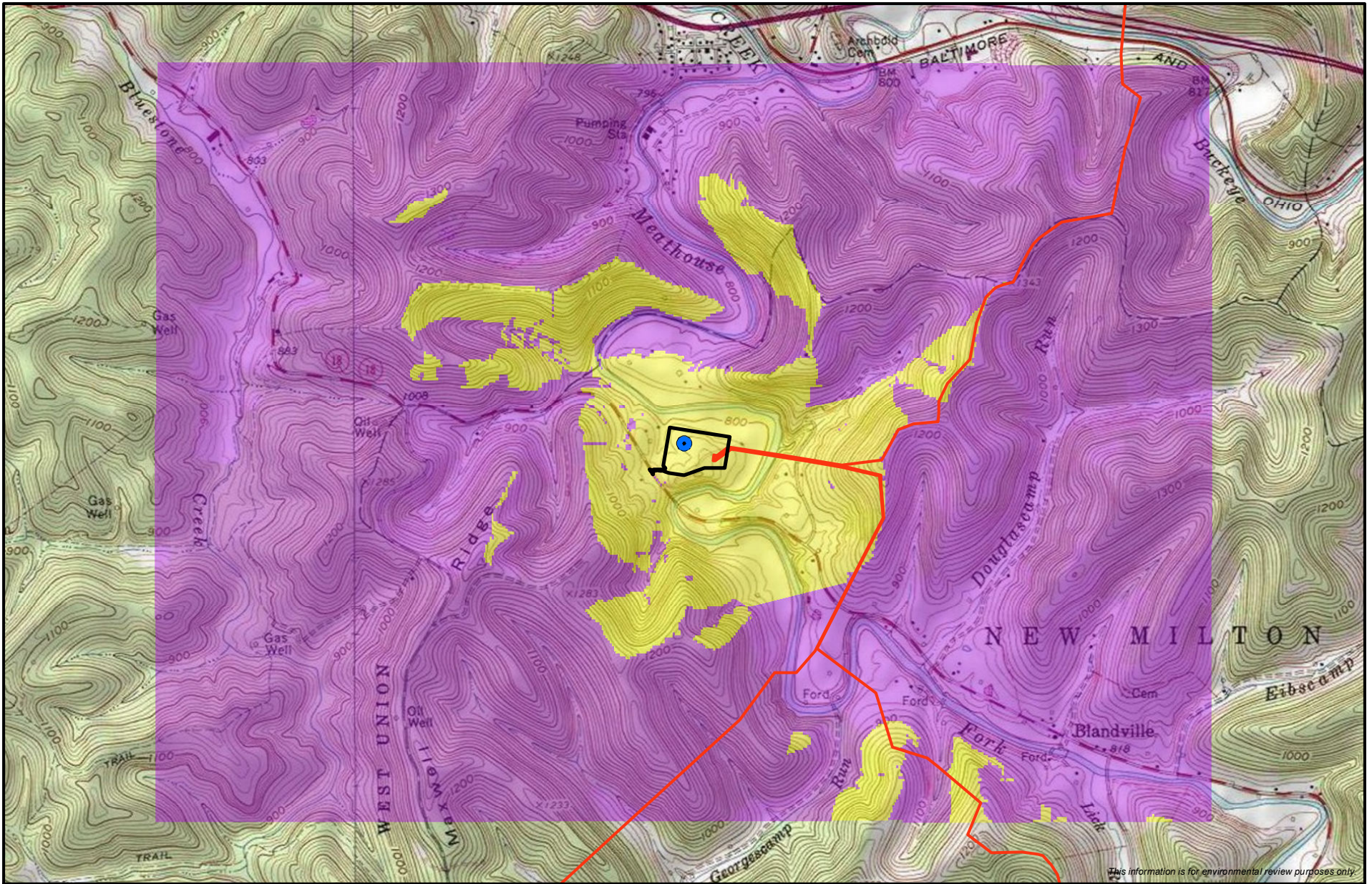




APPENDIX M-1
Viewshed Analysis for New Compressor Stations Associated with the
Mountaineer XPress Project



This information is for environmental review purposes only.

	Compressor Station	Viewshed
	Proposed Centerline	 Not Visible
	Compressor Station Permanent Boundary	 Visible

0 1,000 2,000 Feet

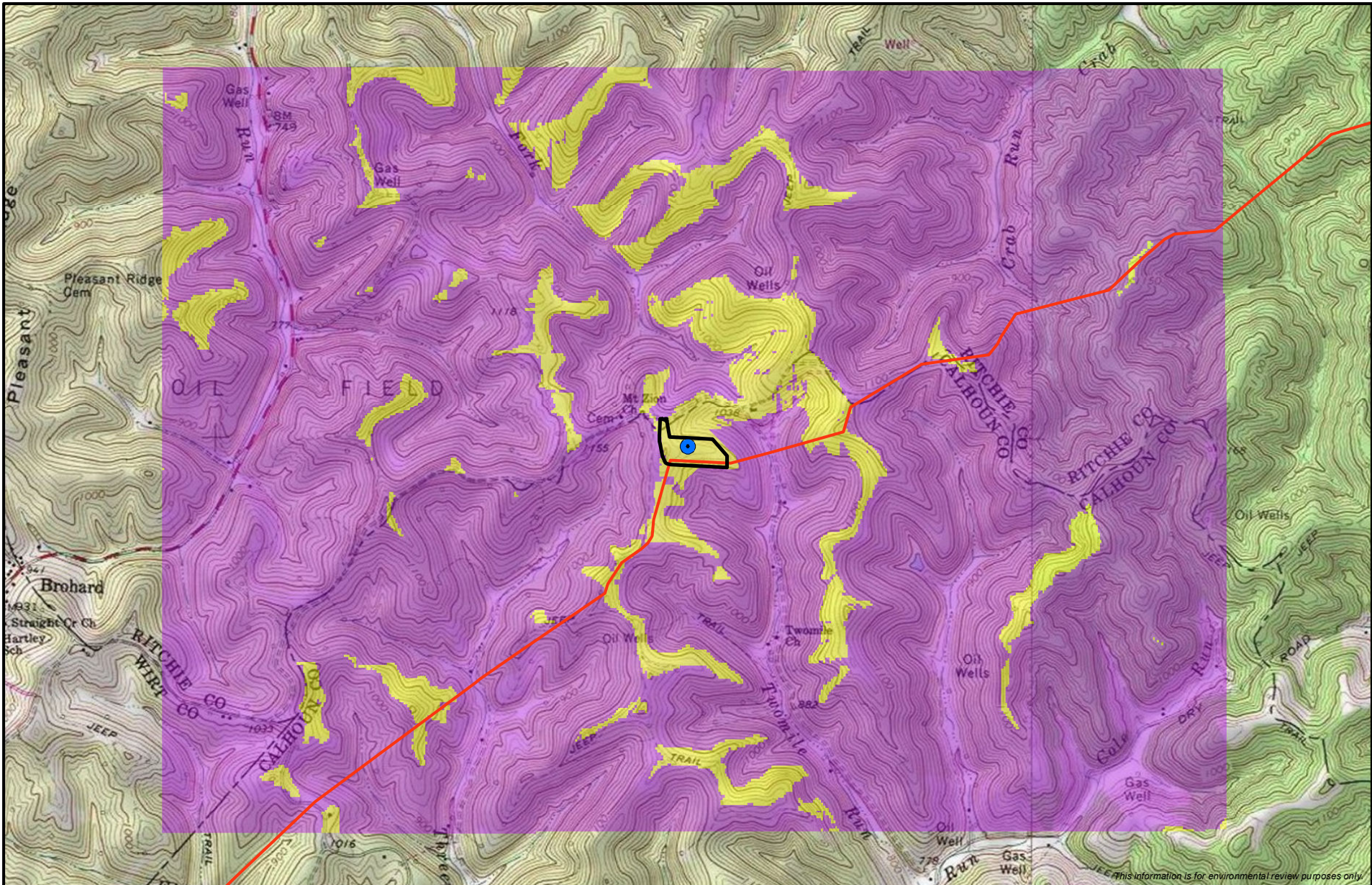
Sheet 1 of 3

Viewshed Analysis
Mountaineer XPress Project
 Columbia Gas Transmission
 Sherwood Compressor Station

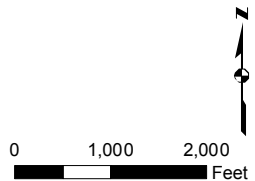


an ERM Group company

DRAWN BY: JPB



- Compressor Station
- Proposed Centerline
- Compressor Station Permanent Boundary
- Viewshed**
- Not Visible
- Visible



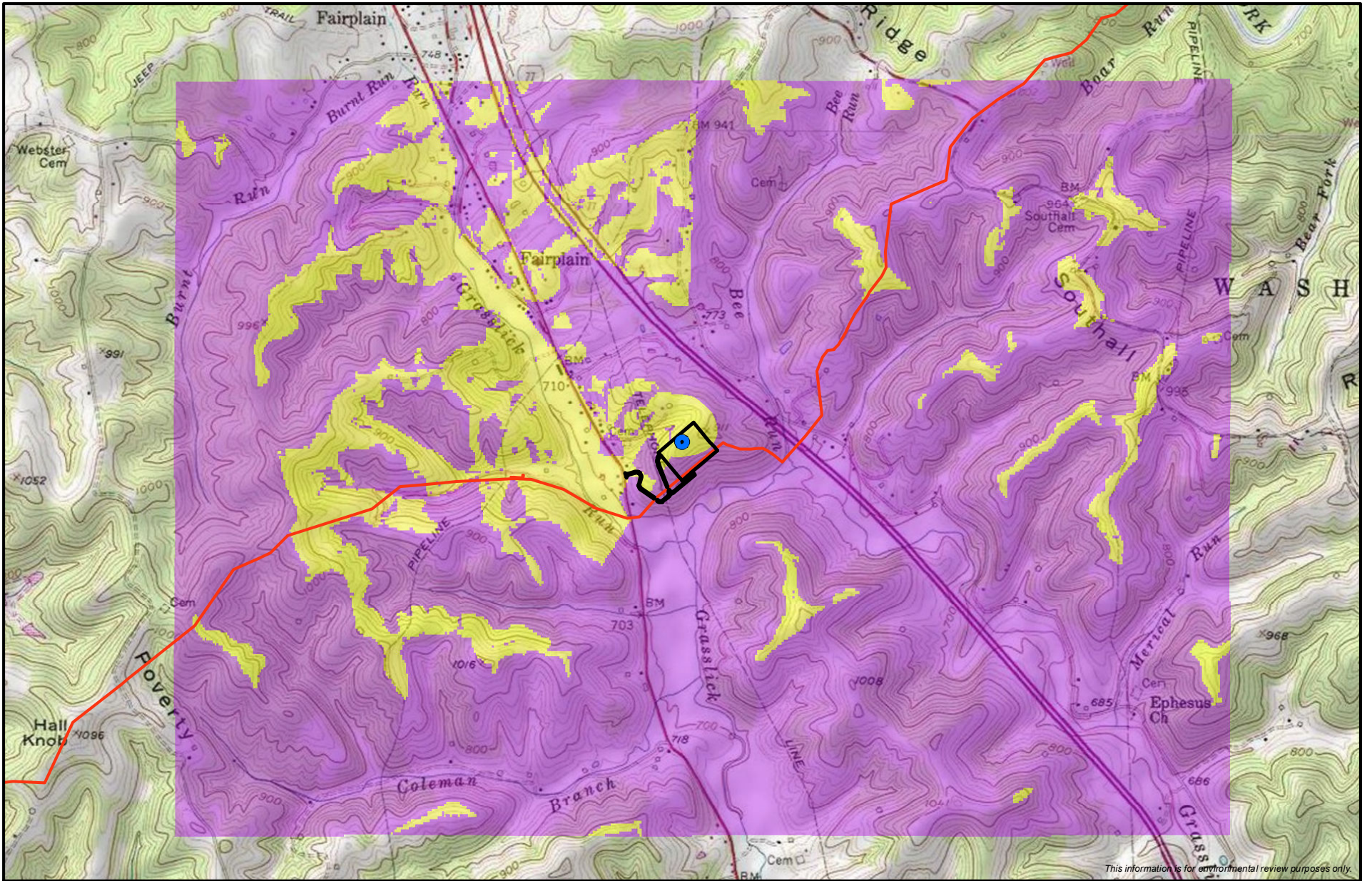
Sheet 2 of 3

Viewshed Analysis
Mountaineer Xpress Project
 Columbia Gas Transmission
 White Oak Compressor Station




an ERM Group company

DRAWN BY: JPB

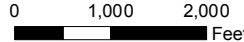


This information is for environmental review purposes only.

 Compressor Station	Viewshed
 Proposed Centerline	 Not Visible
 Compressor Station Permanent Boundary	 Visible



Sheet 3 of 3



Viewshed Analysis
Mountaineer XPress Project
 Columbia Gas Transmission
 Mount Olive Compressor Station



an ERM Group company

DRAWN BY: JPB

APPENDIX M-2
Viewshed Analysis for Facilities Associated with the Gulf XPress Project

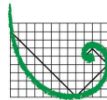


COLUMBIA GULF TRANSMISSION, LLC

**Gulf XPress Project
Docket No. CP16-361-000**

**VISUAL IMPACT ASSESSMENT
FOR THE
MOREHEAD, PAINT LICK, AND CANE RIDGE COMPRESSOR STATIONS**

Prepared by



ERM

November 2016

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Appendix 17-3 Lighting Plans (Contains CEII – Filed Under Separate Cover)

1.0 INTRODUCTION

Columbia Gulf Transmission, LLC (Columbia Gulf), conducted a visual impact assessment to describe conditions and potential visual impacts on sensitive features near the Morehead, Paint Lick, and Cane Ridge Compressor Stations. Residential and recreational land use areas are considered to be sensitive locations because the scenic values of a landscape may be used as part of a leisure experience for varying durations. Transportation corridors¹, agricultural fields, and commercial areas are not considered sensitive areas as they are not typically associated with leisure use. This assessment uses topographic data in a Geographic Information System (GIS) to determine areas that would be visible from each compressor station. This analysis assumes clear weather and no intervening vegetation or structures (i.e., a “cleared ground surface” analysis) and therefore, represents the maximum potentially visible area of the Project or a “worst-case” scenario. The interaction between the proposed Gulf XPress Project (Project) and visually sensitive locations will help define the basis for assessing impacts and developing mitigation strategies.

1.1 METHODOLOGY

The Morehead, Paint Lick, and Cane Ridge Compressor Stations are located on private lands; therefore, they are not subject to federal visual resource management plans and standards. The visual impact assessment methodology applied in this analysis is based on the general concepts found in the United States Forest Service (USFS) Scenery Management System (SMS) (U.S. Department of Agriculture [USDA], 1995) and is described in the *Agriculture Handbook 701, Landscape Aesthetics - A Handbook for Scenery Management* and the National Park Service (NPS) Guide to Evaluating Visual Impact Assessments for Renewable Energy Projects (NPS, 2014).

The SMS establishes a method for measuring the scenic value of lands in National Forests, according to the opinions of various types of viewers and takes into account a wide variety of existing characteristics, such as (but not limited to) slope; vegetative cover type, pattern, height and distribution; soils; geology; and the “edge effect” where different landscape elements meet.

The USFS defines distance zones as the generalized groupings used to describe how viewers see the landscape. The SMS identifies four distance zones:

- immediate foreground (0 to 300 feet);
- foreground (300 feet to 0.5 mile);
- middleground (0.5 mile to 4 miles); and
- background (4 miles to the horizon).

Immediate foreground and foreground views tend to highlight details ranging from individual leaves to individual trees. The middleground “is usually the predominant distance zone at which National Forest landscapes are seen, except for regions lands or tall, dense vegetation.” In the background, “texture has disappeared and color has flattened, but large patterns of vegetation or rock are still distinguishable” (USDA, 1995 4-12). Foreground and the immediate foreground are usually the most visually sensitive areas. This assessment considers views within a 2-mile-wide buffer of each compressor station to capture the area in which visual impacts would be the greatest (Figures 1, 6, and 7).

¹ The compressor stations are not located along scenic byways.

Visual impacts are defined by the NPS as “changes to the scenic attributes of the landscape brought about by the introduction of visual contrasts from a proposed project, and associated changes in the human visual experience of the landscape” (NPS, 2014:17). They describe the change to the visual qualities of the landscape resulting from the introduction of visual contrasts as well as the human response to that change (NPS, 2014). Specifically for the compressor stations, the visual contrast created by the exhaust stack extending above the tree line could give viewers the perception of a natural landscape being interrupted by manmade elements.

The visual analysis is based on topography from 10-meter Digital Elevation Model (DEM) data available from the United States Geological Survey (USGS). The analysis was performed using the Viewshed Analysis tool in ArcGIS (specifically ArcMap 10.3.1), the industry standard for GIS mapping and analysis. The GIS-based analysis identified areas where the top of the exhaust stack (the tallest component of each compressor station) at the Morehead, Paint Lick, and Cane Ridge Compressor Stations could potentially be visible. The other components of the compressor stations are not necessarily insignificant, but have less significant visual effect due to a lack vertical scale. Tables 1 through 3 provide a list of potentially sensitive features identified as a result of the GIS analysis. These features are depicted on Figures 2, 7, and 9.

The visual impact area was further refined through identification of surrounding vegetation and structures that potentially obscure views and restrict views from sensitive locations. Aerial photography of current conditions (2015) was examined to refine the visual analysis. Additionally, as requested in the Federal Energy Regulatory Commission’s Data Request dated August 24, 2016, the views of the Cane Ridge Compressor Station include photographs taken from public locations within nearby communities of Mill Run; the residences along Hidden Creek Drive; Mill Creek Park and the Mill Creek Greenway; and Stanford Village. The location of each photograph location was recorded by a global position system (GPS) unit. These photographs are included in Attachment 17-1 along with an overview map depicting the locations from which the photographs were taken.

TABLE 1

**Gulf XPress Project
Morehead Compressor Station
Potentially Sensitive Features**

ID	Description	Latitude (decimal degrees)	Longitude (decimal degrees)	Distance from Project (miles)	Distance Zone
Business 1	Business			218 feet	Immediate Foreground
Business 2	Business			248 feet	Immediate Foreground
1	Residence	38.27	-83.43	1.0	Middleground
2	Residence	38.26	-83.44	0.7	Middleground
3	Residence	38.26	-83.44	0.6	Middleground
4	Residence	38.26	-83.44	0.6	Middleground
5	Residence	38.26	-83.44	0.6	Foreground
6	Residence	38.26	-83.44	0.5	Foreground
7	Residence	38.26	-83.44	0.4	Foreground
8	Residence	38.26	-83.44	0.4	Foreground
9	Residence	38.26	-83.44	0.4	Middleground
10	Residence	38.26	-83.44	0.5	Foreground
11	Residence	38.26	-83.44	0.5	Foreground
12	Residence	38.25	-83.44	0.4	Foreground
13	Residence	38.25	-83.44	0.3	Foreground
14	Residence	38.25	-83.44	0.3	Foreground
15	Residence	38.25	-83.44	0.2	Foreground
16	Residence	38.25	-83.44	0.2	Foreground
17	Residence	38.26	-83.44	0.5	Foreground
20	Residence	38.25	-83.44	0.2	Foreground
21	Residence	38.25	-83.44	0.1	Foreground
22	Residence	38.25	-83.44	0.1	Foreground
23	Residence	38.25	-83.44	0.2	Foreground
24	Residence	38.24	-83.44	0.3	Foreground
25	Residence	38.24	-83.45	0.6	Middleground
26	Residence	38.24	-83.45	0.8	Middleground
27	Residence	38.24	-83.44	0.5	Middleground
28	Residence	38.24	-83.45	0.7	Middleground
29	Residence	38.24	-83.45	0.7	Middleground
30	Business	38.24	-83.45	0.8	Middleground
31	Residence	38.24	-83.45	0.8	Middleground
32	Residence	38.24	-83.45	0.8	Middleground
33	Residence	38.24	-83.45	0.8	Middleground
34	Residence	38.24	-83.45	0.8	Middleground
35	Residence	38.24	-83.45	0.8	Middleground
36	Residence	38.24	-83.45	0.8	Middleground
37	Residence	38.24	-83.45	0.8	Middleground
38	Residence	38.24	-83.45	0.9	Middleground

TABLE 2

**Gulf XPress Project
Paint Lick Compressor Station
Potentially Sensitive Features**

ID	Description	Latitude (decimal degrees)	Longitude (decimal degrees)	Distance from Project (miles)	Distance Zone
NSA 1 ^a	Residence	37.58	-84.46	0.1	Foreground
NSA 2 ^a	Residence	37.58	-84.46	0.2	Foreground
NSA 4 ^a	Residence	37.58	-84.45	0.4	Foreground
NSA 5 ^a	Residence	37.58	-84.47	0.4	Foreground
1	Residence	37.58	-84.46	0.1	Foreground
2	Residence	37.58	-84.45	0.6	Middleground
3	Residence	37.59	-84.45	0.8	Middleground
4	Residence	37.58	-84.44	0.9	Middleground
5	Residence	37.59	-84.44	1.0	Middleground
6	Residence	37.59	-84.46	0.7	Middleground
7	Residence	37.59	-84.46	0.8	Middleground
8	Residence	37.57	-84.46	0.9	Middleground
9	Residence	37.59	-84.47	0.7	Middleground

Notes

^a Resource Report 9, Appendix 9D-Noise Sensitive Areas identified the ambient sound survey for Paint Lick Compressor Station (April 2016).

TABLE 3

**Gulf XPress Project
Cane Ridge Compressor Station
Potentially Sensitive Features**

ID	Description	Latitude (decimal degrees)	Longitude (decimal degrees)	Distance from Project (miles)	Distance Zone
NSA 1	Residence, Closest house in Delvin Downs	36.03	-86.69	255 feet	Immediate Foreground
NSA 2	Residence, Closest house in Stanford Village	36.02	-86.69	135 feet	Immediate Foreground
NSA 3	Residence	36.03	-86.68	0.3	Foreground
NSA 4	Residence	36.03	-86.69	0.2	Foreground
1	Residence	36.03	-86.68	0.3	Foreground
2	Residence	36.03	-86.70	0.3	Foreground
3	Residence, Closest house on Hidden Creek Drive	36.02	-86.68	0.3	Foreground
4	Residence	36.01	-86.68	0.6	Middleground
5	Residence, Closest house in Mill Run Neighborhood	36.02	-86.69	0.3	Foreground

Notes

^a Resource Report 9, Appendix 9D-Noise Sensitive Areas identified in the ambient sound survey for Cane Ridge Compressor Station (April 2016).

1.2 MOREHEAD COMPRESSOR STATION

A visual assessment was conducted to determine if the Morehead Compressor Station would have a visual effect on the nearby residences, the Daniel Boone National Forest (DBNF), and the Sheltoewe Trace National Recreation Trail within the DBNF. Sheltoewe Trace National Recreation Trail is an approximately 290-mile-long trail that interconnects with many other trails. The trail traverses narrow ridges and deep ravines past historic homesteads, old logging tracts, and oil and gas wells (USDA, 2016).

The Morehead Compressor Station includes a paved access road, control building (approximately 26 feet tall), auxiliary building (approximately 24 feet tall), and compressor building (approximately 48 feet tall) with an exhaust stack (an additional 9 feet). The total combined height of the compressor building and stack would be approximately 57 feet above the ground surface consisting of 10 foot by 10 foot square ducting. Security chain link fencing will be installed around the perimeter of the permanent facility. The security fencing would be 8 feet in height with three strand barb wire extending an additional 1 foot above the top rail of the chain link fence.

Generally, the lighting system can be classified into the following categories:

- Compressor station operations
- Security; and
- Emergency

The Morehead Compressor station is situated within the Appalachian Plateaus (Kanawha) physiographic region which is characterized by relatively flat-lying rock beds with elevation ranging from 500 feet to 1,300 feet above mean sea level (AMSL) (USDA, 2006). Most of the region consists of farms, farm woodlots, and state and national forests. The proposed site is located at an elevation of 756 feet AMSL in relatively flat agricultural farmland. The proposed site is situated in a narrow valley surrounded by dissected uplands reaching approximately 1,260 feet AMSL on either side of the valley. State Route 377 (Cranston Road) is adjacent to the site along the western property boundary and Interstate 64 is to the east. An overhead utility distribution line is aligned along the western property boundary. DeBord Branch flows from west to east through the northern portion of the site into North Fork Triplett Creek, which is located east of the site. The area is surrounded by a combination of agricultural fields, public and private forest lands, and residential areas. The property is bordered to the north and south by private woodlots, which would provide natural visual screening. The DBNF is heavily forested and located east of Interstate 64 and west of Cranston Road. The Sheltoewe Trace National Recreation Trail is located within the DBNF approximately 1.5 miles east of the compressor station at an elevation of approximately 1,000 feet AMSL.

The results of the GIS analysis are depicted in Figure 1 and suggest that the Morehead Compressor Station would primarily be visible in the valley from the northeast and the southwest. Figure 2 identifies the residences and other areas that may have a view of the compressor station. The proposed compressor station may be visible to two businesses (a gas station and an unknown business) within the immediate foreground distance zone, 16 residences within the foreground distance zone, and 19 residences within the middleground distance zone.

There is no visual barrier between the compressor station and the businesses within the immediate foreground; however, these are not considered to be sensitive viewpoints. The

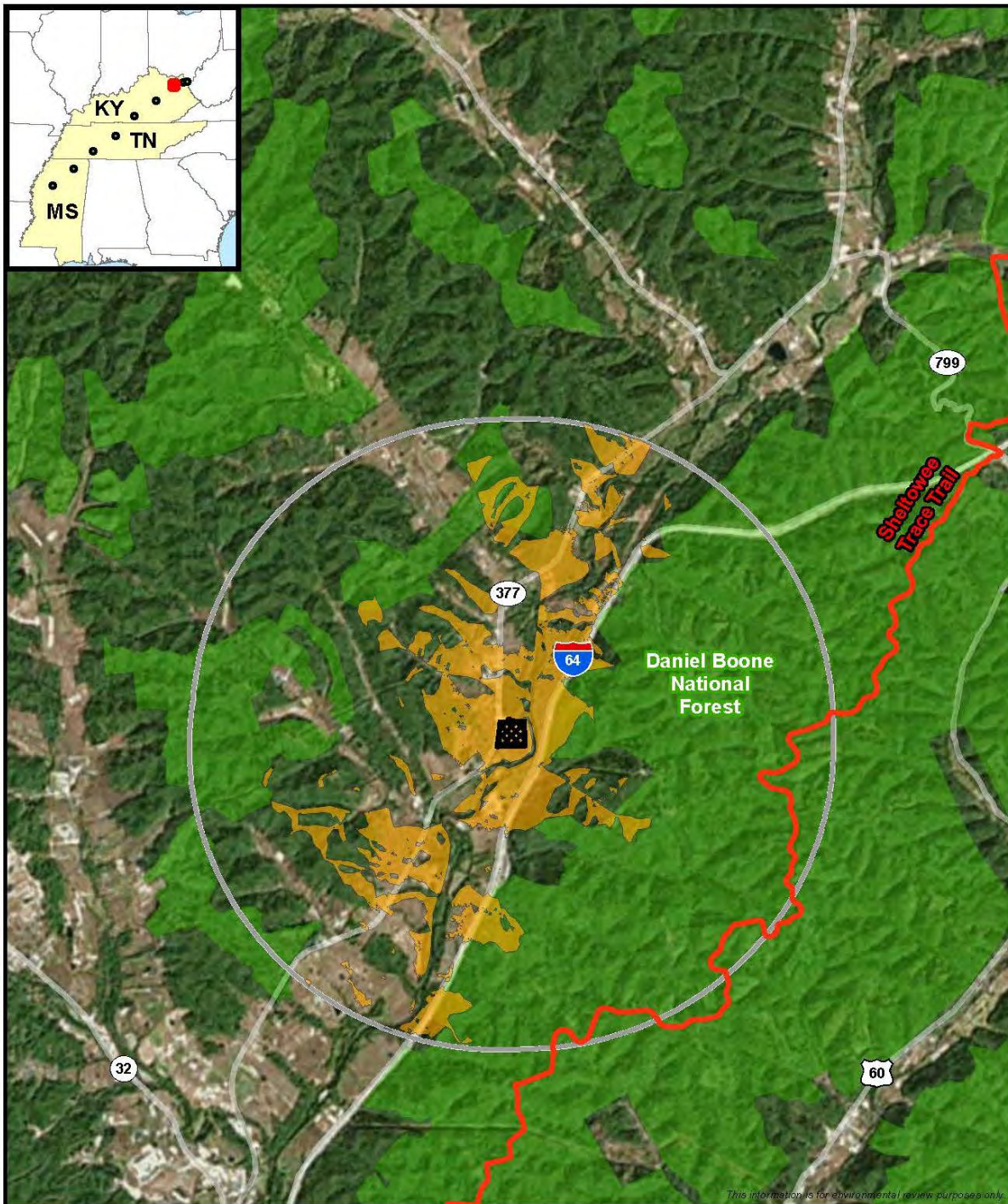
compressor station will not be visible to hikers on the Sheltopee Trace Trail due to the topographic relief and the screening effect of existing forested land in the DBNF.

The visual contrast created by the compressor station would be most evident from the three residences located southwest of the compressor station within the foreground distance zone (Figure 2: points 20, 21, and 22). A representative photograph of this view is depicted in Figure 3.

The compressor station would introduce new elements into the existing landscape that would alter the form, line, and color of the existing landscape. However, the remainder of the residences in the foreground distance zone with the potential to view the compressor station are at the same approximate elevation. They are not within a direct line of site of the compressor station due to intervening trees in windbreaks or forested areas. While portions of the compressor stations buildings may be visible above the trees, through gaps in vegetation, or during winter months when the deciduous trees have shed their leaves, the most visible part of the Morehead Compressor Station would be the exhaust stack.

The residences in the middleground distance zone with the potential to view the compressor station are not within a direct line of site of the compressor station. These residences range in distance between 0.7 and 0.9 mile from the compressor station site. Residences near the North Fork Triplett Creek to the southwest and residences along Democrat Road to the northwest would not see the compressor station due to intervening trees in windbreaks or forested areas, and at a distance of 0.5 mile or greater the compressor station, particularly the stack, would not dominate the landscape.

The existing source of nighttime lighting would be the gas station (Business 2 on Figure 2) on the west side of Cranston Road. There are no street lights along Cranston Road, but other sources of light would be from residences. The Morehead Compressor Station would be lit at night for Project and public safety. Night lighting would increase the visibility of the compressor station from sensitive views.



This information is for environmental review purposes only.

-  Compressor Station
-  Visible
-  2-mile Radius
-  U.S. Forest Service Land



Figure 1
 Visibility Analysis Overview
 Morehead Compressor Station
 Rowan County, Kentucky
 Gulf XPress Project



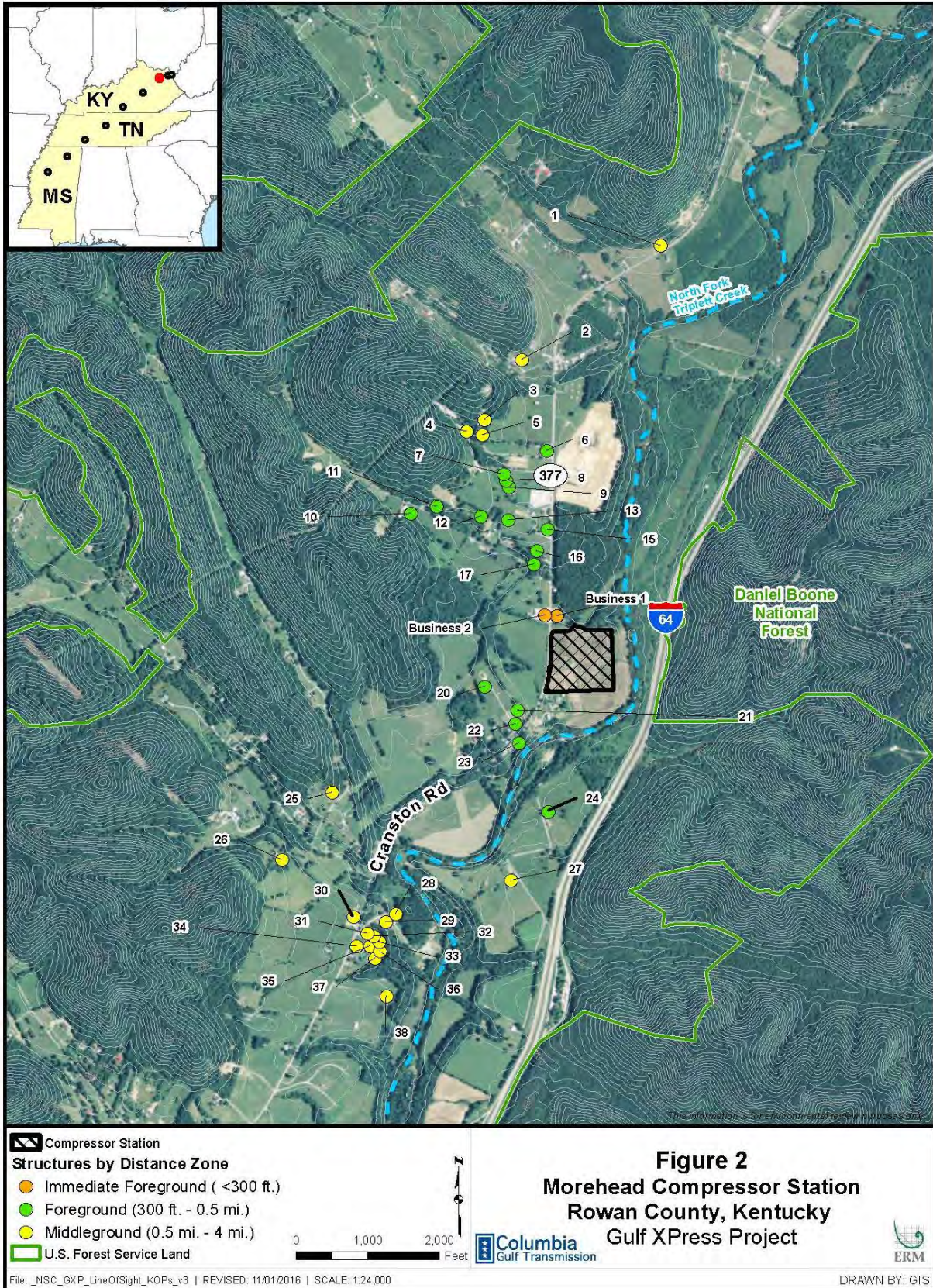




Figure 3. Morehead Compressor Station Site from Stegall Cemetery Road, facing northeast.

1.2.1 Mitigation

1.2.1.1 Facility Color

The exterior color of the proposed buildings at Morehead Compressor Station is CS-200, or Columbia Green. The majority of the equipment and piping will be the same Columbia Green color. The exhaust stack of the turbine will be a shade of gray per the manufacturer's Federal Standard Color (<http://www.federalstandardcolor.com/>).

The color of the stack will consist of non-reflective neutral gray. The stack will be viewed against the background sky and gray is conducive to minimizing the visual contrast with the background sky. When viewed against the sky, the color contrasts will vary depending on the weather conditions and distance of the viewer. For instance, the stack located in the middleground could be visible on a sunny day, but on a cloudy day the color contrast will be less. Contrast with vegetation is also an important element. Typical vegetation colors include shades of green, brown, and tan. Similar to the contrast with the background sky, the color contrast will vary depending on distance and weather conditions and will generally be more pronounced the closer the viewer is to the compressor station.

1.2.1.2 Landscape Plan

The most visible portion of the facility is along Cranston Road to the north and south of the Morehead Compressor Station. Landscaping will be established to screen the length of the security fencing along Cranston Road between the north and south property line. A combination of native evergreen shrubs and trees will be planted along the west side property

boundary that will extend to the southwestern property corner to provide visual relief of the Morehead Compressor Station. The shrubs and trees will be planted approximately 15 feet apart in the area described above, with exception of the pipeline right-of-way area, as presented on Drawing FD-GC21-150, titled “Morehead Landscape Plan” in Appendix 17-2 and marked as CEII.

1.2.1.3 Lighting Plan

The objective of this plan is to provide adequate lighting at the compressor station, to comply with applicable regulatory requirements, and to minimize light pollution and trespass affecting the surrounding environment.

Minimum illumination levels were determined in accordance with current industry standards. Outdoor lighting may consist of general illumination (area lighting) and local illumination (task lighting) in order to provide sufficient lighting for the necessary operating and maintenance activities performed at the site.

The outdoor lighting systems are designed to ensure that minimal stray light will leave the site, and that glare is not encountered by personnel performing normal operations activities. At the compressor station facilities, the yard lighting will be directionally aimed inward to the center of the facility. The illumination levels at the property line are significantly less than 0.5 footcandles (fc). The yard lights will be automated so that the station lighting will only illuminate if maintenance work is being performed after hours or in the event of certain unanticipated conditions. In addition, dark-sky compliant lighting will be installed to reduce light pollution and trespass when illuminated. The lighting plan is presented on Drawing FD-GC21-SK01-P3 in Appendix 17-3 and marked as Critical Energy Infrastructure (CEII).

Generally, emergency lighting will provide for fit-for-purpose safety needs resulting from a loss of power to the facility due to weather events or interrupted service from the electricity provider.

1.3 PAINT LICK COMPRESSOR STATION

A visual assessment was conducted to determine if the Paint Lick Compressor Station would have a visual impact on potential sensitive views. The Paint Lick Compressor Station includes a paved access road, the control building (approximately 27 feet tall), an auxiliary building (approximately 25 feet tall), and the compressor building (approximately 48 feet tall) with an exhaust stack (an additional 9 feet). The total combined height of the compressor building and stack would be approximately 57 feet above the ground surface consisting of 10 foot by 10 foot square ducting. Security chain link fencing will be installed around the perimeter of the permanent facility. The security fencing would be 8 feet in height with three strand barb wire extending an additional 1 foot above the top rail of the chain link fence. Generally, the lighting system can be classified into the following categories:

- Compressor station operations
- Security; and
- Emergency

The Paint Lick Compressor station is situated within the Interior Low Plateaus physiographic region which is characterized by gently rolling hills and rich, fertile soils (USDA, 2006). Most of the region consists of farms and pasture interspersed with mixed hardwood forest. Elevation ranges from about 660 feet to 1,100 feet. The proposed site is at an elevation of 995 feet AMSL within an area of low rolling hills. The site is located away from the town center of Lancaster, which lies about 6.8 miles to the west, and population within the area is sparse. Medium to large farming operations with scattered residences surround the site. Kentucky Route 52 borders the property to the north and an overhead utility distribution line is aligned along the north side of the highway. A windbreak along the western edge of the compressor station property creates a visual screen that helps minimize the visibility of the compressor station to the west (Figure 4). The photograph in Figure 5 was taken from the southwestern corner of the proposed facility fence line toward a water tower located about 0.6 mile east. Without access to the property, the water tower height was estimated from the highway to be about 80 feet. Only the top of the water tower is visible due to the undulating topography and natural vegetative screening.



Figure 4. Existing Landscape from Proposed Compressor Station site, facing southwest

The results of the GIS analysis are depicted in Figure 6 and suggest that the Paint Lick Station would be visible in patches in all directions around the compressor station site. Figure 7 identifies the residences and other areas that may have a view of the compressor station. No sensitive viewpoints are located in the immediate foreground. Five residences are within the foreground distance zone and eight residences are within the middleground distance zone. The Paint Lick Elementary School and the Fariview Christian Church are west of the Paint Lick Compressor Station along Kentucky Route 52, but would have no views of the facility.

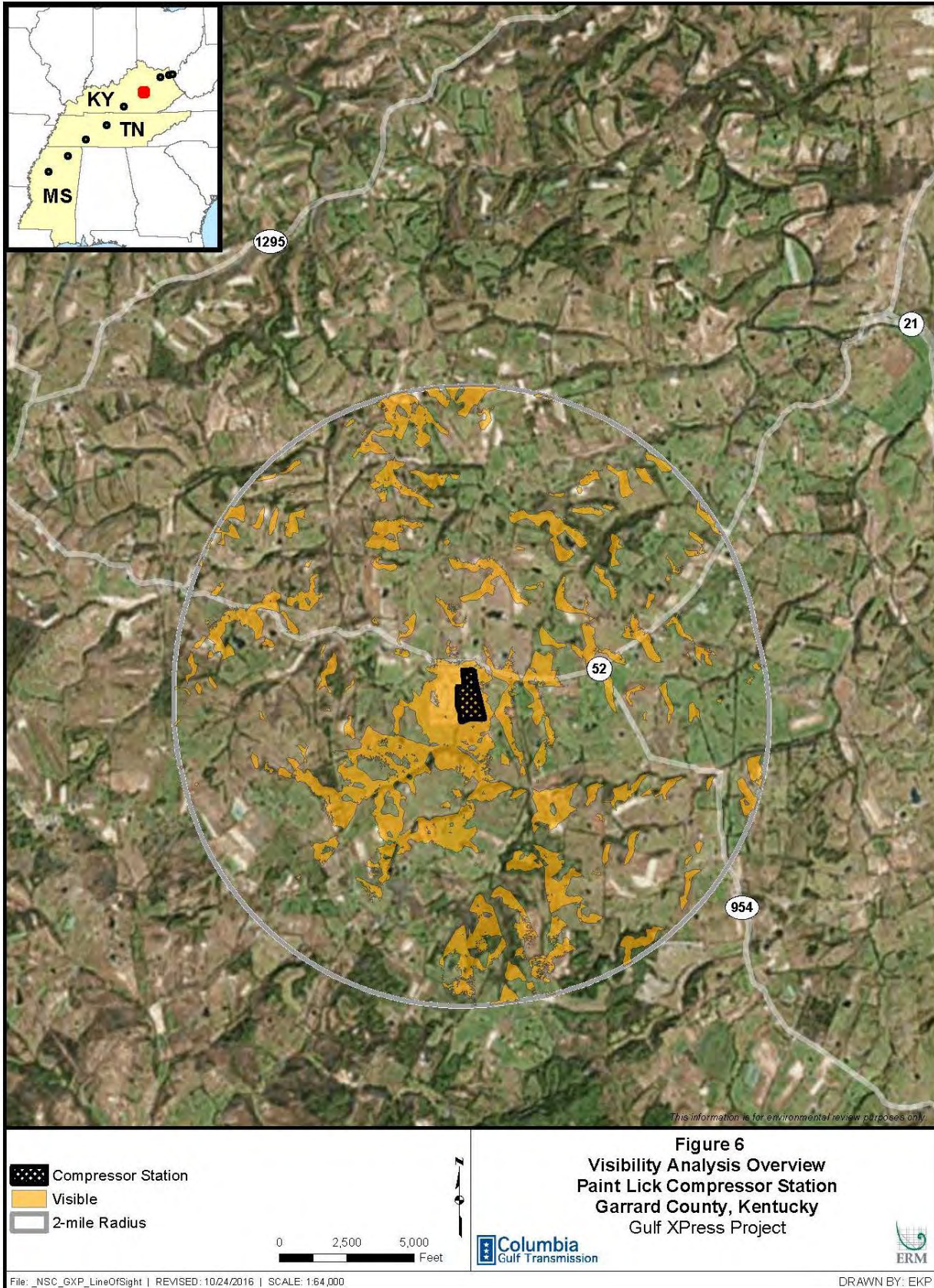


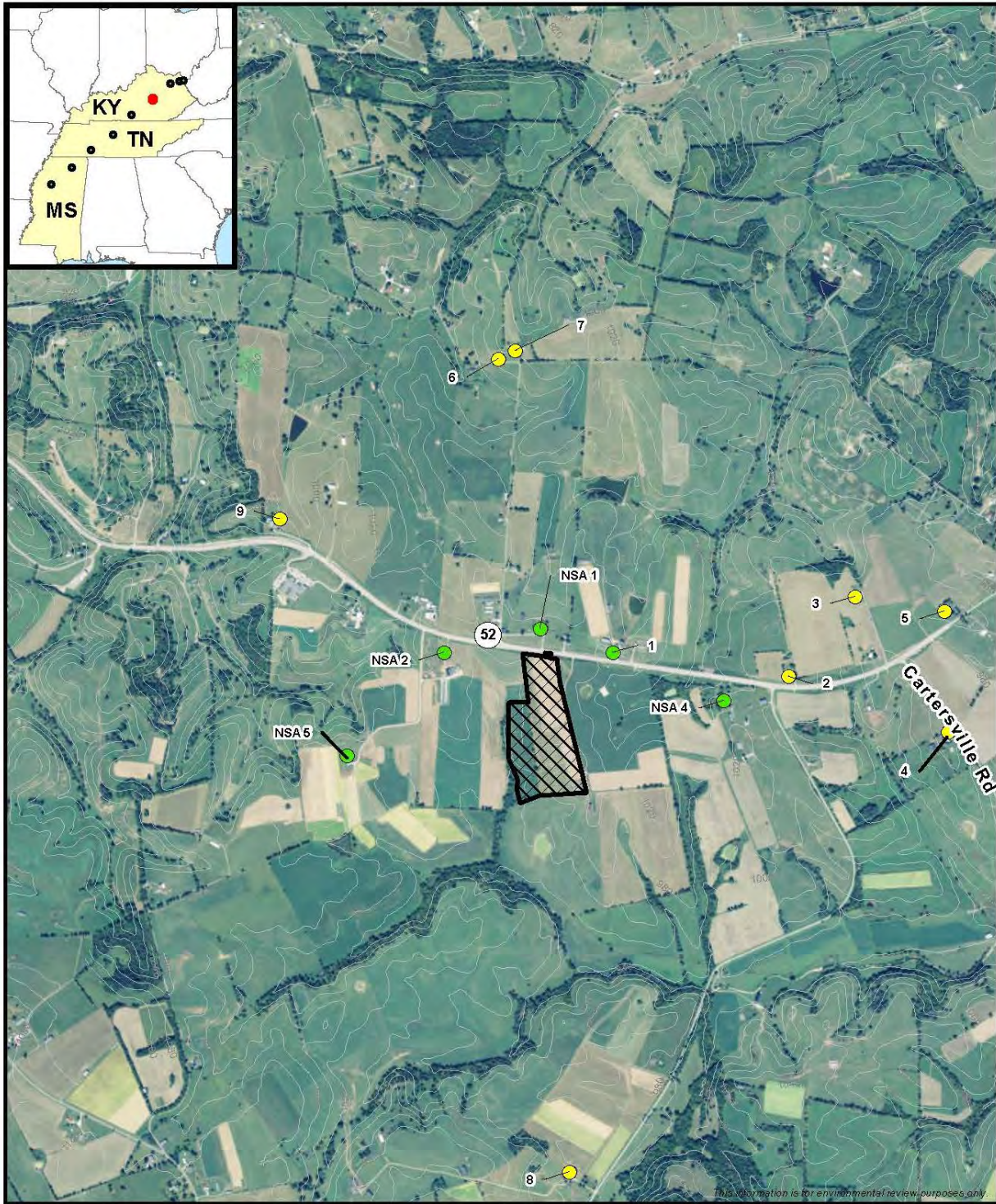
Figure 5. Water Tower about 0.6 mile east of Proposed Paint Lick Compressor Station.




Three residences within the foreground distance zone would have a direct view of the compressor station (Figure 7, points NSA1, NSA2, and 1). The compressor station would introduce new elements into the existing landscape that would alter the form, line, and color of the existing landscape for these direct viewers. However, for these viewers the geometric forms of the buildings would be similar to those of the surrounding farming operations. The remaining residences in the foreground may have views blocked by trees that are part of windbreaks located to the east and west of the proposed compressor station. While portions of the compressor stations buildings may be visible above the trees, through gaps in vegetation, or during winter months when the deciduous trees have shed their leaves, the most visible part of the Paint Lick Compressor Station would be the exhaust stack (similar to the existing water tower).

A small number of potential viewers are in the middleground distance zone. However, the residences in the middleground distance zone with the potential to view the compressor station are not within a direct line of site of the compressor station due to intervening trees in windbreaks or forested areas, although at a distance of 0.5 mile or greater the compressor station would not dominate the landscape.

There are no street lights along Kentucky Route 52, but other sources of nighttime lighting would be from residences. The Paint Lick Compressor Station would be lit at night for Project and public safety. Night lighting would increase the visibility of the compressor station from sensitive views.





-  Compressor Station
- Structures by Distance Zone**
-  Foreground (300 ft. - 0.5 mi.)
-  Middleground (0.5 mi. - 4 mi.)

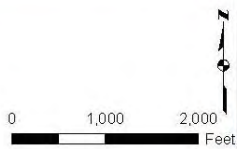


Figure 7
Paint Lick Compressor Station
Garrard County, Kentucky
Gulf XPress Project



1.3.1 Mitigation

1.3.1.1 Facility Color

The exterior color of the proposed buildings at Paint Lick Compressor Station is CS-200, or Columbia Green. The majority of the equipment and piping will be the same Columbia Green color. The exhaust stack of the turbine will be a shade of gray per the manufacturer's Federal Standard Color (<http://www.federalstandardcolor.com/>).

The color of the stack will consist of non-reflective neutral gray. The stack will be viewed against the background sky and gray is conducive to minimizing the visual contrast with the background sky. When viewed against the sky, the color contrasts will vary depending on the weather conditions and distance of the viewer. For instance, the stack located in the middleground could be visible on a sunny day, but on a cloudy day the color contrast will be less. Contrast with vegetation is also an important element. Typical vegetation colors include shades of green, brown, and tan. Similar to the contrast with the background sky, the color contrast will vary depending on distance and weather conditions and will generally be more pronounced the closer the viewer is to the compressor station.

1.3.1.2 Landscape Plan

The most visible portion of the facility is immediately north and northwest of the Paint Lick Compressor Station across Kentucky Route 52. Landscaping will be established parallel to and north of Columbia Gulf's existing pipelines at a bearing of 35 degrees (reciprocal bearing of 215 degrees) across the width of the property. A combination of native evergreen shrubs and trees will be planted along the existing northern ridge to provide visual relief of the Paint Lick Compressor Station. The shrubs and trees will be planted approximately 15 feet apart in the area described above, with exception of the pipeline right-of-way area, as presented on Drawing FD-GC22-150, titled "Paint Lick Landscape Plan" included in Appendix 17-2 and marked as CEII.

1.3.1.3 Lighting Plan

The objective of this plan is to provide adequate lighting at the compressor station, to comply with applicable regulatory requirements, while minimizing light pollution and trespass affecting the surrounding environment.

Minimum illumination levels were determined in accordance with current industry standards. Outdoor lighting may consist of general illumination (area lighting) and local illumination (task lighting) in order to provide sufficient lighting for the necessary operating and maintenance activities performed at the site.

The outdoor lighting systems are designed to ensure that minimal stray light will leave the site, and that glare is not encountered by personnel performing normal operations activities. At the compressor station facilities, the yard lighting will be directionally aimed inward to the center of the facility. The illumination levels at the property line are significantly less than 0.5 fc. The yard lights will be automated so that the station lighting will only illuminate if maintenance work is being performed after hours or in the event of certain unanticipated conditions. In addition, dark-sky compliant lighting will be installed to reduce light pollution and trespass when illuminated. The lighting plan is presented on Drawing FD-GC22-SK01-P3 in Appendix 17-3 and marked as CEII.

Generally, emergency lighting will provide for fit-for-purpose safety needs resulting from a loss of power to the facility due to weather events or interrupted service from the electricity provider.

1.4 CANE RIDGE COMPRESSOR STATION

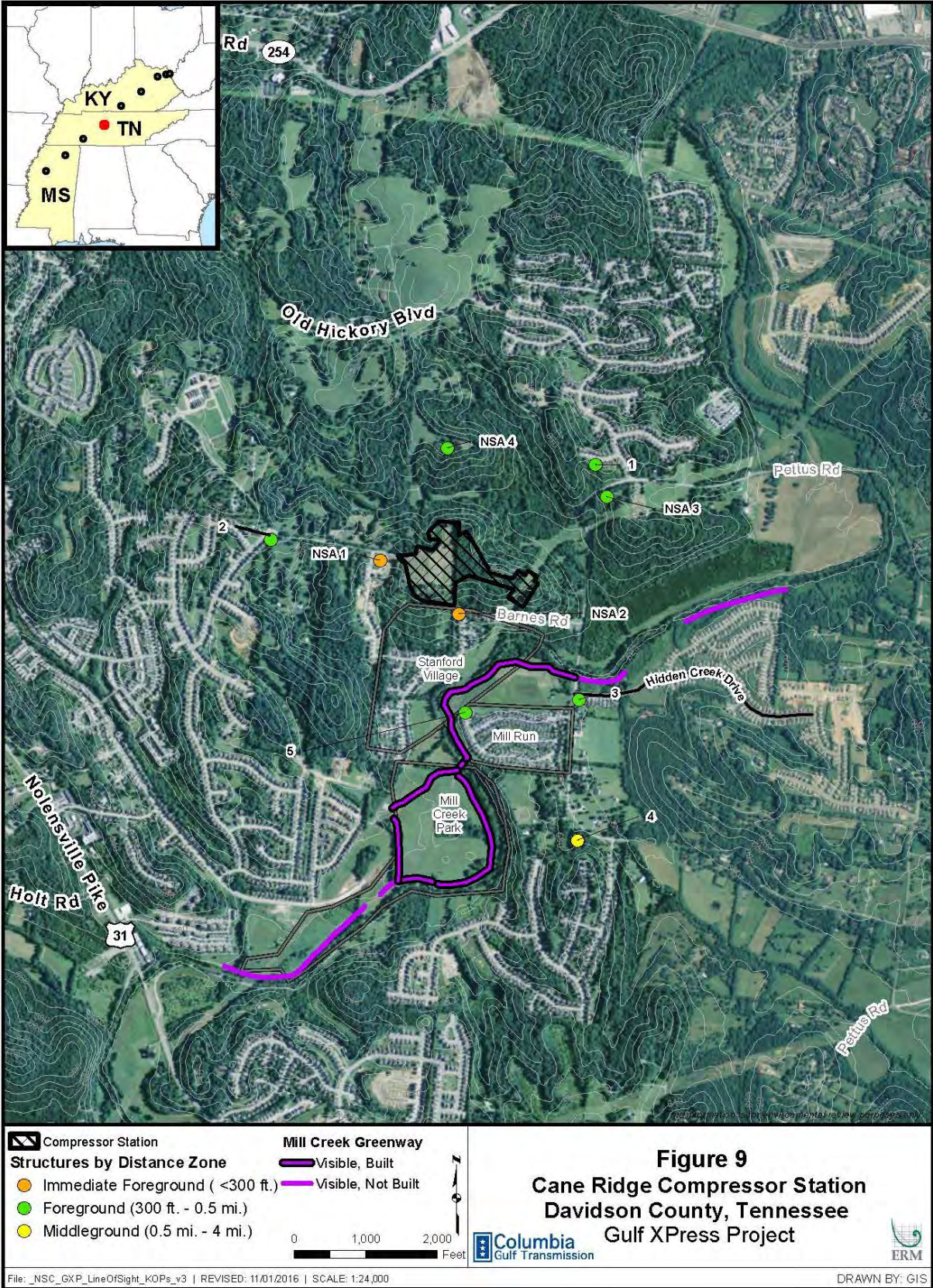
The area proposed for the Cane Ridge Compressor Station site is grass/hay and forest with a general topographic gradient toward the southeast. The property is situated adjacent to the north side of Barnes Road. Columbia Gulf has purchased about 90 acres of land surrounding the site as a visual and noise buffer and to provide a buffer against future encroachment resulting from outside development. Columbia Gulf has no plans to develop the land within the buffer. Much of the farmland in this area south of Nashville has been converted to residential use. The surrounding suburban residential subdivisions and commercial and industrial uses establish the urban form and character of the overall landscape within this greater Nashville metropolitan area. Interstate 24 is located about 2.2 miles to the northeast of the site. Development along the interstate corridor is mixed residential, commercial, and industrial. In addition to the overhead utility distribution lines within the residential subdivisions, overhead distribution lines are aligned with Barnes Road, Old Hickory Boulevard, and Pettus Road. A 500 kilovolt electric transmission corridor traverses the landscape generally parallel to Columbia Gulf's pipeline right-of-way about 1.5 miles to the south. There are no street lights along Barnes Road and the suburban residences would be the main source of nighttime lighting.

The Cane Ridge Compressor Station includes a paved access road, the control building (approximately 27 feet tall), an auxiliary building (approximately 25 feet tall), and the compressor building (approximately 48 feet tall) with an exhaust stack (an additional 9 feet). The total combined height of the compressor building and stack would be approximately 57 feet above the ground surface consisting of 10 foot by 10 foot square ducting. Security chain link fencing will be installed around the perimeter of the permanent facility. The security fencing would be 8 feet in height with three strand barb wire extending an additional 1 foot above the top rail of the chain link fence.

The Cane Ridge Compressor Station is located in the Nashville Basin which is characterized as “deeply dissected and consists of steep slopes between narrow, rolling ridgetops and narrow valleys” underlain by limestone bedrock (USDA, 2006: 395). This area is densely populated and much of the former farmland around Nashville has been converted to residential use.

The results of the GIS analysis are depicted in Figure 8 and suggest that the Cane Ridge Compressor Station would be visible at certain locations along Mill Creek and its tributaries as well as the wooded area around the site. Figure 9 identifies the residences or nearest residences in subdivisions that may have a view of the compressor station. The proposed compressor station may be visible to houses along Barnes Road in the immediate foreground, residences within Mill Run subdivision, along Hidden Creek Drive or three residences to the northeast in the foreground distance zone, and 1 residence within the middleground distance zone.





In Columbia Gulf's response to the Federal Energy Regulatory Commission's August 24, 2016 Data Request, the results of the visual video simulation along Barnes Road and the Stanford Village subdivision was filed to the Project docket on September 7, 2016. This visual simulation includes conceptual buildings and landscaping that would minimize views of the compressor station. Additional photographs were taken subsequent to the September 7 submittal to document the existing conditions from the Mill Run subdivision, along Hidden Creek Drive, Mill Creek Park, the Mill Creek Greenway, and Stanford Village subdivision. Figures 10 through 12 in Appendix 17-1 depict locations from which photographs were taken in each subdivision, park or path toward the proposed Cane Ridge Compressor Station.

Views from Hidden Creek Subdivision

Hidden Creek Subdivision is situated between Old Hickory Boulevard and Pettus Road. The Hidden Creek subdivision is an established neighborhood primarily with 1.5-story and 2-story houses. An overhead utility distribution line is aligned with Hidden Creek Drive. The majority of this subdivision is within the middleground distance zone except near Old Hickory Boulevard where the residences fall within the foreground distance zone. Figures 13 through 21 are photographs taken from the Hidden Creek subdivision toward the Cane Ridge Compressor station (Appendix 17-1). Table 4 lists the bearing of each photograph point depicted on Figure 10 (Appendix 17-1).

Views from Mill Run

The Mill Run subdivision is located southeast of the compressor station site east of Mill Creek. The Mill Creek subdivision is an established neighborhood primarily with 2-story houses. The Mill Creek Greenway is located north and west of the subdivision along Mill Creek. The neighborhood is accessible from Old Hickory Boulevard. This subdivision is within the foreground distance zone. Figures 22 through 26 in Appendix 17-1 are photographs taken in the Mill Run subdivision toward the proposed Cane Ridge Compressor Station. Table 4 lists the bearing of each photograph point depicted on Figure 11 (Appendix 17-1).

Views from Mill Creek Park and Mill Creek Greenway

The Mill Creek Greenway is a paved trail from its intersection with Old Hickory Boulevard west to Mill Creek Park; other segments are planned, but not yet built to connect various communities (Nashville Metropolitan Government, 2016). Nashville actively works with the Metro Greenway Division of the Metropolitan Board of Parks and Recreation to build greenway trails for recreation and transportation. Figure 9 depicts the potentially visible built and planned segments near the Project. Figures 37 through 47 are photographs taken along the path toward the compressor station. Table 4 lists each photograph point and the bearing. West of Old Hickory Boulevard for about 0.6 mile, the path borders Mill Creek which is lined with mature hardwood trees. The path intersect Columbia Gulf's pipeline corridor (see Figures 29 through 32, photo points 16, 16a, and 17 depicted on Figure 11). The path crosses Mill Creek and enters Mill Creek Park where it is a trail loop. Mill Creek Park is an open grassy area bordered to the east and south by Mill Creek and residential subdivisions to the west.

Views from Stanford Village

Stanford Village subdivision is situated south of Barnes Road and is within the foreground distance zone. This subdivision is an established neighborhood primarily with 2-story houses. Several overhead utility distribution lines are visible within the subdivision.

Figures 38 through 46 are photographs taken from this subdivision toward the proposed Cane Ridge Compressor Station. Table 4 lists the bearing of each photograph point depicted on Figure 12 (Appendix 17-1).

TABLE 4			
Gulf XPress Project Cane Ridge Compressor Station Photographs of Current Conditions			
Photo Point	Location	Bearing	Figure in Appendix 17-1
1	Stanford Village	343	38
2	Stanford Village	355	39
3	Stanford Village	16	40
4	Stanford Village	18	41
5	Stanford Village	15	42
6	Stanford Village	33	43
6a	Stanford Village	36	44
7	Stanford Village	56	45
8	Stanford Village	93	46
9	Mill Run	353	22
10	Mill Run	327	23
11	Mill Run	341	24
12	Mill Run	334	25
13	Mill Run	346	26
14	Mill Creek Greenway	314	27
15	Mill Creek Greenway	327	28
16	Mill Creek Greenway	349	29
16a	Mill Creek Greenway	234	31
16a	Mill Creek Greenway	46	31
17	Mill Creek Greenway	2	32
18	Mill Creek Greenway	7	33
19	Mill Creek Greenway	291	34
20	Mill Creek Greenway	9	35
21	Mill Creek Greenway	352	36
22	Mill Creek Greenway	355	37
23	Hidden Creek Subdivision	314	13
24	Hidden Creek Subdivision	304	14
25	Hidden Creek Subdivision	293	15
26	Hidden Creek Subdivision	295	16
27	Hidden Creek Subdivision	296	17
28	Hidden Creek Subdivision	295	18
29	Hidden Creek Subdivision	301	19
30	Hidden Creek Subdivision	299	20
31	Hidden Creek Subdivision	303	21

Field observation and the photographs of the residential subdivisions included in Appendix 17-1 confirm a moderate to high level of man-made changes to the landscape which was formerly agricultural. The residences and the greenway path generally do not have direct views of the proposed compressor station due to intervening vegetation, including Columbia Gulf's forested buffer surrounding the Cane Ridge Compressor Station. The large mature trees in these areas along with 1- and 2- storied structures would likely block views in the direction of the Project site. While portions of the compressor stations buildings may be visible above the

trees, through gaps in vegetation, or during winter months when the deciduous trees have shed their leaves, the most visible part of the Cane Ridge Compressor Station would be the exhaust stack.

1.4.1 Mitigation

1.4.1.1 Facility Color

The exterior color of the proposed buildings at Cane Ridge Compressor Station is CS-200, or Columbia Green. The majority of the equipment and piping will be the same Columbia Green color. The exhaust stack of the turbine will be a shade of gray per the manufacturer's Federal Standard Color (<http://www.federalstandardcolor.com/>).

The color of the stack will consist of non-reflective neutral gray. The stack will be viewed against the background sky and gray is conducive to minimizing the visual contrast with the background sky. When viewed against the sky, the color contrasts will vary depending on the weather conditions and distance of the viewer. For instance, the stack located in the middleground could be visible on a sunny day, but on a cloudy day the color contrast will be less. Contrast with vegetation is also an important element. Typical vegetation colors include shades of green, brown, and tan. Similar to the contrast with the background sky, the color contrast will vary depending on distance and weather conditions and will generally be more pronounced the closer the viewer is to the compressor station.

1.4.1.2 Landscape Plan

The most visible portion of the facility is along Barnes Road to the south of the Cane Ridge Compressor Station. Landscaping will be established to screen the length of the security fencing along Barnes Road. A combination of native evergreen shrubs and trees along with native deciduous tree behind the evergreens will be planted along the west side property boundary that will extend to the southwestern property corner to provide visual relief of the Cane Ridge Compressor Station. The shrubs and trees will be planted approximately 15 feet apart in the area described above as presented on Drawing FD-GC24-150, titled "Cane Ridge Landscape Plan" included in Appendix 17-2 and marked as CEII. This has also been represented in the Truescape video simulation shown during open houses and referenced in the September 7, 2016 filing.

1.4.1.3 Lighting Plan

The objective of this plan is to provide adequate lighting at the compressor station, to comply with applicable regulatory requirements, while minimizing light pollution and trespass affecting the surrounding environment.

Minimum illumination levels were determined in accordance with current industry standards. Outdoor lighting may consist of general illumination (area lighting) and local illumination (task lighting) in order to provide sufficient lighting for the necessary operating and maintenance activities performed at the site.

The outdoor lighting systems are designed to ensure that minimal stray light will leave the site, and that glare is not encountered by personnel performing normal operations activities. At the compressor station facilities, the yard lighting will be directionally aimed inward to the center of the facility. The illumination levels at the property line are significantly less than 0.5 fc.

The yard lights will be automated so that the station lighting will only illuminate if maintenance work is being performed after hours or in the event of certain unanticipated conditions. In addition, dark-sky compliant lighting will be installed to reduce light pollution and trespass when illuminated. The lighting plan is presented on Drawing FD-GC24-SK01-P3 in Attachment 17-3.

Generally, emergency lighting will provide for fit-for-purpose safety needs resulting from a loss of power to the facility due to weather events or interrupted service from the electricity provider.

2.0 REFERENCES

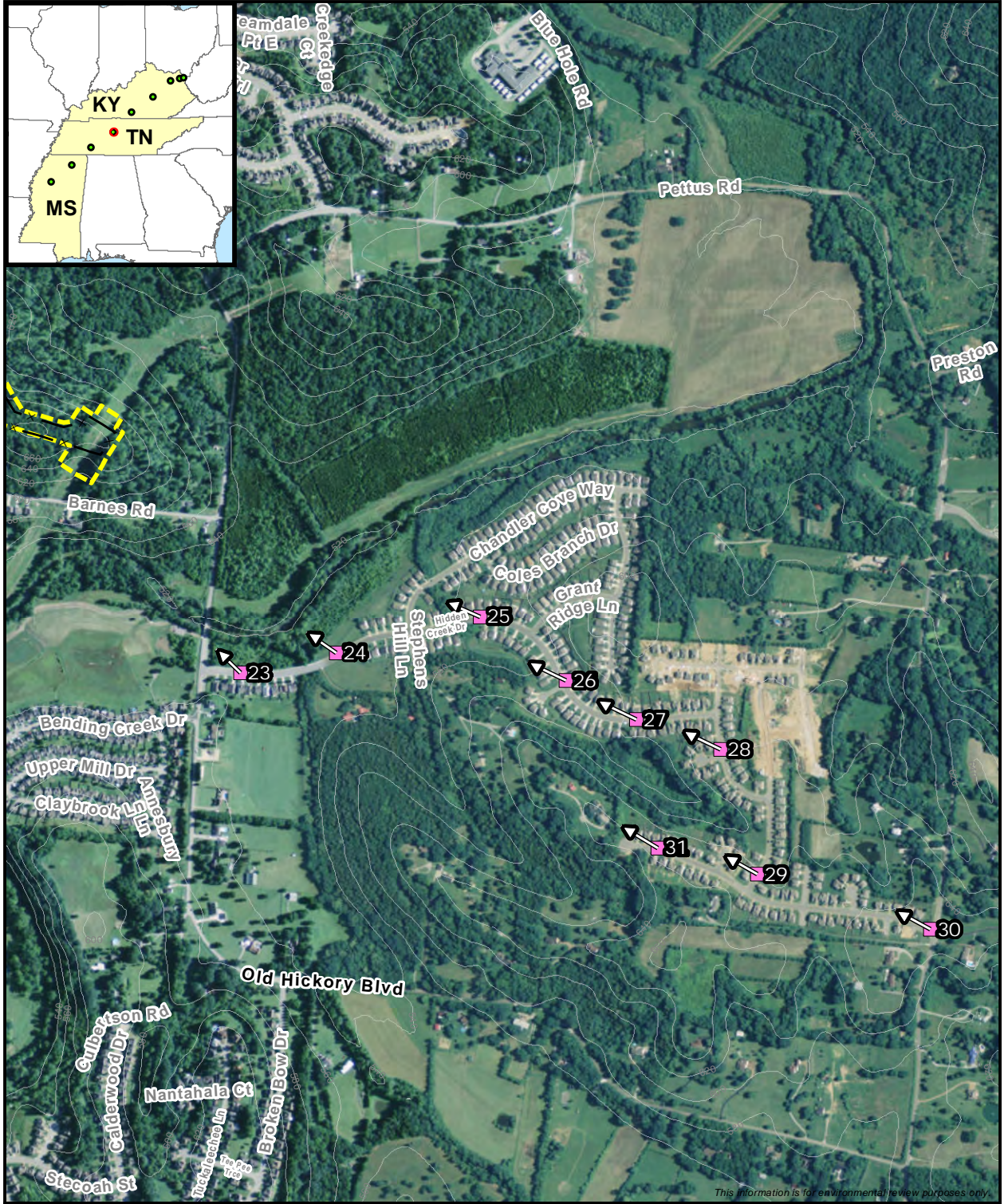
- Nashville Metropolitan Government. 2016. Nashville's Trails & Greenways, Mill Creek Greenway Details. Available online at: <http://www.nashville.gov/Portals/0/SiteContent/Parks/images/greenways/MC%20Park-Lenox.jpg>. Accessed September 2016.
- National Park Service. 2014. *Guide to Evaluating Visual Impact Assessments for Renewable Energy Projects*. Available online at: <http://visualimpact.anl.gov/npsguidance/>. Accessed September 2016.
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- U.S. Department of Agriculture. 1995. *Agriculture Handbook 701, Landscape Aesthetics-A Handbook for Scenery Management*.
- U.S. Department of Agriculture. 2006. *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin*. United States Department of Agriculture Handbook 296. Available online at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050898.pdf. Accessed September 2016.

Data Request Pursuant to:
OEP/DG2E/Gas Branch 4
Data Request Pursuant to:
OEP/DG2E/Gas Branch 4
Columbia Gulf Transmission, LLC
Gulf XPress Project
Docket No. CP16-361-000
§ 375.308(x)

**COLUMBIA GULF TRANSMISSION, LLC
DOCKET NO. CP16-361-000**

**RESPONSE TO AUGUST 24, 2016
ENVIRONMENTAL DATA REQUEST 17
NOVEMBER 3, 2016
3, 2016**

APPENDIX 17-1



This information is for environmental review purposes only.

- Photo Point
- Photo Direction
- Fenced Area
- Compressor Station

0 380 760
Feet

Figure 10
Photo Points along Hidden Creek Drive
Cane Ridge Compressor Station
 Gulf XPress Project



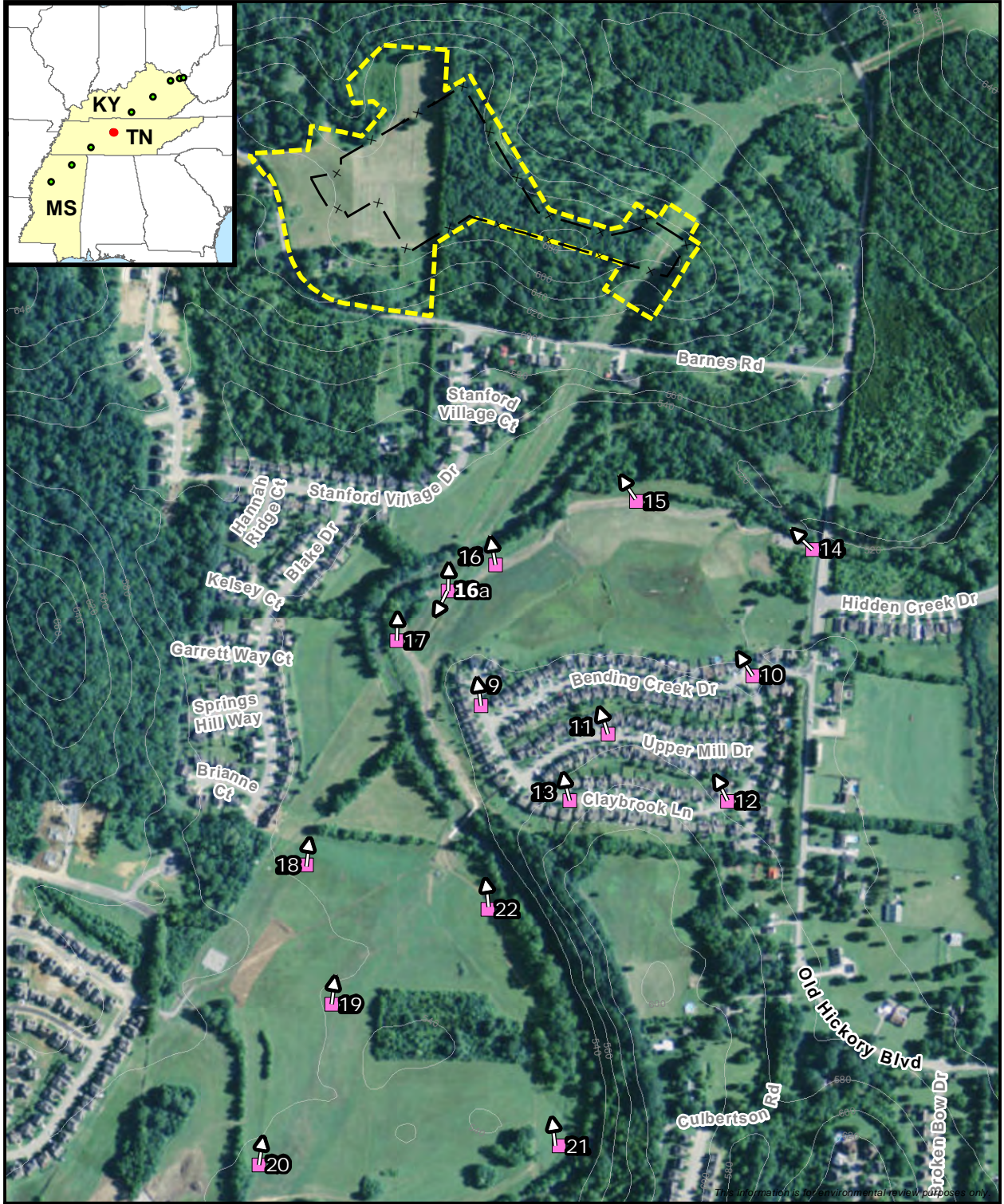


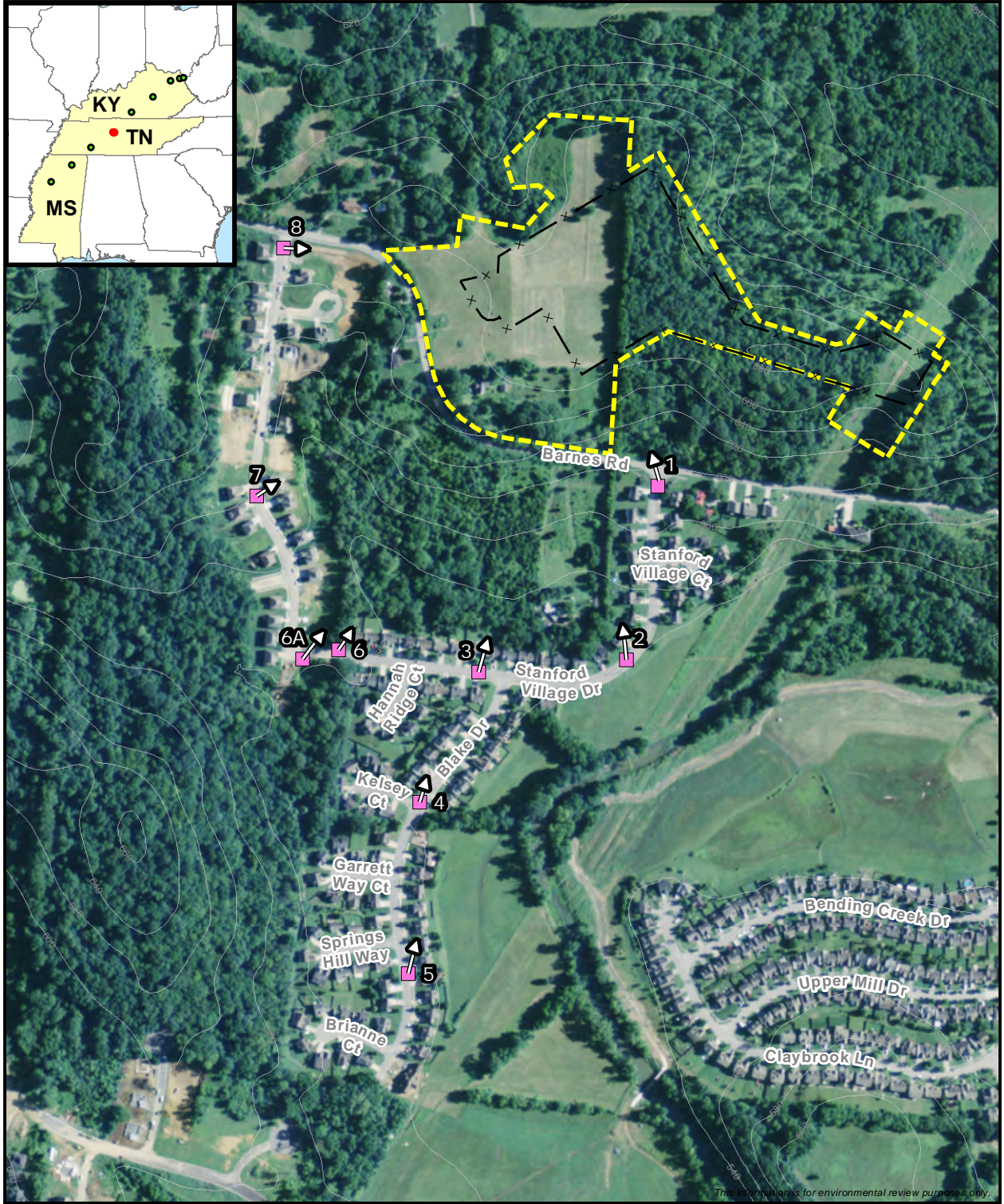


Photo Point
 Photo Direction
 Fenced Area
 Compressor Station

0 250 500 Feet

Figure 11
Photo Points in Mill Run Neighborhood, Mill Creek Park and Greenway
Cane Ridge Compressor Station
 Gulf XPress Project



■ Photo Point
⇨ Photo Direction
x Fenced Area
 Compressor Station

0 200 400 Feet

Figure 12
Photo Points in Stanford Village
Cane Ridge Compressor Station
 Gulf XPress Project





Figure 13. Hidden Creek Subdivision, Photo Point 23



Figure 14. Hidden Creek Drive, Photo Point 24



Figure 15. Hidden Creek Subdivision, Photo Point 25



Figure 16. Hidden Creek Subdivision, Photo Point 26



Figure 17. Hidden Creek Subdivision, Photo Point 27



Figure 18. Hidden Creek Subdivision, Photo Point 28



Figure 19. Hidden Creek Subdivision, Photo Point 29



Figure 20. Hidden Creek Subdivision, Photo Point 30



Figure 21. Hidden Creek Subdivision, Photo Point 31



Figure 22. Mill Run, Photo Point 9



Figure 23. Mill Run, Photo Point 10



Figure 24. Mill Run, Photo Point 11



Figure 25. Mill Run, Photo Point 12



Figure 26. Mill Run, Photo Point 13



Figure 27. Mill Creek Greenway at intersection with Old Hickory Boulevard, Photo Point 14



Figure 28. Mill Creek Greenway, Photo Point 15



Figure 29. Mill Creek Greenway, Photo Point 16



Figure 30. Mill Creek Greenway toward pipeline right-of-way, Photo Point 16a (234 degrees)



Figure 31. Mill Creek Greenway toward pipeline right-of-way, Photo Point 16b (46 degrees)



Figure 32. Mill Creek Greenway, Photo Point 17



Figure 33. Mill Creek Greenway, Photo Point 18



Figure 34. Mill Creek Greenway, Photo Point 19



Figure 35. Mill Creek Greenway, Photo Point 20



Figure 36. Mill Creek Greenway, Photo Point 21



Figure 37. Mill Creek Greenway, Photo Point 22



Figure 38. Stanford Village, Photo Point 1



Figure 39. Stanford Village, Photo Point 2



Figure 40. Stanford Village, Photo Point 3



Figure 41. Stanford Village, Photo Point 4



Figure 42. Stanford Village, Photo Point 5



Figure 43. Stanford Village, Photo Point 6



Figure 44. Stanford Village, Photo Point 6a



Figure 45. Stanford Village, Photo Point 7



Figure 46. Stanford Village, Photo Point 8

Data Request Pursuant to:
OEP/DG2E/Gas Branch 4
Columbia Gulf Transmission, LLC
Gulf XPress Project
Docket No. CP16-361-000
§ 375.308(x)

**COLUMBIA GULF TRANSMISSION, LLC
DOCKET NO. CP16-361-000**

**RESPONSE TO AUGUST 24, 2016
ENVIRONMENTAL DATA REQUEST 17
NOVEMBER 3, 2016**

APPENDIX 17-2

Landscape Plans

Provided Separately

Contains Critical Energy Infrastructure

(CEII) – Do Not Release

Data Request Pursuant to:
OEP/DG2E/Gas Branch 4
Columbia Gulf Transmission, LLC
Gulf XPress Project
Docket No. CP16-361-000
§ 375.308(x)

**COLUMBIA GULF TRANSMISSION, LLC
DOCKET NO. CP16-361-000**

**RESPONSE TO AUGUST 24, 2016
ENVIRONMENTAL DATA REQUEST 17
NOVEMBER 3, 2016**

APPENDIX 17-3

Lighting Plans

Provided Separately

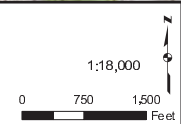
Contains Critical Energy Infrastructure

(CEII) – Do Not Release

APPENDIX N-1
Noise Sensitive Areas Associated with the Mountaineer XPress Project



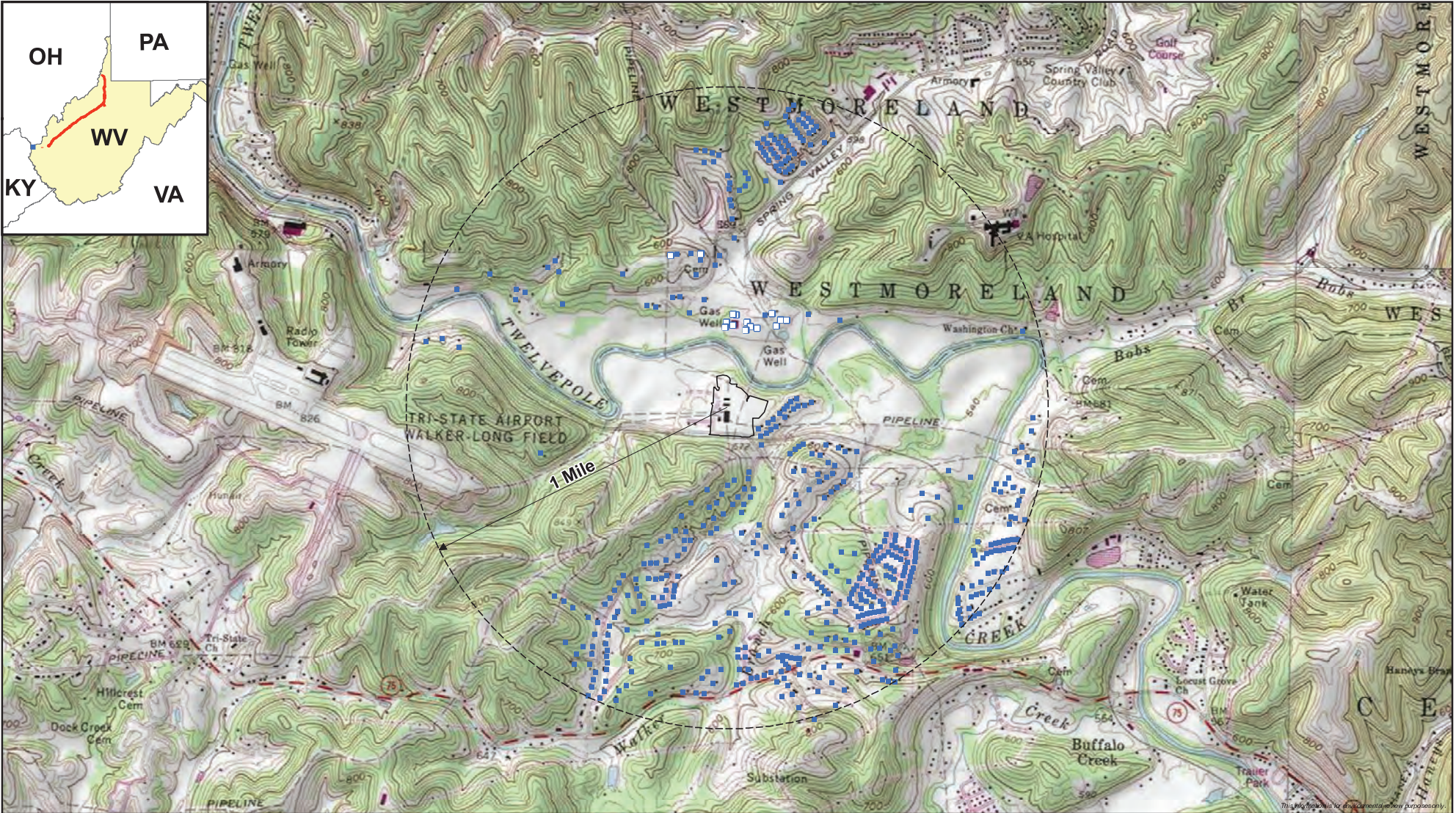
- 1 Mile Radius
- House or Mobile Home
- Non-Residential Building
- Site Boundary



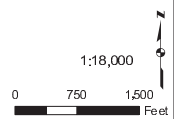
Noise Sensitive Areas within a 1 Mile Radius of the Existing Lone Oak Compressor Station
Marshall County, West Virginia
 Mountaineer XPress Project
 Columbia Gas Transmission

File: _NSAs | REVISED: 05/11/2016 | SCALE: 1:18,000 when printed at 11x17

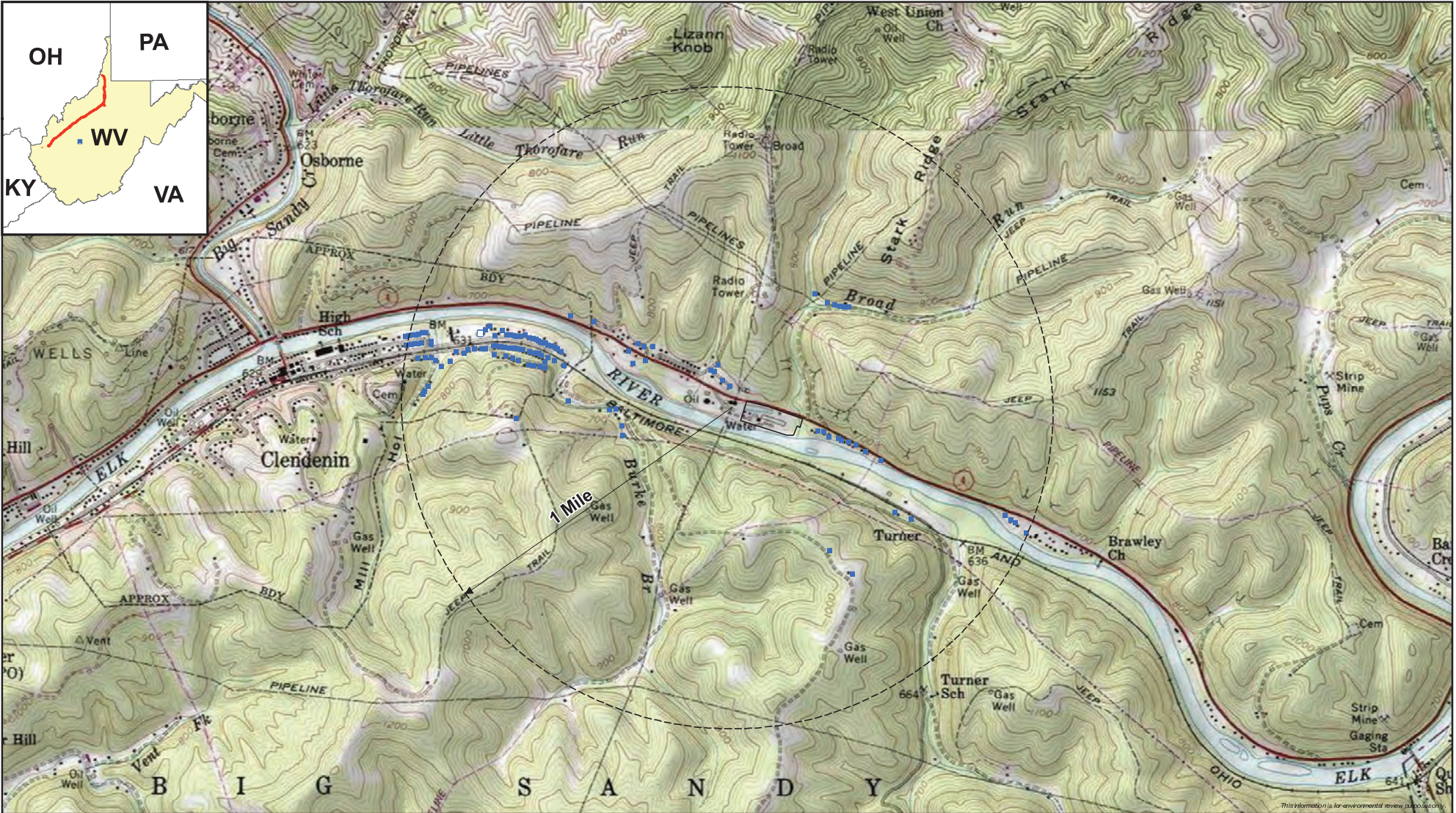
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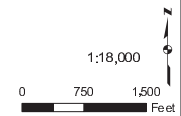
- 1 Mile Radius
- House or Mobile Home
- Non-Residential Building
- Site Boundary



Noise Sensitive Areas within a 1 Mile Radius of the Existing Ceredo Compressor Station
Wayne County, West Virginia
 Mountaineer XPress Project
 Columbia Gas Transmission



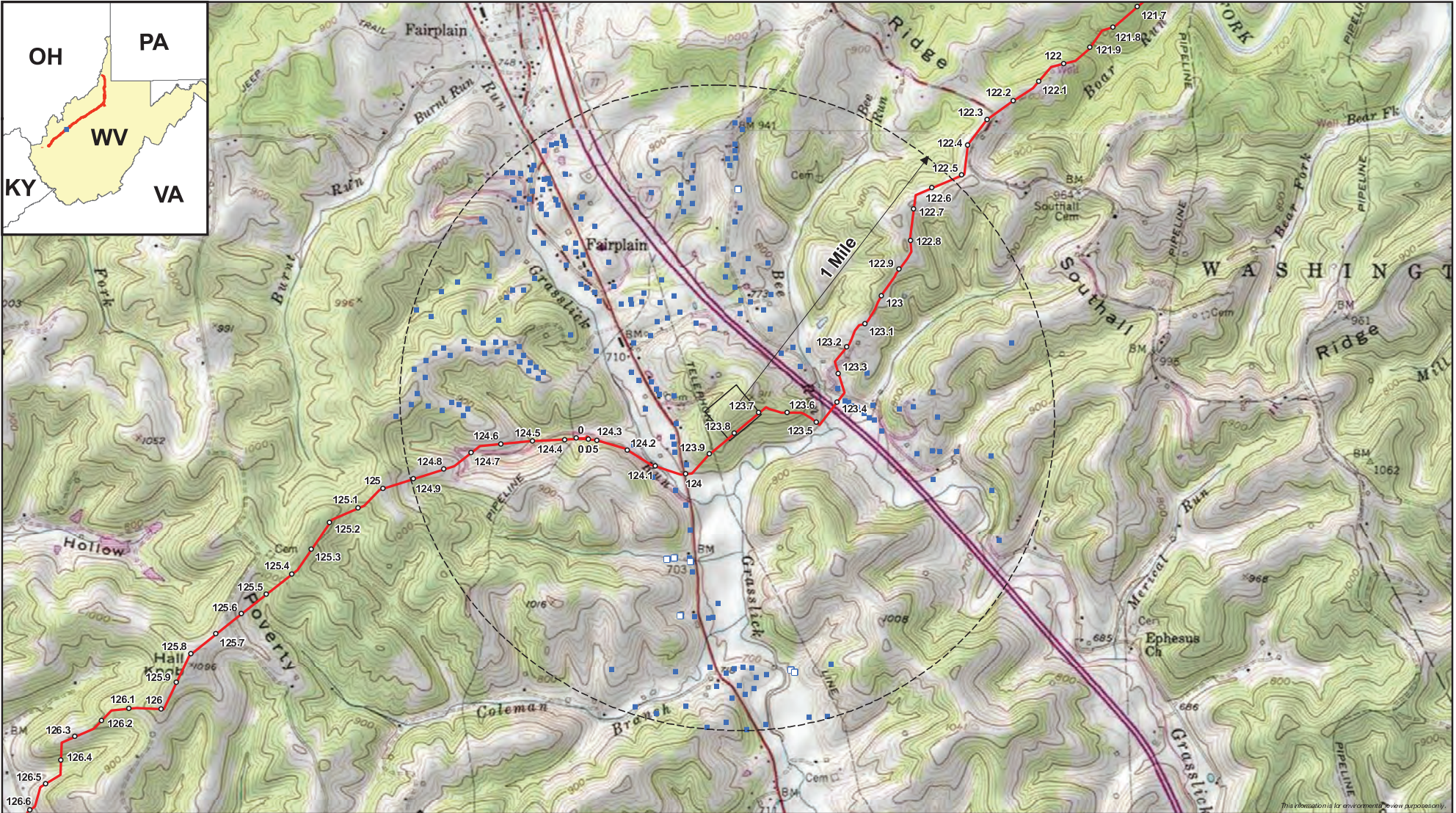
- 1 Mile Radius
- House or Mobile Home
- Non-Residential Building
- Site Boundary



Noise Sensitive Areas within a 1 Mile Radius of the Existing Elk River Compressor Station
Kanawha County, West Virginia
 Mountaineer XPress Project
 Columbia Gas Transmission

File: _NSAs | REVISED: 05/11/2016 | SCALE: 1:18,000 when printed at 11x17

DRAWN BY: TG



 1 Mile Radius — Proposed Centerline
■ House or Mobile Home Site Boundary
□ Non-Residential Building
○ Milepost

1:18,000
 0 750 1,500
 Feet

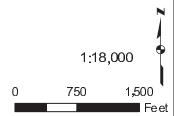
**Noise Sensitive Areas within a 1 Mile Radius of the
 Proposed Mount Olive Compressor Station**
Jackson County, West Virginia
 Mountaineer XPress Project
 Columbia Gas Transmission

File: _NSAs | REVISED: 05/11/2016 | SCALE: 1:18,000 when printed at 11x17

DRAWN BY: TG



- 1 Mile Radius
- Proposed Centerline
- House or Mobile Home
- Site Boundary
- Non-Residential Building
- Milepost



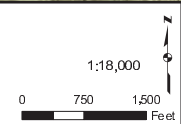
**Noise Sensitive Areas within a 1 Mile Radius of the
Proposed Sherwood Compressor Station**
Doddridge County, West Virginia
 Mountaineer XPress Project
 Columbia Gas Transmission

File: _NSAs | REVISED: 05/11/2016 | SCALE: 1:18,000 when printed at 11x17

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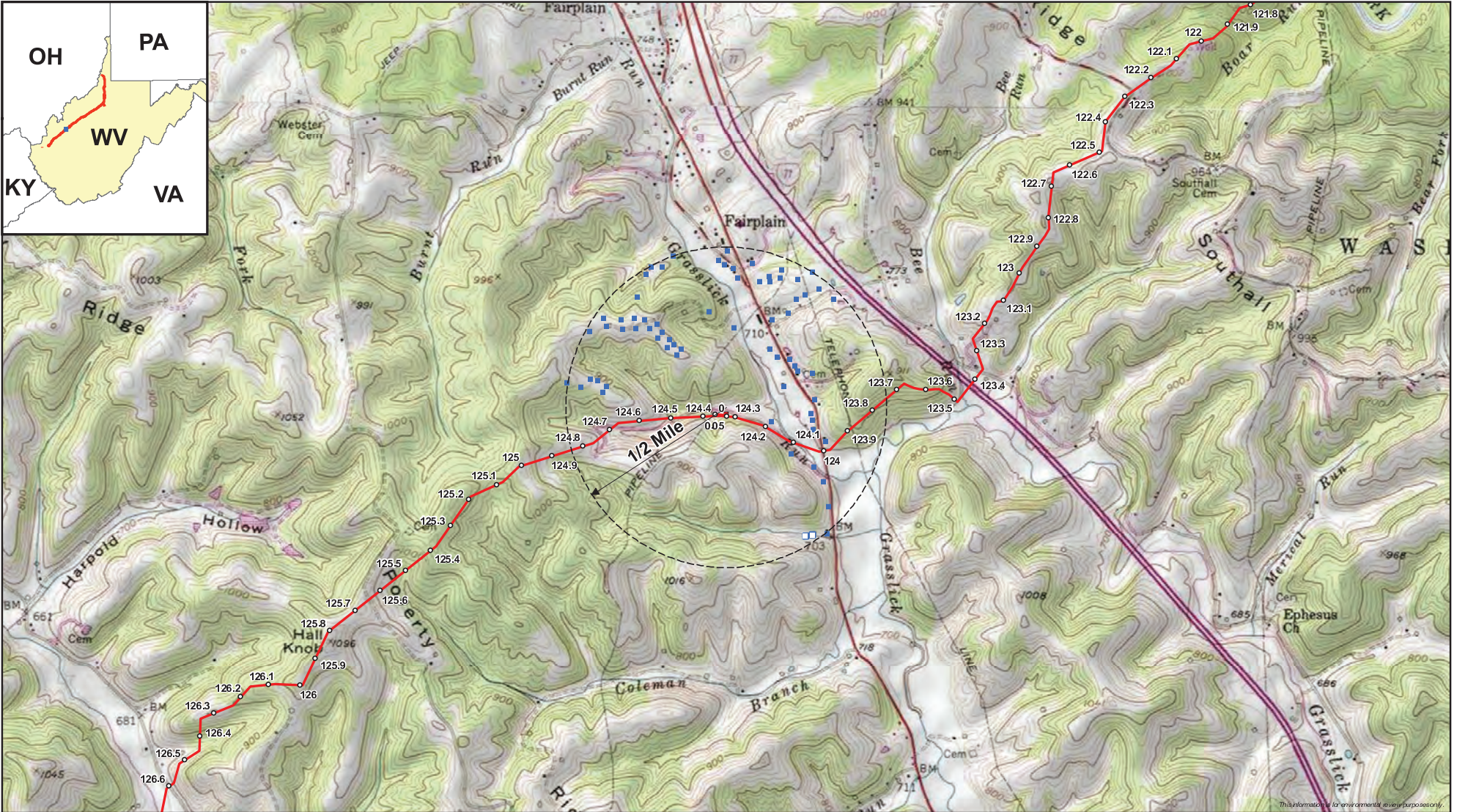
- 1 Mile Radius
- Site Boundary
- House or Mobile Home
- Milepost
- Proposed Centerline



**Noise Sensitive Areas within a 1 Mile Radius of the
Proposed White Oak Compressor Station
Calhoun County, West Virginia
Mountaineer XPress Project
Columbia Gas Transmission**

File: _NSAs | REVISED: 05/11/2016 | SCALE: 1:18,000 when printed at 11x17

DRAWN BY: TG



 1/2 Mile Radius — Proposed Centerline
■ House or Mobile Home Site Boundary
□ Non-Residential Building
○ Milepost

1:18,000
 0 750 1,500
 Feet

**Noise Sensitive Areas within a 1/2 Mile Radius of the
 Proposed Ripley Regulator Station
 Jackson County, West Virginia
 Mountaineer XPress Project
 Columbia Gas Transmission**

File: _NSAs | REVISED: 05/11/2016 | SCALE: 1:18,000 when printed at 11x17

DRAWN BY: TG



 1/2 Mile Radius — Proposed Centerline
■ House or Mobile Home Site Boundary
□ Non-Residential Building
○ Milepost

1:18,000

0 750 1,500
Feet

**Noise Sensitive Areas within a 1/2 Mile Radius of the
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 Cabell County, West Virginia**
 Mountaineer XPress Project
 Columbia Gas Transmission

APPENDIX N-2
Noise Sensitive Areas Associated with the Gulf XPress Project

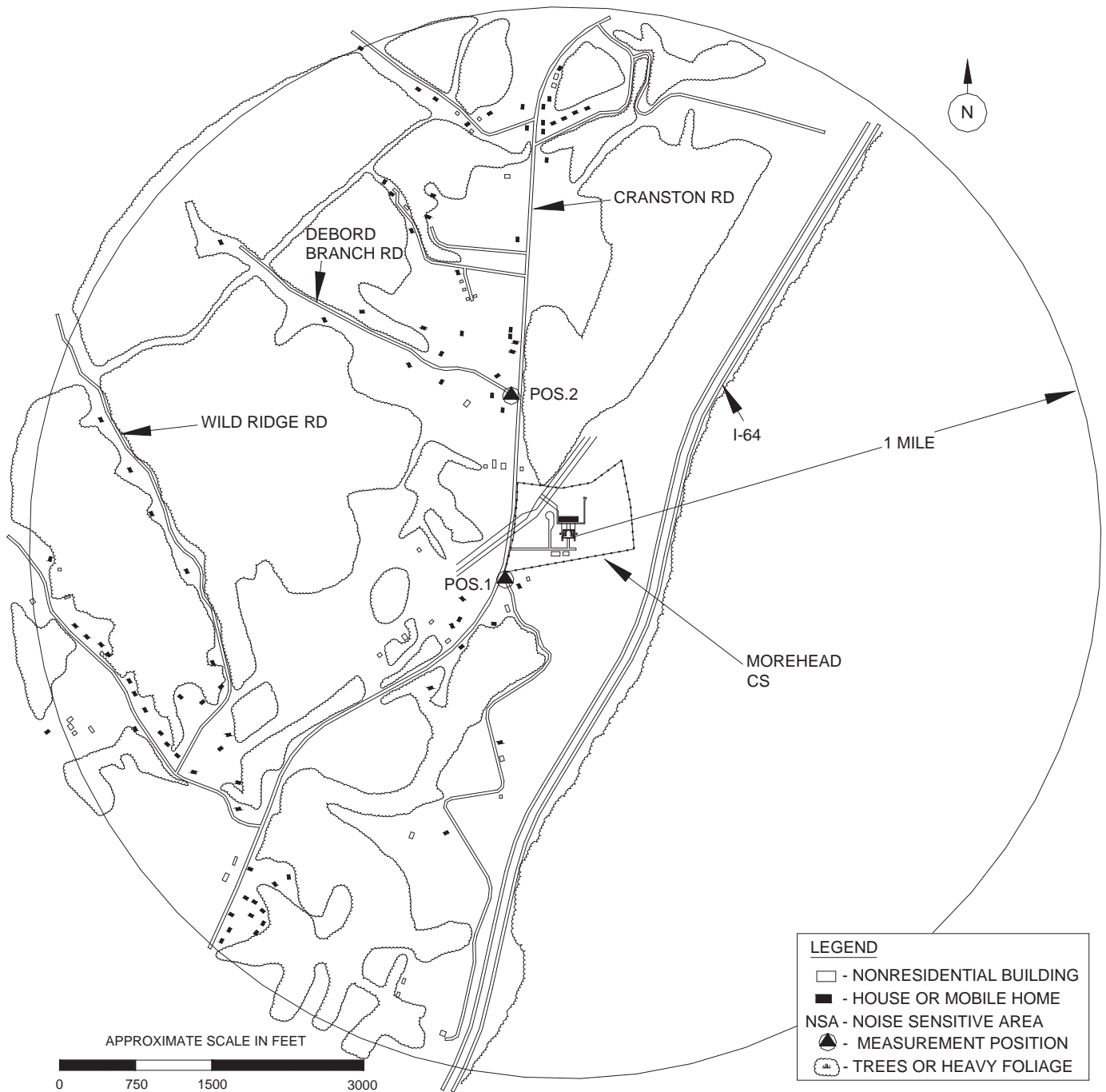


Figure 1: Morehead Compressor Station (GXP Project): General Area Layout around the Station showing the NSAs within 1 Mile of the Station Site and Other Areas of Interest.

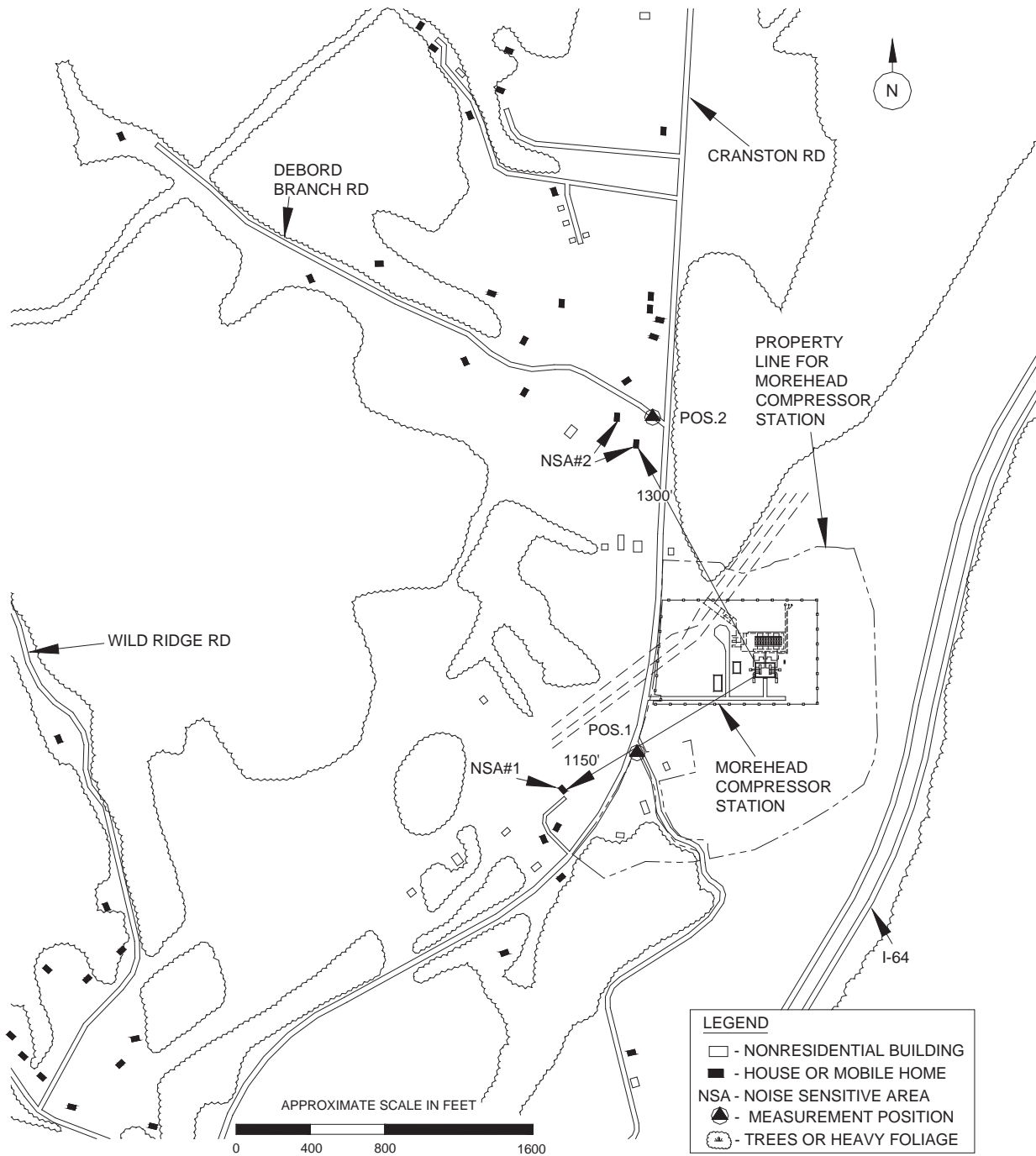


Figure 2: Morehead Compressor Station (GXP Project): Layout showing the Identified Closest NSAs, Chosen Sound Measurement Positions near the Closest NSAs and Conceptual Layout of Station Equipment and Buildings.

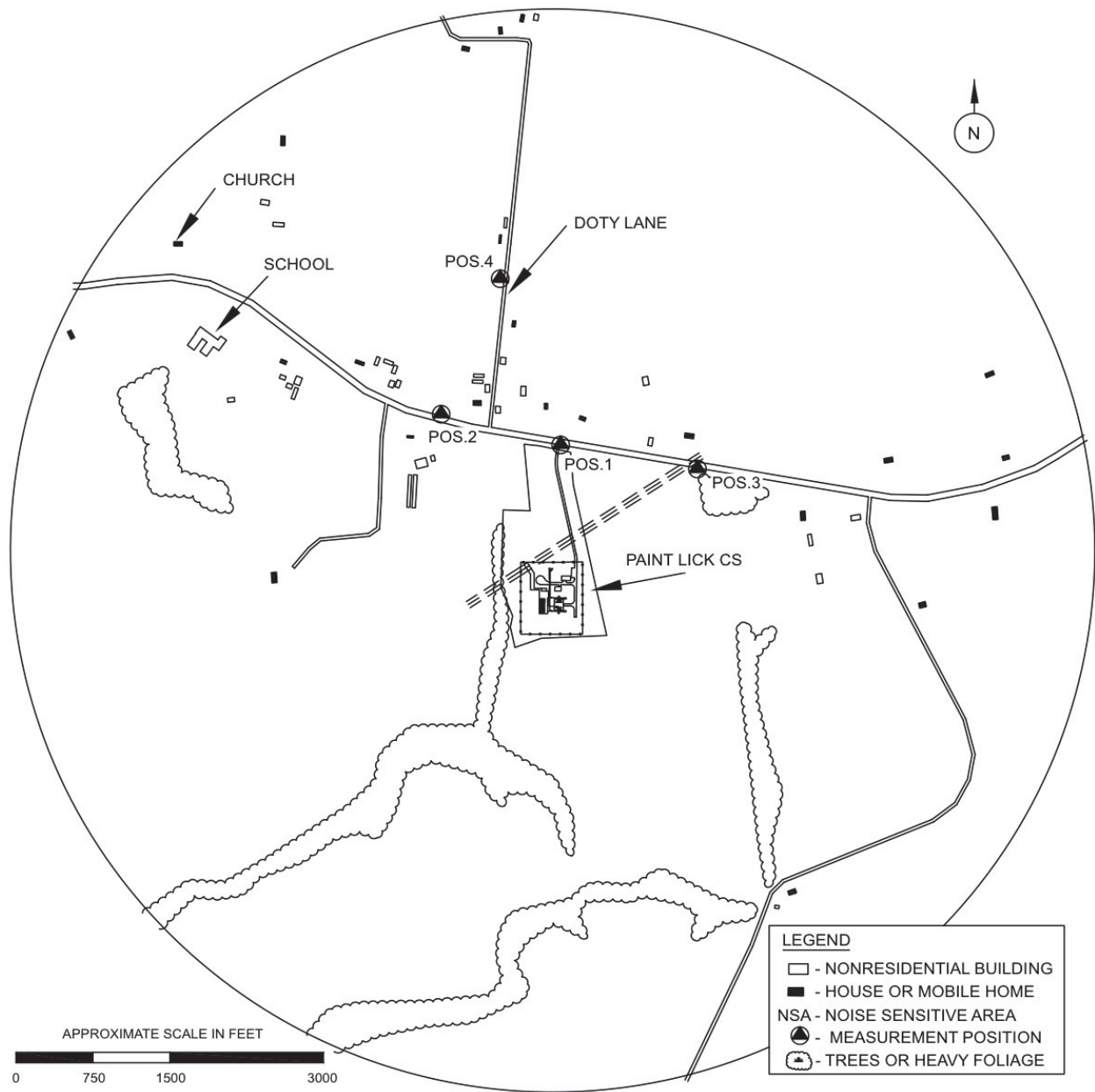


Figure 1: Paint Lick Compressor Station (GXP Project): General Area Layout around the Station showing the NSAs within 1 Mile of the Station Site and Other Areas of Interest.

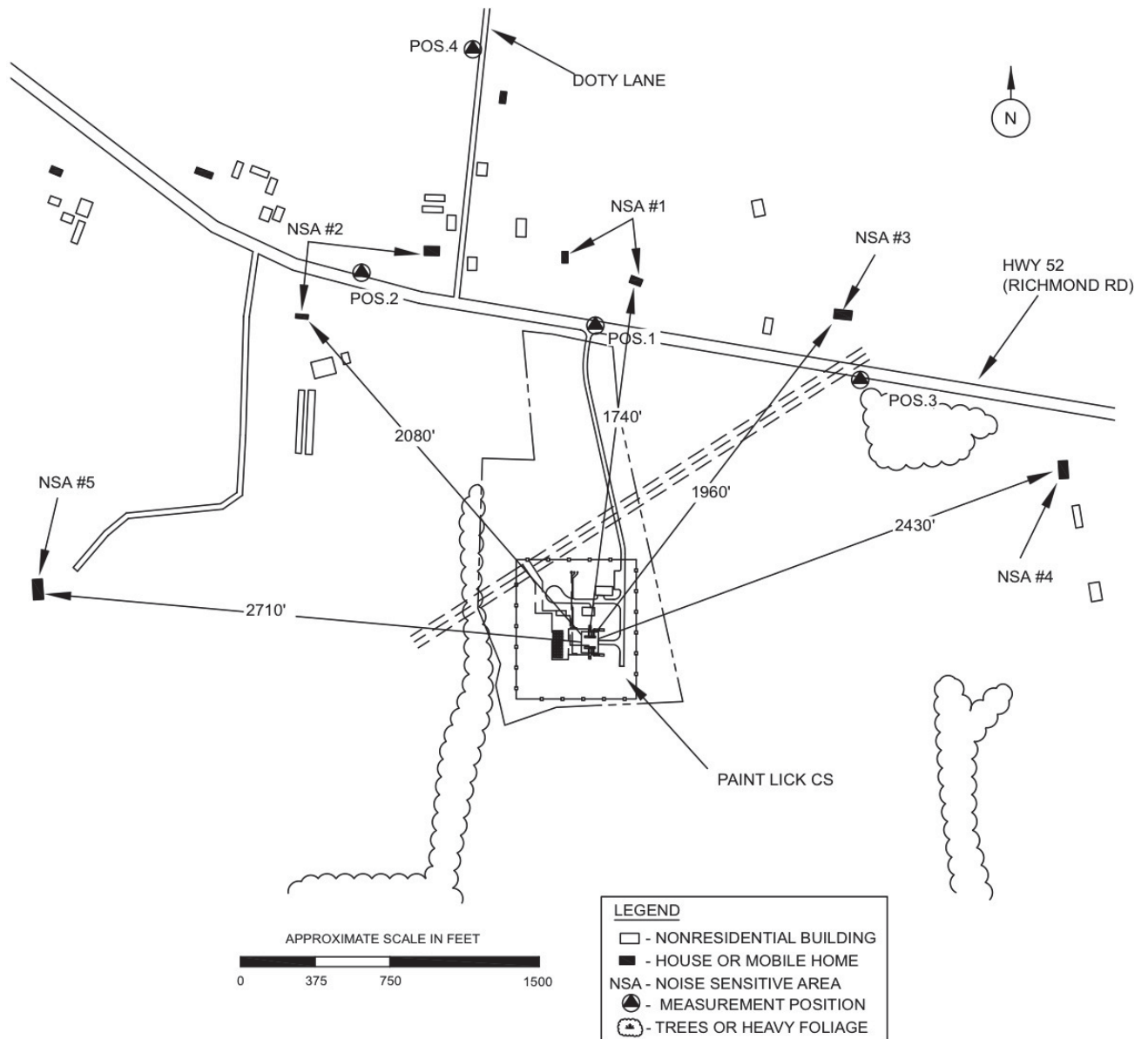


Figure 2: Paint Lick Compressor Station (GXP Project): Layout showing the Identified Closest NSAs, Chosen Sound Measurement Positions near the Closest NSAs and Conceptual Layout of Station Equipment and Buildings.

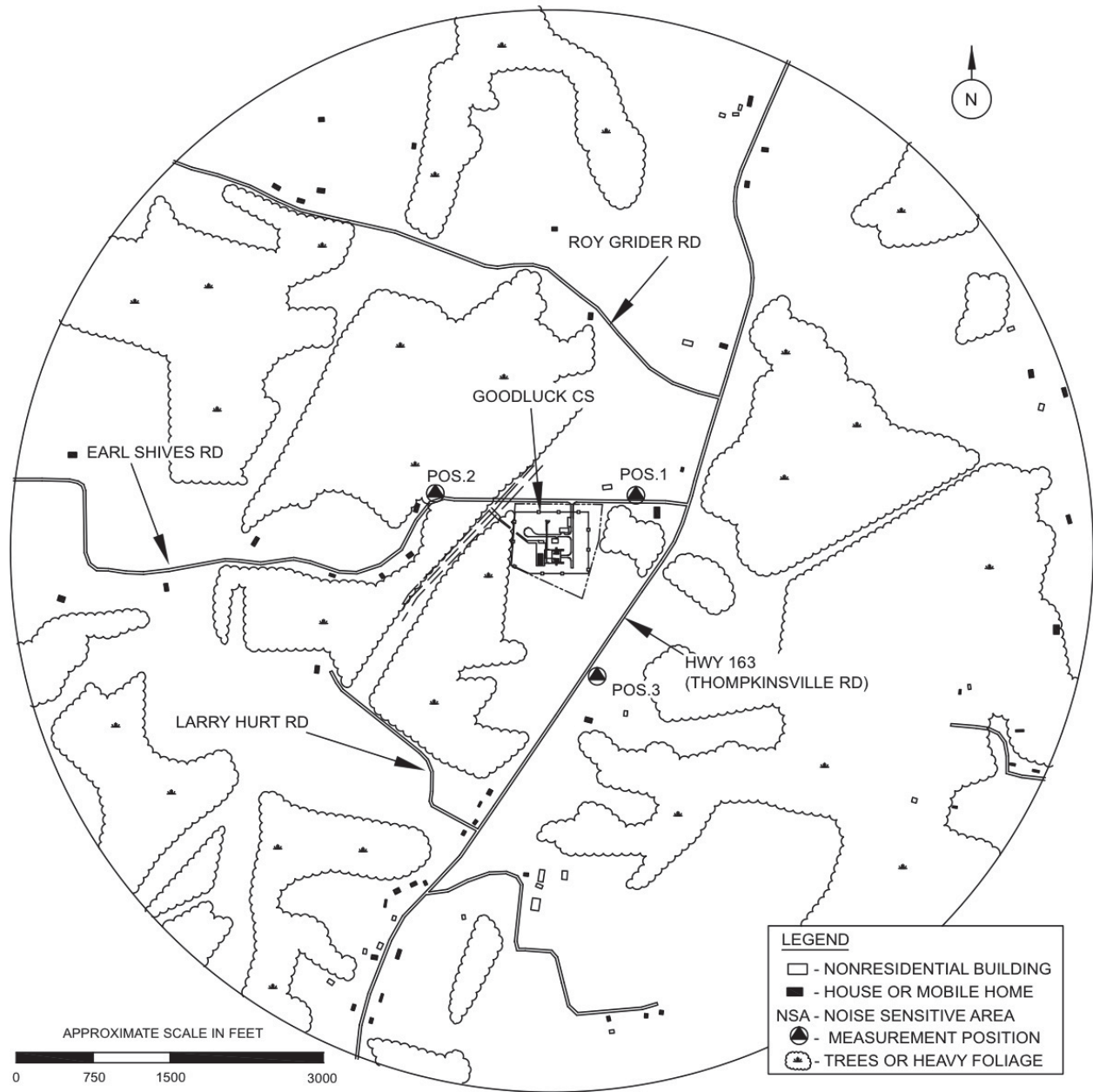


Figure 1: Goodluck Compressor Station (GXP Project): General Area Layout around the Station showing the NSAs within 1 Mile of the Station Site and Other Areas of Interest.

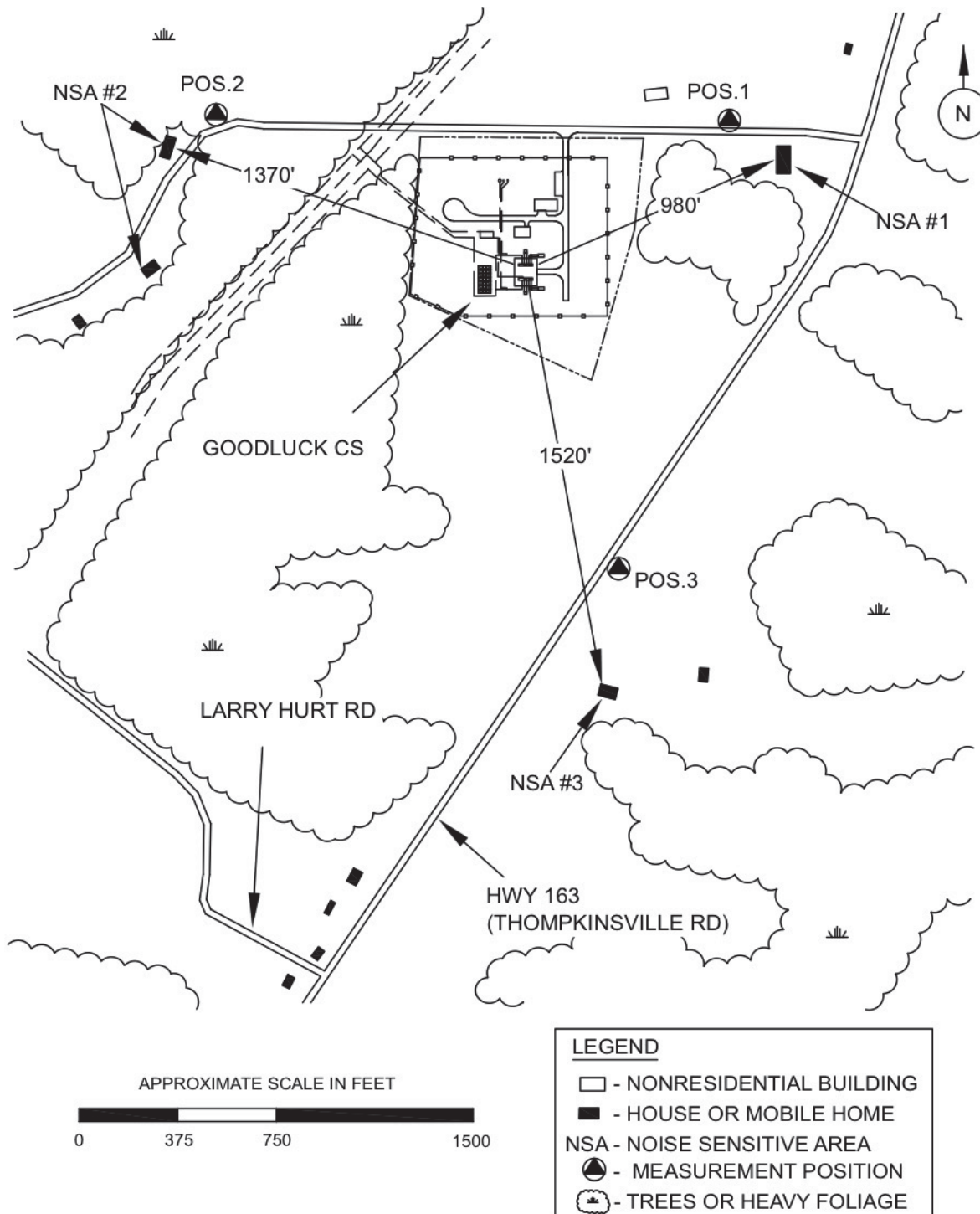


Figure 2: Goodluck Compressor Station (GXP Project): Layout showing the Identified Closest NSAs, Chosen Sound Measurement Positions near the Closest NSAs and Conceptual Layout of Station Equipment and Buildings.

Columbia Pipeline Group – Grayson Compressor Station



Figure A NSA Distances and Directions, Referenced from Proposed Compressor Building Location.



Figure 1: Cane Ridge Compressor Station (GXP Project): General Area Layout around the Station showing the NSAs within 1 Mile of the Station Site and Other Areas of Interest.

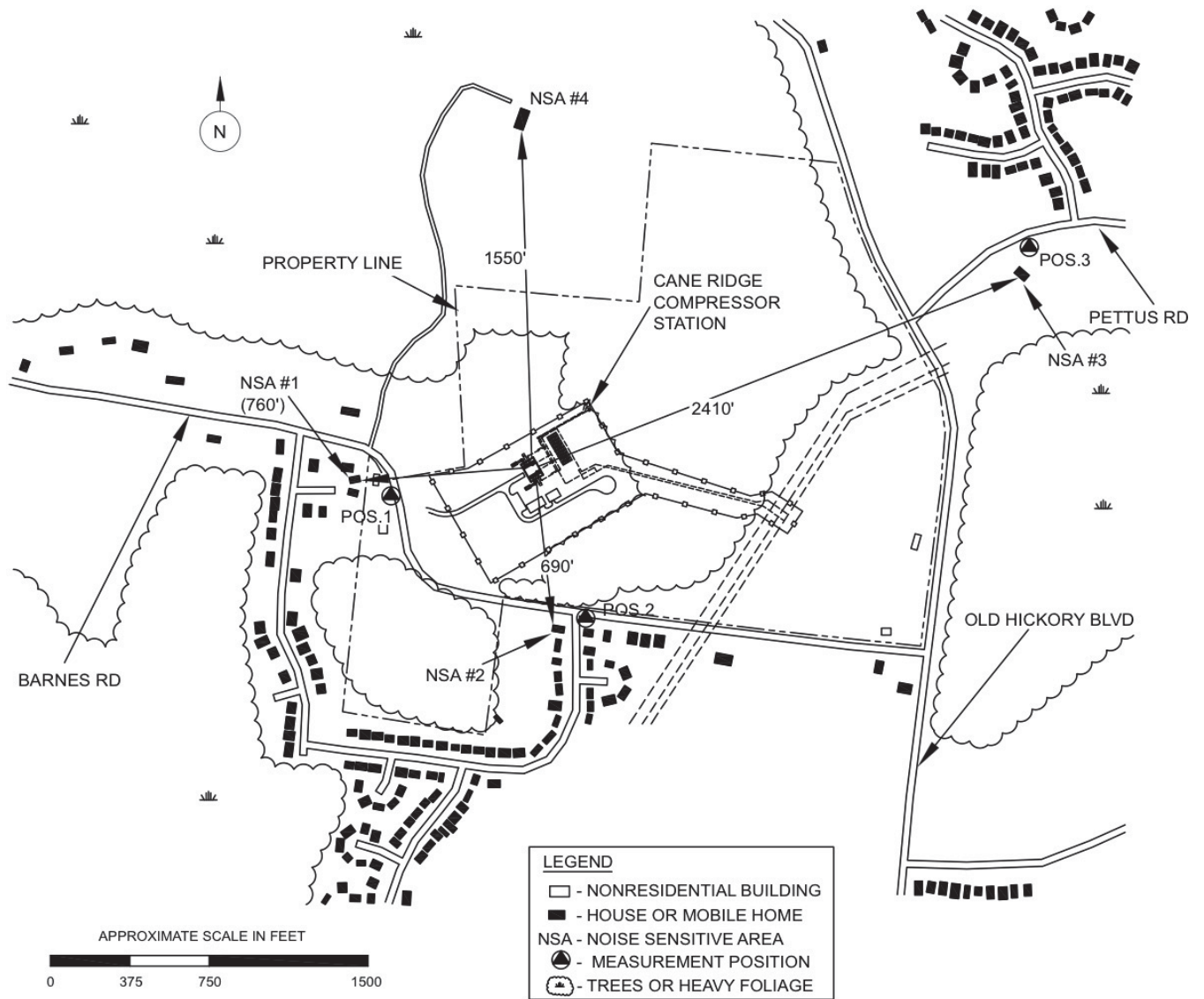


Figure 2: Cane Ridge Compressor Station (GXP Project): Layout showing the Identified Closest NSAs, Chosen Sound Measurement Positions near the Closest NSAs and Conceptual Layout of Station Equipment and Buildings.

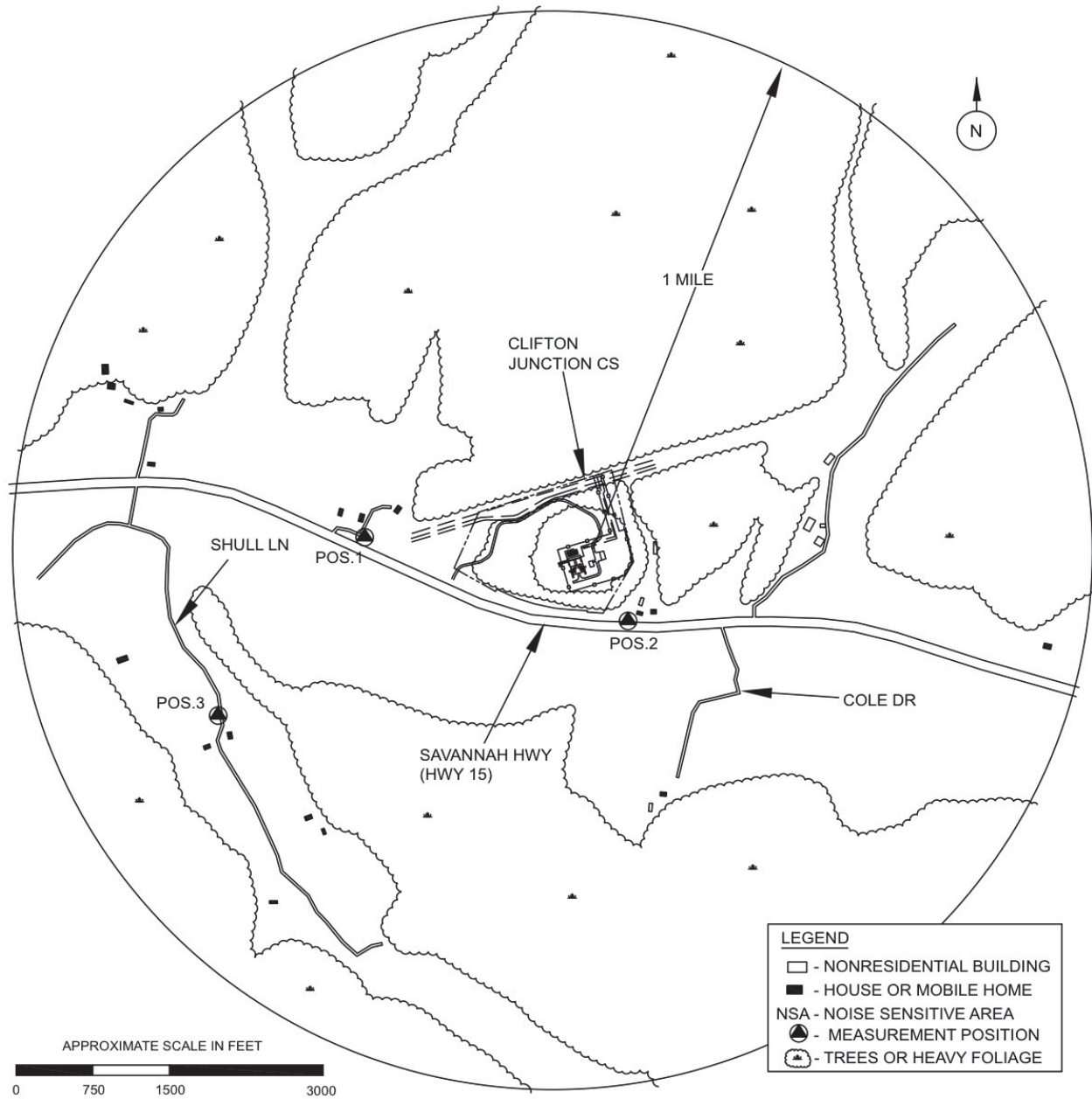


Figure 1: Clifton Junction Compressor Station (GXP Project): General Area Layout around the Station showing the NSAs within 1 Mile of the Station Site and Other Areas of Interest.

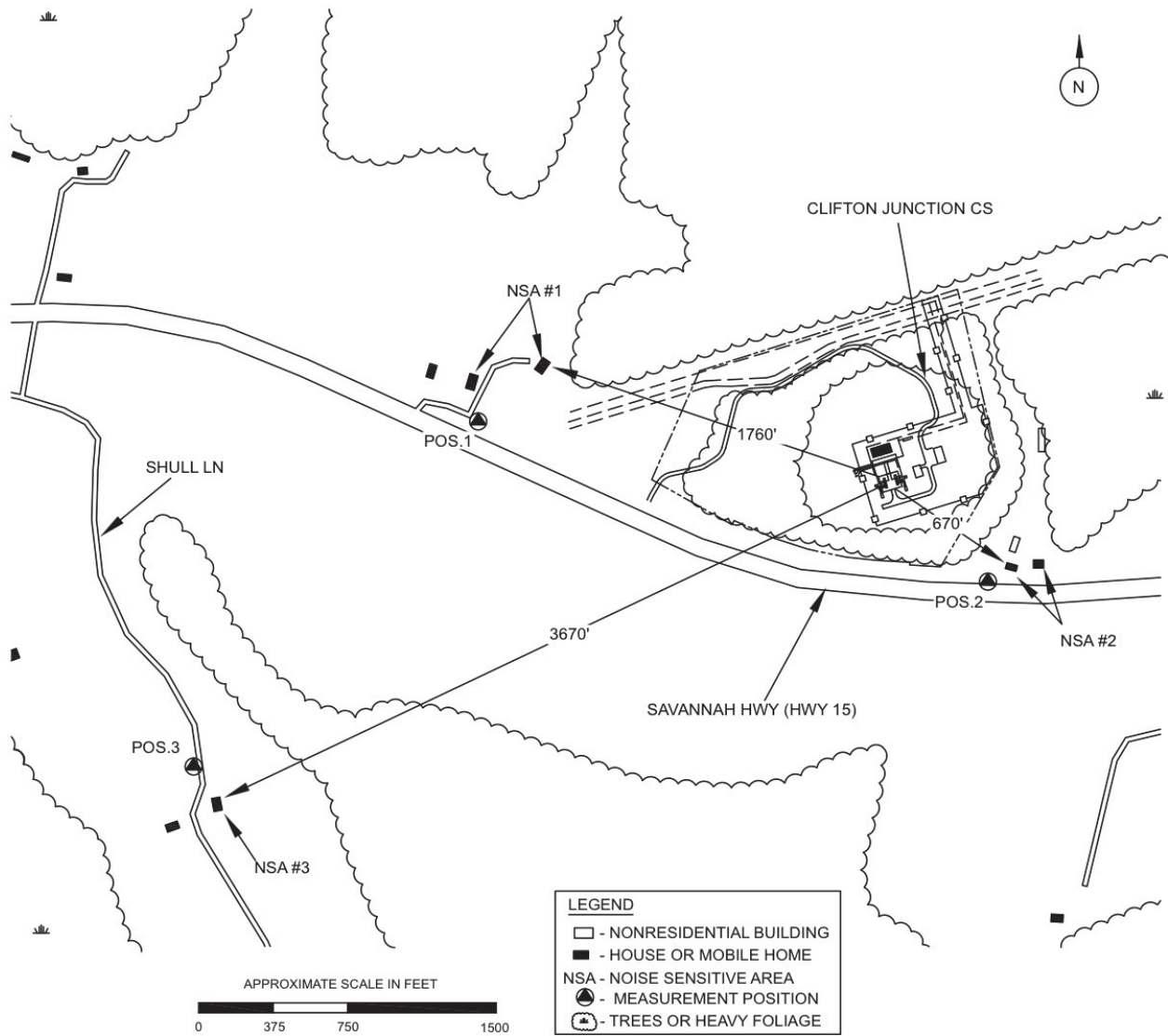


Figure 2: Clifton Junction Compressor Station (GXP Project): Layout showing the Identified Closest NSAs, Chosen Sound Measurement Positions near the Closest NSAs and Conceptual Layout of Station Equipment and Buildings.

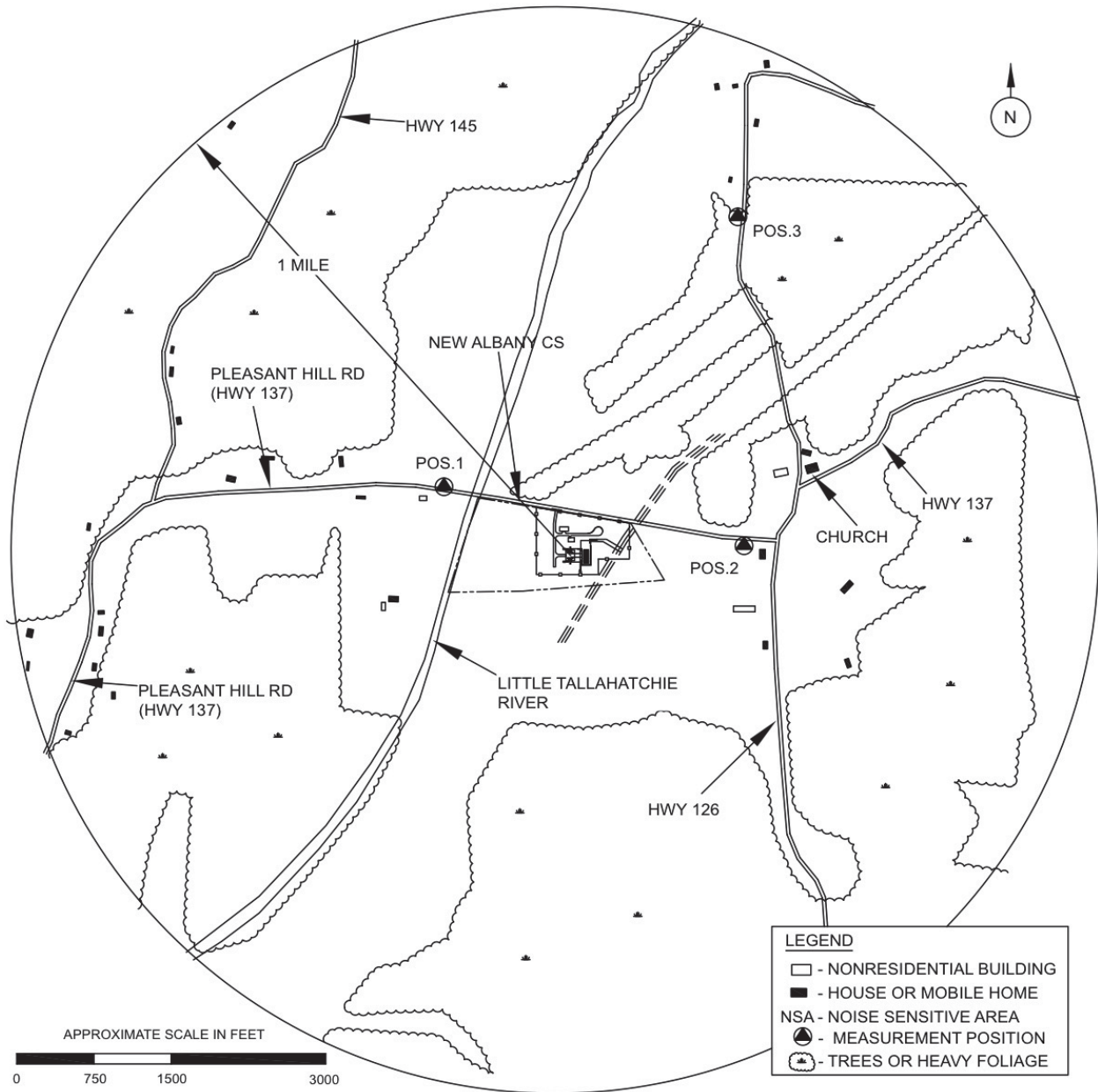


Figure 1: New Albany Compressor Station (GXP Project): General Area Layout around the Station showing the NSAs within 1 Mile of the Station Site and Other Areas of Interest.

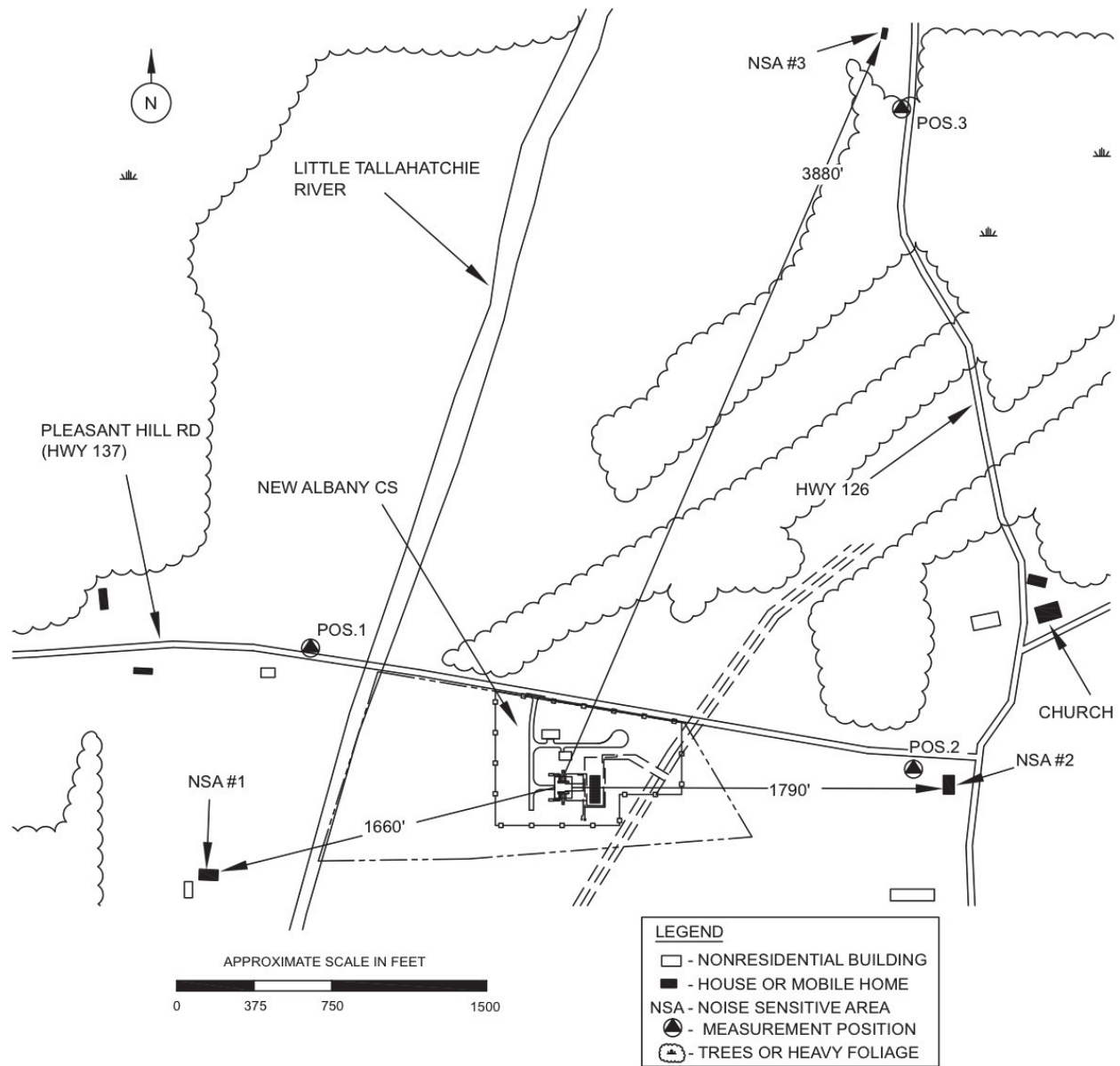


Figure 2: New Albany Compressor Station (GXP Project): Layout showing the Identified Closest NSAs, Chosen Sound Measurement Positions near the Closest NSAs and Conceptual Layout of Station Equipment and Buildings.

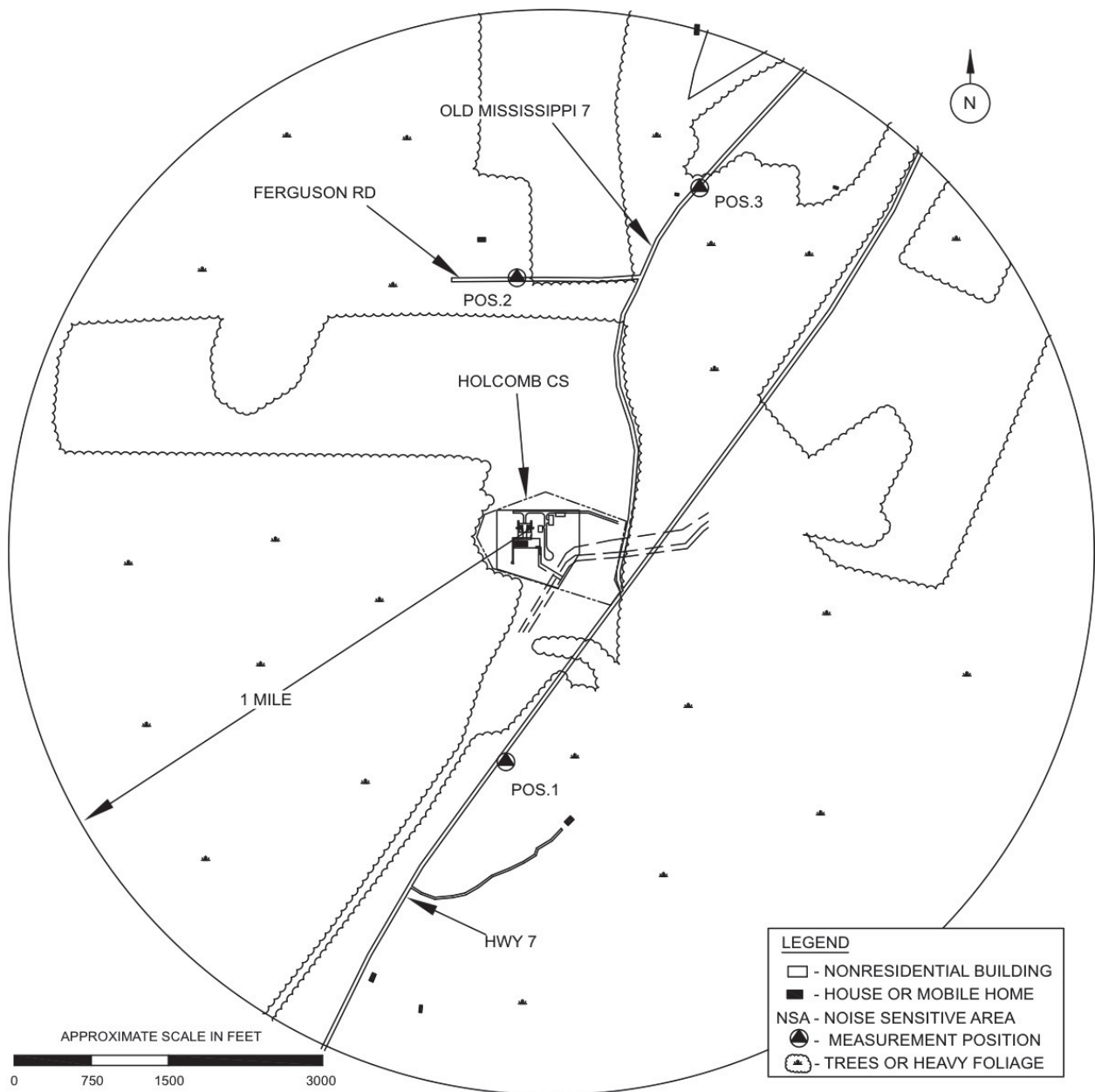


Figure 1: Holcomb Compressor Station (GXP Project): General Area Layout around the Station showing the NSAs within 1 Mile of the Station Site and Other Areas of Interest.

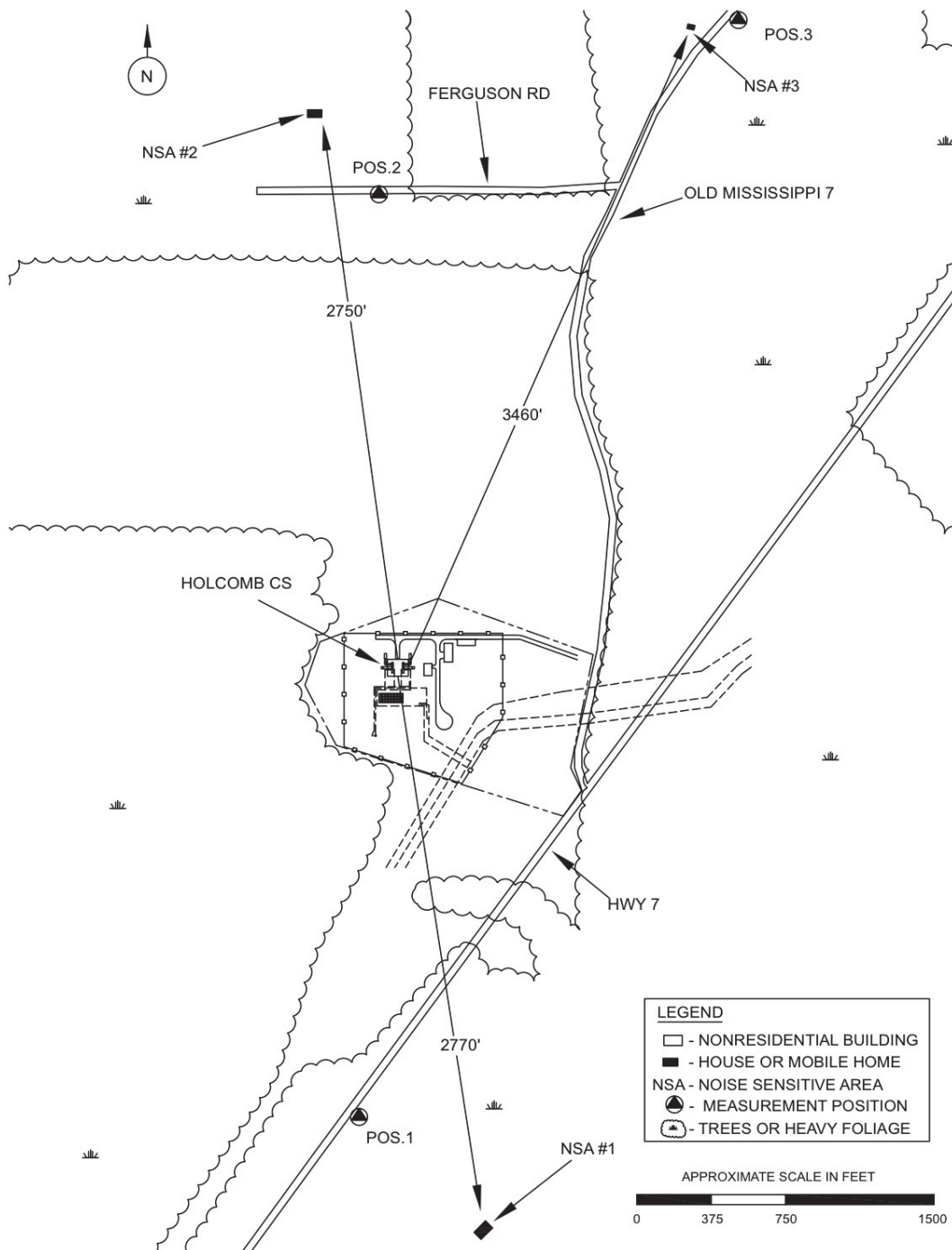


Figure 2: Holcomb Compressor Station (GXP Project): Layout showing the Identified Closest NSAs, Chosen Sound Measurement Positions near the Closest NSAs and Conceptual Layout of Station Equipment and Buildings.

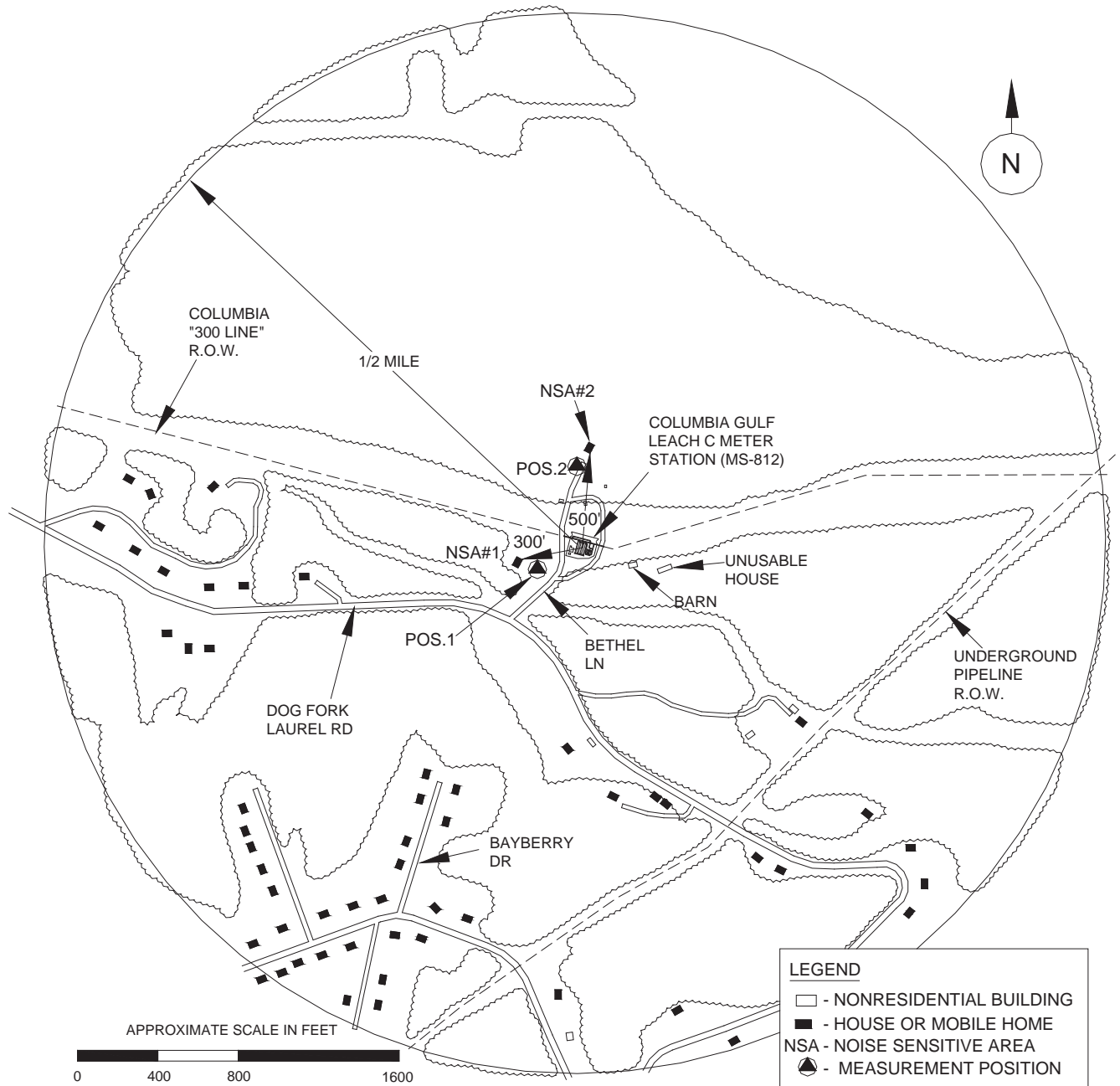


Figure 1: GXP Project and Leach C M&R Station: Area Layout showing NSAs within ½ Mile of the M&R Station Site, Identified Closest NSAs and the Chosen Sound Measurement Positions near the Closest NSAs.

APPENDIX O
References

APPENDIX O - REFERENCES

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APPENDIX P
List of Preparers

APPENDIX P – LIST OF PREPARERS

Federal Energy Regulatory Commission

Yuan, Julia –Project Manager, Water Resources, Wetlands, Vegetation, Wildlife, T&E and Other Special Status Species

M.P.S. Natural Resources Management, 2003, College of Environmental Science and Forestry, State University of New York

B.S. Environmental Biology/Forestry, 1999, College of Environmental Science and Forestry, State University of New York

Johnson, Gertrude F. – Deputy Project Manager

B.S. Mechanical Engineering, 2003, Virginia Commonwealth University

Boros, Laurie – Cultural Resources

B.A. Anthropology/Archaeology, 1980, Queens College, City University of New York

Cotton, Doug – Land Use, Socioeconomics

M.S. University of Wisconsin-Madison, 1980, Urban & Regional Planning

B.A. University of Massachusetts-Amherst, 1977, Geography

Jernigan, Anthony – Geology, Soils

B.A. Geophysical Sciences, 1995, The University of Chicago

Kopka, Robert – Soils

M.S. Soil Science, 1990, Cornell University

B.S. Agronomy, 1987, Delaware Valley College of Science and Agriculture

Kragie, S. Xiah – Air Quality, Noise, Reliability and Safety

M.A. Geochemistry, 2013, Columbia University

M.P.H. Global Environmental Health, 2008, Emory University

B.S. Civil & Environmental Engineering, 2006, University of Maryland, College Park

Burns & McDonnell Engineering, Inc.

Susemihl, Robyn – Project Manager, Introduction, Proposed Action, Cumulative Impacts

B.S. Zoology, 2001, College of Science and Mathematics, Auburn University

Sauter, L.J. – Senior Technical Consultant Introduction, Proposed Action, Alternatives, Waterbodies, Cumulative Impacts

M.S. Engineering/Environmental Chemistry, University of Maryland

B.S. Civil Engineering, University of Maryland

Thomas, D.P. – Senior Project Manager, Alternatives, T&E and Other Special Status Species, Wildlife

M.S. Zoology, College of Science and Mathematics, Auburn University

B.S. Biology, David Lipscomb University

Bell, Jennifer – Senior Environmental Scientist, Socioeconomics, Land Use
Master of Urban and Regional Planning (M.U.R.P.), Portland State University
B.S. Environmental Studies, University of Kansas

Gilstrap, Sarah – Senior Environmental Scientist, Geology, Soils, Conclusions
M.S. Environmental Science, University of Kansas
B.S. Chemistry and Biology, Drury University

Clark, Samantha – Senior Environmental Scientist, Vegetation
B.A. Biology, Lawrence University

Gottsfeld, Andrew – Senior Cultural Resources Specialist, Cultural Resources
M.A. Anthropology, University of Kansas
B.A. Anthropology, Northern Arizona University

Hess, Marc – Senior Project Manager, Wetlands, Cumulative Impacts
M.S. Wildlife and Fisheries Sciences, Texas A&M University
B.S. Wildlife and Fisheries Sciences, Texas A&M University

Robbins, Emily – Staff Environmental Engineer, Air & Noise, Cumulative Impacts
M.S. Environmental Engineering, University of Kansas
B.S. Civil Engineering, University of Kansas

Brewe, Ian – Senior Noise Specialist, Air & Noise, Cumulative Impacts
B.S. Mathematics, Indiana University

Barton, Carrie – Quality Assurance Manager, Various sections
M.S. Marine Geology/Geochemistry, Massachusetts Institute of Technology
B.A. Earth Science, University of California at Berkeley

Woehler, Angie- Assistant Environmental Scientist, Socioeconomics
M.S. Environmental Biology, Regis University
B.S. Biology, Metropolitan State University of Denver

Krystal Kaufman – Proofing, Editing, and Formatting
B.S. Communications, News Editorial Journalism, University of Nebraska Omaha

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