71
12/06/2013	2.67	8	10/27/2011	6.75	72
11/18/2013	2.67	10	12/12/2013	6.92	73
10/09/2012	2.92	11	10/16/2013	6.96	74
12/17/2012	2.92	11	11/02/2012	6.96	74
12/18/2013	3.04	13	11/14/2011	7.00	76
11/06/2013	3.17	14	10/30/2011	7.08	77
12/05/2012	3.17	14	10/12/2012	7.12	78
12/28/2010	3.17	14	12/25/2010	7.29	79
10/07/2013	3.25	17	12/02/2012	7.33	80
11/27/2013	3.29	18	10/01/2013	7.37	81
10/10/2013	3.33	19	12/20/2011	7.37	81
12/23/2011	3.33	19	12/27/2013	7.38	83
12/01/2010	3.37	21	11/04/2013	7.46	84
11/24/2013	3.42	22	10/24/2011	7.62	85
12/14/2011	3.42	23	10/06/2012	7.63	86
11/26/2012	3.50	24	11/20/2012	7.67	87
12/11/2012	3.71	25	11/09/2013	7.79	88
12/26/2011	3.71	25	12/17/2011	7.96	89
10/26/2010	3.79	27	11/26/2011	8.00	90
11/04/2010	3.83	28	11/29/2012	8.00	90
12/30/2013	3.96	29	12/08/2012	8.08	92
12/05/2011	4.00	30	12/19/2010	8.25	93
10/13/2013	4.04	31	11/05/2011	8.43	94
10/03/2012	4.12	32	10/11/2010	8.46	95
11/11/2011	4.12	32	11/10/2010	8.54	96
11/01/2013	4.13	34	12/14/2012	8.58	97
10/21/2011	4.38	35	12/20/2012	8.87	98
10/21/2012	4.54	36	10/27/2012	8.96	99
12/16/2010	4.65	37	11/03/2013	9.00	100
11/07/2010	4.67	38	10/18/2012	9.54	101
12/15/2013	4.67	39	10/24/2012	9.54	102
10/17/2010	4.79	40	10/04/2013	9.71	103
10/23/2010	4.79	41	11/11/2012	9.75	104
11/02/2013	4.79	41	11/01/2010	9.79	105
12/29/2012	4.83	43	10/06/2011	10.08	106
12/23/2012	4.88	44	11/08/2012	10.25	107
12/22/2010	5.00	45	11/19/2010	10.25	107
11/12/2013	5.17	46	11/28/2010	10.46	109
10/09/2011	5.25	47	11/14/2012	10.58	110
10/14/2010	5.29	48	10/18/2011	10.79	111
10/03/2011	5.50	49	11/13/2010	10.87	112
11/05/2012	5.50	49	11/02/2011	11.00	113

Table B-1. 4th Quarter Concentrations Measured at Boone 2010 to 2013 Listed by Rank

Date	Concentration	Rank	Date	Concentration	Rank
12/24/2013	5.58	51	11/17/2012	11.29	114
10/24/2013	5.67	52	10/20/2010	11.29	115
11/20/2011	5.75	53	12/08/2011	11.46	116
12/11/2011	5.92	54	11/22/2010	11.58	117
10/09/2010	5.96	55	12/03/2013	12.17	118
12/02/2011	6.00	56	10/31/2013	12.37	119
12/12/2010	6.08	57	12/18/2010	13.17	120
11/25/2010	6.12	58	12/31/2010	13.17	120
11/21/2013	6.21	59	11/30/2013	14.29	122
10/15/2012	6.25	60	10/12/2010	14.38	123
10/10/2010	6.25	61	12/11/2010	21.83	124
10/26/2013	6.29	62	11/15/2013	59.25	125
12/21/2013	6.29	62			

Concentrations are in micrograms per cubic meter.

APPENDIX C. BOONE, NC, WEATHER HISTORY - NOVEMBER 15, 2013

Weather History for Boone, NC | Weather Underground

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Weather History for Boone, NC

Friday, November 15, 2013

Friday, November 15, 2013

« Previous Day

November 15 2013

View

Next Day »

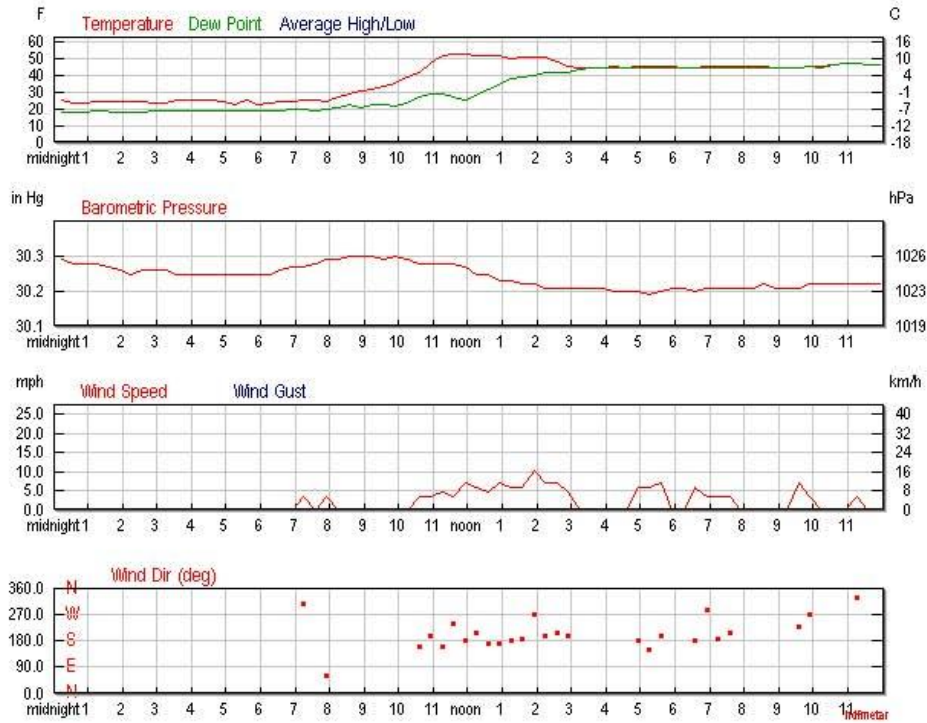
	Actual	Average (KGEV)	Record (KGEV)
Temperature			
Mean Temperature	37 °F	-	
Max Temperature	53 °F	54 °F	74 °F (1993)
Min Temperature	22 °F	31 °F	9 °F (1969)
Degree Days			
Heating Degree Days	28		
Moisture			
Dew Point	32 °F		
Average Humidity	81		
Maximum Humidity	100		
Minimum Humidity	35		
Precipitation			
Precipitation	0.15 in	-	- ()
Sea Level Pressure			
Sea Level Pressure	30.24 in		
Wind			
Wind Speed	1 mph (SSW)		
Max Wind Speed	10 mph		
Max Gust Speed	17 mph		
Visibility	6 miles		
Events	Rain		

Averages and records for this station are not official NWS values.

T = Trace of Precipitation, MM = Missing Value

Source: NWS Daily Summary

Seasonal Weather Averages



Certify This Report

Hourly Weather History & Observations

Time (EST)	Temp.	Windchill	DewPoint	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust S
12:15 AM	25.2 °F	-	18.1 °F	75%	30.29 in	10.0 mi	Calm	Calm	-
12:35 AM	23.5 °F	-	18.3 °F	80%	30.28 in	10.0 mi	Calm	Calm	-
12:55 AM	23.4 °F	-	18.0 °F	80%	30.28 in	10.0 mi	Calm	Calm	-
1:15 AM	24.4 °F	-	18.5 °F	78%	30.28 in	10.0 mi	Calm	Calm	-
1:55 AM	24.4 °F	-	18.1 °F	77%	30.26 in	10.0 mi	Calm	Calm	-
2:15 AM	24.1 °F	-	18.1 °F	78%	30.25 in	10.0 mi	Calm	Calm	-
2:35 AM	24.3 °F	-	18.3 °F	78%	30.26 in	7.0 mi	Calm	Calm	-

Show full METARS | METAR FAQ | Comma Delimited File

<http://www.wunderground.com/history/airport/KTNB/2013/11/15/DailyHist...> 5/19/2014

Time (EST)	Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust S
2:55 AM	23.9 °F	-	19.0 °F	82%	30.26 in	7.0 mi	Calm	Calm	-
3:15 AM	23.7 °F	-	19.0 °F	82%	30.26 in	7.0 mi	Calm	Calm	-
3:35 AM	25.3 °F	-	18.7 °F	76%	30.25 in	7.0 mi	Calm	Calm	-
3:55 AM	25.7 °F	-	18.5 °F	74%	30.25 in	7.0 mi	Calm	Calm	-
4:15 AM	25.0 °F	-	18.5 °F	76%	30.25 in	7.0 mi	Calm	Calm	-
4:35 AM	25.3 °F	-	18.5 °F	75%	30.25 in	10.0 mi	Calm	Calm	-
4:55 AM	24.4 °F	-	19.0 °F	80%	30.25 in	10.0 mi	Calm	Calm	-
5:15 AM	23.0 °F	-	18.7 °F	84%	30.25 in	7.0 mi	Calm	Calm	-
5:35 AM	25.5 °F	-	18.9 °F	76%	30.25 in	10.0 mi	Calm	Calm	-
5:55 AM	22.8 °F	-	18.5 °F	83%	30.25 in	7.0 mi	Calm	Calm	-
6:15 AM	23.2 °F	-	18.5 °F	82%	30.25 in	7.0 mi	Calm	Calm	-
6:35 AM	24.1 °F	-	18.9 °F	80%	30.26 in	10.0 mi	Calm	Calm	-
6:55 AM	24.8 °F	-	19.6 °F	81%	30.27 in	10.0 mi	Calm	Calm	-
7:15 AM	25.3 °F	21.1 °F	19.4 °F	78%	30.27 in	7.0 mi	NW	3.5 mph	-
7:35 AM	25.5 °F	-	19.2 °F	77%	30.28 in	7.0 mi	Calm	Calm	-
7:55 AM	24.3 °F	19.9 °F	20.1 °F	84%	30.29 in	7.0 mi	ENE	3.5 mph	-
8:15 AM	27.1 °F	-	21.0 °F	78%	30.29 in	7.0 mi	Calm	Calm	-
8:35 AM	28.8 °F	-	22.3 °F	77%	30.30 in	7.0 mi	Calm	Calm	-
8:55 AM	30.9 °F	-	21.2 °F	67%	30.30 in	7.0 mi	Calm	Calm	-
9:15 AM	32.0 °F	-	22.3 °F	67%	30.30 in	10.0 mi	Calm	Calm	-
9:35 AM	33.4 °F	-	22.5 °F	64%	30.29 in	10.0 mi	Calm	Calm	-
9:55 AM	35.4 °F	-	21.7 °F	58%	30.30 in	10.0 mi	Calm	Calm	-
10:15 AM	39.0 °F	-	23.5 °F	54%	30.29 in	10.0 mi	Calm	Calm	-
10:35 AM	42.3 °F	40.5 °F	27.0 °F	55%	30.28 in	10.0 mi	SSE	3.5 mph	-
10:55 AM	47.3 °F	-	29.5 °F	50%	30.28 in	10.0 mi	SSW	3.5 mph	-
11:15 AM	52.2 °F	-	29.5 °F	42%	30.28 in	10.0 mi	SSE	4.6 mph	-
11:35 AM	52.7 °F	-	26.8 °F	37%	30.28 in	10.0 mi	WSW	3.5 mph	-
11:55 AM	52.7 °F	-	25.7 °F	35%	30.27 in	5.0 mi	South	6.9 mph	17.3 m
12:15 PM	52.3 °F	-	28.4 °F	40%	30.25 in	3.0 mi	SSW	5.8 mph	-
12:35 PM	52.3 °F	-	32.0 °F	46%	30.25 in	3.0 mi	South	4.6 mph	-

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<http://www.wunderground.com/history/airport/KTNB/2013/11/15/DailyHist...> 5/19/2014

Time (EST)	Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust S
12:55 PM	52.0 °F	-	34.5 °F	51%	30.23 in	2.0 mi	South	6.9 mph	-
1:15 PM	50.7 °F	-	37.9 °F	62%	30.23 in	2.5 mi	South	5.8 mph	-
1:35 PM	50.9 °F	-	39.2 °F	64%	30.22 in	2.5 mi	South	5.8 mph	-
1:55 PM	51.6 °F	-	40.5 °F	66%	30.22 in	4.0 mi	West	10.4 mph	-
2:15 PM	51.1 °F	-	41.5 °F	70%	30.21 in	4.0 mi	SSW	6.9 mph	-
2:35 PM	48.0 °F	-	42.3 °F	80%	30.21 in	2.5 mi	SSW	6.9 mph	-
2:55 PM	45.9 °F	43.6 °F	42.1 °F	87%	30.21 in	2.0 mi	SSW	4.6 mph	-
3:15 PM	45.1 °F	-	44.2 °F	97%	30.21 in	2.5 mi	Calm	Calm	-
3:35 PM	45.0 °F	-	44.8 °F	99%	30.21 in	1.8 mi	Calm	Calm	-
3:55 PM	45.0 °F	-	45.0 °F	100%	30.21 in	1.2 mi	Calm	Calm	-
4:15 PM	45.5 °F	-	45.0 °F	98%	30.20 in	1.5 mi	Calm	Calm	-
4:35 PM	45.1 °F	-	45.1 °F	100%	30.20 in	1.2 mi	Calm	Calm	-
4:55 PM	45.5 °F	42.5 °F	45.1 °F	99%	30.20 in	1.2 mi	South	5.8 mph	-
5:15 PM	45.3 °F	42.3 °F	45.1 °F	99%	30.19 in	1.2 mi	SSE	5.8 mph	-
5:35 PM	45.5 °F	41.8 °F	45.1 °F	99%	30.20 in	2.5 mi	SSW	6.9 mph	-
5:55 PM	45.5 °F	-	45.1 °F	99%	30.21 in	3.0 mi	Calm	Calm	-
6:15 PM	44.6 °F	-	44.6 °F	100%	30.21 in	3.0 mi	Calm	Calm	-
6:35 PM	45.1 °F	42.0 °F	44.6 °F	98%	30.20 in	7.0 mi	South	5.8 mph	-
6:55 PM	45.5 °F	44.2 °F	44.6 °F	97%	30.21 in	5.0 mi	WNW	3.5 mph	-
7:15 PM	45.5 °F	44.2 °F	45.1 °F	99%	30.21 in	7.0 mi	South	3.5 mph	-
7:35 PM	45.5 °F	44.2 °F	45.1 °F	99%	30.21 in	4.0 mi	SSW	3.5 mph	-
7:55 PM	45.5 °F	-	45.0 °F	98%	30.21 in	5.0 mi	Calm	Calm	-
8:15 PM	45.7 °F	-	45.0 °F	97%	30.21 in	10.0 mi	Calm	Calm	-
8:35 PM	45.5 °F	-	45.0 °F	98%	30.22 in	7.0 mi	Calm	Calm	-
8:55 PM	45.1 °F	-	44.8 °F	99%	30.21 in	7.0 mi	Calm	Calm	-
9:15 PM	45.0 °F	-	45.0 °F	100%	30.21 in	5.0 mi	Calm	Calm	-
9:35 PM	45.1 °F	41.4 °F	45.1 °F	100%	30.21 in	5.0 mi	SW	6.9 mph	-
9:55 PM	45.7 °F	44.4 °F	45.5 °F	99%	30.22 in	7.0 mi	West	3.5 mph	-
10:15 PM	45.3 °F	-	45.1 °F	99%	30.22 in	4.0 mi	Calm	Calm	-

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Time (EST)	Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust S
10:35 PM	46.4 °F	-	46.4 °F	100%	30.22 in	5.0 mi	Calm	Calm	-
10:55 PM	47.1 °F	-	47.1 °F	100%	30.22 in	3.0 mi	Calm	Calm	-
11:15 PM	47.5 °F	-	47.3 °F	99%	30.22 in	5.0 mi	NNW	3.5 mph	-
11:35 PM	46.9 °F	-	46.9 °F	100%	30.22 in	5.0 mi	Calm	Calm	-
11:55 PM	46.8 °F	-	46.8 °F	100%	30.22 in	4.0 mi	Calm	Calm	-

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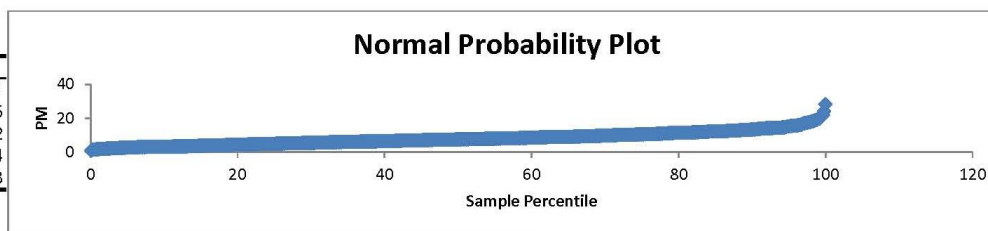
APPENDIX D. BOONE BUT FOR ANALYSIS DATA & RESULTS

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.520907041
R Square	0.271344145
Adjusted R Square	0.260964432
Standard Error	3.462350634
Observations	713

ANOVA

	df	SS	MS	F	Significance F
Regression	10	3133.842764	313.3842764	26.14178	2.02374E-42
Residual	702	8415.486084	11.98787191		
Total	712	11549.32885			



	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 99.0%	Upper 99.0%
Intercept	8.984898112	1.208096101	7.437237903	3.01E-13	6.612983861	11.35681236	5.864566054	12.10523017
TAVG	-0.064205131	0.028973901	-2.215964364	0.027014	-0.12109101	-0.007319253	-0.139040396	0.010630133
TDAVG	0.132098032	0.027035067	4.886173608	1.27E-06	0.07901876	0.185177304	0.062270485	0.201925579
WSPD	-0.162519274	0.038640621	-4.205917709	2.94E-05	-0.238384298	-0.086654249	-0.262322236	-0.062716311
Uwind	-0.028713999	0.065562957	-0.437960704	0.661549	-0.157436963	0.100008966	-0.198053338	0.140625341
RHAVG	-0.03213426	0.009586123	-3.352164236	0.000845	-0.050955166	-0.013313354	-0.056893787	-0.007374733
RHMIN	-0.022182673	0.009422992	-2.354100822	0.018842	-0.040683295	-0.003682051	-0.046520857	0.00215551
PRECIP	-1.235184108	0.350219309	-3.526887511	0.000448	-1.922786832	-0.547581383	-2.139748353	-0.330619862
PRECIP_Lag1	-0.822133863	0.295569843	-2.781521464	0.005556	-1.402440615	-0.241827112	-1.585546689	-0.058721038
SR	0.021229555	0.004998883	4.246859533	2.46E-05	0.011415003	0.031044108	0.008318185	0.034140925
Mixing Ratio	-0.015186292	0.003996866	-3.79954975	0.000158	-0.023033535	-0.007339049	-0.025509601	-0.004862983

11/15/2013 - PM prediction:	9.50
11/15/2013 - lower 99th percentile:	-2.48
11/15/2013 - upper 99th percentile:	21.47

RESIDUAL OUTPUT

Observation	Predicted PM	Residuals	Standard Residuals
1	5.396914424	0.31141891	0.090582723
2	7.805497984	-4.472164651	-1.300822913
3	7.020677943	2.395988724	0.696923588
4	6.641904309	-2.100237642	-0.610898181
5	7.636534839	1.446798494	0.420831695
6	6.492550423	6.174116243	1.795871241
7	4.076882799	3.048117201	0.886608837
8	6.645748598	0.645918069	0.187878822
9	4.286031891	-1.452698557	-0.422547853
10	6.697263723	0.427736277	0.12441607

PROBABILITY OUTPUT

Percentile	PM
0.070126227	1.083333333
0.210378682	1.561181435
0.350631136	1.623931624
0.49088359	1.625
0.631136045	1.708333333
0.771388499	1.791666667
0.911640954	1.833333333
1.051893408	1.833333333
1.192145863	1.848739496
1.332398317	1.916666667

11	7.484130621	-2.234130621	-0.649843763	1.472650771	1.958333333
12	6.51574476	0.525921907	0.15297542	1.612903226	2.041666667
13	7.256581779	0.493418221	0.143521041	1.753155568	2.125
14	6.66235046	0.545982873	0.158810573	1.893408135	2.125
15	7.198073069	1.801926931	0.524128252	2.033660589	2.125
16	7.278108185	5.087037043	1.479671449	2.173913043	2.166666667
17	6.481698701	0.434967966	0.126519558	2.314165498	2.166666667
18	6.846006156	-2.096006156	-0.609667364	2.454417952	2.208333333
19	6.625228347	5.66643832	1.648202466	2.594670407	2.208333333
20	6.883636485	3.491363515	1.015536326	2.734922861	2.333333333
21	3.747936641	14.46039669	4.206109753	2.875175316	2.333333333
22	7.224185456	-3.724185456	-1.083257472	3.01542777	2.416666667
23	5.793355547	-0.75168888	-0.218644481	3.155680224	2.458333333
24	8.18724931	-4.103915977	-1.193710061	3.295932679	2.458333333
25	2.139933614	2.276733053	0.662235574	3.436185133	2.5
26	5.819171289	1.972495378	0.573741663	3.576437588	2.5
27	8.156965503	0.92636783	0.269453518	3.716690042	2.541666667
28	8.698107014	3.218559653	0.9361856	3.856942496	2.583333333
29	5.325690798	-2.159024131	-0.627997464	3.997194951	2.625
30	7.999195649	-2.499195649	-0.726943487	4.137447405	2.625
31	7.138144387	3.445188946	1.002105484	4.27769986	2.666666667
32	6.951491616	5.423508384	1.577541197	4.417952314	2.666666667
33	7.951155462	1.090511205	0.317198063	4.558204769	2.666666667
34	7.475017631	4.316649036	1.255587934	4.698457223	2.666666667
35	8.018654323	-5.68532099	-1.653694886	4.838709677	2.666666667
36	6.345160073	2.488173261	0.723737394	4.978962132	2.761506276
37	6.105138489	-2.730138489	-0.794118057	5.119214586	2.791666667
38	9.602584557	2.772415443	0.806415196	5.259467041	2.833333333
39	8.101355693	-1.518022359	-0.441548651	5.399719495	2.833333333
40	8.315174842	-0.815174842	-0.237110705	5.53997195	2.833333333
41	8.990105994	8.551560673	2.487400831	5.680224404	2.875
42	9.877224004	-0.918890671	-0.26727863	5.820476858	2.916666667
43	11.93652311	-5.269856444	-1.532848307	5.960729313	2.916666667
44	9.486752235	-1.570085568	-0.456692328	6.100981767	2.916666667
45	10.96226094	-0.128927604	-0.037501299	6.241234222	2.916666667
46	11.01713098	0.607869022	0.176811458	6.381486676	3.041666667
47	10.12868665	-3.545353318	-1.031240393	6.52173913	3.041666667
48	6.417243597	2.457756403	0.714890013	6.661991585	3.041666667
49	10.31815459	4.223512072	1.228497094	6.802244039	3.083333333
50	9.391227435	-0.807894102	-0.234992949	6.942496494	3.083333333
51	9.823491753	-1.406825086	-0.409204591	7.082748948	3.083333333
52	11.84594291	-3.012609573	-0.876280698	7.223001403	3.125
53	11.69666433	-0.071664329	-0.020845074	7.363253857	3.125
54	12.52687385	-0.026873847	-0.007816822	7.503506311	3.125

55	11.92310792	-2.631441258	-0.765409897	7.643758766	3.166666667
56	12.70486784	-1.163201175	-0.338341465	7.78401122	3.166666667
57	12.40075366	5.599246339	1.628658268	7.924263675	3.166666667
58	13.07508322	-0.700083222	-0.203633893	8.064516129	3.166666667
59	12.1284455	2.121554505	0.617098637	8.204768583	3.166666667
60	10.69010979	-1.523443128	-0.443125395	8.345021038	3.166666667
61	12.36288231	0.553784359	0.161079799	8.485273492	3.166666667
62	8.069574755	2.305425245	0.6705813	8.625525947	3.177966102
63	12.4427915	2.140541836	0.622621501	8.765778401	3.208333333
64	12.46086835	-1.835868346	-0.534000825	8.906030856	3.25
65	12.16319555	4.128471119	1.200852439	9.04628331	3.25
66	10.33355321	0.54144679	0.157491158	9.186535764	3.291666667
67	10.78888631	-1.455552975	-0.42337812	9.326788219	3.291666667
68	8.472478752	1.402521248	0.40795273	9.467040673	3.291666667
69	11.48246709	12.64253291	3.677345935	9.607293128	3.291666667
70	10.17685034	18.11481632	5.269074372	9.747545582	3.333333333
71	8.899532074	2.725467926	0.792759526	9.887798036	3.333333333
72	10.12707029	4.456263045	1.296197598	10.02805049	3.333333333
73	10.56726718	0.516066154	0.150108668	10.16830295	3.333333333
74	10.13727137	5.696061963	1.656819124	10.3085554	3.333333333
75	11.02964898	4.470351022	1.300295382	10.44880785	3.333333333
76	8.183420795	4.108245872	1.194969502	10.58906031	3.333333333
77	10.14622491	2.270441752	0.660405617	10.72931276	3.375
78	9.600905359	4.607427975	1.340167089	10.86956522	3.375
79	10.49429897	5.172367692	1.504491658	11.00981767	3.375
80	10.9380896	7.471952241	2.173374069	11.15007013	3.416666667
81	11.60144254	0.065224129	0.018971806	11.29032258	3.416666667
82	11.38076055	-2.339093885	-0.68037453	11.43057504	3.416666667
83	4.737591932	-1.237591932	-0.359979578	11.57082749	3.416666667
84	10.41967638	4.913656956	1.429240213	11.71107994	3.416666667
85	10.81711313	2.641220207	0.768254309	11.8513324	3.458333333
86	8.935527171	2.689472829	0.782289597	11.99158485	3.458333333
87	8.198539121	4.176460879	1.214811268	12.13183731	3.458333333
88	9.293486299	-5.001819633	-1.454884177	12.27208976	3.458333333
89	9.221873054	-3.51353972	-1.021986741	12.41234222	3.458333333
90	10.6047007	-1.146367364	-0.333444998	12.55259467	3.5
91	9.952504193	-3.577504193	-1.04059215	12.69284712	3.5
92	10.13642831	-2.553094978	-0.742621238	12.83309958	3.5
93	5.38479423	-2.88479423	-0.839102924	12.97335203	3.5
94	8.991180082	-0.782846749	-0.227707401	13.11360449	3.541666667
95	9.341827518	-2.425160851	-0.705408913	13.25385694	3.666666667
96	10.15536604	7.71963396	2.245417493	13.3941094	3.666666667
97	8.229957673	-6.104957673	-1.77575502	13.53436185	3.666666667
98	9.622682287	-4.372682287	-1.271886381	13.67461431	3.666666667

99	9.756772616	-1.96510595	-0.571592293	13.81486676	3.666666667
100	7.708885378	2.624447956	0.763375748	13.95511921	3.708333333
101	4.519027607	-1.22736094	-0.357003679	14.09537167	3.708333333
102	6.13834659	-2.471679924	-0.718939961	14.23562412	3.791666667
103	8.024556318	-3.024556318	-0.879755659	14.37587658	3.791666667
104	8.834691437	6.873641896	1.999342953	14.51612903	3.791666667
105	8.723714844	-5.432048178	-1.580025175	14.65638149	3.833333333
106	7.118822894	-2.66048956	-0.773859205	14.79663394	3.875
107	7.999432064	1.958901269	0.569787531	14.9368864	3.875
108	7.213885014	-1.130551681	-0.328844675	15.07713885	3.916666667
109	4.403412331	1.054921002	0.306845905	15.2173913	3.916666667
110	5.224602572	5.483730761	1.595058139	15.35764376	3.958333333
111	7.484010361	2.432656306	0.707589123	15.49789621	3.958333333
112	6.821640448	-1.446640448	-0.420785724	15.63814867	3.958333333
113	7.034713079	2.131953588	0.620123429	15.77840112	4
114	5.324367965	-0.657701299	-0.191306221	15.91865358	4
115	7.226923147	-1.768589814	-0.514431452	16.05890603	4.041666667
116	3.830720085	-1.330720085	-0.387067855	16.19915849	4.041666667
117	7.328537094	-2.411870428	-0.701543114	16.33941094	4.041666667
118	6.905127965	-4.446794632	-1.293443511	16.47966339	4.083333333
119	6.397249125	-1.438915792	-0.418538846	16.61991585	4.083333333
120	7.540781051	-0.374114384	-0.108819017	16.7601683	4.083333333
121	7.337919987	1.162080013	0.338015352	16.90042076	4.083333333
122	6.538189084	-1.454855751	-0.423175318	17.04067321	4.125
123	8.130718343	4.910948324	1.42845235	17.18092567	4.125
124	2.920261593	-0.295261593	-0.085883029	17.32117812	4.125
125	6.783304653	6.55002868	1.905213259	17.46143058	4.125
126	5.771485096	0.561848237	0.163425347	17.60168303	4.125
127	3.949574849	7.508758484	2.184079937	17.74193548	4.125
128	6.081168855	2.168831145	0.63085004	17.88218794	4.125
129	4.551794056	-0.510127389	-0.148381253	18.02244039	4.208333333
130	6.787758484	-3.70442515	-1.077509773	18.16269285	4.208333333
131	6.214854638	-2.256521305	-0.656356563	18.3029453	4.225941423
132	5.199371097	-1.90770443	-0.554895857	18.44319776	4.25
133	8.758792184	2.699541149	0.785218179	18.58345021	4.25
134	4.868881822	-2.660548488	-0.773876345	18.72370266	4.25
135	7.562909679	1.187090321	0.345290125	18.86395512	4.291666667
136	5.716184645	5.283815355	1.536908549	19.00420757	4.291666667
137	7.697020378	-1.030353711	-0.299699994	19.14446003	4.333333333
138	5.918719289	3.247947378	0.944733636	19.28471248	4.333333333
139	5.023532844	-0.106866177	-0.03108427	19.42496494	4.333333333
140	8.659325919	1.632340748	0.474800553	19.56521739	4.375
141	9.213761854	1.36957148	0.398368598	19.70546985	4.375
142	7.354704712	2.020295288	0.58764527	19.8457223	4.416666667

143	5.61304363	2.470289703	0.718535586	19.98597475	4.416666667
144	9.561739221	1.896594112	0.551664188	20.12622721	4.458333333
145	7.780372468	8.927960865	2.596884724	20.26647966	4.5
146	9.314647872	4.102018794	1.193158226	20.40673212	4.541666667
147	5.426321311	-1.634654644	-0.475473598	20.54698457	4.541666667
148	8.899751815	0.266914852	0.077637785	20.68723703	4.541666667
149	6.557701941	1.942298059	0.564958139	20.82748948	4.541666667
150	5.005137909	-0.880137909	-0.256006576	20.96774194	4.541666667
151	9.860988952	-2.319322286	-0.674623546	21.10799439	4.583333333
152	9.91912537	-0.960792037	-0.279466521	21.24824684	4.583333333
153	8.388381211	0.444952122	0.12942366	21.3884993	4.647302905
154	8.573063429	-5.323063429	-1.548324675	21.52875175	4.666666667
155	6.167227474	-2.250560807	-0.654622827	21.66900421	4.666666667
156	10.10722761	-1.607227609	-0.467495869	21.80925666	4.666666667
157	9.968229482	-1.884896149	-0.54826159	21.94950912	4.666666667
158	9.530935237	-2.155935237	-0.627098995	22.08976157	4.666666667
159	7.941186362	-4.816186362	-1.400888846	22.23001403	4.708333333
160	4.273979766	-0.148979766	-0.043333891	22.37026648	4.708333333
161	9.064245944	-2.064245944	-0.60042924	22.51051893	4.708333333
162	9.390604563	1.901062103	0.552963796	22.65077139	4.75
163	9.285530887	-3.368864221	-0.979904836	22.79102384	4.789915966
164	9.425190277	-5.008523611	-1.45683417	22.9312763	4.791666667
165	10.31770406	-3.901037391	-1.134698568	23.07152875	4.791666667
166	9.582846849	-6.666180182	-1.938998361	23.21178121	4.791666667
167	8.552106679	-2.802106679	-0.815051515	23.35203366	4.791666667
168	9.676166357	0.11550031	0.033595688	23.49228612	4.791666667
169	10.27542719	3.182906147	0.925815029	23.63253857	4.833333333
170	10.36901853	-4.660685197	-1.35565807	23.77279102	4.875
171	10.82309082	3.468575846	1.008908055	23.91304348	4.875
172	9.419068214	-2.794068214	-0.812713359	24.05329593	4.916666667
173	8.283743636	3.799589697	1.105190378	24.19354839	4.916666667
174	9.291186847	-0.166186847	-0.048338931	24.33380084	4.916666667
175	9.448639396	1.96802727	0.57244202	24.4740533	4.958333333
176	10.55215763	1.73950904	0.505972699	24.61430575	5
177	11.3005504	5.866116268	1.706282986	24.7545582	5
178	9.42501949	-2.133352823	-0.620530426	24.89481066	5
179	8.668090819	-1.334757485	-0.388242217	25.03506311	5
180	9.312494482	-4.520827815	-1.314977616	25.17531557	5.041666667
181	8.754004237	8.16266243	2.374281618	25.31556802	5.041666667
182	9.590938573	9.200728094	2.676224795	25.45582048	5.041666667
183	10.34170163	4.051603814	1.178493971	25.59607293	5.083333333
184	8.92751066	-1.344177326	-0.390982176	25.73632539	5.083333333
185	9.897589957	2.560743376	0.744845935	25.87657784	5.125
186	10.90302836	0.513638306	0.149402477	26.01683029	5.166666667

187	9.836702997	0.788297003	0.229292722	26.15708275	5.166666667
188	9.296170119	-2.962836785	-0.861803239	26.2973352	5.166666667
189	7.621866423	-1.330199756	-0.386916506	26.43758766	5.166666667
190	8.886106684	-1.636106684	-0.475895954	26.57784011	5.25
191	10.11152294	6.013477057	1.749145963	26.71809257	5.25
192	9.866045322	-0.491045322	-0.142830834	26.85834502	5.25
193	10.17966456	1.278668768	0.371927637	26.99859748	5.291666667
194	8.982782425	-2.441115758	-0.710049732	27.13884993	5.291666667
195	9.292143813	-2.250477147	-0.654598493	27.27910238	5.291666667
196	8.936608971	0.605057696	0.175993725	27.41935484	5.291666667
197	10.20555266	3.127780678	0.90978063	27.55960729	5.291666667
198	9.919482682	-1.877816015	-0.546202184	27.69985975	5.291666667
199	8.606665769	1.893334231	0.550715983	27.8401122	5.291666667
200	10.18205363	-0.015386966	-0.004475622	27.98036466	5.333333333
201	7.227567432	-1.644234098	-0.478259983	28.12061711	5.333333333
202	10.22408007	-4.307413405	-1.252901557	28.26086957	5.375
203	8.836056564	-2.127723231	-0.618892941	28.40112202	5.375
204	9.868991102	-3.993991102	-1.161736105	28.54137447	5.416666667
205	10.65504928	-2.738382608	-0.796516032	28.68162693	5.458333333
206	9.07632503	-3.117991696	-0.906933299	28.82187938	5.458333333
207	7.937800888	3.312199112	0.963422601	28.96213184	5.458333333
208	9.137163483	-1.137163483	-0.330767856	29.10238429	5.5
209	7.743189367	-3.4515227	-1.003947789	29.24263675	5.5
210	8.668863072	-6.002196405	-1.745864749	29.3828892	5.5
211	2.538923522	-0.497256855	-0.144637589	29.52314165	5.5
212	4.026883952	0.556449381	0.161854977	29.66339411	5.5
213	3.419313173	-1.627646506	-0.473435134	29.80364656	5.541666667
214	6.853455615	-1.728455615	-0.502757578	29.94389902	5.541666667
215	6.313758508	0.269574825	0.078411493	30.08415147	5.574468085
216	5.712077575	-2.253744242	-0.655548796	30.22440393	5.583333333
217	7.493862522	-4.827195855	-1.404091188	30.36465638	5.583333333
218	6.585805496	-5.502472162	-1.600509469	30.50490884	5.583333333
219	7.350254749	0.024745251	0.007197675	30.64516129	5.625
220	7.723130574	-1.723130574	-0.501208678	30.78541374	5.625
221	8.597040361	7.194626306	2.092708002	30.9256662	5.666666667
222	3.563213652	-1.938213652	-0.563770104	31.06591865	5.666666667
223	9.214518954	-5.881185621	-1.710666224	31.20617111	5.708333333
224	6.108037145	-2.441370479	-0.710123823	31.34642356	5.708333333
225	8.428787191	3.321212809	0.966044424	31.48667602	5.708333333
226	7.680340849	-4.222007516	-1.228059462	31.62692847	5.75
227	2.981548614	0.35178472	0.102323966	31.76718093	5.75
228	5.453128245	-2.036461578	-0.592347574	31.90743338	5.791666667
229	3.002839871	0.663826796	0.193087951	32.04768583	5.833333333
230	7.628201213	1.288465453	0.374777209	32.18793829	5.833333333

231	6.673532956	3.951467044	1.149367091	32.32819074	5.833333333
232	5.015726234	2.067607099	0.601406903	32.4684432	5.875
233	6.398752041	5.559581292	1.617120857	32.60869565	5.875
234	5.287699186	4.087300814	1.188877192	32.74894811	5.916666667
235	7.282548596	12.50911807	3.638539429	32.88920056	5.916666667
236	6.848939919	-2.973939919	-0.865032818	33.02945302	5.916666667
237	7.924443991	3.242222676	0.943068486	33.16970547	5.916666667
238	7.347963375	-2.347963375	-0.682954407	33.30995792	5.958333333
239	7.823536275	4.676463725	1.360247585	33.45021038	5.958333333
240	4.324667637	-0.991334304	-0.28835038	33.59046283	6
241	5.548999326	-0.257332659	-0.074850603	33.73071529	6
242	6.201192637	-2.534525971	-0.737220052	33.87096774	6
243	5.812487472	-2.645820805	-0.76959249	34.0112202	6
244	3.740135235	-0.240135235	-0.069848371	34.15147265	6.008403361
245	3.514613847	1.027052819	0.29873986	34.29172511	6.041666667
246	6.544401968	-0.461068634	-0.134111485	34.43197756	6.041666667
247	7.386513357	2.030153309	0.590512682	34.57223001	6.083333333
248	6.963761123	7.202905544	2.095116192	34.71248247	6.083333333
249	6.657501202	2.384165465	0.693484545	34.85273492	6.083333333
250	1.63201871	4.826314624	1.403834863	34.99298738	6.083333333
251	4.785985855	5.422347478	1.577203523	35.13323983	6.083333333
252	3.377893155	3.955440178	1.15052276	35.27349229	6.083333333
253	6.247827637	-1.664494303	-0.484153089	35.41374474	6.125
254	7.583682165	2.416317835	0.702836736	35.55399719	6.125
255	3.842399049	0.532600951	0.15491816	35.69424965	6.125
256	5.226455122	3.565211545	1.037016575	35.8345021	6.208333333
257	7.212660971	-3.129327638	-0.910230596	35.97475456	6.25
258	5.109500659	-1.692833992	-0.492396282	36.11500701	6.25
259	5.391778256	-2.516778256	-0.732057757	36.25525947	6.25
260	9.030072077	-0.446738744	-0.129943336	36.39551192	6.25
261	5.615300132	6.051366534	1.760166913	36.53576438	6.25
262	8.618665112	2.839668221	0.825977078	36.67601683	6.291666667
263	8.433792288	-0.517125621	-0.150416836	36.81626928	6.291666667
264	7.009783435	-2.093116768	-0.608826925	36.95652174	6.291666667
265	9.745768345	4.170898322	1.213193281	37.09677419	6.291666667
266	9.098367825	0.859965509	0.25013901	37.23702665	6.291666667
267	8.659450058	0.423883276	0.123295344	37.3772791	6.291666667
268	9.12274876	-2.99774876	-0.871958119	37.51753156	6.291666667
269	9.562410309	3.562589691	1.036253954	37.65778401	6.333333333
270	7.262720197	1.362279803	0.396247661	37.79803647	6.333333333
271	8.873604822	-0.581938156	-0.169268922	37.93828892	6.333333333
272	9.089194937	4.744138396	1.379932183	38.07854137	6.348547718
273	6.435464739	-2.977131405	-0.865961129	38.21879383	6.375
274	9.302043655	-0.427043655	-0.124214606	38.35904628	6.375

275	9.074239341	3.842427326	1.117650601	38.49929874	6.375
276	10.2773957	-1.985729029	-0.577590948	38.63955119	6.375
277	7.12674927	2.164917396	0.629711644	38.77980365	6.416666667
278	8.22004382	-0.261710486	-0.076123986	38.9200561	6.416666667
279	10.34622235	-1.179555681	-0.343098516	39.06030856	6.458333333
280	10.84378597	-6.302119306	-1.833103617	39.20056101	6.458333333
281	10.31593849	0.059061508	0.017179279	39.34081346	6.458333333
282	9.756693218	-2.548359885	-0.741243936	39.48106592	6.458333333
283	10.45943568	1.040564317	0.302669962	39.62131837	6.458333333
284	9.146570674	-3.68823734	-1.072801209	39.76157083	6.5
285	9.453615275	-1.745281941	-0.507651868	39.90182328	6.541666667
286	9.465942452	3.242390882	0.943117412	40.04207574	6.541666667
287	9.900758227	-2.23409156	-0.649832401	40.18232819	6.541666667
288	10.69236843	3.474298241	1.010572533	40.32258065	6.541666667
289	10.80018046	-1.175180458	-0.341825891	40.4628331	6.583333333
290	10.32144414	5.220222525	1.51841124	40.60308555	6.583333333
291	8.418642138	2.873024529	0.835679459	40.74333801	6.583333333
292	11.31930652	2.555693479	0.743377066	40.88359046	6.583333333
293	10.46234285	4.120990488	1.198676541	41.02384292	6.625
294	10.70551372	2.044486283	0.594681728	41.16409537	6.666666667
295	9.355692194	0.685974472	0.199530067	41.30434783	6.666666667
296	8.878175103	-3.003175103	-0.873536485	41.44460028	6.708333333
297	10.72639078	2.190275883	0.637087692	41.58485273	6.708333333
298	9.107725131	-2.191058464	-0.637315322	41.72510519	6.708333333
299	10.5773771	-0.327377099	-0.095224497	41.86535764	6.75
300	10.46790141	4.698765256	1.366734453	42.0056101	6.791666667
301	8.840509584	-0.673842917	-0.196001349	42.14586255	6.833333333
302	8.451002015	7.257331319	2.110947071	42.28611501	6.833333333
303	4.449707206	9.133626127	2.65670678	42.42636746	6.875
304	9.402598239	4.639068427	1.349370379	42.56661992	6.875
305	10.97525066	7.483082671	2.176611588	42.70687237	6.916666667
306	10.59142029	3.950246372	1.149012032	42.84712482	6.916666667
307	8.899095723	-2.607429056	-0.758425444	42.98737728	6.916666667
308	8.418328702	-1.543328702	-0.448909532	43.12762973	6.916666667
309	9.178167531	1.071832469	0.31176496	43.26788219	6.916666667
310	9.505544214	1.07778912	0.313497577	43.40813464	6.916666667
311	10.5484371	5.701562896	1.658419186	43.5483871	6.958333333
312	10.99435499	-0.536021659	-0.155913145	43.68863955	6.958333333
313	10.5350415	2.089958497	0.607908275	43.82889201	6.958333333
314	8.865236807	-3.781903474	-1.100045969	43.96914446	6.958333333
315	8.14133379	2.816999543	0.819383417	44.10939691	7
316	8.953257203	-0.453257203	-0.131839367	44.24964937	7
317	10.14428172	-3.435948385	-0.999417673	44.38990182	7
318	10.01126994	2.072063397	0.60270311	44.53015428	7.041666667

319	10.34852032	0.443146344	0.128898411	44.67040673	7.041666667
320	11.09134266	4.200324011	1.22175236	44.81065919	7.083333333
321	6.746786287	1.711547047	0.497839366	44.95091164	7.083333333
322	7.875221207	-2.041887874	-0.593925926	45.0911641	7.125
323	9.019534938	-2.561201605	-0.74497922	45.23141655	7.125
324	9.630799054	-3.089132387	-0.898538964	45.371669	7.125
325	9.810482303	-3.85214897	-1.120478345	45.51192146	7.166666667
326	10.24232462	-3.992324622	-1.161251374	45.65217391	7.166666667
327	9.77610982	-1.317776486	-0.383302938	45.79242637	7.166666667
328	9.328091605	5.046908395	1.467999189	45.93267882	7.166666667
329	8.451631226	-3.159964559	-0.919141987	46.07293128	7.208333333
330	8.70056523	-3.908898563	-1.136985155	46.21318373	7.208333333
331	8.307615516	2.984051151	0.867973882	46.35343619	7.25
332	9.552596943	-4.760930276	-1.384816454	46.49368864	7.25
333	7.509689389	-3.718022723	-1.081464912	46.63394109	7.291666667
334	7.471451892	-1.013118559	-0.294686788	46.77419355	7.291666667
335	9.351740447	0.43992622	0.127961771	46.914446	7.291666667
336	5.696279885	-1.862946552	-0.541877089	47.05469846	7.291666667
337	6.961400437	-2.29473377	-0.66747146	47.19495091	7.333333333
338	8.775325074	-0.233658407	-0.06796445	47.33520337	7.333333333
339	9.240380553	1.634619447	0.47546336	47.47545582	7.333333333
340	5.70005986	0.633273474	0.184200876	47.61570827	7.333333333
341	8.822259573	1.427740427	0.415288257	47.75596073	7.333333333
342	9.316555991	2.266777342	0.659339746	47.89621318	7.375
343	9.561131028	-3.436131028	-0.999470799	48.03646564	7.375
344	8.275310323	2.183023011	0.634978042	48.17671809	7.375
345	-0.538850302	3.913850302	1.138425472	48.31697055	7.375
346	6.228779752	0.119767966	0.034837025	48.457223	7.375
347	8.453964005	13.37936933	3.891670265	48.59747546	7.375
348	5.260018863	0.823314471	0.239478287	48.73772791	7.416666667
349	5.768323526	-1.121020621	-0.326072366	48.87798036	7.416666667
350	6.597523312	-0.305856645	-0.088964822	49.01823282	7.458333333
351	7.203470153	5.963196514	1.734520812	49.15848527	7.5
352	6.518813395	1.731186605	0.503551944	49.29873773	7.5
353	5.74718347	-0.74718347	-0.217333988	49.43899018	7.5
354	7.014594656	0.277072011	0.080592207	49.57924264	7.541666667
355	6.189999861	-3.023333195	-0.879399888	49.71949509	7.583333333
356	8.894556124	4.272110543	1.242632979	49.85974755	7.583333333
357	7.540152932	-1.915152932	-0.55706241	50	7.583333333
358	7.349795175	-1.849795175	-0.538051735	50.14025245	7.583333333
359	5.550121086	1.74154558	0.506565069	50.28050491	7.583333333
360	3.992274837	3.642579935	1.059520794	50.42075736	7.615062762
361	7.419357689	-3.294357689	-0.958233048	50.56100982	7.625
362	8.255492592	0.869507408	0.252914472	50.70126227	7.625

363	5.238729614	-0.90539628	-0.263353503	50.84151473	7.625
364	8.216811708	7.283188292	2.118468114	50.98176718	7.634854772
365	6.269248718	1.689084616	0.491305697	51.12201964	7.666666667
366	8.581644532	0.001688801	0.000491223	51.26227209	7.666666667
367	5.863656706	-1.32199004	-0.384528538	51.40252454	7.666666667
368	7.050448704	-4.883782037	-1.420550466	51.542777	7.69874477
369	4.495011565	-0.453344898	-0.131864875	51.68302945	7.708333333
370	4.723403972	0.443262694	0.128932254	51.82328191	7.75
371	8.931734855	10.94326515	3.183078254	51.96353436	7.75
372	7.652009466	-4.527009466	-1.316775679	52.10378682	7.75
373	8.955839256	-1.372505923	-0.399222142	52.24403927	7.7593361
374	7.757619734	-2.382619734	-0.693034936	52.38429173	7.791666667
375	9.151851375	-3.068518041	-0.892542849	52.52454418	7.791666667
376	5.284981846	-2.107015744	-0.612869734	52.66479663	7.791666667
377	0.088118557	1.473062877	0.428471242	52.80504909	7.791666667
378	5.677487913	1.947512087	0.566474749	52.94530154	7.875
379	3.848306663	-1.999567167	-0.581616061	53.085554	7.916666667
380	7.671845128	-0.755178462	-0.219659499	53.22580645	7.916666667
381	9.185862199	-1.068707387	-0.310855965	53.36605891	7.916666667
382	8.129922326	2.203411007	0.640908318	53.50631136	7.916666667
383	8.303829106	-2.295425745	-0.667672735	53.64656381	7.958333333
384	7.241850093	-1.667382007	-0.484993038	53.78681627	7.958333333
385	6.785911963	-3.45257863	-1.004254929	53.92706872	7.958333333
386	7.968593625	-4.926926958	-1.433100071	54.06732118	8
387	6.287213474	-3.703880141	-1.077351245	54.20757363	8
388	9.814036335	4.602630332	1.338771594	54.34782609	8
389	8.657623222	-5.824289889	-1.694116906	54.48807854	8
390	8.994290994	2.763031182	0.803685587	54.628331	8
391	9.927613581	-0.01129559	-0.003285559	54.76858345	8.041666667
392	10.82713682	-3.035470153	-0.882930177	54.9088359	8.041666667
393	10.42320186	-2.214868529	-0.644240979	55.04908836	8.041666667
394	7.57438303	-1.032716363	-0.30038722	55.18934081	8.041666667
395	9.550632819	-2.717299485	-0.790383564	55.32959327	8.083333333
396	8.918854574	-0.835521241	-0.243028882	55.46984572	8.083333333
397	8.851276438	-4.625335015	-1.345375727	55.61009818	8.083333333
398	8.304289499	-0.605544729	-0.176135389	55.75035063	8.083333333
399	9.461951549	7.746381785	2.253197659	55.89060309	8.117154812
400	7.847948675	-3.639615342	-1.05865848	56.03085554	8.125
401	7.294704464	-2.504788498	-0.728570284	56.17110799	8.166666667
402	10.14238019	2.357619806	0.685763183	56.31136045	8.166666667
403	9.967412577	3.157587423	0.918450547	56.4516129	8.166666667
404	8.151990012	-3.901990012	-1.134975658	56.59186536	8.208333333
405	10.68976866	3.661695772	1.065081037	56.73211781	8.208333333
406	10.61705822	1.265786973	0.368180697	56.87237027	8.208333333

407	10.1404245	5.817908838	1.692260844	57.01262272	8.208333333
408	10.91527866	10.75836151	3.129295152	57.15287518	8.208333333
409	10.30306131	4.59233618	1.335777324	57.29312763	8.208333333
410	9.007521592	0.492478408	0.143247677	57.43338008	8.25
411	10.42034884	-2.920348839	-0.849444728	57.57363254	8.25
412	8.837482489	-2.004149156	-0.582948829	57.71388499	8.25
413	9.447043668	-5.447043668	-1.584386928	57.85413745	8.291666667
414	10.90274759	2.763919079	0.80394385	57.9943899	8.291666667
415	10.8371941	-2.587194098	-0.752539682	58.13464236	8.333333333
416	10.65208709	1.47291291	0.428427621	58.27489481	8.416666667
417	10.91544733	2.180786977	0.634327645	58.41514727	8.425531915
418	9.756847548	1.326485785	0.38583622	58.55539972	8.458333333
419	10.25291811	-4.919584773	-1.430964443	58.69565217	8.458333333
420	10.76502411	8.478673373	2.466200031	58.83590463	8.5
421	10.92822783	2.071772173	0.602618402	58.97615708	8.5
422	10.69220896	1.828799439	0.531944685	59.11640954	8.5
423	10.77761939	10.34738061	3.009752735	59.25666199	8.5
424	11.06100761	0.730659053	0.212527515	59.39691445	8.541666667
425	10.83104547	6.407448257	1.863740752	59.5371669	8.583333333
426	8.94109161	0.892241723	0.259527224	59.67741935	8.583333333
427	9.973836919	0.442829748	0.128806323	59.81767181	8.583333333
428	10.37242701	1.919239656	0.558251119	59.95792426	8.583333333
429	10.45049678	1.257836558	0.365868152	60.09817672	8.625
430	10.14882178	2.445320479	0.711272763	60.23842917	8.625
431	9.418044553	-1.08471122	-0.315511015	60.37868163	8.666666667
432	10.32786762	2.588799043	0.753006514	60.51893408	8.666666667
433	9.378533922	2.085901225	0.606728133	60.65918654	8.75
434	10.58629034	4.038709658	1.174743435	60.79943899	8.75
435	10.63785793	9.445475403	2.747414684	60.93969144	8.75
436	3.582435902	-0.820929626	-0.238784604	61.0799439	8.791666667
437	9.242587507	-1.82592084	-0.531107384	61.22019635	8.833333333
438	10.43094495	-2.389278284	-0.694971715	61.36044881	8.833333333
439	9.063093684	0.311906316	0.090724496	61.50070126	8.833333333
440	6.699013363	-1.99068003	-0.579031051	61.64095372	8.875
441	7.78163341	-4.614966743	-1.342359898	61.78120617	8.875
442	9.087718373	-2.962718373	-0.861768796	61.92145863	8.875
443	9.140541652	-1.557208319	-0.452946709	62.06171108	8.916666667
444	6.97795218	-1.561285513	-0.454132647	62.20196353	8.958333333
445	7.737419265	-2.237419265	-0.650800334	62.34221599	8.958333333
446	9.713375088	0.369958246	0.107610117	62.48246844	8.958333333
447	9.560645711	-4.310645711	-1.253841741	62.6227209	8.958333333
448	8.670653786	-6.837320453	-1.988778099	62.76297335	9
449	7.292094132	-4.625427465	-1.345402618	62.90322581	9
450	9.270580077	1.52108659	0.442439947	63.04347826	9

451	7.528742789	-3.153742789	-0.917332255	63.18373072	9.041666667
452	8.946207571	-1.33114481	-0.387191395	63.32398317	9.041666667
453	6.672001634	0.077998366	0.022687461	63.46423562	9.041666667
454	8.751943277	-1.668609943	-0.485350209	63.60448808	9.083333333
455	8.617790061	2.38639404	0.694132772	63.74474053	9.083333333
456	8.743781876	-0.318249961	-0.092569678	63.88499299	9.083333333
457	4.70033041	-0.57533041	-0.16734692	64.02524544	9.083333333
458	8.795041356	-1.795041356	-0.522125438	64.1654979	9.083333333
459	3.267232117	-1.100565451	-0.320122551	64.30575035	9.125
460	8.586670619	-2.836670619	-0.825105162	64.44600281	9.125
461	5.197693896	-3.281027229	-0.954355605	64.58625526	9.125
462	9.126367261	-1.126367261	-0.327627549	64.72650771	9.125
463	3.885518447	-1.927185114	-0.560562222	64.86676017	9.125
464	8.19683121	-2.19683121	-0.638994446	65.00701262	9.166666667
465	5.227192929	-1.227192929	-0.35695481	65.14726508	9.166666667
466	6.896909659	4.561423674	1.326785773	65.28751753	9.166666667
467	8.177764207	-2.26109754	-0.657687657	65.42776999	9.166666667
468	8.49785745	-5.081190783	-1.477970941	65.56802244	9.166666667
469	6.684601047	1.273732286	0.370491758	65.70827489	9.25
470	7.903132761	-0.528132761	-0.153618494	65.84852735	9.25
471	4.230063983	-0.896730649	-0.260832923	65.9887798	9.291666667
472	-2.070919107	5.77925244	1.681016819	66.12903226	9.291666667
473	6.571492102	0.011841232	0.003444271	66.26928471	9.291666667
474	6.453700253	2.296299747	0.667926957	66.40953717	9.333333333
475	5.711103698	-0.169437032	-0.049284315	66.54978962	9.333333333
476	6.82532176	0.92467824	0.268962066	66.69004208	9.375
477	7.927717306	-1.469383972	-0.427401156	66.83029453	9.375
478	1.867443044	0.590890289	0.171872837	66.97054698	9.375
479	6.371623458	11.33670988	3.297519908	67.11079944	9.375
480	4.89573538	3.72926462	1.084734854	67.25105189	9.416666667
481	6.466922557	-0.55025589	-0.16005347	67.39130435	9.416666667
482	8.88998279	-4.223316123	-1.228440099	67.5315568	9.416666667
483	5.252184705	-1.127184705	-0.327865319	67.67180926	9.458333333
484	8.426759675	-0.385093009	-0.112012381	67.81206171	9.5
485	8.694067858	-6.569067858	-1.910751204	67.95231417	9.541666667
486	7.35023374	1.316432927	0.382912135	68.09256662	9.541666667
487	7.966152176	-3.091152176	-0.899126462	68.23281907	9.541666667
488	7.626816223	-4.543482889	-1.321567319	68.37307153	9.541666667
489	4.360519291	3.398816808	0.988617175	68.51332398	9.583333333
490	8.561751975	-4.645085309	-1.351120515	68.65357644	9.625
491	8.998744828	-0.790411495	-0.229907766	68.79382889	9.708333333
492	7.963959638	-0.047292972	-0.013756153	68.93408135	9.708333333
493	6.612454026	-0.320787359	-0.093307733	69.0743338	9.708333333
494	8.372904038	-2.539570705	-0.738687419	69.21458626	9.708333333

495	7.386266149	-3.052932815	-0.888009559	69.35483871	9.75
496	6.047504704	-1.33917137	-0.389526089	69.49509116	9.791666667
497	8.629812397	-0.629812397	-0.183194149	69.63534362	9.791666667
498	7.166773366	-0.916773366	-0.266662767	69.77559607	9.791666667
499	8.85422714	-2.312560474	-0.672656731	69.91584853	9.833333333
500	9.849341207	-0.724341207	-0.210689837	70.05610098	9.875
501	9.98524982	-0.401916486	-0.116905842	70.19635344	9.916317992
502	6.051321936	2.115344731	0.615292394	70.33660589	9.916666667
503	8.523551469	4.143115198	1.205111977	70.47685835	9.958333333
504	9.073270662	-3.073270662	-0.893925248	70.61711108	9.958333333
505	9.280321868	-4.613655202	-1.341978409	70.75736325	9.958333333
506	7.163761675	-3.372095008	-0.980844579	70.89761571	10
507	4.165138167	-1.2484715	-0.363144129	71.03786816	10.04166667
508	9.786051344	0.172281989	0.050111831	71.17812062	10.08333333
509	7.090652573	0.076014093	0.022110294	71.31837307	10.08333333
510	9.193598045	-2.193598045	-0.638054012	71.45862553	10.16666667
511	6.455407564	-1.163740898	-0.338498455	71.59887798	10.16666667
512	9.017912005	1.190421329	0.346259018	71.73913043	10.20833333
513	9.678852751	3.612813916	1.050862723	71.87938289	10.20833333
514	10.3061536	-1.556153597	-0.452639921	72.01963534	10.20833333
515	9.958039386	-2.541372719	-0.739211573	72.1598878	10.25
516	7.810793326	-1.51912666	-0.44186986	72.30014025	10.25
517	9.862008997	0.42965767	0.124974947	72.44039271	10.25
518	9.255342136	-6.088675469	-1.771018999	72.58064516	10.25
519	9.591483588	4.241849746	1.233830991	72.72089762	10.29166667
520	9.769469465	-1.644469465	-0.478328445	72.86115007	10.29166667
521	9.770651901	0.396014765	0.115189203	73.00140252	10.33333333
522	10.65585884	0.219141163	0.063741805	73.14165498	10.33333333
523	9.676308368	-3.676308368	-1.069331417	73.28190743	10.375
524	8.592791257	-1.634457924	-0.475416378	73.42215989	10.375
525	9.876627557	-2.70996089	-0.788248979	73.56241234	10.375
526	10.56497067	-2.981637335	-0.867271773	73.7026648	10.375
527	8.954687779	-5.413021112	-1.574490754	73.84291725	10.375
528	10.24454934	-2.911216003	-0.846788251	73.98316971	10.41666667
529	10.08032152	-0.955321517	-0.277875306	74.12342216	10.45833333
530	10.38151228	2.785154385	0.810120585	74.26367461	10.45833333
531	10.91768275	1.540650583	0.448130545	74.40392707	10.5
532	10.39064168	-3.515641679	-1.02259814	74.54417952	10.5
533	9.357290926	4.892709074	1.423147082	74.68443198	10.58333333
534	9.908286564	0.67504677	0.196351515	74.82468443	10.58333333
535	9.668062791	2.998603876	0.872206847	74.96493689	10.58333333
536	10.47668766	8.648312337	2.515543082	75.10518934	10.58333333
537	8.889023317	1.485976683	0.432227494	75.2454418	10.58333333
538	10.00865046	-5.925317126	-1.723502798	75.38569425	10.625

539	10.64519622	-2.64519622	-0.769410816	75.5259467	10.625
540	9.503461463	-6.420128129	-1.867428959	75.66619916	10.625
541	9.750030397	-0.500030397	-0.145444331	75.80645161	10.70833333
542	9.828006641	0.255326692	0.074267125	75.94670407	10.70833333
543	10.31370312	-1.022036449	-0.297280743	76.08695652	10.75
544	6.379506746	4.370493254	1.271249655	76.22720898	10.75
545	6.5200819	1.2299181	0.357747483	76.36746143	10.79166667
546	5.280570837	-0.238904171	-0.06949029	76.50771388	10.79166667
547	8.517668581	-1.017668581	-0.296010257	76.64796634	10.83333333
548	6.145794537	2.062538796	0.59993268	76.78821879	10.83333333
549	9.453810151	1.046189849	0.304306266	76.92847125	10.875
550	9.223655068	-3.431988401	-0.998265829	77.0687237	10.875
551	9.115461875	2.759538125	0.802669558	77.20897616	10.875
552	9.518638605	1.564694728	0.455124289	77.34922861	10.875
553	10.09774464	-0.556077976	-0.161746946	77.48948107	10.95833333
554	10.31778119	0.51555214	0.149959156	77.62973352	11
555	8.657175652	-2.157175652	-0.627459795	77.76998597	11.0041841
556	9.469496234	-4.177829568	-1.215209379	77.91023843	11.08333333
557	9.136984905	-4.428651571	-1.288166221	78.05049088	11.08333333
558	8.587747767	2.287252233	0.665295298	78.19074334	11.08333333
559	9.164523441	2.835476559	0.824757845	78.33099579	11.16666667
560	7.126619955	-5.418286621	-1.576022338	78.47124825	11.25
561	8.105286581	2.103046752	0.611715269	78.6115007	11.29166667
562	8.927236332	-5.885569665	-1.711941415	78.75175316	11.29166667
563	9.283445221	1.424888112	0.414458601	78.89200561	11.29166667
564	8.67252142	-0.464188087	-0.135018844	79.03225806	11.29166667
565	8.283312412	-4.158312412	-1.209532405	79.17251052	11.41666667
566	7.817247525	-0.192247525	-0.055919226	79.31276297	11.41666667
567	8.424684229	-5.508017562	-1.602122465	79.45301543	11.45833333
568	8.060929736	-0.935929736	-0.272234799	79.59326788	11.45833333
569	6.976133007	-0.726133007	-0.211211019	79.73352034	11.45833333
570	7.185987645	2.355679022	0.685198665	79.87377279	11.45833333
571	8.074158496	-3.532491829	-1.027499359	80.01402525	11.45833333
572	8.006099335	1.535567331	0.446651974	80.1542777	11.45833333
573	7.821591126	1.136742207	0.330645319	80.29453015	11.46443515
574	4.094781952	-2.261448619	-0.657789775	80.43478261	11.5
575	6.246944757	0.711388577	0.206922292	80.57503506	11.54166667
576	7.937050229	-2.437050229	-0.708867188	80.71528752	11.58333333
577	6.939256532	3.310743468	0.962999196	80.85553997	11.58333333
578	7.983923085	1.766076915	0.513700523	80.99579243	11.625
579	8.292828386	2.290504947	0.666241418	81.13604488	11.625
580	8.706336035	2.585330631	0.751997654	81.27629734	11.625
581	8.030433086	-0.36376642	-0.105809095	81.41654979	11.625
582	6.768984876	-3.268984876	-0.950852834	81.55680224	11.66666667

583	8.560117696	-0.560117696	-0.162921983	81.6970547	11.66666667
584	7.826120311	-0.492786977	-0.143337431	81.83730715	11.708333333
585	7.928219628	-4.761552962	-1.384997575	81.97755961	11.75
586	8.04046955	0.042863783	0.012467831	82.11781206	11.75732218
587	6.154858173	-2.446524839	-0.711623077	82.25806452	11.79166667
588	8.533278508	0.050054825	0.014559496	82.39831697	11.79166667
589	6.490056358	-3.573389692	-1.039395361	82.53856942	11.833333333
590	4.906502856	3.968497144	1.154320652	82.67882188	11.833333333
591	6.442802982	-1.567802982	-0.456028389	82.81907433	11.875
592	1.404067677	0.219863947	0.063952042	82.95932679	11.88284519
593	3.437725309	1.395608025	0.405941873	83.09957924	11.91666667
594	6.046617029	-3.838283696	-1.116445339	83.2398317	11.958333333
595	5.903012586	0.13865408	0.040330448	83.38008415	12
596	7.502456693	1.164209974	0.338634896	83.52033661	12.083333333
597	8.089390467	-4.881057133	-1.419757871	83.66058906	12.083333333
598	7.965531836	-3.715531836	-1.080740385	83.80084151	12.125
599	8.675572659	5.491094008	1.597199894	83.94109397	12.16666667
600	4.778124708	-1.403124708	-0.408128259	84.08134642	12.16666667
601	4.706142315	3.335524352	0.970207236	84.22159888	12.29166667
602	8.910941298	5.089058702	1.480259491	84.36185133	12.29166667
603	4.585250945	-2.168584279	-0.630778234	84.50210379	12.29166667
604	3.886673162	1.154993505	0.335954092	84.64235624	12.29166667
605	7.99548702	-2.662153687	-0.774343251	84.7826087	12.36514523
606	7.328473218	2.004860116	0.583155626	84.92286115	12.375
607	6.294223971	-3.502557304	-1.018792275	85.0631136	12.375
608	7.598988245	-2.307321578	-0.671132888	85.20336606	12.375
609	8.02697127	-2.443637937	-0.710783361	85.34361851	12.375
610	7.302788974	-3.344455641	-0.972805089	85.48387097	12.375
611	6.896290217	-1.72962355	-0.503097297	85.62412342	12.41666667
612	6.435001213	-2.35166788	-0.68403194	85.76437588	12.458333333
613	5.592336514	-1.63400318	-0.475284106	85.90462833	12.458333333
614	7.491105099	5.175561567	1.505420664	86.04488079	12.5
615	6.384761543	1.490238457	0.43346712	86.18513324	12.5
616	7.230894671	-0.772561337	-0.224715673	86.32538569	12.5
617	6.083541839	-1.583541839	-0.460606366	86.46563815	12.5210084
618	7.238083806	4.928582861	1.433581726	86.6058906	12.59414226
619	6.210557775	-3.668891108	-1.067173951	86.74614306	12.625
620	8.247142344	-0.080475678	-0.023408039	86.88639551	12.66666667
621	5.3438352	-1.010501867	-0.293925668	87.02664797	12.66666667
622	7.633807281	-1.967140614	-0.572184118	87.16690042	12.66666667
623	7.215366014	-1.173699347	-0.341395079	87.30715288	12.66666667
624	7.234151238	-0.817484571	-0.237782538	87.44740533	12.708333333
625	9.023305787	0.060027547	0.017460271	87.58765778	12.75
626	10.00875024	4.032916425	1.173058352	87.72791024	12.91666667

627	7.112197859	-3.445531192	-1.002205034	87.86816269	12.91666667
628	9.997283537	-2.830616871	-0.823344302	88.00841515	12.91666667
629	5.617146679	-3.283813346	-0.955166005	88.1486676	12.91666667
630	9.092850449	-3.009517115	-0.875381192	88.28892006	13
631	7.689220082	-2.147553415	-0.624660966	88.42917251	13.04166667
632	7.089446365	-3.214446365	-0.934989163	88.56942496	13.09623431
633	8.241459827	-5.616459827	-1.633665172	88.70967742	13.125
634	7.063468451	-0.813468451	-0.236614365	88.84992987	13.125
635	7.75939416	-2.13439416	-0.620833321	88.99018233	13.16666667
636	9.763047759	-0.054714426	-0.015914839	89.13043478	13.16666667
637	7.87199597	-3.080329304	-0.895978402	89.27068724	13.16666667
638	8.928093572	-1.594760239	-0.463869473	89.41093969	13.20833333
639	9.14363453	-3.976967863	-1.156784539	89.55119215	13.29166667
640	10.21184377	-2.961843766	-0.861514398	89.6914446	13.33333333
641	8.024095403	-4.607428737	-1.340167311	89.83169705	13.33333333
642	9.922205858	3.286127475	0.955839118	89.97194951	13.41666667
643	10.17389851	-4.882231845	-1.42009956	90.11220196	13.45833333
644	1.489391569	2.760608431	0.802980879	90.25245442	13.45833333
645	8.618323317	-5.493323317	-1.597848335	90.39270687	13.45833333
646	8.43066959	-0.764002923	-0.222226279	90.53295933	13.58333333
647	9.67633667	2.156996664	0.627407733	90.67321178	13.66666667
648	10.18064408	-2.555644076	-0.743362696	90.81346424	13.83333333
649	8.374667525	-2.541334192	-0.739200366	90.95371669	13.83333333
650	10.5150014	1.068331938	0.310746758	91.09396914	13.875
651	9.673732646	-3.590399313	-1.044342966	91.2342216	13.91666667
652	9.267856146	-1.892856146	-0.550576922	91.37447405	14
653	8.532528626	-1.740861959	-0.506366224	91.51472651	14.04166667
654	4.915144228	-1.456810894	-0.423744012	91.65497896	14.04166667
655	8.569125204	-2.194125204	-0.638207348	91.79523142	14.16666667
656	9.822080737	-3.113747404	-0.905698758	91.93548387	14.16666667
657	8.956971191	-3.665304525	-1.066130718	92.07573633	14.16666667
658	6.853715898	-3.395382565	-0.987618253	92.21598878	14.20833333
659	8.818226973	-4.60989364	-1.340884279	92.35624123	14.20833333
660	9.355927966	1.019072034	0.296418481	92.49649369	14.25
661	9.990646475	-1.782313142	-0.51842317	92.63674614	14.25
662	9.986741718	-0.736741718	-0.214296785	92.7769986	14.29166667
663	10.17403141	-0.757364747	-0.220295426	92.91725105	14.29166667
664	10.25210475	-1.293771413	-0.376320559	93.05750351	14.35146444
665	10.12231549	-0.413982154	-0.120415395	93.19775596	14.375
666	9.772365995	-2.814032662	-0.818520437	93.33800842	14.375
667	9.351736047	-0.268402714	-0.07807056	93.47826087	14.39330544
668	8.294541266	-2.794541266	-0.812850956	93.61851332	14.41666667
669	10.16173125	-7.328397912	-2.131618281	93.75876578	14.54166667
670	9.213606371	4.244726962	1.23466789	93.89901823	14.54166667

671	10.24308649	-1.118086488	-0.325218912	94.03927069	14.58333333
672	7.67119471	6.70380529	1.949942413	94.17952314	14.58333333
673	7.245717867	1.754282133	0.510269763	94.3197756	14.58333333
674	10.14193057	-3.76693057	-1.095690785	94.46002805	14.625
675	10.02749849	-0.319165159	-0.092835882	94.6002805	14.89539749
676	10.77839298	3.429940353	0.997670111	94.74053296	15.16666667
677	8.398405748	-2.148405748	-0.624908885	94.88078541	15.29166667
678	8.865848729	1.884151271	0.548044926	95.02103787	15.33333333
679	8.515328157	3.318005177	0.965111416	95.16129032	15.5
680	7.845903671	-2.845903671	-0.827790789	95.30154278	15.5
681	7.861104548	1.930562119	0.561544495	95.44179523	15.54166667
682	8.928250968	-2.011584301	-0.585111497	95.58204769	15.66666667
683	9.489674887	-2.114674887	-0.615097556	95.72230014	15.70833333
684	9.752888867	-0.044555534	-0.012959912	95.86255259	15.70833333
685	3.719070795	-0.469070795	-0.136439082	96.00280505	15.79166667
686	7.646085382	-4.312752049	-1.254454414	96.1430575	15.83333333
687	9.086496725	-5.044830059	-1.467394662	96.28330996	15.95833333
688	9.164266849	-2.205933515	-0.641642043	96.42356241	16.125
689	5.837883939	-0.171217273	-0.049802136	96.56381487	16.25
690	5.94793262	0.42706738	0.124221507	96.70406732	16.29166667
691	7.787559837	-1.49589317	-0.435111912	96.84431978	16.70833333
692	7.067803172	5.307196828	1.543709541	96.98457223	16.91666667
693	8.245167636	-4.120167636	-1.198437197	97.12482468	17.16666667
694	6.536828002	-1.745161335	-0.507616787	97.26507714	17.20833333
695	7.667165388	1.332834612	0.387682909	97.40532959	17.23849372
696	8.414836899	-0.956503566	-0.278219129	97.54558205	17.54166667
697	8.423570065	-5.256903399	-1.529080642	97.6858345	17.70833333
698	7.889897221	-0.098230554	-0.028572418	97.82608696	17.875
699	5.008795235	0.157871431	0.045920218	97.96633941	18
700	6.720465026	-4.053798359	-1.1791323	98.10659187	18.20833333
701	7.764382182	-1.556048849	-0.452609453	98.24684432	18.41004184
702	6.357243326	-2.940576659	-0.855328414	98.38709677	18.45833333
703	0.704853222	2.586813445	0.752428961	98.52734923	18.79166667
704	7.893448199	6.398218468	1.861056074	98.66760168	19.125
705	8.256888871	3.909777796	1.137240898	98.80785414	19.24369748
706	6.33810939	-3.671442723	-1.067916142	98.94810659	19.79166667
707	6.254306631	-4.129306631	-1.201095465	99.08835905	19.875
708	5.819940447	1.096726219	0.31900583	99.2286115	20.08333333
709	4.425137577	0.24152909	0.070253803	99.36886396	21.125
710	5.740655815	-2.698989149	-0.785057618	99.50911641	21.67364017
711	7.175040658	-0.883373991	-0.256947858	99.64936886	21.83333333
712	4.527671259	1.055662074	0.307061462	99.78962132	24.125
713	8.209458904	-0.834458904	-0.242719879	99.92987377	28.29166667

APPENDIX E. PUBLIC COMMENT PROCESS

The data exclusion request package was posted for public comment on May 27. A link to the data exclusion request package was posted in the public notices event calendar at <http://daq.state.nc.us/cgi-bin/cal.cgi?5+2014>:

Monday	Tuesday	Wednesday	Thursday	Friday
			1	2
5 Public Comment Period Ends for Nomaco Inc - Tarboro (Tarboro) Air Quality Permit (Betty Gatano)	6	7 Air Quality Committee Meeting, 11:00 a.m., Raleigh, NC.	8 Public Notice of Intent to Issue an Air Quality Permit to Slurry Pavers, Inc. (Morehead City) (Brian Bland) <u>Slurry (Draft Permit)</u> <u>Slurry (Permit Rev.)</u> EPA Comment Period Begins for Slurry Pavers, Inc. (Morehead City) Air Quality Permit (Brian Bland)	9 Public Notice of Intent to Issue an Air Quality Permit to NCSU Central Heat Plant (Raleigh) (Rahul Thaker) <u>NCSU (Draft Permit)</u> <u>NCSU (Permit Rev.)</u> EPA Comment Period Begins for NCSU Central Heat Plant (Raleigh) Air Quality Permit (Rahul Thaker)
12	13 Public Notice of Intent to Issue an Air Quality Permit to Plastic Packaging Inc (Hickory) (Charlie Yirka) <u>Plastic (Draft Permit)</u> <u>Plastic (Permit Rev.)</u> EPA Comment Period Begins for Plastic Packaging Inc (Hickory) Air Quality Permit (Charlie Yirka) Outside Involvement Committee Meeting 1:30 pm Raleigh, NC	14	15 Public Notice of Intent to Issue an Air Quality Permit to JELD-WEN, Inc. dba JELD-WEN Fiber of North Carolina (Marion) (Betty Gatano) <u>JELD-WEN (Draft Permit)</u> <u>JELD-WEN (Permit Rev.)</u> EPA Comment Period Begins for JELD-WEN, Inc. dba JELD-WEN Fiber of North Carolina (Marion) Air Quality Permit (Betty Gatano)	16
19 EPA Comment Period Ends for Nomaco Inc - Tarboro (Tarboro) Air Quality Permit (Betty Gatano)	20	21	22 Public Comment Period Ends for Coats American, Sevier Plant (Marion) Air Quality Permit (Russell Braswell)	23
26	27 EPA Public Comment Period begins for the exceptional event data exclusion package for fine particle data collected at Boone on November 15, 2013.	28 NCSAB Teleconference 2PM <u>Public Notice of Intent to Issue an Air Quality Permit to Nucor Steel (Cofield) (Heather Sands)</u> <u>Nucor (Draft Permit)</u> <u>Nucor (Permit Rev.)</u> EPA Comment Period Begins for Nucor Steel (Cofield) Air Quality Permit (Heather Sands)	29	30

Note: Links to Public Notices, Draft Permits, and Permit Reviews are removed once the corresponding permit is issued. Entries shown on calendar for issued permits are for reference only. Please contact Kathy Hash, DAQ Permitting at 919-707-8734 or Kathy.Hash@ncdenr.gov for information on these entries.



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The link goes to the http://daq.state.nc.us/monitor/projects/exceptional/exceptional_2013.shtml page which has a link to the document:

Data Proposed For Exclusion From NAAQS Compliance Determinations

"Exceptional Events Documentation Packages"

Data impacted by an exceptional event may be excluded from use in determining compliance with the National Ambient Air Quality Standards (NAAQS) when they meet certain criteria defined in 40 CFR § 50.14 - "Treatment of air quality monitoring data influenced by exceptional events". Exceptional events are defined as events that occur and impact air quality that cannot be controlled by human intervention and that are not expected to reoccur, such as wildfires. To exclude data impacted by an exceptional event the agency must demonstrate to the Environmental Protection Agency that the event occurred, the event impacted the monitor, the value measured was not what would have been expected for that location and season (i.e., it was atypical), and that the NAAQS would not have been exceeded if that event had not occurred. The following fine particle exceptional events documentation package has been prepared and is available for public comment until June 27:

- Table Rock Wildfire, Wildfire, November 2013, affecting one exceedance in Watauga County



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APPENDIX F. PUBLIC COMMENTS RECEIVED

One comment was received:

From: Wayne Cornelius [wayne_cornelius@prodigy.net]
Sent: Monday, June 09, 2014 10:26 AM
To: Redmond, Donnie
Subject: Comments on the Exceptional Event Documentation for Linville Gorge Wilderness Area, 15 Nov. 2013

Donnie,

Almost two weeks ago, I saw the Exceptional Event documentation on the Division of Air Quality's RSS feed, inviting public comments. I found that I had some to offer, but I didn't find any instructions for how to submit those comments. I assume emailing them to you will suffice and you will see to it they are received appropriately, so I wrote my comments in a short document and have attached the same to this message. Thank you for the opportunity to do that.

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Comments on the Exceptional Event Documentation for Linville Gorge Wilderness Area, 15 Nov. 2013

Wayne L. Cornelius, Ph.D.
Wayne_cornelius@prodigy.net
919 747-1212

The data sample of Nov. 15 certainly appears to qualify as an exceptional event deserving exclusion from consideration in evaluating the PM_{2.5} daily standard, but in my opinion the atypical-data analysis and the but-for data analysis are problematic, and accordingly EPA may not wish to concur with them. The purpose of this note is to comment on errors in the data analyses.

1. In the exposition of atypical data based on fourth quarter samples of four consecutive years (page 17) it is claimed that the probability of exceeding 20.0, which is stated to be the 99th percentile of a reference dataset, is 1 percent. That would be true for a randomly selected concentration from the sample. However, instead of a random data point, here you are examining a data point *known to be the maximum*, and the true probability of including the maximum value in such a large sample is much larger than 0.01. It is very close to $1/e$ (~ 0.368), and this probability statement holds true regardless of the actual underlying distribution of the data.
 - a. Correct inference of such probabilities generally requires a reasonably accurate characterization of the distribution of the data values. I didn't find any assumption of the distribution stated in this document.
 - b. The median, 90th and 99th percentiles are stated, but that is not sufficient to define a distribution function. Visual inspection of Figure 12 is not helpful. Fig. 12 seems designed to obscure, rather than clarify, any suitable data distribution!
 - c. The form of the graph on page 39 for the but-for analysis could be adopted to serve this purpose, although a boxplot or a carefully designed histogram of the data would be more intuitive to most people. (It might be possible to attach a suitable boxplot or a horizontal histogram to Fig. 12, scaled the same as the data points. However, the trendless time series of data points is unhelpful.)
 - d. The typical data distribution for data like these is the *lognormal* distribution (see, e.g., Gerald van Belle, *Statistical Rules of Thumb*, Wiley, 2002; or Wayne R. Ott, *Environmental Statistics and Data Analysis*, Lewis Publishers, 1995).
 - e. I transcribed the data in Table B-1 to perform my own analysis using the R statistical computing package. In order to evaluate whether the lognormal distribution fits the data, I computed the quantiles of a "standard" lognormal distribution for a sample of 125 data points, and I regressed the observed log concentrations on these quantiles, first trimming the maximum and minimum concentrations since the maximum is a problematic outlier, while the analytical objective is to estimate what value it *should* "typically" have. This

regression analysis is shown in Table 1, with a graphical representation in Figure 1. Note that the regression intercept agrees almost perfectly with the mean of the log transformed data, and the regression slope differs from the standard deviation of the trimmed log transformed data by less than 4 percent. This is good evidence that the lognormal distribution fits the data very well. (It can be made more rigorous by superimposing tolerance intervals on the regression line and observing how well the percent of the data enclosed by them matches the nominal probability of the interval.)

- f. To decide what range of data values would be “typical” for the maximum of this distribution, extrapolate the regression and tolerance limit lines to the quantile of the outlier point. (All textbooks on multiple regression give the appropriate formula based on the residual error, sample size and regression coefficients. I used the R `predict()` function.) In the raw data scale, the expected value of the maximum concentration is 23.78, and the upper 99 percent tolerance limit is 28.25. (In fact, the *lower* 99 percent tolerance limit is 20.0—affirming, I suppose, the trivial fact that the maximum is greater than the 99th percentile.) In contrast to the documentation’s assertion that there is a less than 1 percent chance of exceeding 20.0, my results suggest there is about a 50 percent chance of the maximum concentration exceeding 23.78 and almost a 1 percent chance of exceeding 28.25.
2. The but-for analysis (pages 18-19) of six calendar years of data contains errors and a misleading approach. (It is not feasible for me to transcribe this dataset and attempt to reanalyze it. Here I can only comment on the information provided in the document.)
 - a. The second paragraph of the summary erroneously claims the regression model explains “just over half” of the variation in the data. However, the statistical results table just below that claim shows that the amount of variation explained by the model is only 27 percent. I do not know whether the accompanying prediction of a 99 percent upper tolerance limit of 21.47 is accurate, but the regression model fits the data so poorly as to make any estimate untrustworthy. A couple of my ideas to attempt to improve it follow next.
 - b. The fact that adjusted R^2 is distinctly smaller than unadjusted R^2 suggests a model with superfluous parameters has been fitted to the data. This means you should have examined the standard errors or the P-values of the parameters and eliminated from the regression model those that are “not significant”. The regression model contains at least one parameter that contributes nothing to the prediction, *Uwind*, because the regression coefficient is not significantly different from 0. Removing *Uwind* and refitting the regression may reveal other such parameters: I have my doubts about the significance of *RHMIN* and *TAVG*.
 - c. Possibly there are nonlinear relationships between the concentrations and some of the parameters, and capturing these in the model, or modeling log concentrations instead of raw concentrations as the regressor, might have produced a better model. (The document doesn’t indicate anything about alternative models that you might have examined and discarded. This suggests you chose the most obvious prospective model and simply uncritically applied it.)
 - d. The applicability of a regression model for this type of inference depends on the regression residuals following a normal distribution. However, the probability plot on

page 39 seems to picture a distribution of the raw data instead. I note that the scaling of this graph fails to demonstrate whether *anything* is actually normally distributed. As a better approach, make a graph with the **residuals** plotted on the y-axis and corresponding **normal distribution quantiles** on the x-axis, size this graph so that the horizontal and vertical lengths of the plot are about equal, and then assess whether the plotted data points fall close to a straight line. (I did something very similar to that in Figure 1, below, for the atypical-data analysis.) The “residual output” table beginning on page 40 of the documentation contains the information needed for this assessment, but presenting it in this format seems intended to be difficult to understand and interpret.

Table 1. Regression Summary For Test of Lognormal Distribution Fit to Data.

```
Call:
lm(formula = y[2:124] ~ x[2:124], data = boone.qqln)

Residuals:
      Min       1Q   Median       3Q      Max
-0.190197 -0.026332  0.000572  0.043548  0.120856

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.781668   0.005732   310.82  <2e-16 ***
x[2:124]     0.523125   0.006018    86.93  <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.06357 on 121 degrees of freedom
Multiple R-squared:  0.9842,    Adjusted R-squared:  0.9841
```

Lognormal Q-Q Plot

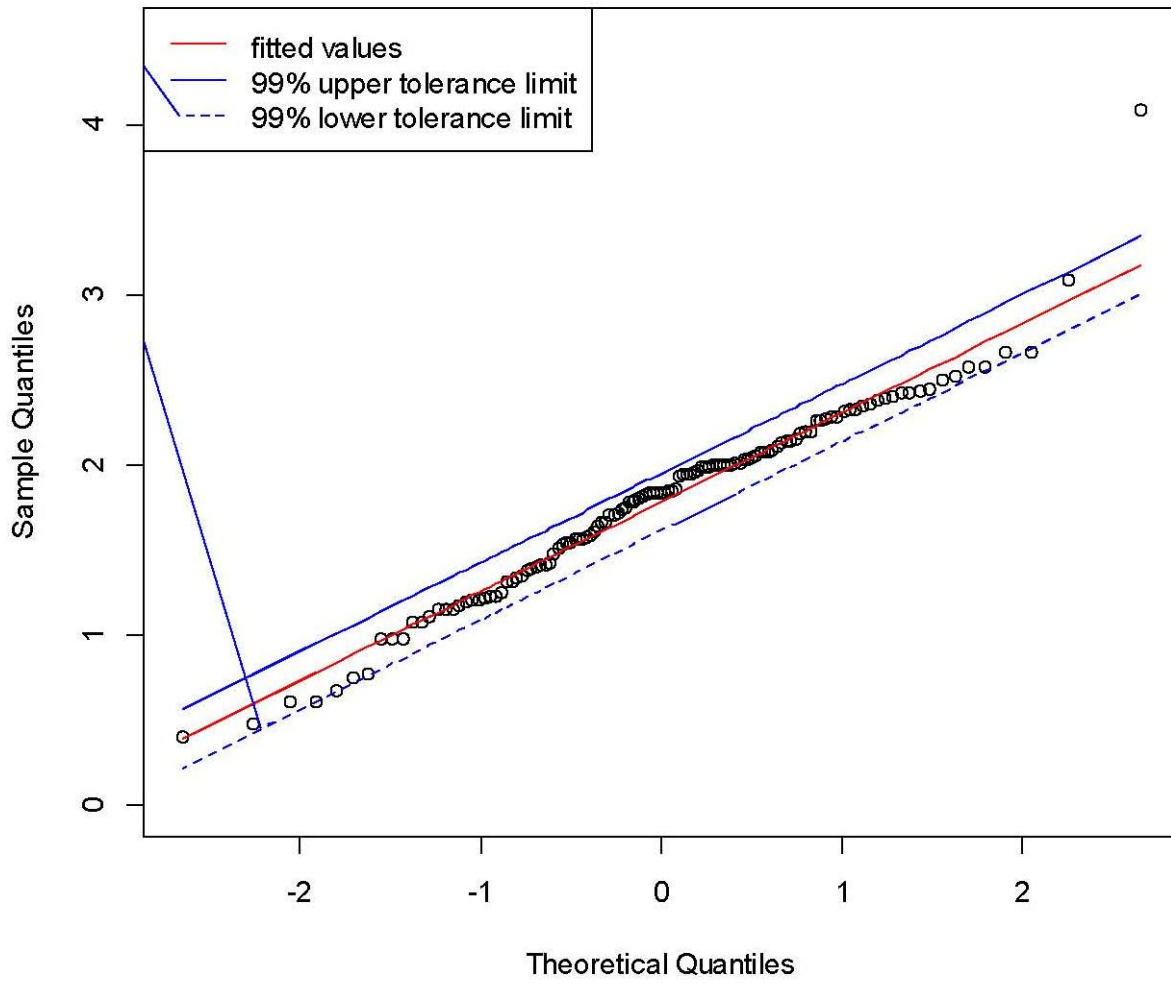


Figure 1. Lognormal fit and point-prediction tolerance interval.