ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

and

DOMINION ENERGY TRANSMISSION, INC.
SUPPLY HEADER PROJECT

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APPENDIX B

Updated Noise Study for Horizontal Directional Drills

ENVIRONMENTAL NOISE CONTROL
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31 January 2017

Dominion Transmission, Inc.
445 West Main Street
PO Box 2450
Clarksburg, West Virginia 26302-2450

Attention: Mr. Ronald M. Baker

Subject: ENC Report No. 562:
Horizontal Directional Drilling Sound Levels for the Atlantic Coast Pipeline Project at Twenty Sites in West Virginia, Virginia and North Carolina
ENC Project No. 15-07

Gentlemen:

At the request of Dominion Transmission, Inc., Environmental Noise Control (ENC) conducted measurements of the ambient sound levels and noise analyses of the horizontal directional drilling (HDD) sound levels for the Atlantic Coast Pipeline Project. The ambient sound level measurements and the HDD noise analyses have been conducted at the nearest noise sensitive areas (NSAs) within one-half mile of the entry and exit points of the twenty HDD sites.

1.0 PURPOSE

The purpose of the ambient sound level measurements was to document the existing ambient L_{dn} sound levels at each HDD site. The purpose of the noise analyses was to predict the HDD L_{dn} sound levels at the nearest NSAs within one-half mile of the entry and exit points. Presented below are descriptions of the HDD equipment located at the entry and exit points, the HDD equipment source sound levels, the ambient L_{dn} sound levels at the twenty HDD sites and the predicted HDD L_{dn} sound levels at the NSAs around each HDD site.

1.1 HDD EQUIPMENT

The following typical equipment is expected at the HDD entry points:

- Drilling rig and associated engine driven hydraulic power unit (2-600 HP engines)
- Two triplex centrifugal main mud pumps (each with a 400 HP engine)
- Two electric generator sets (one with a 200 HP engine and one with a 350 HP engine)
- Mud mixing/cleaning equipment with five ditch pumps (each with a 50 HP engine) and three mud tank pumps (each with a 90 HP engine)

- Fluids system shale shakers
- Crane (280 HP engine), boom truck (160 HP engine), loader (290 HP engine) and backhoe (210 HP engine)
- Five engine driven light plants for nighttime operation (each with a 25 HP engine).

The following typical equipment is expected at the HDD exit points:

- Triplex centrifugal main mud pump (400 HP engine)
- Electric generator set (350 HP engine)
- Mud tank with three pumps (each with a 90 HP engine)
- Backhoe (210 HP engine)
- Three welders
- Five engine driven light plants for nighttime operation (each with a 25 HP engine).

1.2 HDD EQUIPMENT SOUND LEVELS

The HDD equipment sound levels were projected to the NSAs from sound level measurements of actual operating HDD equipment at sites in Arlington, WA. Based upon these sound level measurements, the total L_{eq} source sound levels of the HDD equipment are 89 dBA at 50 feet (sound power level of 121 dBA) at the entry point and 76 dBA at 50 feet (sound power level of 108 dBA) at the exit point.

1.3 PREDICTED HDD SOUND LEVELS

The total L_{eq} source sound levels were projected to the nearest NSAs from both the entry point HDD equipment and the exit point HDD equipment using typical outdoor sound propagation including hemispherical spreading and standard day molecular absorption. Additional sound level reductions were taken for any natural barriers, fields, and woods between the HDD entry and exit points and the NSAs. The L_{eq} sound levels projected from the entry point HDD equipment and from the exit point HDD equipment were then summed to get the predicted L_{eq} sound level at each NSA if the NSA was within one-half mile of both the entry and exit points.

The predicted HDD L_{dn} sound level at each NSA was calculated from the predicted HDD L_{eq} sound level at each NSA based upon the following equation:

$$L_{dn} = 10 \log 1/24 \, [\, 15 \, X \, 10^{(Ld/10)} + 9 \, X \, 10^{((Ln+10)/10)} \,]$$

In this equation, L_d is the L_{eq} for the 15 daytime hours between 7 AM and 10 PM and L_n is the L_{eq} for the 9 nighttime hours between 10 PM and 7 AM. This equation adds a 10 dBA penalty to the nighttime L_{eq} to account for the fact that noise is more disturbing at residential locations during the typically quieter nighttime hours. Since HDD construction is planned for 24 hours per day, the predicted L_{eq} sound level at each NSA was entered into this equation for both L_d and L_n to calculate the predicted L_{dn} sound levels from the HDD construction at each NSA.

2.0 AMBIENT AND PREDICTED HDD SOUND LEVELS AT THE NSAs AROUND EACH HDD SITE

The ambient sound levels were measured during September and October 2015 at Blue Ridge Parkway, James River Alternate, Roanoke River, Nottaway River, Blackwater River, Lake Prince, Western Branch Reservoir, Nansemond River Tributary, Nansemond River, Interstate 64, Route 17, and Elizabeth River. The ambient sound levels were measured in July 2016 at Cape Fear River Alternate. The ambient sound levels were measuring during August 2016 at Fishing Creek, Swift Creek, Tar River, Contentnea Creek, and Little River. The ambient sound levels were measured in January 2017 at Interstate 79 and Route 58. The ambient sound levels and predicted HDD L_{dn} sound levels at the nearest NSAs are presented for each HDD site in the following Sections 2.1 through 2.20.

2.1 INTERSTATE 79

The HDD entry point for the Interstate 79 HDD site is in Lewis County, West Virginia, east of the interstate. The HDD exit point is also in Lewis county, west of the interstate. The land uses surrounding the site are residential, agricultural, and forested areas. The nearest NSAs to the entry point are approximately 1250 feet northeast and 2050 feet southwest. The nearest NSAs to the exit point are approximately 2350 feet southwest, 1850 feet west-southwest, 1700 feet west, and 2200 feet northwest. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 1.

Sound survey measurements were conducted at the NSAs on 18 January 2017. Daytime measurements were conducted between 10 AM and 12 PM and nighttime measurements were conducted between 10 PM and 11 PM. The weather conditions during the daytime measurements were a temperature of 45 degrees F, a relative humidity of 85% decreasing to 70%, cloudy skies, light rain, and southwest winds (3 to 7 mph). During the nighttime measurements, the weather conditions were a temperature of 42 degrees F, a relative humidity of 60% increasing to 65%, cloudy skies, and light north winds (0 to 1 mph) switching to light south winds (1 to 2 mph).

Audible sources of daytime ambient sound were traffic on Interstate 79, local traffic, birds, airplanes, a rooster crowing at S2, an electric fence buzzing at S3, chickens clucking at S4, and cows mooing at S3, S5, and S6. During the nighttime, audible ambient sound sources were traffic on Interstate 79, water flowing in the creek, airplanes, local traffic, cows mooing at S3, dogs barking at S4 and S5, and an electric fence buzzing at S3.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 46.4 to 54.7 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 32.9 to 49.8 dBA, and the calculated ambient L_{dn} sound levels ranged from 47.6 to 57.0 dBA.

At the NSAs approximately 1250 to 2050 feet from the HDD entry point, the HDD L_{dn} sound levels are predicted to range from 45.4 to 52.1 dBA. At the NSAs approximately 1700 to 2350 feet from the HDD exit point, the HDD L_{dn} sound levels are predicted to range from 27.5 to 44.0 dBA. The predicted L_{dn} sound levels are below 55 dBA at all of the nearest NSAs around this HDD site.

Table 1 presents the sound levels at the NSAs around the proposed Interstate 79 HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increases in the ambient L_{dn} sound levels due to the HDD equipment.

At the nearest NSAs, the predicted total L_{dn} sound levels range from 49.2 to 57.3 dBA. These total L_{dn} sound levels are below 55 dBA at all NSAs around the site, except for S2. At NSA S2, where the total L_{dn} sound level is over 55 dBA, the predicted L_{dn} sound level from the HDD equipment is lower than the ambient L_{dn} sound level.

2.2 BLUE RIDGE PARKWAY

The HDD northwest entry point for the Blue Ridge Parkway HDD site is in Augusta County, Virginia west of the parkway. The HDD southeast entry point is in Nelson County east of the parkway. The land uses surrounding the site are residential and recreational. The nearest NSAs to the northwest entry point are approximately 1300 and 1650 northwest, 2100 feet west-northwest, 2300 feet west, and 2250 feet south-southwest. The nearest NSAs to the southeast entry point are approximately 2250 feet west-southwest, 1800 feet southwest, 900 feet west, 500 feet west-northwest, and 2400 feet east-southeast. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 2.

Sound survey measurements were conducted at the NSAs on 17 September 2015. Daytime measurements were conducted between 10 AM and 12 PM and nighttime measurements were conducted between 10 PM and 11 PM. The residents around the exit point in Nelson County would not allow the sound survey measurement team around their properties. Because of this, daytime and nighttime ambient sound levels were measured at the Security Headquarters for Wintergreen and these ambient sound levels have been used for the five NSAs east of the parkway (S6 through S10).

The weather conditions during the daytime measurements were a temperature of 67 degrees F increasing to 80 degrees F, a relative humidity of 70% decreasing to 55%, clear skies and light east winds (1 to 3 mph). During the nighttime measurements, the weather conditions were a temperature of 66 degrees F, a relative humidity of 70%, clear skies and calm winds (1 to 2 mph).

Audible sources of daytime ambient sound were crickets, traffic, birds, airplanes, dogs barking, wind blowing through the trees, and a horse at S4. During the nighttime, audible ambient sound sources were crickets, traffic, peepers, airplanes, and owls.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 44.7 to 48.5 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 48.7 to 53.4 dBA, and the calculated ambient L_{dn} sound levels ranged from 54.7 to 59.3 dBA.

Intercepting drilling will be used for the Blue Ridge Parkway HDD; meaning that drilling equipment will be used at both ends of the HDD segment. At the NSAs approximately 1300 to 2300 feet from the HDD northwest entry point, the HDD L_{dn} sound levels are predicted to range from 31.6 to 40.5 dBA. At the NSAs approximately 500 to 2400 feet from the HDD southeast entry point, the HDD L_{dn} sound levels are predicted to range from 30.8 to 57.8 dBA. The predicted L_{dn} sound levels are below 55 dBA at all of the nearest NSAs around this HDD site; except at S9.

A noise control barrier wall should be installed west and south of the HDD southeast entry point, running 100 feet north to south along the west side of the designated workspace and 150 feet east to west along the south side of the designated workspace, meeting in the southwest corner, to reduce the HDD equipment noise at S9. This noise control barrier wall must be a minimum of 20 feet tall. This barrier wall should be constructed of prefabricated metal panels in a width that allows stacking and transportation on a flatbed trailer with a minimum sound transmission class (STC) rating of 30 and a minimum noise reduction coefficient (NRC) of 0.95. These prefabricated metal panels can be provided by Standard Industrial Structures Corporation (SISCORP), United Steel Structures, Inc., and Parkline, Inc. The predicted HDD L_{dn} sound level with the noise control barrier wall installed is reduced to 45.5 dBA at S9. With the sound barrier wall installed the HDD L_{dn} sound levels at all of the nearest NSAs are predicted to be below the FERC limit of 55 dBA.

Table 2 presents the sound levels at the NSAs around the proposed Blue Ridge Parkway HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increases in the ambient L_{dn} sound levels due to the HDD equipment.

At the nearest NSAs, the predicted total L_{dn} sound levels range from 54.7 to 59.6 dBA. At NSAs, S1 through S4 and S6 through S10, where the total L_{dn} sound levels are over 55 dBA, the predicted L_{dn} sound levels from the HDD equipment are lower than the ambient L_{dn} sound levels.

2.3 JAMES RIVER ALTERNATE

The HDD entry point for the James River Alternate HDD site is in Buckingham County, Virginia east of the river. The HDD exit point is in Nelson County west of the river. The land uses surrounding the site are residential and agricultural. The nearest NSA to the entry point is approximately 2100 feet west-northwest. The nearest NSAs to the exit point are approximately 2000 feet north-northwest, 1000 feet north-northeast, and 1000 feet east-northeast. This NSA at 1000 feet east-northeast is the same NSA that is located 2100 feet west-northwest of the entry point. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 3.

Sound survey measurements were conducted at the NSAs on 16 September 2015. Daytime measurements were conducted between 2 PM and 4 PM and nighttime measurements were conducted between 10 PM and 11 PM. The weather conditions during the daytime measurements were a temperature of 81 degrees F, a relative humidity of 45%, clear skies getting partly cloudy and light east winds (1 to 2 mph). During the nighttime measurements, the weather conditions were a temperature of 67 degrees F, a relative humidity of 80% decreasing to 75%, clear skies and light southwest winds (1 to 2 mph).

Audible sources of daytime ambient sound were crickets, water flowing in the James River, wind blowing in the trees, birds, airplanes, and leaves falling from the trees. During the nighttime, audible ambient sound sources were crickets, peepers, and water flowing in the James River.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 39.1 to 45.8 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 48.5 to 52.2 dBA, and the calculated ambient L_{dn} sound levels ranged from 54.3 to 58.1 dBA.

At the NSA approximately 2100 feet from the HDD entry point, the HDD L_{dn} sound level is predicted to be 32.8 dBA. At the NSAs approximately 1000 to 2000 feet from the HDD exit point, the HDD L_{dn} sound levels are predicted to range from 19.0 to 28.0 dBA. NSA S1 is within one-half mile of both the entry and exits points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point L_{dn} sound levels were summed for these locations: the summed predicted L_{dn} sound level at S1 is 33.1 dBA. The predicted HDD L_{dn} sound levels are below 55 dBA at all NSAs around this HDD site.

Table 3 presents the sound levels at the NSAs around the site of the proposed James River Alternate HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increases in the ambient L_{dn} sound levels due to the HDD equipment.

At the nearest NSAs, the predicted total L_{dn} sound levels range from 54.3 to 58.1 dBA. At the NSAs where the total L_{dn} sound levels are over 55 dBA, the predicted L_{dn} sound levels from the HDD equipment are lower than the ambient L_{dn} sound levels.

2.4 NOTTAWAY RIVER

The HDD entry point for the Nottaway River HDD site is in Southampton County, Virginia west of the river. The HDD exit point is also in Southampton County east of the river. The land uses surrounding the site are residential, agricultural, and industrial. The nearest NSAs to the entry point are approximately 2000 feet southeast, 2300 and 2500 feet southeast, 2600 feet east, 2200 and 2600 feet east-northeast, and 2000 feet north-northeast. The nearest NSAs to the exit point are

approximately 2400 feet south, 2300 and 2400 feet south-southeast, 1750 feet southeast, 800 feet east-southeast, 1100 feet east, 1250 feet east-northeast, 1500 feet northeast, 2350 feet north-northeast, and 975 feet north-northwest. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 4.

Sound survey measurements were conducted at the NSAs on 6 October 2015. Daytime measurements were conducted between 11 AM and 1:30 PM and nighttime measurements were conducted between 10 PM and 11:30 PM. The weather conditions during the daytime measurements were a temperature of 67 degrees F increasing to 77 degrees F, a relative humidity of 75% decreasing to 55%, partly sunny skies clearing to mostly sunny skies and light southeast winds (1 to 3 mph). During the nighttime measurements, the weather conditions were a temperature of 58 degrees F decreasing to 53 degrees F, a relative humidity of 60%, clear skies and calm winds.

Audible sources of daytime ambient sound were wind blowing through the trees, birds, local traffic, crickets, the Enviva factory and a dog barking at S5. During the nighttime, audible ambient sound sources were peepers, a train, local traffic, the Enviva factory and water flowing at S5 and S6.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 42.8 to 54.9 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 38.2 to 47.3 dBA, and the calculated ambient L_{dn} sound levels ranged from 45.6 to 54.2 dBA.

At the NSAs approximately 2000 to 2600 feet from the HDD entry point, the L_{dn} sound levels are predicted to range from 29.6 to 33.6 dBA. At the NSAs approximately 800 to 2400 feet from the HDD exit point, the L_{dn} sound levels are predicted to range from 16.5 to 41.7 dBA. NSAs S1, S2, S4 through S6, and S10 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed for these locations. The summed predicted L_{dn} sound levels for these locations range from 30.3 to 41.1 dBA.

Table 4 presents the sound levels at the NSAs around the proposed Nottaway River HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increase in the ambient L_{dn} sound levels due to the HDD equipment.

At the NSAs, the predicted total L_{dn} sound levels range from 45.9 to 54.2 dBA. These total L_{dn} sound levels are below 55 dBA at all of the NSAs around this site.

2.5 BLACKWATER RIVER

The HDD entry point for the Blackwater River HDD site is in Southampton County, Virginia west of the river. The HDD exit point is in Suffolk County east of the river. The land uses surrounding the site are residential, agricultural, and industrial. The nearest NSAs to the entry point are approximately 2100 and 2300 feet north-northwest, 600, 1400, and 1700 feet northwest, 1100 feet west, 1600 and 2000 feet west-southwest, 1600 feet southwest, 1600 feet south-southwest and 1600 and 2000 feet south-southeast. The nearest NSAs to the exit point are approximately 2400 feet west, and 2100 and 2600 feet south-southwest. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 5.

Sound survey measurements were conducted at the NSAs on 7 October 2015. Daytime measurements were conducted between 9:30 PM and 12:30 PM and nighttime measurements were conducted between 10 PM and 11:30 PM. The weather conditions during the daytime measurements were a temperature of 63 degrees F increasing to 77 degrees F, a relative humidity of 80% decreasing to 65%, clearing partly cloudy skies and light northeast winds (0 to 2 mph). During the nighttime measurements, the weather conditions were a temperature of 66 degrees F, a relative humidity of 75% increasing to 85%, clear skies and calm winds.

Audible sources of daytime ambient sound were local traffic, birds, crickets, dogs barking, hammering at S5, mowing at S1, the International Paper mill at S1 and S4 through S12, and a power washer at S2 and S3. During the nighttime, audible ambient sound sources were traffic, peepers, the International Paper mill, and dogs barking at S6, S11, and S12.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 42.0 to 49.9 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 44.3 to 52.4 dBA, and the calculated ambient L_{dn} sound levels ranged from 50.4 to 58.2 dBA.

At the NSAs approximately 600 to 2300 feet from the HDD entry point, the L_{dn} sound levels are predicted to range from 31.5 to 63.2 dBA. At the NSAs approximately 2100 to 2600 feet from the HDD exit point, the L_{dn} sound levels are predicted to range from 19.1 to 29.3 dBA. NSAs S5, S11, and S12 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed for these locations. The summed predicted L_{dn} sound levels for these locations range from 35.6 to 62.3 dBA. The predicted L_{dn} sound levels are below 55 dBA at all of the nearest NSAs around this HDD site except S5.

A noise control barrier wall should be installed north of the HDD entry point, running 200 feet east to west along the north side of the designated workspace and 50 feet northwest to southeast along the northeast side of the designated workspace, meeting at the northeast corner, to reduce the HDD equipment noise at S5. This noise control barrier wall must be a minimum of 20 feet tall. This barrier wall should be constructed of prefabricated metal panels in a width that allows stacking and transportation on a flatbed trailer with a minimum sound transmission class (STC) rating of 30 and a minimum noise reduction coefficient (NRC) of 0.95. These prefabricated metal panels can be provided by Standard Industrial Structures Corporation (SISCORP), United Steel Structures, Inc., Parkline, Inc. and other companies. The predicted L_{dn} sound level with the noise control barrier wall

installed is reduced to 46.2 dBA at S5. With the sound barrier wall installed the HDD L_{dn} sound levels at all of the nearest NSAs are predicted to be below the FERC limit of 55 dBA.

Table 5 presents the sound levels at the NSAs around the proposed Blackwater River HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increase in the ambient L_{dn} sound levels due to the HDD equipment.

At the nearest NSAs, the predicted total L_{dn} sound levels range from 51.1 to 58.3 dBA. At NSAs S2, S3, and S6, where the total L_{dn} sound levels are over 55 dBA, the predicted L_{dn} sound levels from the HDD equipment are lower than the ambient L_{dn} sound levels.

2.6 LAKE PRINCE

The HDD entry point for the Lake Prince HDD site is in Suffolk County, Virginia west of the lake. The HDD exit point is also in Suffolk County east of the lake. The land uses surrounding the site are residential and agricultural. The nearest NSAs to the entry point are approximately 800 feet northeast, 625 feet north, 475 northwest, 500 feet west-northwest, 800 feet west, 400 feet east-southeast, 1500 feet south-southeast, 1450 feet southeast, 1100 feet east, 2500 feet east-northeast, and 1600 and 2600 feet northeast. The nearest NSAs to the exit point are approximately 1350, 1750, and 2150 feet west, 1700 and 2350 feet west-southwest, 1100, and 2500 feet southwest, 2100 feet southwest, 1150 feet southeast, 625 feet east, 500 feet west-northwest, 800 feet north-northeast, and 2400 feet north-northwest. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 6.

Sound survey measurements were conducted at the NSAs on 8 October 2015. Daytime measurements were conducted between 9 AM and 1 PM and nighttime measurements were conducted between 10 PM and 12 AM. The weather conditions during the daytime measurements were a temperature of 66 degrees F increasing to 82 degrees F, a relative humidity of 80% decreasing to 35%, clear skies and light winds. During the nighttime measurements, the weather conditions were a temperature of 61 degrees F, a relative humidity of 80% increasing to 85%, clear skies and light southwest winds (0 to 2 mph).

Audible sources of daytime ambient sound were birds, local traffic, airplanes, dogs barking at S1, S3, S5, S6, and S12, a helicopter at S2 and S9, and mowing at S10 through S12. During the nighttime, audible ambient sound sources were peepers, local traffic, airplanes, dogs barking at S1 through S4 and S9, and a helicopter at S8.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 36.1 to 47.3 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 41.4 to 50.1 dBA, and the calculated ambient L_{dn} sound levels ranged from 47.8 to 56.0 dBA.

At the NSAs approximately 400 to 2600 feet from the HDD entry point, the L_{dn} sound levels are predicted to range from 27.3 to 65.3 dBA. At the NSAs approximately 500 to 2500 feet from the HDD exit point, the L_{dn} sound levels are predicted to range from 17.3 to 54.4 dBA. NSAs S1 through S4, S6 through S9, and S11 through S13 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed for these locations. The summed predicted L_{dn} sound levels for these locations range from 38.5 to 65.3 dBA. The predicted L_{dn} sound levels are below 55 dBA at all NSAs around this HDD site except S2 through S6.

A noise control barrier wall should be installed around the HDD entry point, running 100 feet north to south along the west side of the designated workspace, 250 feet east to west along the north side of the designated workspace, 200 feet north to south along the east side of the designated workspace, and 100 feet east to west along the south side of the designated workspace, meeting at the northwest, northeast, and southeast corners, to reduce the HDD equipment noise to S2 through S5. The noise control barrier walls must be a minimum of 20 feet tall. These barrier walls should be constructed of prefabricated metal panels in a width that allows stacking and transportation on a flatbed trailer with a minimum sound transmission class (STC) rating of 30 and a minimum noise reduction coefficient (NRC) of 0.95. These prefabricated metal panels can be provided by Standard Industrial Structures Corporation (SISCORP), United Steel Structures, Inc., Parkline, Inc. and other companies. The predicted L_{dn} sound levels with the noise control barrier walls installed are reduced to 43.7 to 52.1 dBA at S2 through S6. With the noise control barrier walls installed the HDD L_{dn} sound levels at all of the nearest NSAs are predicted to be below the FERC limit of 55 dBA.

Table 6 presents the sound levels at the NSAs around the proposed Lake Prince HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increase in the ambient L_{dn} sound levels due to the HDD equipment.

At the nearest NSAs, the predicted total L_{dn} sound levels range from 49.3 to 55.6 dBA. At NSAs S1, S12, and S14, where the total L_{dn} sound level is over 55 dBA, the predicted L_{dn} sound levels from the HDD equipment are lower than the ambient L_{dn} sound levels.

2.7 WESTERN BRANCH RESERVOIR

The HDD entry point for the Western Branch Reservoir HDD site is in Suffolk County, Virginia west of the reservoir. The HDD exit point is also in Suffolk County east of the reservoir. The land uses surrounding the site are residential and agricultural. The nearest NSAs to the entry point are approximately 1800 feet north-northwest, 2400 feet northwest, 2100 feet west, 2400 feet west-southwest, 2200 feet southwest, 2200 and 2300 feet south-southeast, and 2200 feet east-northeast. The nearest NSAs to the exit point are approximately 1200 feet south-southwest, 1100 feet south, and 1800 feet north-northeast. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 7.

Sound survey measurements were conducted at the NSAs on 9 October 2015. Daytime measurements were conducted between 9 AM and 11:30 AM and nighttime measurements were conducted between 11:30 PM and 12:30 AM. The weather conditions during the daytime measurements were a temperature of 71 degrees F increasing to 82 degrees F, a relative humidity of 70% decreasing to 60%, clear skies and southeast winds (4 to 5 mph) shifting to south winds (5 to 8 mph). During the nighttime measurements, the weather conditions were a temperature of 69 degrees F, a relative humidity of 70% increasing to 80%, clear skies becoming cloudy and light winds.

Audible sources of daytime ambient sound were birds, wind blowing through the trees, local traffic, crickets, airplanes, gun shots at S6 and S7, mowing at S7, and hammering at S5. During the nighttime, audible ambient sound sources were peepers, local traffic, and airplanes.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 42.5 to 51.1 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 42.2 to 50.6 dBA, and the calculated ambient L_{dn} sound levels ranged from 48.7 to 57.1 dBA.

At the NSAs approximately 1800 to 2400 feet from the HDD entry point, the L_{dn} sound levels are predicted to range from 27.5 to 50.8 dBA. At the NSAs approximately 1100 to 1800 feet from the HDD exit point, the L_{dn} sound levels are predicted to range from 26.7 to 36.9 dBA. NSAs S6 through S8 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed for these locations. The summed predicted L_{dn} sound levels for these locations range from 34.4 to 38.8 dBA. The predicted L_{dn} sound levels are below 55 dBA at all NSAs around this HDD site.

Table 7 presents the sound levels at the NSAs around the proposed Western Branch Reservoir HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increase in the ambient L_{dn} sound levels due to the HDD equipment.

At the NSAs, the predicted total L_{dn} sound levels range from 52.9 to 57.1 dBA. At NSAs S1, and S6 through S8, where the total L_{dn} sound levels are over 55 dBA, the predicted L_{dn} sound levels from the HDD equipment are lower than the ambient L_{dn} sound levels.

2.8 NANSEMOND RIVER TRIBUTARY

The HDD entry point for the Nansemond River Tributary HDD site is in Suffolk County, Virginia east of the tributary. The HDD exit point is also in Suffolk County west of the tributary. The land uses surrounding the site are residential and agricultural. The nearest NSAs to the entry point are approximately 1600 feet north-northeast and 2000 feet north. The nearest NSAs to the exit point are approximately 500 feet east, 1450 feet west, 1400 feet southwest, 1400 feet southeast, and 1000 feet east-southeast. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 8.

Sound survey measurements were conducted at the NSAs on 9 October 2015. Daytime measurements were conducted between 11:30 AM and 2 PM and nighttime measurements were conducted between 10 PM and 11:30 PM. The weather conditions during the daytime measurements were a temperature of 82 degrees F, a relative humidity of 60%, clear skies and south winds (5 to 8 mph) shifting to west winds (6 to 8 mph). During the nighttime measurements, the weather conditions were a temperature of 70 degrees F, a relative humidity of 70%, partly cloudy skies and light southwest winds (2 to 3 mph).

Audible sources of daytime ambient sound were wind blowing through the trees, airplanes, local traffic, crickets, and a chain saw at S2. During the nighttime, audible ambient sound sources were peepers, local traffic, wind blowing through the trees, birds, and a train at S7.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 43.6 to 55.4 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 43.2 to 51.2 dBA, and the calculated ambient L_{dn} sound levels ranged from 49.7 to 58.5 dBA.

At the NSAs approximately 1600 to 2000 feet from the HDD entry point, the L_{dn} sound levels are predicted to range from 36.9 to 38.4 dBA. At the NSAs approximately 500 to 1450 feet from the HDD exit point, the L_{dn} sound levels are predicted to range from 36.8 to 51.8 dBA. The predicted L_{dn} sound levels are below 55 dBA at all NSAs around this HDD site.

Table 8 presents the sound levels at the NSAs around the proposed Nansemond River Tributary HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increase in the ambient L_{dn} sound levels due to the HDD equipment.

At the NSAs, the predicted total L_{dn} sound levels range from 50.0 to 58.6 dBA. At NSAs S3 through S7, where the total L_{dn} sound levels are over 55 dBA, the predicted total L_{dn} sound levels from the HDD equipment are lower than the ambient L_{dn} sound levels.

2.9 NANSEMOND RIVER

The HDD entry point for the Nansemond River HDD site is in Suffolk County, Virginia west of the river. The HDD exit point is also in Suffolk County east of the river. The land uses surrounding the site are residential and agricultural. The nearest NSAs to the entry point are approximately 1300 feet north-northeast, and 2000 feet northwest. The nearest NSA to the exit point is approximately 2500 feet east. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 9.

Sound survey measurements were conducted at the NSAs on 9 October 2015. Daytime measurements were conducted between 11:30 AM and 2 PM and nighttime measurements were conducted between 10 PM and 11:30 PM. The weather conditions during the daytime measurements were a temperature of 82 degrees F, a relative humidity of 60%, clear skies and south winds (5 to 8 mph) shifting to west winds (6 to 8 mph). During the nighttime measurements, the weather conditions were a temperature of 70 degrees F, a relative humidity of 70%, partly cloudy skies and light southwest winds (2 to 3 mph).

Audible sources of daytime ambient sound were wind blowing through the trees, airplanes, local traffic, crickets, a chain saw at S2, and a 4-wheeler at S3. During the nighttime, audible ambient sound sources were peepers and local traffic.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 43.6 to 48.2 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 43.2 to 48.2 dBA, and the calculated ambient L_{dn} sound levels ranged from 49.7 to 54.2 dBA.

At the NSAs approximately 1300 to 2000 feet from the HDD entry point, the L_{dn} sound levels are predicted to range from 38.4 to 47.2 dBA. At the NSA approximately 2500 feet from the HDD exit point, the L_{dn} sound level is predicted to be 34.0 dBA. The predicted L_{dn} sound levels are below 55 dBA at all NSAs around this HDD site.

Table 9 presents the sound levels at the NSAs around the proposed Nansemond River HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increase in the ambient L_{dn} sound levels due to the HDD equipment.

At the NSAs, the predicted total L_{dn} sound levels range from 50.0 to 54.3 dBA. These total L_{dn} sound levels are below 55 dBA at all of the NSAs around this site.

2.10 ROUTE 58

The HDD entry point for the Route 58 HDD site is in Suffolk County, Virginia south of the road. The HDD exit point is also in Suffolk County north of the road. The HDD entry and exit points, and the one-half mile radius circles around the entry and exit points are shown in Figure 10. There are no NSAs within one-half mile of the entry or exit points. The closest NSA to the entry point is approximately 8100 feet east-northeast. The closest NSA to the exit point is approximately 7100 feet northeast.

2.11 INTERSTATE 64

The HDD entry point for the Interstate 64 HDD site is in Norfolk County, Virginia east of the interstate. The HDD exit point is also in Norfolk County west of the interstate. The land uses surrounding the site are residential and commercial. A VEPCO substation is located approximately 250 feet north-northwest of the entry point. The nearest NSAs to the entry point are approximately 1800 feet west, 2000 feet west-northwest, 650, 1000, 1300, 1700, 2000, 2300, and 2600 feet west-southwest, 550 feet southwest, 650 feet south, 950 feet south-southeast, 1900 feet southeast, 1800 feet east-southeast, 1900 feet east, 1800 feet northeast, and 1100 feet west. The nearest NSAs to the exit point are approximately 225 and 1000 feet east-northeast, 325 feet northeast, 525 feet north-northeast, 800 feet north, 650 feet west-southwest, 350 feet south-southwest, 250 feet south-southeast, 475 feet southeast, 900 feet east-southeast, 1100, 1400, and 1600 feet east, and 2000 and 2500 feet east-southeast. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 11.

Sound survey measurements were conducted at the NSAs on 22 September 2015. Daytime measurements were conducted between 10:30 AM and 4:30 PM and nighttime measurements were conducted between 10:30 PM and 1 AM. The weather conditions during the daytime measurements were a temperature of 74 degrees F, a relative humidity of 80%, cloudy skies and north winds (4 to 6 mph). During the nighttime measurements, the weather conditions were a temperature of 72 degrees F, a relative humidity of 70%, cloudy skies and north winds (1 to 7 mph).

Audible sources of daytime ambient sound were traffic on Interstate 64, birds, airplanes, wind blowing through the trees, geese honking at S5, traffic on Route 17 at S17, traffic on Galberry Road at S7 through S11, and power line buzz at S1, S2, S10, S12, and S15. During the nighttime, audible ambient sound sources were traffic on Interstate 64, peepers, airplanes, birds wind blowing through the trees, and power line buzz at S12, S13, and S15.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 50.5 to 65.3 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 47.3 to 58.4 dBA, and the calculated ambient L_{dn} sound levels ranged from 54.6 to 66.7 dBA.

At the NSAs approximately 550 to 2600 feet from the HDD entry point, the L_{dn} sound levels are predicted to range from 34.2 to 71.3 dBA. At the NSAs approximately 225 to 2500 feet from the

HDD exit point, the L_{dn} sound levels are predicted to range from 31.4 to 67.9 dBA. NSAs S1 through S4, S6 through S15, and S20 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed for these locations. The summed predicted L_{dn} sound levels for these locations range from 55.2 to 71.3 dBA. The predicted L_{dn} sound levels are below 55 dBA at all NSAs around this HDD site except at S1 through S4, S6 through S15, and S20.

A noise control barrier wall should be installed west and south of the HDD entry point, running 200 feet north to south along the west side of the designated workspace and 250 feet east to west along the south side of designated workspace, meeting at the southwest corner, to reduce the HDD equipment noise to S1 through S15 and S20. A noise control barrier wall should be installed around of the HDD exit point, running 100 feet east to west along the north side of the designated workspace, 150 feet north to south along the east side of the designated workspace, 250 feet east to west along the south side of the designated workspace and 50 feet north to south along the west side of the designated workspace, meeting at the northeast, southeast, and southwest corners, to reduce the HDD equipment noise to S1 through S15 and S20. The noise control barrier walls must be a minimum of 24 feet tall. These noise control barrier walls should be constructed of prefabricated metal panels in a width that allows stacking and transportation on a flatbed trailer with a minimum sound transmission class (STC) rating of 30 and a minimum noise reduction coefficient (NRC) of 0.95. These prefabricated metal panels can be provided by Standard Industrial Structures Corporation (SISCORP), United Steel Structures, Inc., Parkline, Inc. and other companies. The predicted L_{dn} sound levels with the noise control barrier wall installed are reduced to 41.3 to 54.2 dBA at S1 through S4, S6 through S15, and S20. With the noise control barrier wall installed the HDD L_{dn} sound levels at all the NSAs are predicted to be below the FERC 55 dBA sound level maximum.

Table 11 presents the sound levels at the NSAs around the proposed Interstate 64 HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increase in the ambient L_{dn} sound levels due to the HDD equipment.

At the NSAs, the predicted total L_{dn} sound levels range from 54.6 to 67.0 dBA. At NSAs S1 through S16, and S18 through S20, where the total L_{dn} sound levels are over 55 dBA, the predicted L_{dn} sound levels from the HDD equipment are lower than the ambient L_{dn} sound levels.

2.12 ROUTE 17

The HDD entry point for the Route 17 HDD site is in Norfolk County, Virginia west of the road. The HDD exit point is also in Norfolk County east of the road. The land uses surrounding the site

are residential, commercial, and industrial. The nearest NSAs to the entry point are approximately 1400 feet north-northeast, 1500 feet northwest, 800 feet west-southwest, 375 southwest, 225 feet south-southeast, 800 and 1100 feet southeast, 1600, 1900, 2100, and 2600 feet east-southeast, 2600 feet south-southeast, 2600 feet east and 2300 feet northeast. The nearest NSAs to the exit point are approximately 2500 feet west-southwest, 1300, 1600, 1800, and 2200 feet southwest, 600 and 1150 feet south-southwest, 80 feet south, 400 feet east, 400 feet north-northwest, 325 feet north, 525 feet northeast, and 1500 feet northwest. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 12.

Sound survey measurements were conducted at the NSAs on 23 September 2015. Daytime measurements were conducted between 9:30 AM and 1:30 PM and nighttime measurements were conducted between 10:30 PM and 1 AM. The weather conditions during the daytime measurements were a temperature of 74 degrees F, a relative humidity of 80% decreasing to 75%, partly cloudy skies and east winds (1 to 7 mph). During the nighttime measurements, the weather conditions were a temperature of 70 degrees F, a relative humidity of 70%, partly cloudy skies and light east winds (0 to 4 mph).

Audible sources of daytime ambient sound were traffic on Interstate 64, traffic on Route 17, wind blowing through the trees, airplanes, train yard noise at S6 and S7, and factory noise at S15 and S16. During the nighttime, audible ambient sound sources were peepers, wind blowing through the trees, airplane, traffic on Route 17, traffic on Interstate 64, and factory noise at S12 through S17.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 48.0 to 58.9 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 43.8 to 53.1 dBA, and the calculated ambient L_{dn} sound levels ranged from 51.8 to 61.0 dBA.

At the NSAs approximately 225 to 2600 feet from the HDD entry point, the L_{dn} sound levels are predicted to range from 40.3 to 81.9 dBA. At the NSAs approximately 80 to 2500 feet from the HDD exit point, the L_{dn} sound levels are predicted to range from 39.9 to 77.7 dBA. NSAs S6 though 12, and S18 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed for these locations. The summed predicted L_{dn} sound levels for these locations range from 54.5 to 69.0 dBA. The predicted L_{dn} sound levels are below 55 dBA at all NSAs around this HDD site except at S4 through S10, and S12 through S18.

A noise control barrier wall should be installed south of the HDD entry point, running 100 feet north to south along the east side of the designated workspace, 250 feet east to west along the south side of the designated workspace, and 50 feet north to south along the west side of the designated workspace, meeting at the southeast and southwest corners, to reduce the HDD equipment noise to S3 through S12 and S18. A noise control barrier wall should be installed around the HDD exit point open on the east end, running 250 east to west along the north side of the designated workspace, 150 feet north to south along the west side of the designated workspace, and 250 feet east to west along the south side of the designated workspace, meeting at the northwest and southwest corners, to reduce the HDD equipment noise to S6 through S18. The noise control barrier walls must be minimum of 24 feet tall. These noise control barrier walls should be constructed of prefabricated metal panels in a width that allows stacking and transportation on a flatbed trailer with a minimum

sound transmission class (STC) rating of 30 and a minimum noise reduction coefficient (NRC) of 0.95. These prefabricated metal panels can be provided by Standard Industrial Structures Corporation (SISCORP), United Steel Structures, Inc., Parkline, Inc. and other companies. The predicted L_{dn} sound levels with the noise control barrier walls installed are reduced to 33.9 to 62.9 dBA. With the noise control barrier wall installed, the HDD L_{dn} sound levels at all the NSAs, except S4, S5, and S13, are predicted to be below the FERC limit of 55 dBA. The noise control barrier walls significantly reduce the HDD L_{dn} sound levels by about 15 to 20 dBA at S4, S5, and S13. These predicted HDD L_{dn} sound levels remain about 4.0 to 7.9 dBA above the FERC limit of 55 dBA.

Table 12 presents the sound levels at the NSAs around the proposed Route 17 HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increase in the ambient L_{dn} sound levels due to the HDD equipment.

At the NSAs, the predicted total L_{dn} sound levels range from 52.1 to 64.7 dBA. At NSAs S2, S3, S6 through S8, S10, S11, and S14 through S16, where the total L_{dn} sound levels are over 55 dBA, the predicted L_{dn} sound levels from the HDD equipment are lower than the ambient L_{dn} sound levels. At NSAs S4, S5, and S13, the predicted total L_{dn} sound levels are over 55 dBA, these total L_{dn} sound levels are higher than the ambient levels by 4.8 to 5.1 dBA. These increases may be noticeable.

2.13 ELIZABETH RIVER

The HDD entry point for the Elizabeth River HDD site is in Norfolk County, Virginia east of the river. The HDD exit point is also in Norfolk County west of the river. The land uses surrounding the site are residential, recreational, commercial, and industrial. The nearest NSA to the entry point is approximately 2300 feet south-southeast. There are no NSAs within one-half mile of the exit point. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSA are shown in Figure 13.

Sound survey measurements were conducted at the NSA on 23 September 2015. Daytime measurements were conducted between 1:30 PM and 2 PM and nighttime measurements were conducted between 10 PM and 10:30 PM. The weather conditions during the daytime measurements were a temperature of 76 degrees F, a relative humidity of 65%, partly cloudy skies and east winds (2 to 4 mph). During the nighttime measurements, the weather conditions were a temperature of 71 degrees F, a relative humidity of 75%, partly cloudy skies and east winds (1 to 4 mph).

Audible sources of daytime ambient sound were local traffic, peepers, and wind blowing through the trees. During the nighttime, audible ambient sound sources were local traffic, wind blowing through the trees, peepers, and traffic on Interstate 13.
At the NSA, the measured daytime ambient L_{eq} sound level was 54.4 dBA, the measured nighttime ambient L_{eq} sound level was 47.1 dBA, and the calculated ambient L_{dn} sound level was 55.6 dBA.

At the NSA approximately 2300 feet from the HDD entry point, the HDD L_{dn} sound level is predicted to be 52.6 dBA. There were no NSAs within one-half mile of the exit point. The predicted L_{dn} sound level is below 55 dBA at the only NSA around this HDD site.

Table 13 presents the sound levels at the only NSA around the proposed Elizabeth River HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound level from the HDD equipment,
- the predicted total L_{dn} sound level resulting from summing the L_{dn} sound level from the HDD equipment with the ambient L_{dn} sound level, and
- the predicted increase in the ambient L_{dn} sound level due to the HDD equipment.

At the NSA, the predicted total L_{dn} sound level is 57.4 dBA. At this NSA, where the total L_{dn} sound level is over 55 dBA, the predicted L_{dn} sound level from the HDD equipment is lower than the ambient L_{dn} sound level.

2.14 ROANOKE RIVER

The HDD entry point for the Roanoke River HDD site is in Northampton County, North Carolina north of the river. The HDD exit point is in Halifax County south of the river. The HDD entry and exit points, and the one-half mile radius circles around the entry and exit points are shown in Figure 14. There are no NSAs within one-half mile of the entry or exit points. The closest NSA to the entry point is approximately 6000 feet northwest. The closest NSA to the exit point is approximately 6100 feet west.

2.15 FISHING CREEK

The HDD entry point for the Fishing Creek HDD site is in Nash County, North Carolina, south of the creek. The HDD exit point is in Halifax County, north of the creek. The land uses surrounding the site are residential, agricultural, and forested areas. The nearest NSAs to the entry point are approximately 1250 and 1500 feet west-southwest, 1600 and 2650 feet southwest, and 2500 feet south. There are no NSAs within half a mile of the exit point. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 15.

Sound survey measurements were conducted at the NSAs on 2 August 2016. Daytime measurements were conducted between 2:30 PM and 3:30 PM and nighttime measurements were

conducted between 11:30 PM and 12:30 PM. The weather conditions during the daytime measurements were a temperature of 88 degrees F increasing to 90 degrees F, a relative humidity of 70%, cloudy skies, and calm winds. During the nighttime measurements, the weather conditions were a temperature of 77 degrees F, a relative humidity of 80%, cloudy skies, and calm winds.

Audible sources of daytime ambient sound were traffic on Interstate Route 95, local traffic, birds, far off thunder, airplanes, and a water pump at S3. During the nighttime, audible ambient sound sources were traffic on Interstate Route 95, cicadas, and crickets.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 38.6 to 43.3 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 43.8 to 49.1 dBA, and the calculated ambient L_{dn} sound levels ranged from 49.8 to 55.0 dBA.

At the NSAs approximately 1250 to 2650 feet from the HDD entry point, the HDD L_{dn} sound levels are predicted to range from 37.4 to 54.4 dBA. The predicted HDD L_{dn} sound levels are below 55 dBA at all NSAs around this HDD site.

Table 15 presents the sound levels at the NSAs around the proposed Fishing Creek HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increases in the ambient L_{dn} sound levels due to the HDD equipment.

At the nearest NSAs, the predicted total L_{dn} sound levels range from 50.3 to 56.6 dBA. At NSAs, S3 and S4, the total L_{dn} sound levels are over 55 dBA. The predicted total L_{dn} sound level at S3 is higher than the ambient L_{dn} sound level by 3.9 dBA. This increase may be noticeable. At S4, the predicted total L_{dn} sound level is only 0.8 dBA higher than the ambient L_{dn} sound level. This increase is negligible and not noticeable.

2.16 SWIFT CREEK

The HDD entry point for the Swift Creek HDD site is in Nash County, North Carolina, west of the creek. The HDD exit point is also in Nash County, east of the creek. The land uses surrounding the site are residential, agricultural, and forested areas. The nearest NSAs to the entry point are approximately 1200 feet east-northeast, 1150 feet east-northeast, 1200, 1650, and 2350 feet northeast, 500 feet northwest, 1650 and 2250 feet north, 500, 1150, and 1600 feet southeast, 1250 feet south, 950 feet south-southwest, and 650 and 750 feet west. The nearest NSAs to the exit point are approximately 550 feet southwest, 575 and 1050 feet west, 900 feet north-northeast, 550, 1600, and 1950 feet northwest, 1800 feet south-southwest, 1600, 2100, 2200, 2450, and 2600 feet southwest, and 1800 and 2250 feet west-southwest. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 16.

Sound survey measurements were conducted at the NSAs on 3 August 2016. Daytime measurements were conducted between 12 PM and 3 PM and nighttime measurements were conducted between 10 PM and 11:30 PM. The residents around the entry point would not allow the sound survey measurement team around their properties. Because of this, daytime and nighttime ambient sound levels were measured at two locations along N. Browntown Road and these ambient sound levels have been used for the seven NSAs around the entry point. For NSAs S9 through S12, the ambient sound levels were measured along the road south of the entry point. For NSAs S13 through S15, the ambient sound levels were measured along the road west of the west point.

The weather conditions during the daytime measurements were a temperature of 85 degrees F increasing to 90 degrees F, a relative humidity of 65%, cloudy skies, and light south winds (3-6 mph). During the nighttime measurements, the weather conditions were a temperature of 75 degrees F, a relative humidity of 70%, clear to cloudy skies, and calm winds.

Audible sources of daytime ambient sound were local traffic, birds, cicadas, airplanes, crickets, water running in creek at S2, and neighbors working in yard at S2 and S3. During the nighttime, audible ambient sound sources were local traffic, cicadas, peepers, crickets and dogs barking at S1, S2, S8, and S9.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 37.5 to 46.6 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 39.5 to 41.5 dBA, and the calculated ambient L_{dn} sound levels ranged from 45.9 to 49.0 dBA.

At the NSAs approximately 500 to 2375 feet from the HDD entry point, the HDD L_{dn} sound levels are predicted to range from 32.4 to 77.4 dBA. At the NSAs approximately 550 to 2600 feet from the HDD exit point, the HDD L_{dn} sound levels are predicted to range from 26.4 to 58.4 dBA. All of the NSAs are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point L_{dn} sound levels were summed. The summed predicted L_{dn} sound levels range from 39.5 to 77.4 dBA. The predicted L_{dn} sound levels are below 55 dBA at all of the nearest NSAs around this HDD site except S1, S2, S4, and S8 through S15.

A noise control barrier wall should be installed around the HDD entry point open on the east end, running 250 feet east to west along the north side of the designated workspace, 200 feet north to south along the west side of the designated workspace, and 250 feet east to west along the south side of the designated workspace, meeting at the northwest and southwest corners, to reduce the HDD equipment noise at S8 through S15. This noise control barrier wall must be a minimum of 20 feet tall. This barrier wall should be constructed of prefabricated metal panels in a width that allows stacking and transportation on a flatbed trailer with a minimum sound transmission class (STC) rating of 30 and a minimum noise reduction coefficient (NRC) of 0.95. These prefabricated metal panels can be provided by Standard Industrial Structures Corporation (SISCORP), United Steel Structures, Inc., Parkline, Inc. and other companies. The predicted L_{dn} sound levels with the noise control barrier wall installed are reduced to 43.4 to 59.4 dBA at S8 through S15.With this noise control barrier wall installed, the predicted HDD L_{dn} sound levels at all of these NSAs, except S11, S13 and S14 are below the FERC limit of 55 dBA. This noise control barrier wall significantly

reduced the HDD L_{dn} sound levels by about 15 to 20 dBA at S11, S13 and S14. These predicted HDD L_{dn} sound levels remain about 1.4 to 4.4 dBA above the FERC limit of 55 dBA.

A noise control barrier wall should be installed north and west of the HDD exit point, running 200 feet east to west along the north side of the designated workspace, 150 feet north to south along the west side of the designated workspace, and 50 feet east to west along the south side of the designated workspace, meeting at the northwest and southwest corners, to reduce the HDD equipment noise at S1, S2, and S4. This noise control barrier wall must be a minimum of 20 feet tall. This barrier wall should be constructed of prefabricated metal panels in a width that allows stacking and transportation on a flatbed trailer with a minimum sound transmission class (STC) rating of 30 and a minimum noise reduction coefficient (NRC) of 0.95. These prefabricated metal panels can be provided by Standard Industrial Structures Corporation (SISCORP), United Steel Structures, Inc., Parkline, Inc. and other companies. The predicted L_{dn} sound levels with this noise control barrier wall installed are reduced to 44.4 to 45.4 dBA at S1, S2, and S4. With this noise control barrier wall installed, the HDD L_{dn} sound levels at NSAs S1, S2, and S4 are predicted to be below the FERC 55 dBA sound level maximum.

Table 16 presents the sound levels at the NSAs around the proposed Swift Creek HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increases in the ambient L_{dn} sound levels due to the HDD equipment.

At the nearest NSAs, the predicted total L_{dn} sound levels range from 47.7 to 59.7 dBA. At NSAs, S11, S13, S14 and S15, where the total L_{dn} sound levels are over 55 dBA, these predicted total L_{dn} sound levels are higher than the ambient L_{dn} sound levels by 8.9 to 13.3 dBA. These increases would probably be noticeable.

2.17 TAR RIVER

The HDD entry point for the Tar River HDD site is in Nash County, North Carolina, north of the river. The HDD exit point is also in Nash County, south of the river. The land uses surrounding the site are residential, agricultural, and forested areas. The nearest NSAs to the entry point are approximately 1900 feet northwest, 2450 and 2600 feet northeast, 1900 feet south, and 2300 feet southwest. The nearest NSAs to the exit point are approximately 2300 and 2600 feet south, 1000 feet southeast, 800 feet south-southeast, and 2300 feet east-northeast. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 17.

Sound survey measurements were conducted at the NSAs on 2 August 2016. Daytime measurements were conducted between 4 PM and 5:30 PM and nighttime measurements were

conducted between 10 PM and 11:30 PM. The weather conditions during the daytime measurements were a temperature of 84 degrees F, a relative humidity of 75%, cloudy skies, and light north winds (3-6 mph). During the nighttime measurements, the weather conditions were a temperature of 76 degrees F, a relative humidity of 80%, cloudy skies, and calm winds.

Audible sources of daytime ambient sound were local traffic, far off thunder, crickets, wind blowing through trees, and Farm Hub operation at S1 through S3. During the nighttime, audible ambient sound sources were traffic on Interstate Route 95, local traffic, crickets, airplanes, cicadas, and Farm Hub operation at S1.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 42.0 to 50.7 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 40.9 to 43.5 dBA, and the calculated ambient L_{dn} sound levels ranged from 47.5 to 51.6 dBA.

At the NSAs approximately 1900 to 2300 feet from the HDD entry point, the HDD L_{dn} sound levels are predicted to range from 35.4 to 49.4 dBA. At the NSAs approximately 800 to 2600 feet from the HDD exit point, the HDD L_{dn} sound levels are predicted to range from 18.4 to 49.4 dBA. NSAs S6 and S7 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point L_{dn} sound levels were summed at these locations. The summed predicted L_{dn} sound levels at these locations range from 48.9 to 51.5 dBA. The predicted L_{dn} sound levels are below 55 dBA at all of the nearest NSAs around this HDD site.

Table 17 presents the sound levels at the NSAs around the proposed Tar River HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increases in the ambient L_{dn} sound levels due to the HDD equipment.

At the nearest NSAs, the predicted total L_{dn} sound levels range from 47.9 to 53.0 dBA. These total L_{dn} sound levels are below 55 dBA at all of the NSAs around this site.

2.18 CONTENTNEA CREEK

The HDD entry point for the Contentnea Creek HDD site is in Wilson County, North Carolina, west of the creek. The HDD exit point is also in Wilson County, east of the creek. The land uses surrounding the site are residential, agricultural, and forested areas. The nearest NSAs to the entry point are approximately 2550 feet south, 2300 feet south-southwest, and 900, 1050, 1250, 1400, and 1850 feet southwest. The nearest NSAs to the exit point are approximately 2100, 2200, 2300, and 2450 feet southwest. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 18.

Sound survey measurements were conducted at the NSAs on 23 August 2016. Daytime measurements were conducted between 11 AM and 1 PM. Neighbors would not allow the nighttime sound survey to be conducted. The weather conditions during the daytime measurements were a temperature of 89 degrees F, a relative humidity of 55%, partly cloudy skies, and light east winds (2-5 mph).

Audible sources of daytime ambient sound were cicadas, farm equipment, birds, local traffic, crickets, neighbors talking at S2, dog barking at S3, and Route 581 bridge work at S4.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 39.4 to 43.7 dBA. Daytime ambient L_{eq} sound levels were used as the nighttime ambient L_{eq} sound levels since the neighbors would not allow nighttime measurements to be taken. Additionally, due to road construction north of S4 along Route 581, ambient sound level measurements could not be taken at S5 through S7, so the ambient sound level of S4 was used at these locations. The calculated ambient L_{dn} sound levels ranged from 45.8 to 50.1 dBA.

At the NSAs approximately 1400 to 2550 feet from the HDD entry point, the HDD L_{dn} sound levels are predicted to range from 30.4 to 53.4 dBA. At the NSAs approximately 2100 to 2450 feet from the HDD exit point, the HDD L_{dn} sound levels are predicted to range from 16.4 to 20.4 dBA. NSAs S4 through S7 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point L_{dn} sound levels were summed at these locations. The summed predicted L_{dn} sound level at these locations range from 39.4 to 53.4 dBA. The predicted L_{dn} sound levels are below 55 dBA at all of the nearest NSAs around this HDD site.

Table 18 presents the sound levels at the NSAs around the proposed Contentnea Creek HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increases in the ambient L_{dn} sound levels due to the HDD equipment.

At the nearest NSAs, the predicted total L_{dn} sound levels range from 46.2 to 54.3 dBA. These total L_{dn} sound levels are below 55 dBA at all of the NSAs around this site.

2.19 LITTLE RIVER

The HDD entry point for the Little River HDD site is in Johnston County, North Carolina, east of the river. The HDD exit point is also in Johnston County, west of the river. The land uses surrounding the site are residential, agricultural, and forested areas. The nearest NSAs to the entry point are approximately 1500 feet northwest, 1600 feet north-northeast, 1600 feet northeast, 1900

feet east, 2200 feet southeast, 2100 and 2500 feet south-southwest, and 2150 and 2450 feet southwest. The nearest NSAs to the exit point are approximately 2250 feet north-northeast, 2200 feet southwest, 1200, 1700, and 2400 feet southeast, and 1100 and 1250 feet south. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 19.

Sound survey measurements were conducted at the NSAs on 23 August 2016. Daytime measurements were conducted between 1 PM and 3 PM and nighttime measurements were conducted between 10 PM and 11 PM. The weather conditions during the daytime measurements were a temperature of 88 degrees F, a relative humidity of 45% increasing to 50%, partly cloudy skies, and light east winds (2-3 mph) increasing to light northwest winds (3-4 mph). During the nighttime measurements, the weather conditions were a temperature of 74 degrees F, a relative humidity of 70% increasing to 75%, clear skies, and calm winds.

Audible sources of daytime ambient sound were cicadas, local traffic, crickets, airplane, dogs barking at S1, and S7 through S11, and wind chimes at S2. During the nighttime, audible ambient sound sources were cicadas, crickets, traffic on Interstate Route 95, dogs barking at S3 and S7 through S10, and a train at S1 through S5. Residents at S7 through S10 would not allow sound level measurements on their property so ambient sound levels were measured at a location on Old Beulah Road south of the NSAs.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 37.6 to 43.7 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 39.2 to 43.3 dBA, and the calculated ambient L_{dn} sound levels ranged from 46.0 to 49.4 dBA.

At the NSAs approximately 1500 to 2225 feet from the HDD entry point, the HDD L_{dn} sound levels are predicted to range from 32.4 to 50.4 dBA. At the NSAs approximately 2150 to 2400 feet from the HDD exit point, the HDD L_{dn} sound levels are predicted to range from 17.4 to 27.4 dBA. NSAs S1 and S7 through S10 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point L_{dn} sound levels were summed at these locations. The summed predicted L_{dn} sound levels at these locations range from 34.5 to 41.4 dBA. The predicted L_{dn} sound levels are below 55 dBA at all of the nearest NSAs around this HDD site.

Table 19 presents the sound levels at the NSAs around the proposed Little River HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increases in the ambient L_{dn} sound levels due to the HDD equipment.

At the nearest NSAs, the predicted total L_{dn} sound levels range from 46.8 to 51.8 dBA. These total L_{dn} sound levels are below 55 dBA at all of the NSAs around this site.

2.20 CAPE FEAR RIVER ALTERNATE

The HDD entry point for the Cape Fear River Alternate HDD site is in Cumberland County, North Carolina west of the river. The HDD exit point is also in Cumberland County east of the river. The land uses surrounding the site are residential and agricultural. The nearest NSAs to the entry point are approximately 1400 feet north-northwest,750 feet northwest, 650 feet west, and 1300 feet southwest. The nearest NSAs to the exit point are approximately 2150 and 2500 feet northwest, 2300 feet west, 2600 feet southwest, 2000, 2400, and 2600 feet southeast, and 1250 feet east-southeast. The HDD entry and exit points, the one-half mile radius circles around the entry and exit points, and the nearest NSAs are shown in Figure 20.

Sound survey measurements were conducted at the NSAs on 5 July 2016. Daytime measurements were conducted between 3 PM and 5:30 PM and nighttime measurements were conducted between 10 PM and 11:30 PM. The weather conditions during the daytime measurements were a temperature of 97 degrees F, a relative humidity of 55%, clear skies and southeast winds (5 to 6 mph) decreasing to light southeast winds (1 to 2 mph). During the nighttime measurements, the weather conditions were a temperature of 77 degrees F, a relative humidity of 80%, clear skies and light winds (0 to 1 mph).

Audible sources of daytime ambient sound were wind blowing through the trees, crickets, cows, airplanes, traffic on Marsh Road, cicadas, dogs barking, and a golf cart at S2. During the nighttime, audible ambient sound sources were cicadas, airplanes, traffic on Marsh Road, frogs, and fireworks at S3, S5, and S6.

At the NSAs, the measured daytime ambient L_{eq} sound levels ranged from 41.5 to 44.4 dBA, the measured nighttime ambient L_{eq} sound levels ranged from 41.1 to 42.3 dBA, and the calculated ambient L_{dn} sound levels ranged from 47.7 to 48.9 dBA.

At the NSAs approximately 650 to 1400 feet from the HDD entry point, the HDD L_{dn} sound levels are predicted to range from 39.7 to 57.0 dBA. At the NSAs approximately 1250 to 2600 feet from the HDD exit point, the HDD L_{dn} sound levels are predicted to range from 15.4 to 29.9 dBA. NSAs S1 through S4 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point L_{dn} sound levels were summed for these locations; the summed predicted L_{dn} sound levels for these locations range from 39.7 to 57.0 dBA. The predicted L_{dn} sound levels are below 55 dBA at all of the nearest NSAs around this HDD site; except at S3.

A noise control barrier wall should be installed north and west of the HDD entry point, running 100 feet east to west along the north side of the designated workspace and 100 feet north to south along the west side of the designated workspace, meeting at the northwest corner, to reduce the HDD equipment noise at S3. This noise control barrier wall must be a minimum of 20 feet tall. This barrier wall should be constructed of prefabricated metal panels in a width that allows stacking and transportation on a flatbed trailer with a minimum sound transmission class (STC) rating of 30 and a

minimum noise reduction coefficient (NRC) of 0.95. These prefabricated metal panels can be provided by Standard Industrial Structures Corporation (SISCORP), United Steel Structures, Inc., and Parkline, Inc. The predicted HDD L_{dn} sound level with the noise control barrier wall installed is reduced to 44.8 dBA at S3. With the sound barrier wall installed the HDD L_{dn} sound levels at all of the nearest NSAs are predicted to be below the FERC limit of 55 dBA.

Table 20 presents the sound levels at the NSAs around the site of the proposed Cape Fear River Alternate HDD site. Shown are:

- the ambient L_d, L_n and L_{dn} sound levels,
- the predicted L_{dn} sound levels from the HDD equipment,
- the predicted total L_{dn} sound levels resulting from summing the L_{dn} sound levels from the HDD equipment with the ambient L_{dn} sound levels, and
- the predicted increase in the ambient L_{dn} sound levels due to the HDD equipment.

At the NSAs, the predicted total L_{dn} sound levels range from 47.7 to 52.7 dBA. These total L_{dn} sound levels are below 55 dBA at all of the NSAs around this site.

3.0 SUMMARY

The predicted HDD L_{dn} sound levels at the NSAs are below the FERC limit of 55 dBA at the Interstate 79, James River Alternate, Nottaway River, Western Branch Reservoir, Nansemond River Tributary, Nansemond River, Elizabeth River, Fishing Creek, Tar River, Little River, and Contentnea Creek HDD sites without additional noise mitigation measures. Also at the Roanoke River and Route 58, there are no NSAs within one-half mile of the HDD entry and exit points.

At the Blue Ridge Parkway, Blackwater River, Lake Prince, Cape Fear River Alternate, and Interstate 64 HDD sites, the predicted HDD L_{dn} sound levels at the NSAs are below the FERC limit of 55 dBA with the installation of noise control barrier walls.

At the Route 17 HDD site, the predicted HDD L_{dn} sound levels at the NSAs are below the FERC limit of 55 dBA at all of the nearest NSAs except S4, S5, and S13 with the installation of noise control barrier walls. At S4, S5, and S13, the predicted HDD L_{dn} sound levels are 4.0 to 7.9 dBA above the FERC limit of 55 dBA with the noise control barrier walls installed. The predicted total L_{dn} sound levels (the sum of the ambient and HDD L_{dn} sound levels) at these three NSAs are about 5 dBA higher than the ambient L_{dn} sound levels and may be noticeable.

At the Swift Creek HDD site, the predicted HDD L_{dn} sound levels at the NSAs are below the FERC limit of 55 dBA at all of the nearest NSAs except S11, S13, and S14 with the installation of noise control barrier walls. At S11, S13, and S14, the predicted HDD L_{dn} sound levels are 1.4 to 4.4 dBA above the FERC limit of 55 dBA with the noise control barrier walls installed. The predicted total L_{dn} sound levels (the sum of the ambient and HDD L_{dn} sound levels) at these three NSAs and S15 where the total L_{dn} sound levels are about 9 to 13 dBA higher than the ambient L_{dn} sound levels and would probably be noticeable.

Sincerely yours,
ENVIRONMENTAL NOISE CONTROL

William E. Biker
Principal Engineer
Noise and Vibration Control

TABLE 1 Sheet 1 of 1
NOISE ANALYSIS FOR THE INTERSTATE 79 HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [3]	Noise Increase [4]
S1. Residence	1250 ft NE From Entry	46.4	42.9	50.0	52.1	54.2	4.2
S2. Residence	2050 ft SW From Entry	53.6	49.8	57.0	45.4	57.3	0.3
S3. Residence	2350 ft SW From Exit	51.9	38.2	50.8	31.0	50.9	0.1
S4. Residence	1850 ft WSW From Exit	49.1	32.9	47.6	44.0	49.2	1.6
S5. Residence	1700 ft W From Exit	49.5	44.1	51.8	34.6	51.9	0.1
S6. Residence	2200 ft NW From Exit	54.7	43.8	54.4	27.5	54.4	0.0

(1) Audible sources of daytime ambient sound were traffic on Interstate 79, local traffic, birds, airplanes, a rooster crowing at S2, an electric fence buzzing at S3, chickens clucking at S4, and cows mooing at S3, S5, and S6. During the nighttime, audible ambient sound sources were traffic on Interstate 79, water flowing in the creek, airplanes, local traffic, cow mooing at S3. dogs barking at S4 and S5, and an electric fence buzzing at S3.

(2) Predicted L_{dn} sound levels for HDD equipment with no additional noise control.

(3) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(4) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 2 Sheet 1 of 2
NOISE ANALYSIS FOR THE BLUE RIDGE PARKWAY HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [5]	Noise Increase [6]
S1. Residence	1650 ft NW From NW Entry	47.8	51.6	57.6	37.3[4]	57.7	0.1
S2. Residence	1300 ft NW From NW Entry	48.5	51.3	57.4	40.5[4]	57.5	0.1
S3. Residence	2100 ft WNW From NW Entry	47.5	52.3	58.3	34.8[4]	58.3	0.0
S4. Residence	2300 ft W From NW Entry	47.4	52.9	58.8	31.6[4]	58.8	0.0
S5. Residence	2250 ft SSW From NW Entry	44.7	48.7	54.7	31.8[4]	54.7	0.0
S6. Residence	22500 ft WSW From SE Entry	47.7	53.4	59.3	31.4[4]	59.3	0.0
S7. Residence	1800 ft SW From SE Entry	47.7	53.4	59.3	35.0[4]	59.3	0.0
S8. Residence	900 ft W From SE Entry	47.7	53.4	59.3	46.6[4]	59.6	0.3
S9. Residence	500 ft WNW From SE Entry	47.7	53.4	59.3	45.5[3]	59.5	0.2
S10. Residence	2400 ft ESE From SE Entry	47.7	53.4	59.3	30.8[4]	59.3	0.0

TABLE 2 (cont.) Sheet 2 of 2
NOISE ANALYSIS FOR THE BLUE RIDGE PARKWAY HDD SITE

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 17 September 2015, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were crickets, traffic, birds, airplanes, dogs barking, wind blowing through the trees, and a horse at S4. During the nighttime, audible ambient sound sources were crickets, traffic, peepers, airplanes, and owls.
The residents around the exit point in Nelson County would not allow the sound survey measurement team around their properties. Because of this, the daytime and nighttime ambient sound levels were measured at the Security Headquarters for Wintergreen and these ambient sound levels have been used at NSAs S6 through S10.

(2) Predicted L_{dn} sound levels for HDD equipment.

(3) HDD L_{dn} sound levels with noise mitigation installed.

(4) No noise mitigation required for noise compliance.

(5) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(6) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 3 Sheet 1 of 1
NOISE ANALYSIS FOR THE JAMES RIVER ALTERNATE HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing (1) $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} (2)	Total L_{dn} (3)	Noise Increase (4)
S1. Residence	2100 ft WNW From entry 1000 ft ENE From exit	45.8	52.2	58.1	33.1	58.1	0.0
S2. Residence	1000 ft NNE From exit	41.5	51.2	57.0	28.0	57.0	0.0
S3. Residence	2000 ft NNW From exit	39.1	48.5	54.3	19.0	54.3	0.0

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 16 September 2015, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were crickets, water flowing in the James River, wind blowing in the trees, birds, airplanes, and leaves falling from the trees. During the nighttime, audible ambient sound sources were crickets, peepers, and water flowing in the James River.

(2) Predicted L_{dn} sound levels for HDD equipment with no additional noise control. NSA S1 is within half a mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point L_{dn} sound levels were summed for this location.

(3) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(4) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 4 Sheet 1 of 2
NOISE ANALYSIS FOR THE NOTTAWAY RIVER HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	Existing [1] $L_{eq}(n)$	Existing [1] L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [3]	Noise Increase [4]
S1. Residence	2000 ft SE From Entry 2400 ft S From exit	42.8	38.2	45.6	33.6	45.9	0.3
S2. Residence	2500 ft SSE From entry 2400 ft SSE From exit	43.5	43.4	49.8	30.4	49.9	0.1
S3. Residence	2300 ft SSE From exit	54.9	42.8	54.2	18.9	54.2	0.0
S4. Residence	2600 ft E From entry 1750 ft SE From exit	45.7	43.6	50.4	30.3	50.4	0.0
S5. Residence	2200 ft ENE From entry 800 ft ESE From exit	45.4	43.5	50.2	41.1	50.7	0.5
S6. Residence	2600 ft ENE From entry 1100 ft E From exit	44.5	42.0	48.9	36.8	49.1	0.2
S7. Residence	1250 ft ENE From exit	45.0	44.2	50.7	41.7	51.2	0.5
S8. Residence	1500 ft NE From exit	44.1	46.5	52.6	38.7	52.8	0.2
S9. Residence	2350 ft NNE From exit	45.1	47.0	53.2	25.8	53.2	0.0
S10. Residence	2000 ft NNE From entry 950 ft NNW From exit	47.7	47.3	53.8	39.4	53.9	0.1

TABLE 4 (cont.) Sheet 2 of 2
NOISE ANALYSIS FOR THE NOTTAWAY RIVER HDD SITE

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 6 October 2015, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were wind blowing through the trees, birds, local traffic, crickets, the Enviva factory and a dog barking at S5. During the nighttime, audible ambient sound sources were peepers, train, local traffic, the Enviva factory and water flowing at S5 and S6.

(2) Predicted L_{dn} sound levels for HDD equipment with no additional noise control. NSAs S1, S2, S4 through S6, and S10 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed for these locations.

(3) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(4) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 5 Sheet 1 of 2
NOISE ANALYSIS FOR THE BLACKWATER RIVER HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [5]	Noise Increase [6]
S1. Residence	2300 ft NNW From entry	42.6	46.1	52.2	31.5 [4]	52.2	0.0
S2. Residence	2100 ft NNW From entry	44.2	52.4	58.2	25.8 [3]	58.3	0.1
S3. Residence	1700 ft NW From entry	46.7	49.1	55.2	29.5 [3]	55.2	0.0
S4. Residence	1400 ft NW From entry	43.9	46.2	52.3	38.6 [3]	52.5	0.2
S5. Residence	600 ft NW From entry 2400 ft W From exit	46.9	45.7	52.3	46.2 [3]	53.3	1.0
S6. Residence	1100 ft W From entry	43.9	49.1	55.1	37.3 [3]	55.1	0.0
S7. Residence	1600 ft WSW From entry	42.0	44.3	50.4	44.8 [4]	51.5	1.1
S8. Residence	2000 ft WSW From entry	42.1	44.9	51.0	35.5 [4]	51.1	0.1
S9. Residence	1600 ft SW From entry	44.9	46.3	52.5	47.1 [4]	53.6	1.1
S10. Residence	1600 ft SSW From entry	43.5	46.1	52.2	47.1 [4]	53.4	1.2
S11. Residence	2000 ft SSE From entry 2600 ft SSW From exit	49.9	45.7	53.0	35.6 [4]	53.1	0.1
S12. Residence	1600 ft SSE From entry 2100 ft SSW From exit	47.6	45.8	52.5	39.3 [4]	52.7	0.2

TABLE 5 (cont.) Sheet 2 of 2
NOISE ANALYSIS FOR THE BLACKWATER RIVER HDD SITE

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 7 October 2015, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were local traffic, birds, crickets, dogs barking, hammering at S5, mowing at S1, International Paper mill at S1 and S4 through S12, and power washer at S2 and S3. During the nighttime, audible ambient sound sources were traffic, peepers, International Paper mill, and dogs barking at S6, S11, and S12.

(2) Predicted L_{dn} sound levels for HDD equipment. NSAs S5, S11, and S12 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point L_{dn} sound levels were summed for these locations.

(3) HDD L_{dn} sound levels with noise mitigation installed.

(4) No noise mitigation required for noise compliance.

(5) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(6) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 6 Sheet 1 of 3
NOISE ANALYSIS FOR THE LAKE PRINCE HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,

Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [5]	Noise Increase [6]
S1. Residence	800 ft NE From entry 1350 ft W From exit	45.8	48.8	54.9	47.1 [4]	55.6	0.7
S2. Residence	625 ft N From entry 1750 ft W From exit	43.0	42.2	48.7	43.7 [3]	49.9	1.2
S3. Residence	475 ft NW From entry 2150 ft W From exit	38.4	43.0	49.0	50.3 [3]	52.7	3.7
S4. Residence	500 ft WNW From entry 2350 ft WSW From exit	38.9	41.7	47.8	49.8 [3]	51.9	4.1
S5. Residence	800 ft W From entry	43.6	45.7	51.9	50.3 [3]	54.2	2.3
S6. Residence	400 ft ESE From entry 1700 ft WSW From exit	39.6	44.3	50.3	52.1 [3]	54.3	4.0
S7. Residence	1500 ft SSE From entry 2500 ft SW From exit	41.9	42.6	48.9	38.5 [4]	49.3	0.4

TABLE 6 (cont.) Sheet 2 of 3

NOISE ANALYSIS FOR THE LAKE PRINCE HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,

Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [5]	Noise Increase [6]
S8. Residence	1450 ft SE From entry 2100 ft SSW From exit	37.8	45.6	51.5	39.1 [4]	51.7	0.2
S9. Residence	1100 ft E From entry 1100 ft SW From exit	36.1	46.8	52.6	46.3 [4]	53.5	0.9
S10. Residence	1150 ft SE From exit	47.3	44.1	51.1	50.1 [4]	53.7	2.6
S11. Residence	2500 ft ENE From entry 625 ft E From exit	41.6	41.4	47.8	51.9 [4]	53.4	5.6
S12. Residence	1600 ft NE From entry 500 ft WNW From exit	43.5	50.1	56.0	54.5 [4]	58.3	2.3
S13. Residence	2600 ft NE From entry 800 ft NNE From Exit	41.9	42.7	49.0	49.0 [4]	52.0	3.0
S14. Residence	2400 ft NNW From exit	45.7	49.3	55.3	21.1 [4]	55.3	0.0

TABLE 6 (cont.) Sheet 3 of 3
NOISE ANALYSIS FOR THE LAKE PRINCE HDD SITE

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 8 October 2015, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were birds, local traffic, airplanes, and dogs barking at S1, S3, S5, S6, and S12, helicopter at S2 and S9, and mowing at S10 through S12. During the nighttime, audible ambient sound sources were peepers, local traffic, airplanes, dogs barking at S1 through S4 and S9, and a helicopter at S8.

(2) Predicted L_{dn} sound levels for HDD equipment. NSAs S1 through S4, S6 through S9, and S11 through S13 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed for these locations.

(3) HDD L_{dn} sound levels with noise mitigation installed.

(4) No noise mitigation required for noise compliance.

(5) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(6) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 7 Sheet 1 of 2
NOISE ANALYSIS FOR THE WESTERN BRANCH RESERVOIR HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	Existing [1] $L_{eq}(n)$	Existing [1] L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [3]	Noise Increase [4]
S1. Residence	1800 ft NNW From entry	44.7	49.9	55.9	31.7	55.9	0.0
S2. Residence	2400 ft NW From entry	44.4	49.0	55.0	32.7	55.0	0.0
S3. Residence	2100 ft W From entry	42.5	42.2	48.7	50.8	52.9	4.2
S4. Residence	2400 ft WSW From entry	43.9	47.2	53.3	48.8	54.6	1.3
S5. Residence	2200 ft SW From entry	43.1	49.1	55.0	27.5	55.0	0.0
S6. Residence	2200 ft SSE From entry 1200 ft SSW From exit	51.1	50.6	57.1	38.8	57.1	0.0
S7. Residence	2300 ft SSE from entry 1100 ft S From exit	50.2	50.0	56.4	38.1	56.5	0.1
S8. Residence	2200 ft ENE From entry 1800 ft NNE From exit	46.1	50.5	56.5	34.4	56.5	0.0

TABLE 7 (cont.) Sheet 2 of 2

NOISE ANALYSIS FOR THE WESTERN BRANCH RESERVOIR HDD SITE

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 9 October 2015, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were birds, wind blowing through the trees, local traffic, crickets, airplanes, gun shots at S6 and S7, mowing at S7, and hammering at S5. During the nighttime, audible ambient sound sources were peepers, local traffic, and airplanes.

(2) Predicted L_{dn} sound levels for HDD equipment with no additional noise control. NSAs S6 through S8 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the L_{dn} predicted entry and exit point sound levels were summed for these locations.

(3) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(4) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 8 Sheet 1 of 1

NOISE ANALYSIS FOR THE NANSEMOND RIVER TRIBUTARY HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [3]	Noise Increase [4]
S1. Residence	1600 ft NNE From entry	48.2	44.7	51.8	36.9	52.0	0.2
S2. Residence	2000 ft N From entry	43.6	43.2	49.7	38.4	50.0	0.3
S3. Residence	500 ft E From exit	50.7	49.2	55.9	51.8	57.3	1.4
S4. Residence	1450 ft W From exit	55.4	51.2	58.5	41.7	58.6	0.1
S5. Church	1400 ft SW From exit	54.0	48.9	56.5	42.3	56.7	0.2
S6. Residence	1400 ft SE From exit	46.7	49.6	55.7	39.4	55.8	0.1
S7. Residence	1000 ft ESE From exit	46.8	49.4	55.5	36.8	55.6	0.1

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 9 October 2015, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were wind blowing through the trees, airplanes, local traffic, crickets, and a chain saw at S2. During the nighttime, audible ambient sound sources were peepers, local traffic, wind blowing through the trees, birds, and a train at S9.

(2) Predicted L_{dn} sound levels for HDD equipment with no additional noise control.

(3) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(4) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 9 Sheet 1 of 1

NOISE ANALYSIS FOR THE NANSEMOND RIVER HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [3]	Noise Increase [4]
S1. Residence	1300 ft NNE From entry	48.2	44.7	51.8	47.2	53.1	1.3
S2. Residence	2000 ft NW From entry	43.6	43.2	49.7	38.4	50.0	0.3
S3. Residence	2500 ft E From exit	44.6	48.2	54.2	34.0	54.3	0.1

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 9 October 2015, and calculated ambient L_{dn} sound levels Audible sources of daytime ambient sound were wind blowing through the trees, airplanes, local traffic, crickets, a chain saw at S2, and a 4-wheeler at S3. During the nighttime, audible ambient sound sources were peepers and local traffic.

(2) Predicted L_{dn} sound levels for HDD equipment with no additional noise control.

(3) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(4) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 11 Sheet 1 of 4
NOISE ANALYSIS FOR THE INTERSTATE 64 HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn}[2]	Total L_{dn}[5]	Noise Increase[6]
S1. Residence	1800 ft W From entry 225 ft ENE From exit	58.1	54.3	61.5	52.9 [3]	62.1	0.6
S2. Residence	1800 ft W From entry 325 ft NE From exit	58.1	53.1	60.7	50.0 [3]	61.0	0.3
S3. Residence	1800 ft W From entry 525 ft NNE From exit	59.8	55.5	62.8	46.7 [3]	63.0	0.2
S4. Residence	2000 ft WNW From entry 800 ft N From exit	59.9	56.1	63.3	44.0 [3]	63.4	0.1
S5. Residence	1600 ft NW From entry	52.8	54.0	60.3	31.4 [3]	60.3	0.0
S6. Residence	2600 ft WSW From entry 650 ft WSW From exit	53.2	54.1	60.4	44.9 [3]	60.5	0.1
S7. Residence	2300 ft WSW From entry 350 ft SSW From exit	52.9	55.4	61.5	48.9 [3]	61.8	0.3
S8. Residence	2000 ft WSW From entry 250 ft SSE From exit	55.1	50.5	57.9	51.9 [3]	58.9	1.0

TABLE 11 (cont.) Sheet 2 of 4
NOISE ANALYSIS FOR THE INTERSTATE 64 HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	Existing [1] $L_{eq}(n)$	Existing [1] L_{dn}	Predicted HDD L_{dn}[2]	Total L_{dn}[5]	Noise Increase[6]
S9. Residence	1700 ft WSW From entry 475 ft SE From exit	58.2	51.5	59.7	48.5 [3]	60.1	0.4
S10. Residence	1300 ft WSW From entry 900 ft ESE From exit	54.0	52.6	59.2	47.1 [3]	59.5	0.3
S11. Residence	1000 ft WSW From entry 1100 ft E From exit	63.0	53.8	63.3	49.7 [3]	63.5	0.2
S12. Residence	650 ft WSW From entry 1400 ft E From exit	62.4	54.1	63.1	48.1 [3]	63.3	0.2
S13. Residence	550 ft SW From entry 1600 ft E From exit	60.8	53.7	62.1	49.1 [3]	62.3	0.2
S14. Residence	650 ft S From entry 2000 ft ESE From exit	65.3	58.4	66.7	54.2 [3]	67.0	0.3
S15. Residence	950 ft SSE From entry 2500 ft ESE From exit	61.4	54.9	63.1	42.1 [3]	63.1	0.0

TABLE 11 (cont.) Sheet 3 of 4
NOISE ANALYSIS FOR THE INTERSTATE 64 HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn}[2]	Total L_{dn}[5]	Noise Increase[6]
S16. Residence	1900 ft SE From entry	60.8	54.1	62.3	34.2 [4]	62.4	0.1
S17. Residence	1800 ft ESE From entry	51.4	47.3	54.6	35.0 [4]	54.6	0.0
S18. Residence	1900 ft E From entry	50.5	50.3	56.8	34.7 [4]	56.8	0.0
S19. Residence	1800 ft NE From entry	59.7	50.1	59.9	45.7 [4]	60.0	0.1
S20. Residence	1100 ft W From entry 1000 ft ENE From exit	58.0	56.8	63.4	41.3 [3]	63.4	0.0

TABLE 11 (cont.) Sheet 4 of 4
NOISE ANALYSIS FOR THE INTERSTATE 64 HDD SITE

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 22 September 2015, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were traffic on Interstate 64, birds, airplanes, wind blowing through the trees, geese honking at S5, traffic on Route 17 at S17, traffic on Galberry Road at S7 through S11, and power line buzz at S1, S2, S10, S12, and S15. During the nighttime, audible ambient sound sources were traffic on Interstate 64, peepers, airplanes, birds wind blowing through the trees, and power line buzz at S12, S13, and S15.

(2) Predicted L_{dn} sound levels for HDD equipment. NSAs S1 through S4, S7 through S15, and S20 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed for these locations.

(3) HDD L_{dn} sound levels with noise mitigation installed.

(4) No noise mitigation required for noise compliance.

(5) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(6) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 12 Sheet 1 of 3
NOISE ANALYSIS FOR THE ROUTE 17 HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn}[2]	Total L_{dn}[5]	Noise Increase[6]
S1. Residence	1400 ft NNE From entry	49.4	44.9	52.3	45.8 [4]	53.2	0.9
S2. Residence	1500 ft NW From entry	54.0	46.7	55.2	40.3 [4]	55.4	0.2
S3. Residence	800 ft WSW From entry	50.2	47.5	54.4	52.1 [3]	56.4	2.0
S4. Residence	375 ft SW From entry	53.0	48.7	56.0	59.0 [3]	60.8	4.8
S5. Residence	225 ft SSE From entry	57.5	52.2	59.9	62.9 [3]	64.7	4.8
S6. Residence	800 ft SE From entry 2500 ft WSW From exit	58.9	53.1	61.0	52.1 [3]	61.5	0.5
S7. Residence	1100 ft SE From entry 2200 ft SW From exit	55.5	50.2	57.9	48.6 [3]	58.4	0.5
S8. Residence	1600 ft ESE From entry 1800 ft SW From exit	53.7	46.7	55.1	44.4 [3]	55.4	0.3
S9. Residence	1900 ft ESE From entry 1600 ft SW From exit	51.4	47.0	54.4	42.5 [3]	54.7	0.3

TABLE 12 (cont.) Sheet 2 of 3
NOISE ANALYSIS FOR THE ROUTE 17 HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn}[2]	Total L_{dn}[5]	Noise Increase[6]
S10. Residence	2100 ft ESE From entry 1300 ft SW From exit	50.8	48.3	55.2	41.7 [3]	55.4	0.2
S11. Residence	2600 ft SSE From entry 1150 ft SSW From exit	51.1	50.8	57.3	33.9 [3]	57.3	0.0
S12. Residence	2600 ft E From entry 600 ft SSW From exit	48.0	46.1	52.8	43.7 [3]	53.3	0.5
S13. Residence	80 ft S From exit	50.4	49.4	56.0	59.5[3]	61.1	5.1
S14. Residence	400 ft E From exit	51.4	50.1	56.7	45.9 [3]	57.1	0.4
S15. Residence	400 ft NNW From exit	50.1	48.8	55.4	45.9 [3]	55.9	0.5
S16. Residence	325 ft N From exit	49.9	48.4	55.1	47.8 [3]	55.8	0.7
S17. Residence	525 ft NE From exit	48.4	48.2	54.6	43.6 [3]	55.0	0.4
S18. Residence	2300 ft NE From entry 1500 ft NW From exit	49.8	43.8	51.8	40.5 [3]	52.1	0.3

TABLE 12 (cont.) Sheet 3 of 3
NOISE ANALYSIS FOR THE ROUTE 17 HDD SITE

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 23 September 2015, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were traffic on Interstate 64, traffic on Route 17, wind blowing through the trees, airplanes, train yard noise at S6 and S7, factory noise at S15 and S16. During the nighttime, audible ambient sound sources were peepers, wind blowing through the trees, airplane, traffic on Route 17, traffic on Interstate 64, and factory noise at S12 through S17.

(2) Predicted L_{dn} sound levels for HDD equipment. NSAs S6 though 12, and S18 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed for these locations.

(3) HDD L_{dn} sound levels with noise mitigation installed.

(4) No noise mitigation required for noise compliance.

(5) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(6) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 13 Sheet 1 of 1
NOISE ANALYSIS FOR THE ELIZABETH RIVER HDD SITE

Ambient Sound Levels, Predicted Sound Level from the HDD Equipment,
Predicted Total Sound Level, and Noise Increase

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn}[2]	Total L_{dn} [3]	Noise Increase[4]
S1. Residence	2300 ft SSE From entry	54.4	47.1	55.6	52.6	57.4	1.8

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 23 September 2015, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were local traffic, peepers, and wind blowing through the trees. During the nighttime, audible ambient sound sources were local traffic, wind blowing through the trees, peepers, and traffic on Interstate 13.

(2) Predicted L_{dn} sound levels for HDD equipment with no additional noise control.

(3) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(4) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 15 Sheet 1 of 1
NOISE ANALYSIS FOR THE FISHING CREEK HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	Existing [1] $L_{eq}(n)$	Existing [1] L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [3]	Noise Increase [4]
S1. Residence	1500 ft WSW From Entry	40.2	43.8	49.8	40.4	50.3	0.5
S2. Residence	1250 ft WSW From Entry	38.6	44.0	49.9	47.4	51.9	2.0
S3. Residence	1600 ft SW From Entry	38.7	46.8	52.7	54.4	56.6	3.9
S4. Residence	2500 ft S From Entry	42.0	49.1	55.0	48.4	55.8	0.8
S5. Residence	2650 ft SW From Entry	43.3	44.7	50.9	37.4	51.1	0.2

(1) Ambient daytime and nighttime L_{eq} sound levels measured on 2 August 2016, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were traffic on Interstate Route 95, local traffic, birds, far off thunder, airplanes, and a water pump at S3. During the nighttime, audible ambient sound sources were traffic on Interstate Route 95, cicadas, and crickets.

(2) Predicted L_{dn} sound levels for HDD equipment with no additional noise control.

(3) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(4) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 16 Sheet 1 of 3
NOISE ANALYSIS FOR THE SWIFT CREEK HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	Existing [1] $L_{eq}(n)$	Existing [1] L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [5]	Noise Increase [6]
S1. Residence	1200 ft ENE From Entry 550 ft SW From Exit	41.0	40.6	47.1	47.5[3]	50.3	3.2
S2. Residence	1150 ft ENE From Entry 575 ft W From Exit	37.5	40.1	46.2	47.4[3]	49.9	3.6
S3. Residence	1200 ft NE From Entry 1050 ft W From Exit	39.5	39.5	45.9	45.4[3]	48.7	2.8
S4. Residence	1650 ft NE From Entry 550 ft NW From Exit	43.1	41.5	48.2	46.6[3]	50.5	2.3
S5. Residence	2350 ft NE From Entry 900 ft NNE From Exit	41.5	39.8	46.5	52.5[4]	53.5	7.0
S6. Residence	1650 ft N From Entry 1600 ft NW From Exit	46.6	41.4	49.0	39.5[4]	49.5	0.5
S7. Residence	2250 ft N From Entry 1950 ft NW From Exit	41.7	39.9	46.6	41.0[4]	47.7	1.1
S8. Residence	1600 ft SE From Entry 2200 ft SW From Exit	40.0	40.4	46.8	46.5[3]	49.6	3.0

TABLE 16 (cont.) Sheet 2 of 3
NOISE ANALYSIS FOR THE SWIFT CREEK HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	Existing [1] $L_{eq}(n)$	Existing [1] L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [5]	Noise Increase [6]
S9. Residence	1150 ft SE From Entry 1800 ft SSW From Exit	42.1	39.9	46.7	43.7[3]	48.5	1.7
S10. Residence	1250 ft S From Entry 2600 ft SW From Exit	42.1	39.9	46.7	49.8[3]	51.5	4.8
S11. Residence	500 ft SE From Entry 1600 ft SW From Exit	42.1	39.9	46.7	59.4[3]	59.7	13.0
S12. Residence	950 ft SSW From Entry 2450 ft SW From Exit	42.1	39.9	46.7	52.4[3]	53.5	6.8
S13. Residence	650 ft W From Entry 2100 ft SW From Exit	40.6	39.8	46.3	56.4[3]	56.8	10.1
S14. Residence	500 ft NW From Entry 1800 ft WSW From Exit	40.6	39.8	46.3	59.4[3]	59.6	13.3
S15. Residence	750 ft W From Entry 2250 ft WSW From Exit	40.6	39.8	46.3	54.6[3]	55.2	8.9

TABLE 16 (cont.) Sheet 3 of 3
NOISE ANALYSIS FOR THE SWIFT CREEK HDD SITE

(2) Ambient daytime and nighttime L_{eq} sound levels measured on 3 August 2016, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were local traffic, birds, cicadas, airplanes, crickets, water running in creek at S2, and neighbors working in yard at S2 and S3. During the nighttime, audible ambient sound sources were local traffic, cicadas, peepers, crickets and dogs barking at S1, S2, S8 and S9. The residents around the entry point would not allow the sound survey measurement team around their properties. Because of this, daytime and nighttime ambient sound levels were measured at two locations along N. Browntown Road and these ambient sound levels have been used for the seven NSAs around the entry point. For NSAs S9 through S12, the ambient sound levels were measured along the road south of the entry point. For NSAs S13 through S15, the ambient sound levels were measured along the road west of the west point.

(3) Predicted L_{dn} sound levels for HDD equipment with no additional noise control. All NSAs are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed.

(4) HDD L_{dn} sound levels with noise mitigation installed.

(5) No noise mitigation required for noise compliance.

(5) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(6) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 17 Sheet 1 of 2

NOISE ANALYSIS FOR THE TAR RIVER HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [3]	Noise Increase [4]
S1. Residence	1900 ft NW From Entry	44.0	43.5	50.0	35.4	50.1	0.1
S2. Residence	2450 ft NE From Entry	44.6	41.3	48.4	49.4	51.9	3.6
S3. Residence	2600 ft NE From Entry	45.8	41.6	48.9	41.4	49.6	0.7
S4. Residence	2600 ft S From Exit	46.1	41.2	48.7	20.4	48.8	0.0
S5. Residence	2300 ft S From Exit	43.8	40.9	47.9	27.4	47.9	0.0
S6. Residence	1900 ft S From Entry 1000 ft SE From Exit	43.3	42.0	48.6	48.9	51.8	3.2
S7. Residence	2300 ft SW From Entry 800 ft SSE From Exit	42.0	40.9	47.5	51.5	53.0	5.5
S8. Residence	2300 ft ENE From Exit	50.7	42.7	51.6	18.4	51.6	0.1

TABLE 17 (cont.) Sheet 2 of 2
NOISE ANALYSIS FOR THE TAR RIVER HDD SITE

(6) Ambient daytime and nighttime L_{eq} sound levels measured on 2 August 2016, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were local traffic, far off thunder, crickets, wind blowing through trees, and Farm Hub at S1 through S3. During the nighttime, audible ambient sound sources were traffic on Interstate Route 95, local traffic, crickets, airplanes, cicadas, and Farm Hub at S1.

(7) Predicted L_{dn} sound levels for HDD equipment with no additional noise control. NSAs S6 and S7 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point L_{dn} sound levels were summed for these locations.

(8) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(9) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 18 Sheet 1 of 2

NOISE ANALYSIS FOR THE CONTENTNEA CREEK HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [3]	Noise Increase [4]
S1. Residence	2550 ft S From Entry	40.4	40.4	46.8	30.4	46.9	0.1
S2. Residence	2300 ft SSW From Entry	43.7	43.7	50.1	32.4	50.2	0.1
S3. Residence	1850 ft SW From Entry	39.4	39.4	45.8	35.4	46.2	0.4
S4. Residence	1400 ft SW From Entry 2450 ft SW From Exit	40.4	40.4	46.8	39.4	47.5	0.7
S5. Residence	1250 ft SW From Entry 2300 ft SW From Exit	40.4	40.4	46.8	40.4	47.7	0.9
S6. Residence	1050 ft SW From Entry 2200 ft SW From Exit	40.4	40.4	46.8	45.4	49.2	2.4
S7. Residence	900 ft SW From Entry 2100 ft SW From Exit	40.4	40.4	46.8	53.4	54.3	7.5

TABLE 18 (cont.) Sheet 2 of 2

NOISE ANALYSIS FOR THE CONTENTNEA CREEK HDD SITE

(2) Ambient daytime L_{eq} sound levels measured on 23 August 2016. Neighbors would not allow a nighttime survey to be conducted so daytime sound levels were used to represent nighttime sound levels and calculated ambient L_{dn} sound levels. Additionally, due to road construction north of S4 along Route 581, ambient sound level measurements could not be taken at S5 through S7, so the ambient sound level of S4 was used at these locations. Audible sources of daytime ambient sound were cicadas, farm equipment, birds, local traffic, crickets, dog barking at S3, and Route 581 bridge work at S4.

(2) Predicted L_{dn} sound levels for HDD equipment with no additional noise control. NSAs S4 through S7 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point sound levels were summed for these locations.

(3) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(4) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 19 Sheet 1 of 2
NOISE ANALYSIS FOR THE LITTLE RIVER HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [3]	Noise Increase [4]
S1. Residence	1500 ft NW From Entry 2250 ft NNE From Exit	37.6	41.4	47.4	41.4	48.4	1.0
S2. Residence	1600 ft NNE From Entry	42.4	41.0	47.6	37.4	48.0	0.4
S3. Residence	1600 ft NE From Entry	40.5	39.4	46.0	46.4	49.2	3.2
S4. Residence	1900 ft E From Entry	42.5	39.2	46.3	50.4	51.8	5.6
S5. Residence	2200 ft SE From Entry	40.5	40.2	46.7	32.4	46.8	0.2
S6. Residence	2400 ft SE From Exit	40.8	40.7	47.1	22.4	47.1	0.0
S7. Residence	2500 ft SSW From Entry 1700 ft SE From Exit	43.7	39.4	46.7	34.9	47.0	0.3
S8. Residence	2100 ft SSW From Entry 1200 ft SE From Exit	43.7	39.4	46.7	36.5	47.1	0.4
S9. Residence	2150 ft SSW From Entry 1100 ft S From Exit	43.7	39.4	46.7	36.5	47.1	0.4
S10. Residence	2450 ft SW From Entry 1250 ft S From Exit	43.7	39.4	46.7	34.5	47.0	0.3
S11. Residence	2200 ft SW From Exit	40.6	43.3	49.4	25.4	49.4	0.0

TABLE 19 (cont.) Sheet 2 of 2

NOISE ANALYSIS FOR THE LITTLE RIVER HDD SITE

(5) Ambient daytime and nighttime L_{eq} sound levels measured on 23 August 2016, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were cicadas, local traffic, crickets, airplane, dog barking at S1, and S7 through S11, and wind chimes at S2. During the nighttime, audible ambient sound sources were cicadas, crickets, traffic on Interstate Route 95, dog barking at S3 and S7 through S10, and train at S1 through S5. Residents at S7 through S10 would not allow sound level measurements on their property so ambient sound levels were measured at a location on Old Beulah Road south of the NSAs.

(6) Predicted L_{dn} sound levels for HDD equipment with no additional noise control. NSAs S1 and S7 through S10 are within one-half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point L_{dn} sound levels were summed for these locations.

(3) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

(4) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

TABLE 20 Sheet 1 of 2
NOISE ANALYSIS FOR THE CAPE FEAR RIVER ALTERNATE HDD SITE

Ambient Sound Levels, Predicted Sound Levels from the HDD Equipment,
Predicted Total Sound Levels, and Noise Increases

A-Weighted Sound Levels in dBA re 20 microPa

Location/ Description	Distance/ Direction	Existing [1] $L_{eq}(d)$	$L_{eq}(n)$	L_{dn}	Predicted HDD L_{dn} [2]	Total L_{dn} [5]	Noise Increase [6]
S1. Residence	1400 ft NNW From entry 2500 ft NW From exit	42.5	41.5	48.1	39.7 [4]	48.7	0.6
S2. Residence	750 ft NW From entry 2150 ft NW From exit	42.7	41.5	48.1	50.8 [4]	52.7	4.6
S3. Residence	650 ft W From entry 2300 ft W From exit	43.5	42.3	48.9	44.8 [3]	50.3	1.4
S4. Residence	1300 ft SW From entry 2600 ft SW From exit	42.1	42.2	48.6	43.2 [4]	49.7	1.1
S5. Residence	2400 ft SE From exit	41.5	41.2	47.7	16.5 [4]	47.7	0.0
S6. Residence	2600 ft SE From exit	43.6	41.2	48.0	15.4 [4]	48.0	0.0
S7. Residence	2000 ft SE From exit	42.1	41.1	47.7	20.1 [4]	47.7	0.0
S8. Residence	1250 ft ESE From exit	44.4	41.4	48.4	29.9 [4]	48.4	0.0

TABLE 20 (cont.) Sheet 2 of 2

(10) Ambient daytime and nighttime L_{eq} sound levels measured on 5 July 2016, and calculated ambient L_{dn} sound levels. Audible sources of daytime ambient sound were wind blowing through the trees, crickets, cows, airplanes, traffic on Marsh Road, cicadas, dogs barking, and a golf cart at S2. During the nighttime, audible ambient sound sources were cicadas, airplanes, traffic on Marsh Road, frogs, and fireworks at S3, S5, and S6.

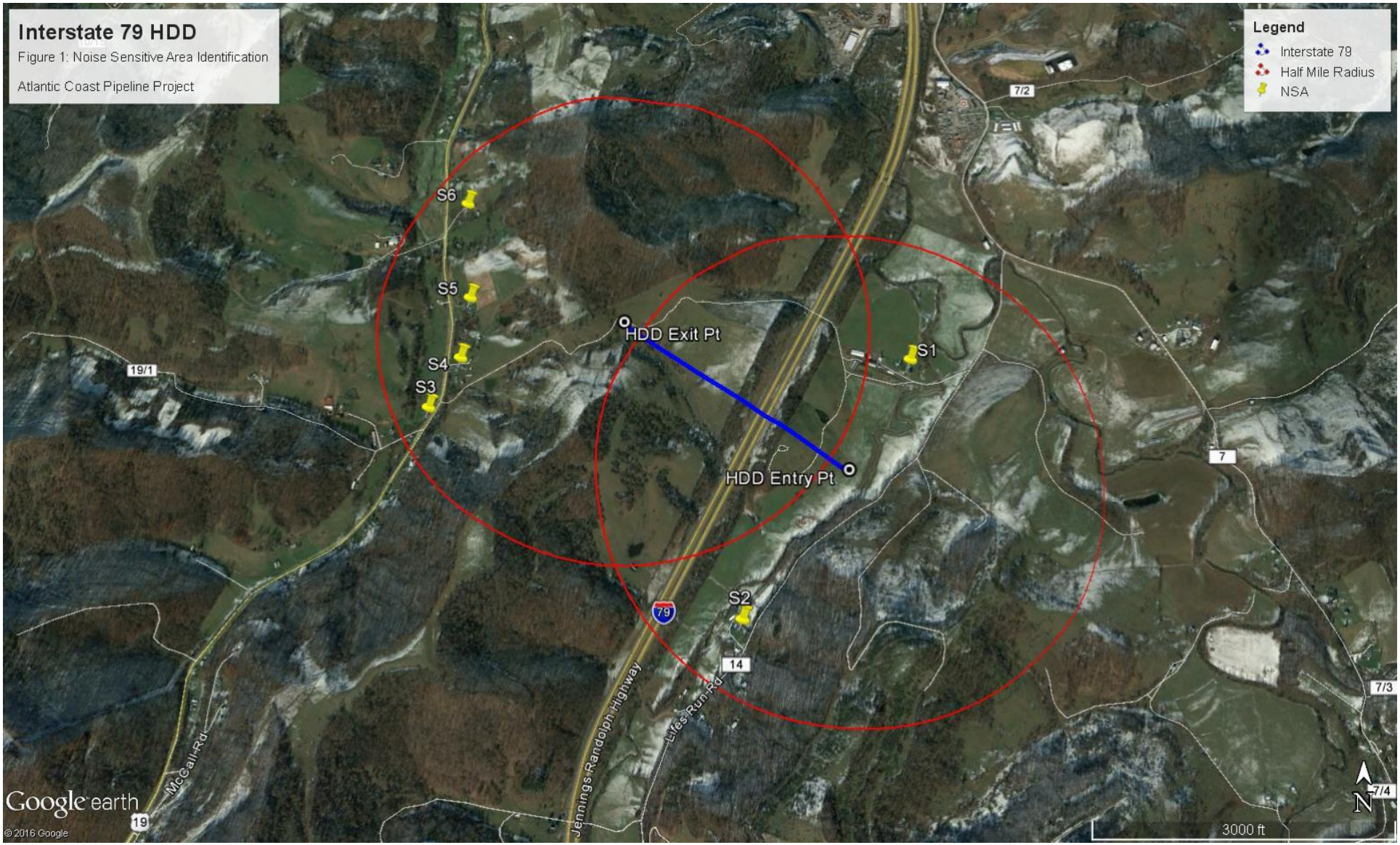
(11) Predicted L_{dn} sound levels for HDD equipment. NSAs S1 through S4 are within a half mile of both the entry and exit points. For a worst case scenario with equipment operating at both the entry and exit points at the same time, the predicted entry and exit point L_{dn} sound levels were summed for these locations.

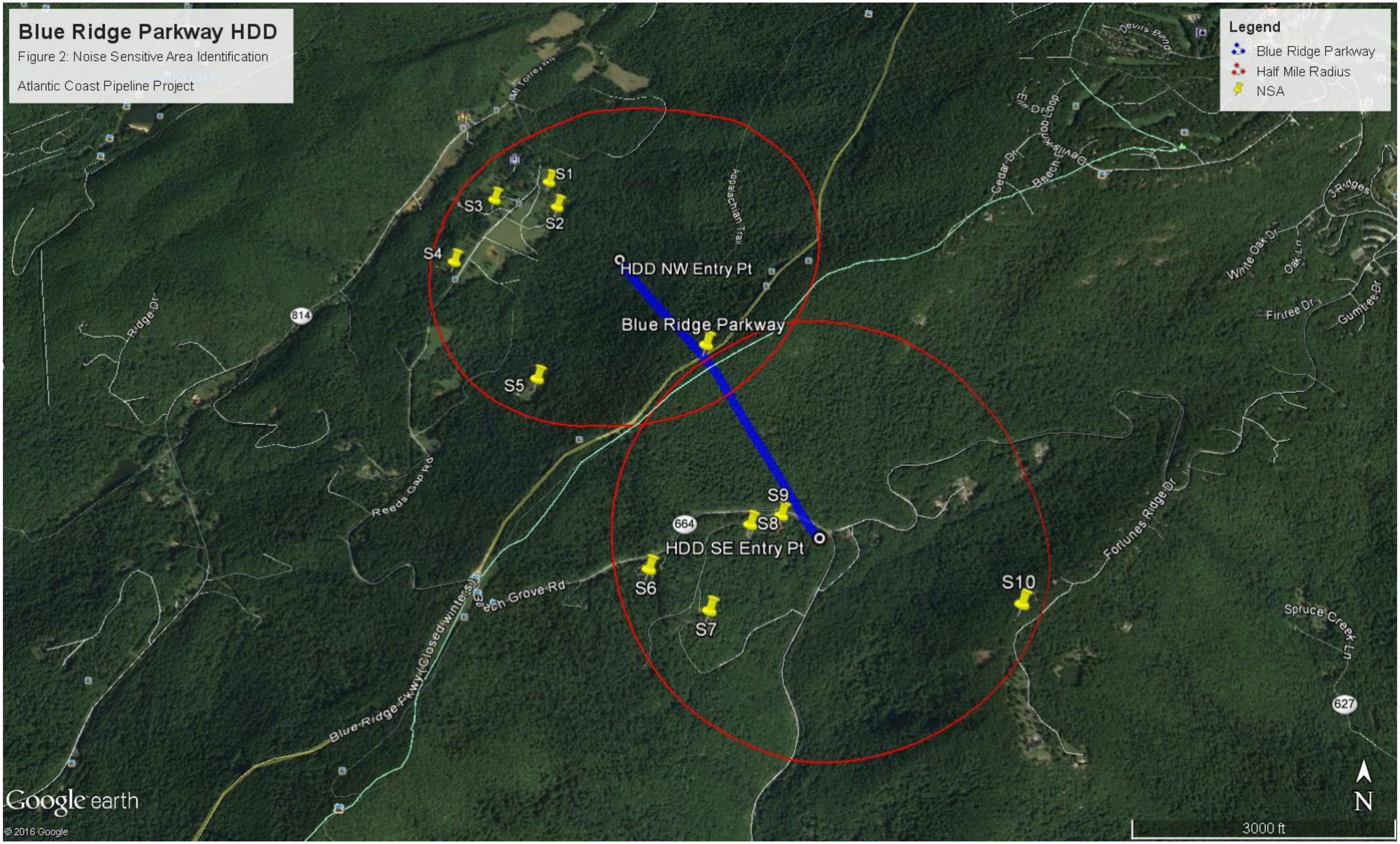
(12) HDD L_{dn} sound levels with noise mitigation installed.

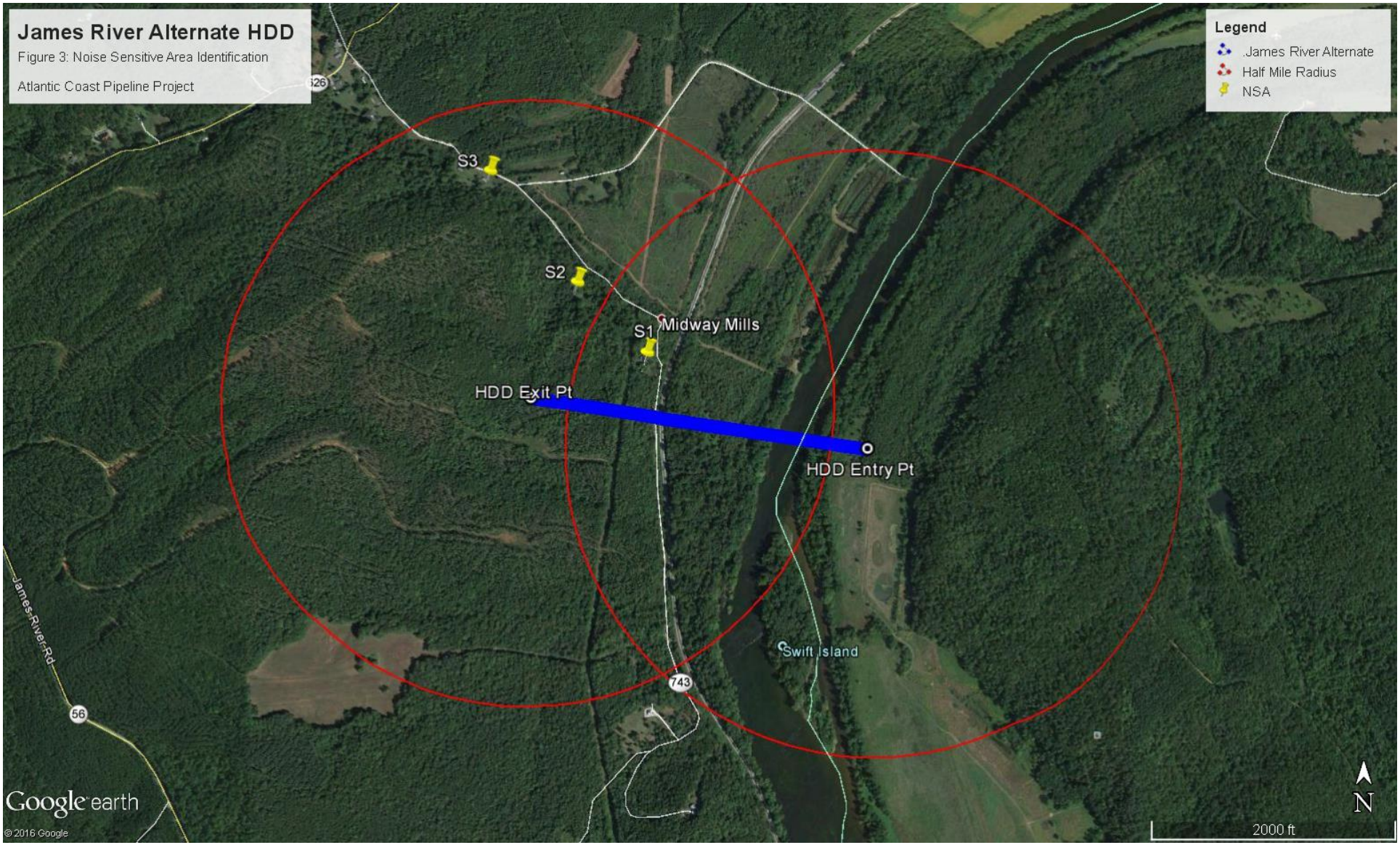
(13) No noise mitigation required for noise compliance.

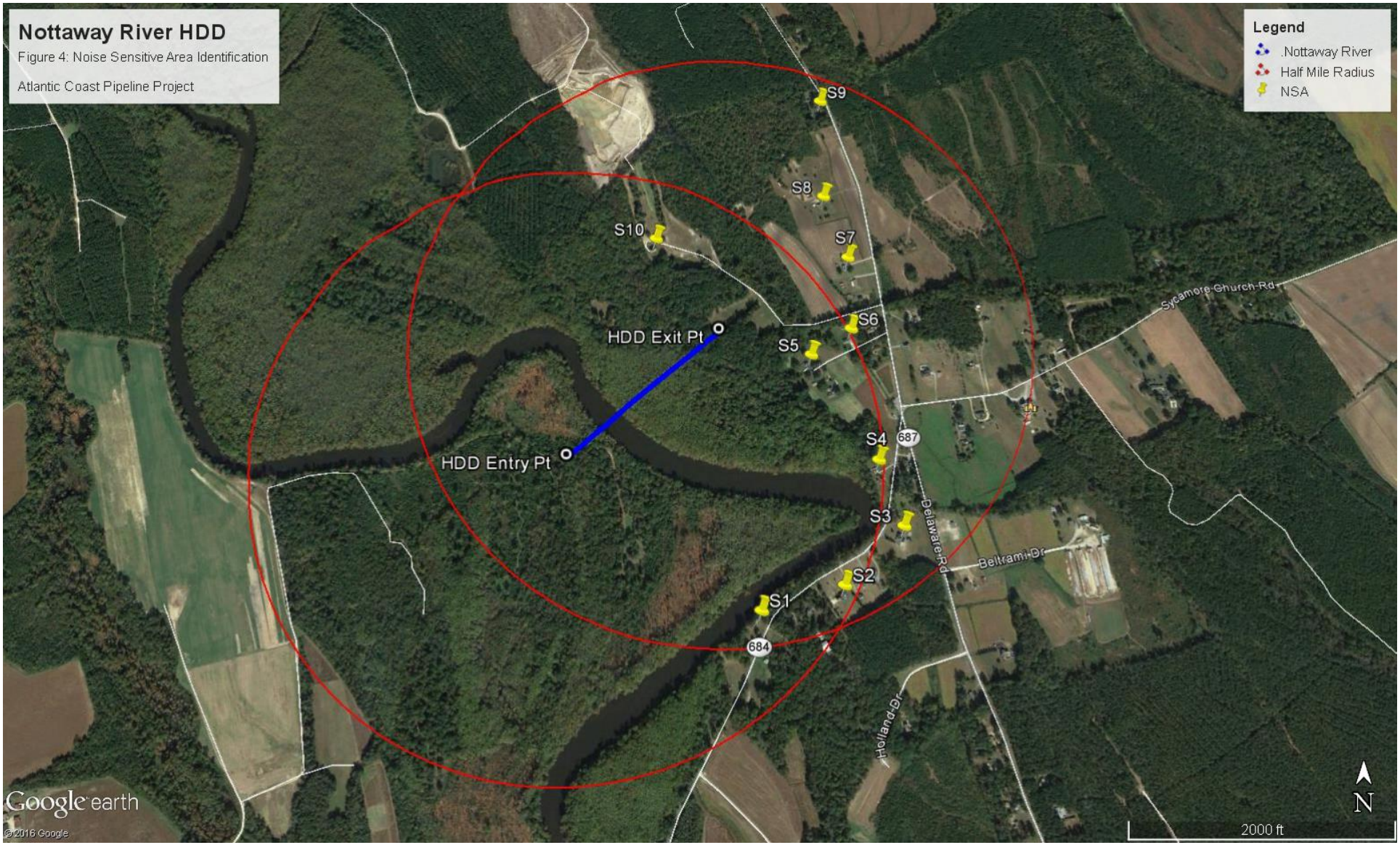
(5) Predicted total $L_{dn} = 10 \log (10^{(\text{Ambient } L_{dn}/10)} + 10^{(\text{Predicted } L_{dn}/10)})$.

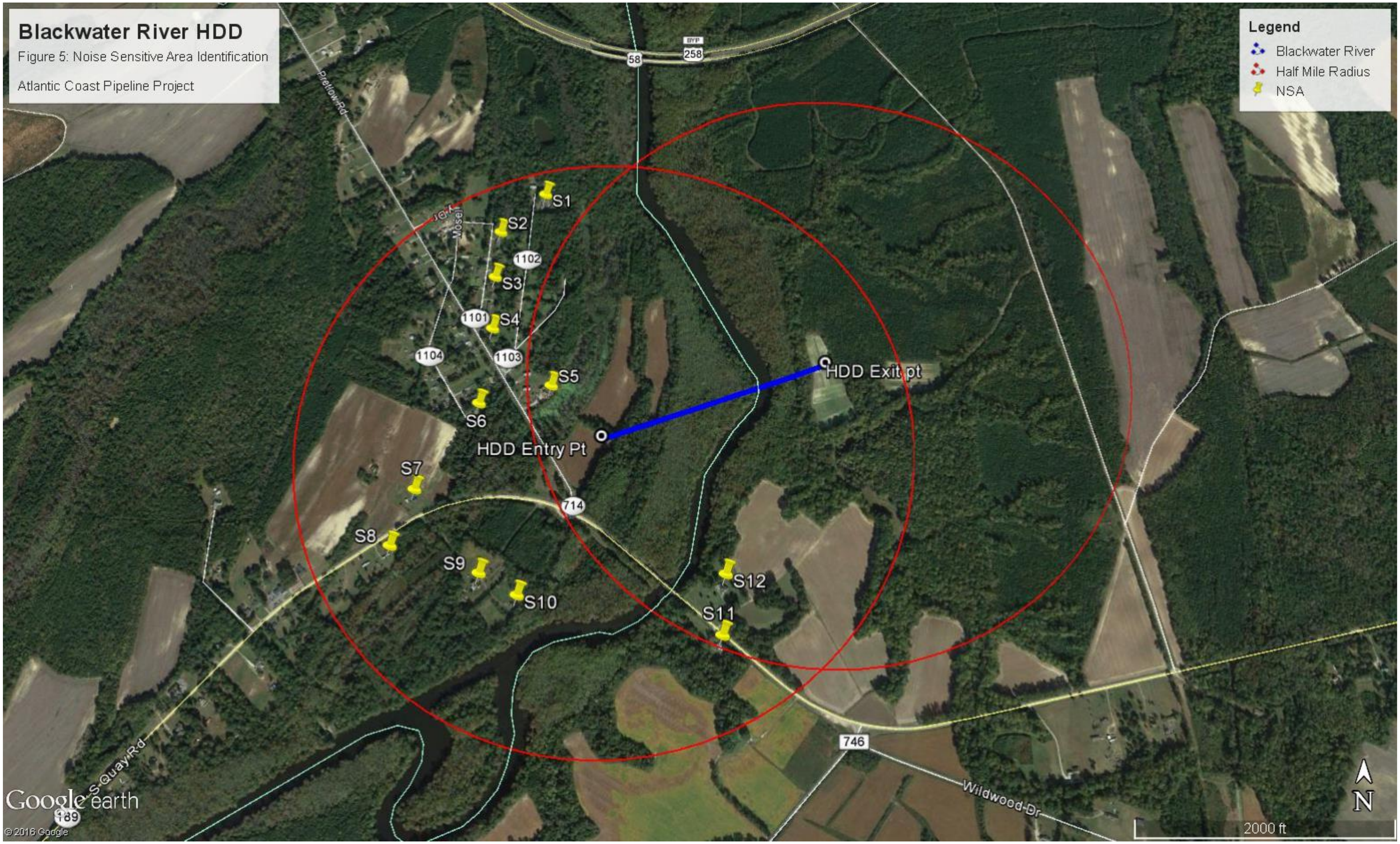
(6) Predicted increase of the ambient L_{dn} sound levels due to the HDD equipment.

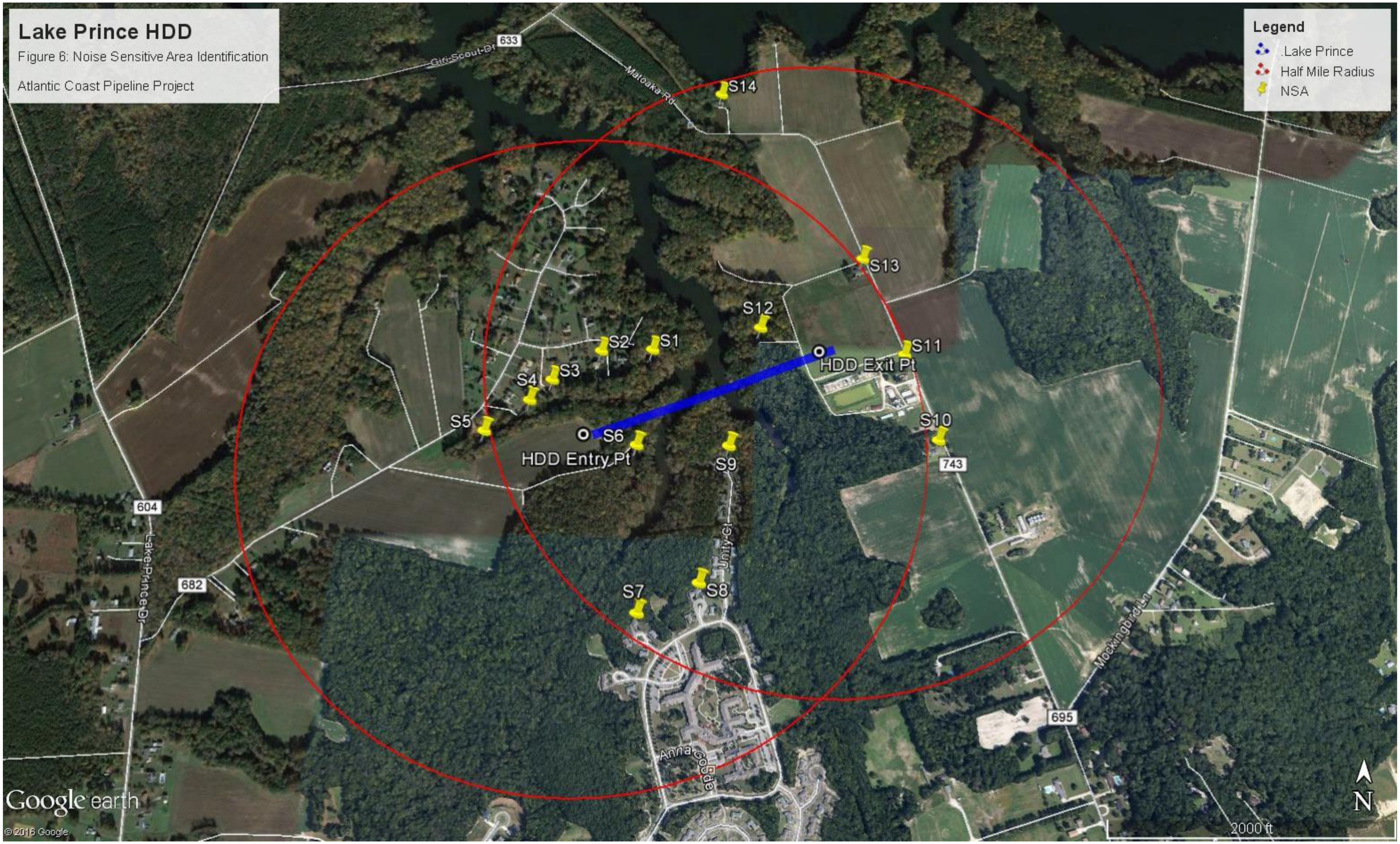

Interstate 79 HDD
Figure 1: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Interstate 79
Half Mile Radius
NSA
HDD Exit Pt
HDD Entry Pt
S1
S2
S3
S4
S5
S6
79
19/1
19
7/2
7
7/3
7/4
14
McCall Rd
Jennings Randolph Highway
Lifes Run Rd
Google earth
© 2016 Google
N
3000 ft


Blue Ridge Parkway HDD
Figure 2: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Blue Ridge Parkway
Half Mile Radius
NSA
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
HDD NW Entry Pt
HDD SE Entry Pt
Blue Ridge Parkway
Appalachian Trail
Reeds Gap Rd
Beech Grove Rd
Blue Ridge Pkwy (Closed winter S)
Fortunes Ridge Dr
Spruce Creek Ln
White Oak Dr
Oak Ln
Firtree Dr
Gumtree Dr
3 Ridges
Cedar Dr
Ridge Dr
814
664
627
Google earth
© 2016 Google
3000 ft
N

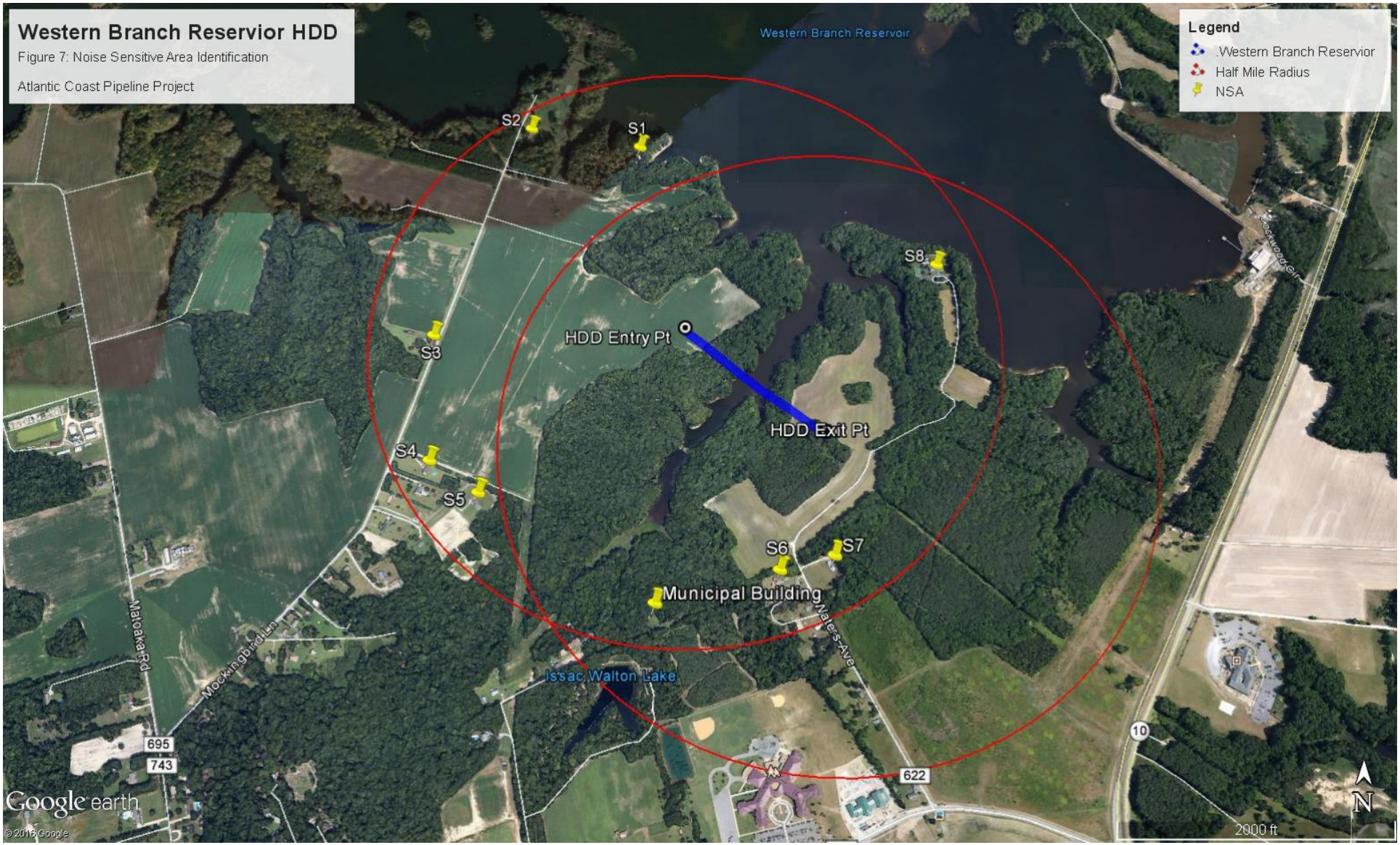

James River Alternate HDD
Figure 3: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
James River Alternate
Half Mile Radius
NSA
S3
S2
S1
Midway Mills
HDD Exit Pt
HDD Entry Pt
Swift Island
James River Rd
56
743
Google earth
© 2016 Google
N
2000 ft

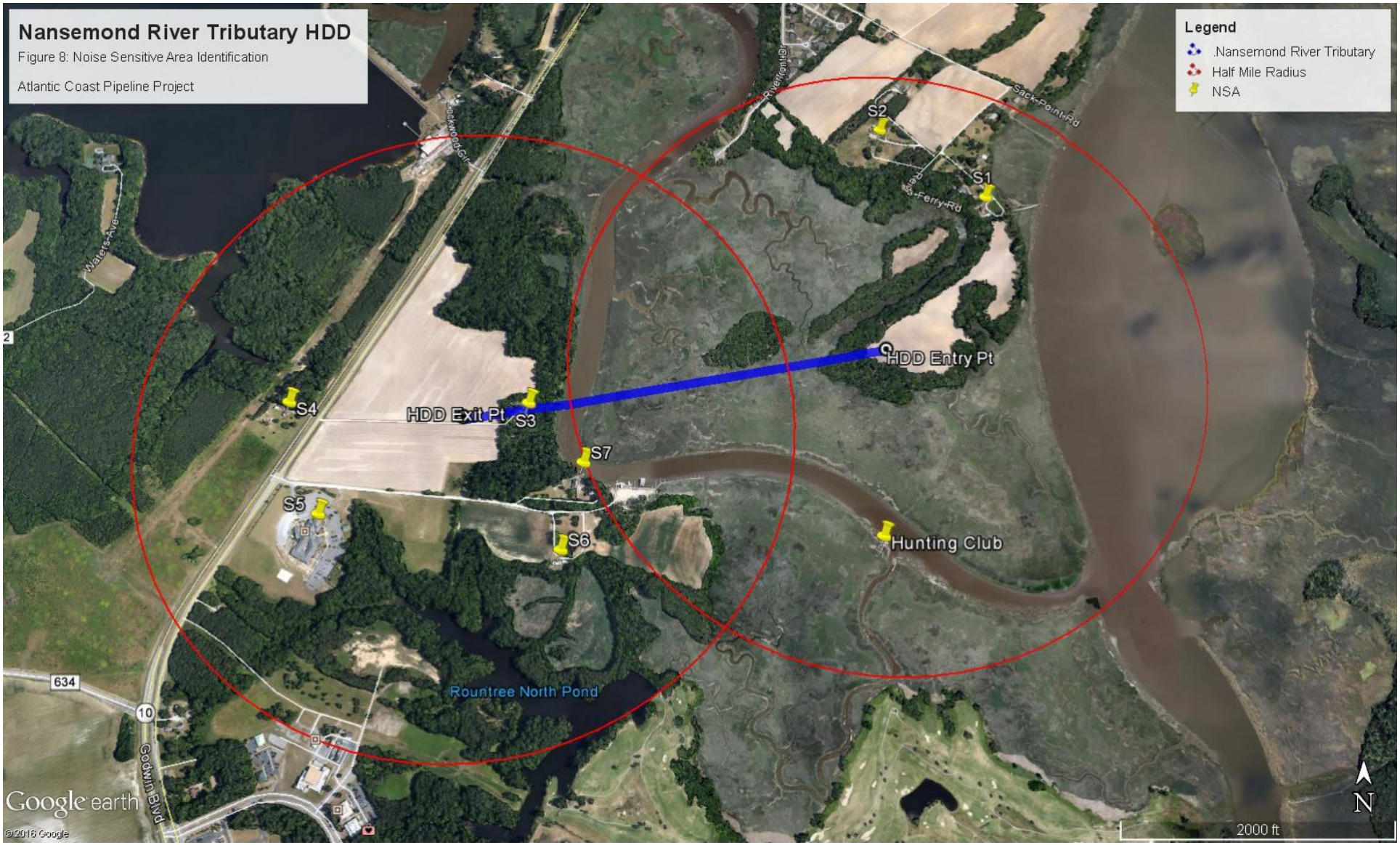

Nottaway River HDD
Figure 4: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
.Nottaway River
Half Mile Radius
NSA
S9
S8
S10
S7
S6
S5
HDD Exit Pt
HDD Entry Pt
S4
S3
S2
S1
687
684
Sycamore Church Rd
Delaware Rd
Beltrami Dr
Holland Dr
Google earth
© 2016 Google
N
2000 ft

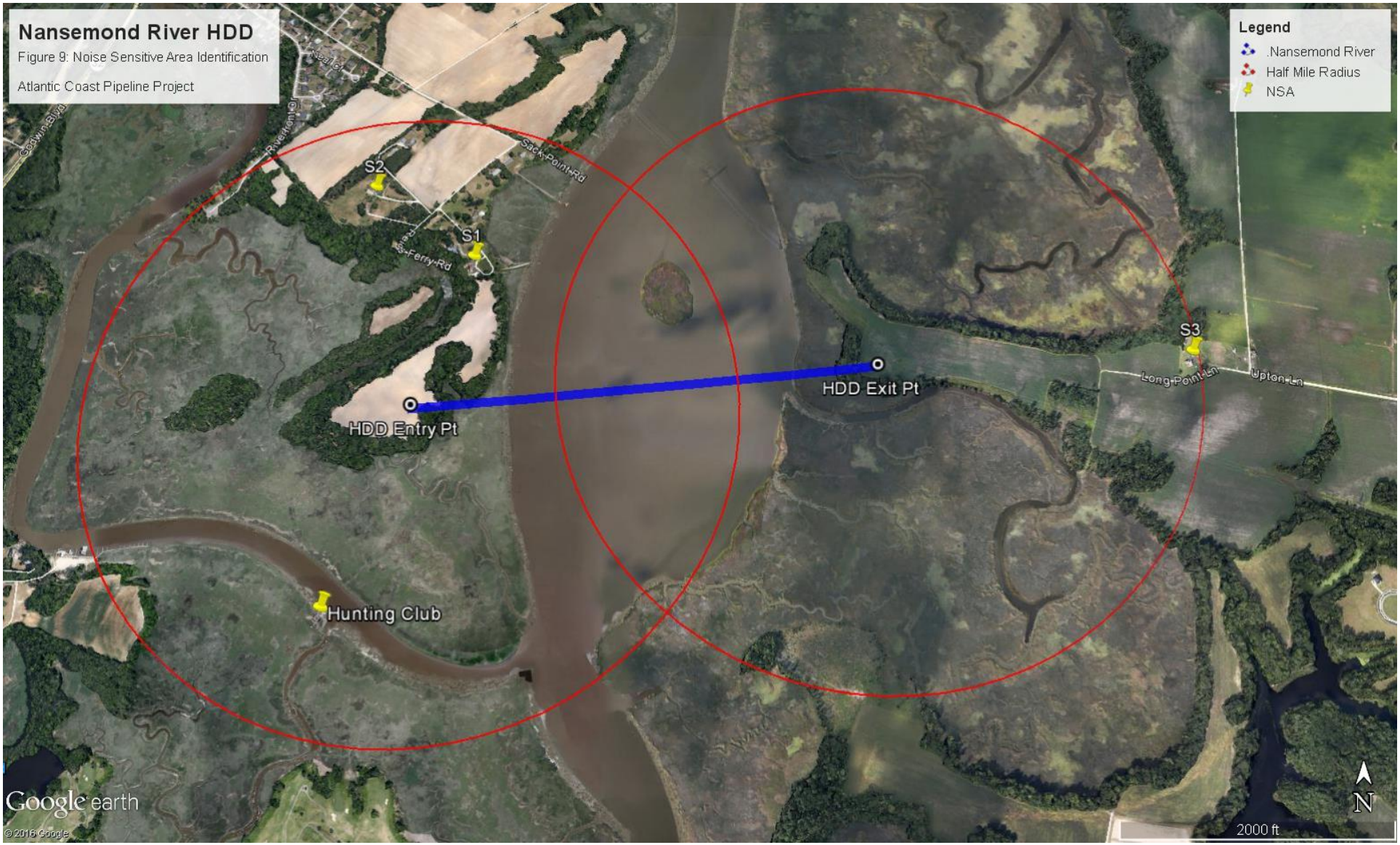

Blackwater River HDD
Figure 5: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Blackwater River
Half Mile Radius
NSA
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
HDD Entry Pt
HDD Exit pt
1101
1102
1103
1104
714
746
58
258
Pretlow Rd
S Quay Rd
Wildwood Dr
Google earth
© 2016 Google
2000 ft
N

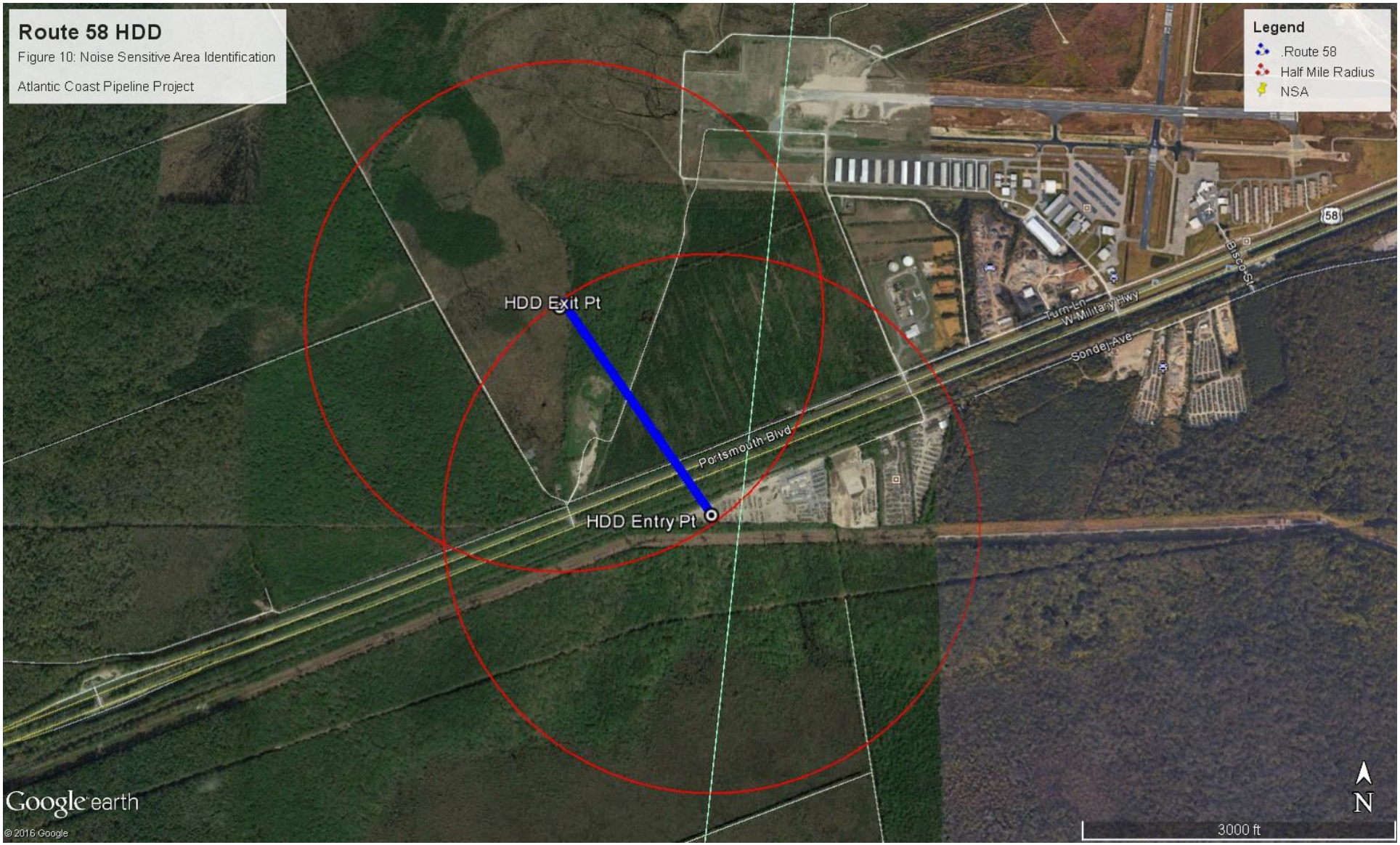


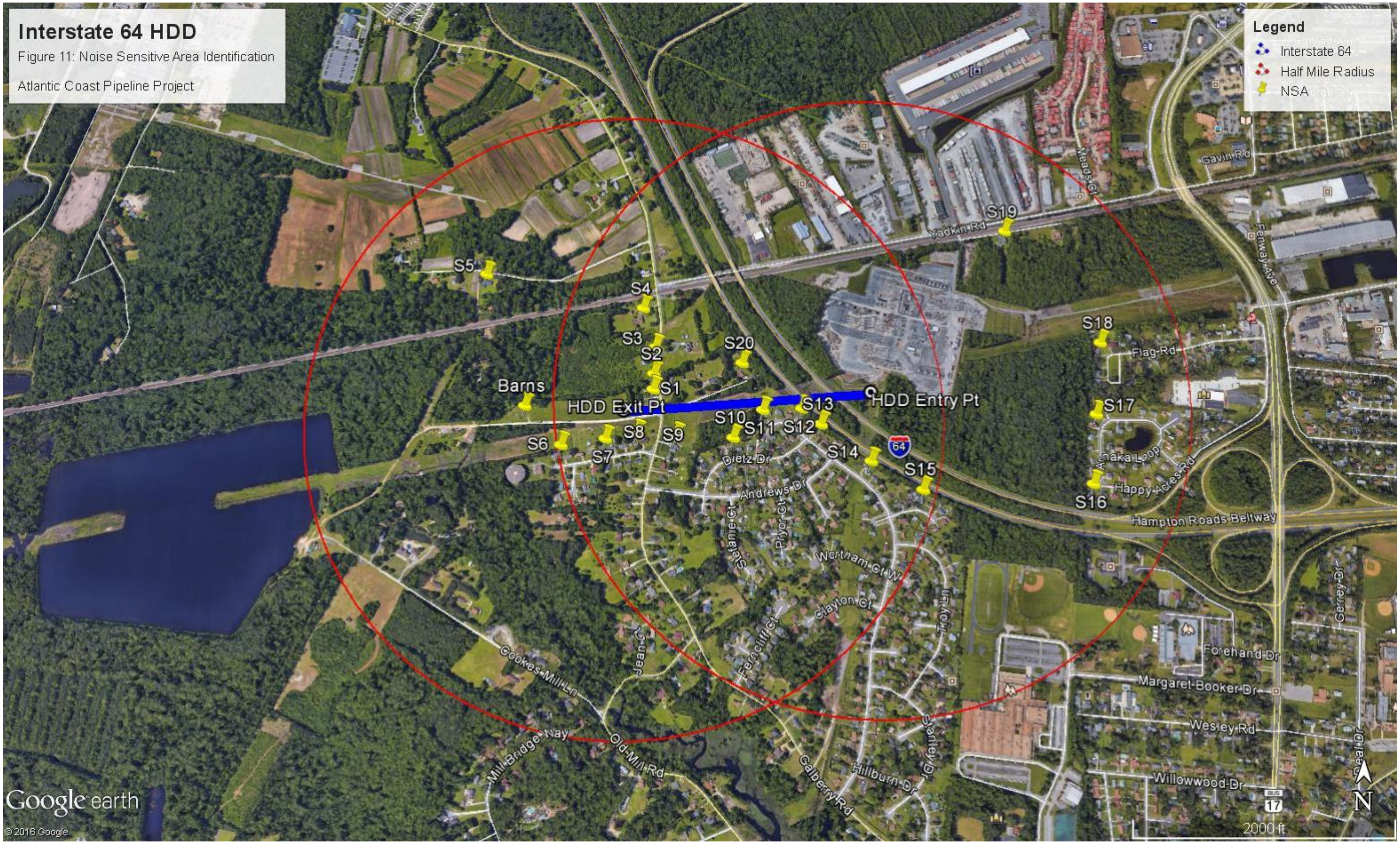
Lake Prince HDD
Figure 6: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
.Lake Prince
Half Mile Radius
NSA
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
S13
S14
HDD Entry Pt
HDD Exit Pt
Girl Scout Dr
Matoaka Rd
Lake Prince Dr
Unity Ct
Anna Goode
Mockingbird Ln
633
604
682
743
695
2000 ft
N
Google earth
© 2016 Google


Western Branch Reservior HDD
Figure 7: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Western Branch Reservoir
Legend
Western Branch Reservior
Half Mile Radius
NSA
S1
S2
S3
S4
S5
S6
S7
S8
HDD Entry Pt
HDD Exit Pt
Municipal Building
Issac Walton Lake
Maloaka Rd
Mockingbird Ln
Nalers Ave
695
743
622
10
Google earth
© 2016 Google
2000 ft
N


Nansemond River Tributary HDD
Figure 8: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Nansemond River Tributary
Half Mile Radius
NSA
HDD Entry Pt
HDD Exit Pt
S1
S2
S3
S4
S5
S6
S7
Hunting Club
Rountree North Pond
Sack Point Rd
Ferry Rd
Waters Ave
Lockwood Cir
River Front Dr
634
10
Godwin Blvd
Google earth
© 2015 Google
2000 ft
N

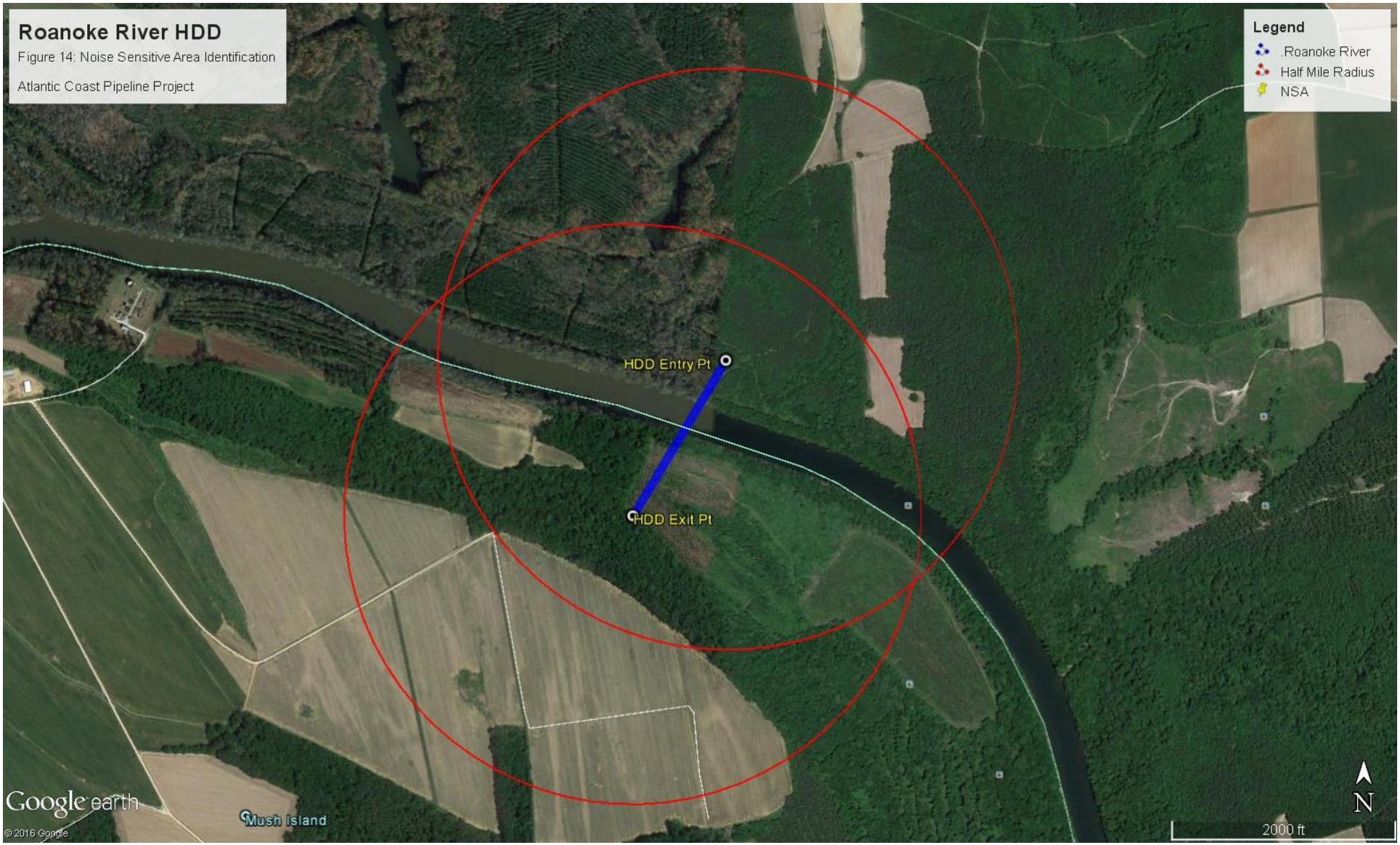

Nansemond River HDD
Figure 9: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Nansemond River
Half Mile Radius
NSA
S1
S2
S3
HDD Entry Pt
HDD Exit Pt
Hunting Club
Sack Point Rd
Long Point Ln
Upton Ln
Google earth
© 2016 Google
N
2000 ft

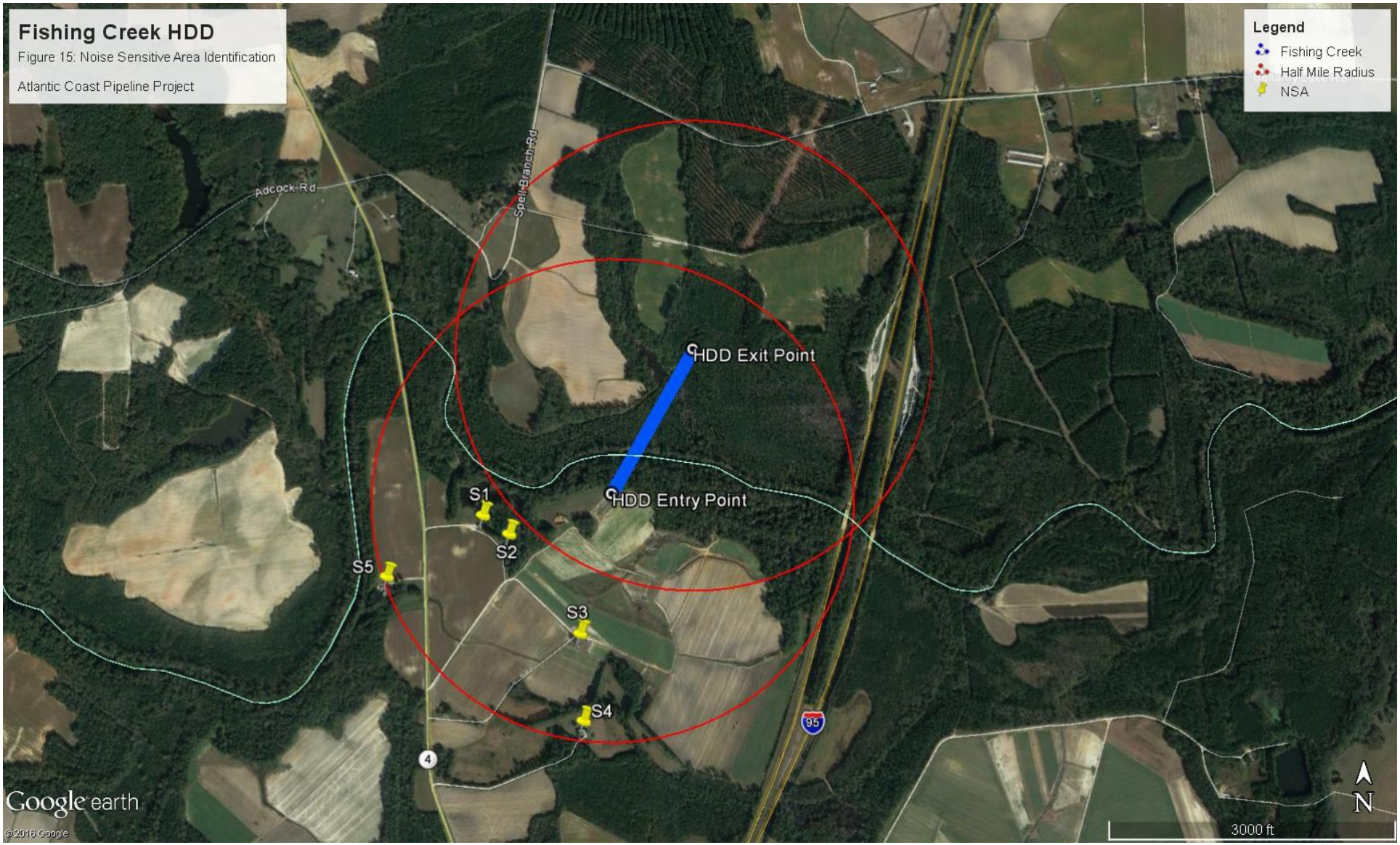

Route 58 HDD
Figure 10: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
.Route 58
Half Mile Radius
NSA
HDD Exit Pt
HDD Entry Pt
Portsmouth Blvd
Sondel Ave
W Military Hwy
Turn Ln
Disco St
58
Google earth
© 2016 Google
N
3000 ft

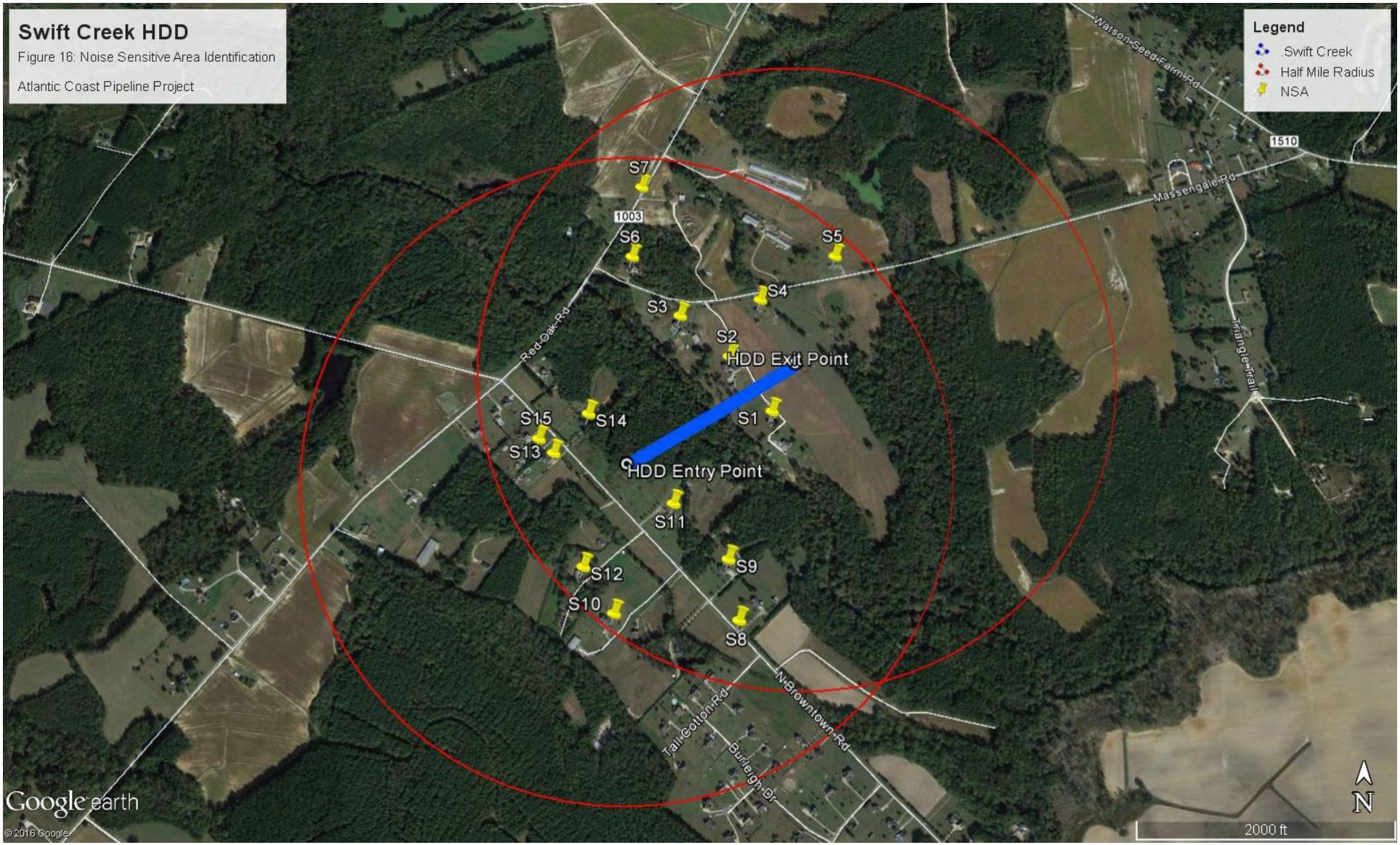

Interstate 64 HDD
Figure 11: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Interstate 64
Half Mile Radius
NSA
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
S13
S14
S15
S16
S17
S18
S19
S20
Barns
HDD Exit Pt
HDD Entry Pt
Yadkin Rd
Gavin Rd
Fenway Ave
Flag Rd
Dietz Dr
Andrews Dr
Hampton Roads Beltway
Happy Acres Rd
Margaret Booker Dr
Forehand Dr
Wesley Rd
Willowwood Dr
Cookes Mill Ln
Old Mill Rd
Mill Bridge Way
Calberry Rd
Hillburn Dr
Stanley Dr
Clayton Ct
Wortham Ct W
Troy Ln
2000 ft
N
Google earth
© 2016 Google

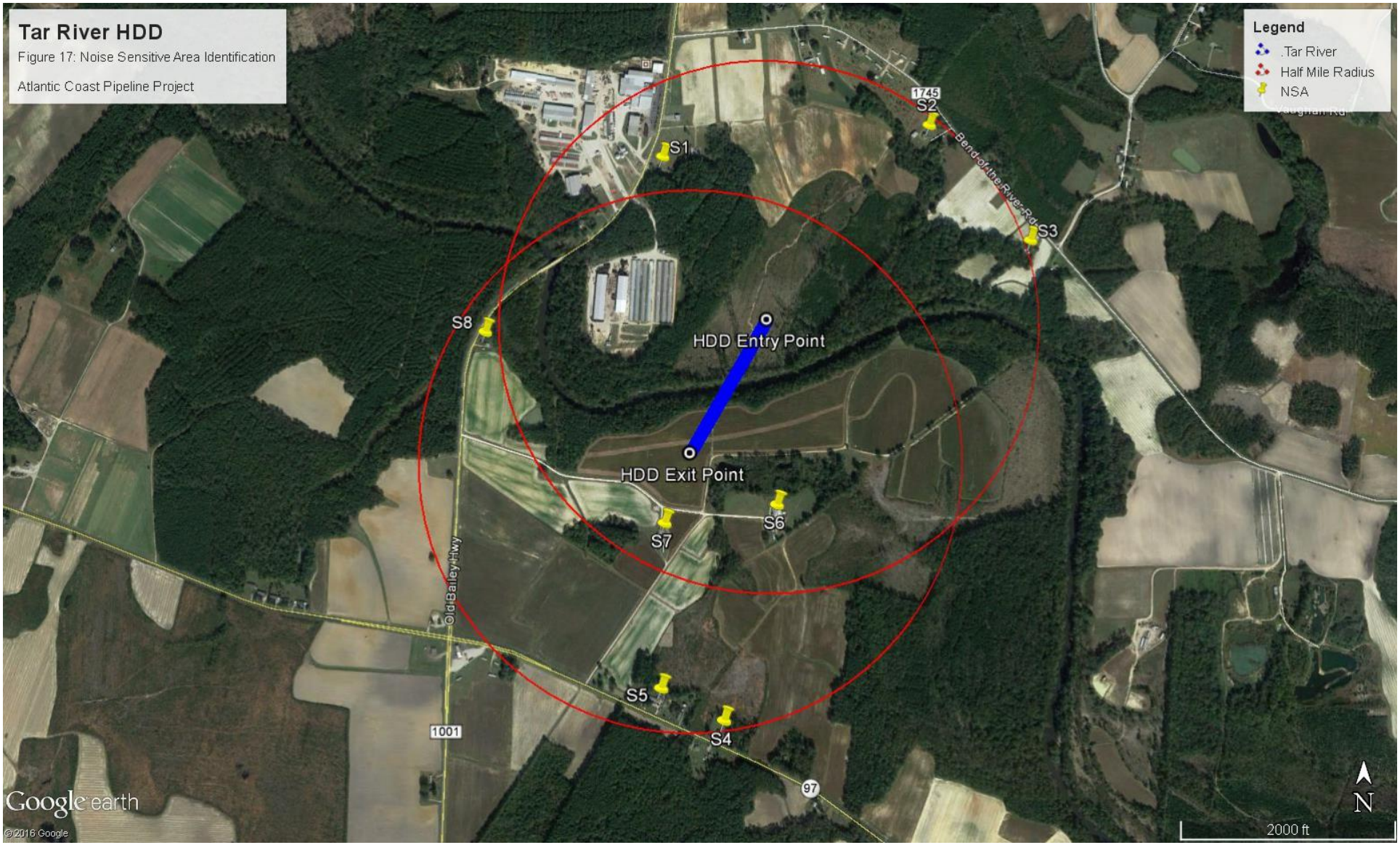
Route 17 HDD
Figure 12: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Route 17
Half Mile Radius
NSA
HDD Entry Pt
HDD Exit Pt
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
S13
S14
S15
S16
S17
S18
S Military Hwy
Conrad Ave
George Dr
Yadkin Rd
Trade St
Fenway Ave
Roundtree Cir
Lake St
Sebring Ave
Garnes Ave
Hampton Roads Beltway
Happy Acres Rd
Margaret Booker Dr
Forehand Dr
Firman St
2000 ft
N
Google earth
© 2016 Google

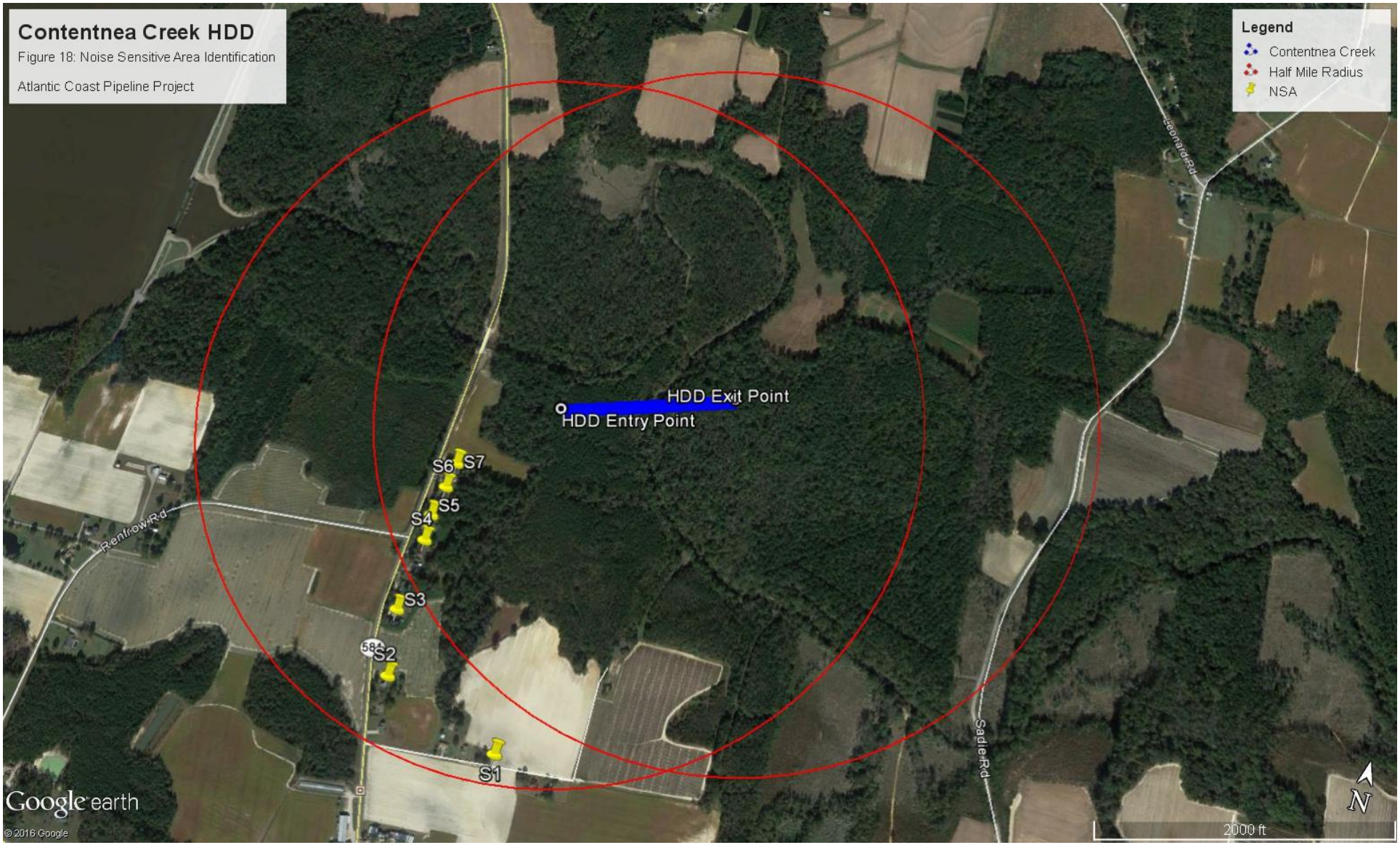

Elizabeth River HDD
Figure 13: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Elizabeth River
Half Mile Radius
NSA
HDD Entry Pt
HDD Exit Pt
S1
Chesapeake
S Military Hwy
Smith-Douglas Rd
McCloud Rd
Pvt-8 Rd
Faulk St
Alice St
Ford St
Shell Rd
Currie Ave
New St
Vepco St
Steel St
Great Bridge Blvd
Jones St
Rivercreek Rd
Portlock Rd
Bernard St
Dynamax St
Mary Ellen Ave
Railroad Ave
Golden Eye Dr
Willis St
Pratt St
13
464
190
166
Google earth
© 2016 Google
2000 ft
N

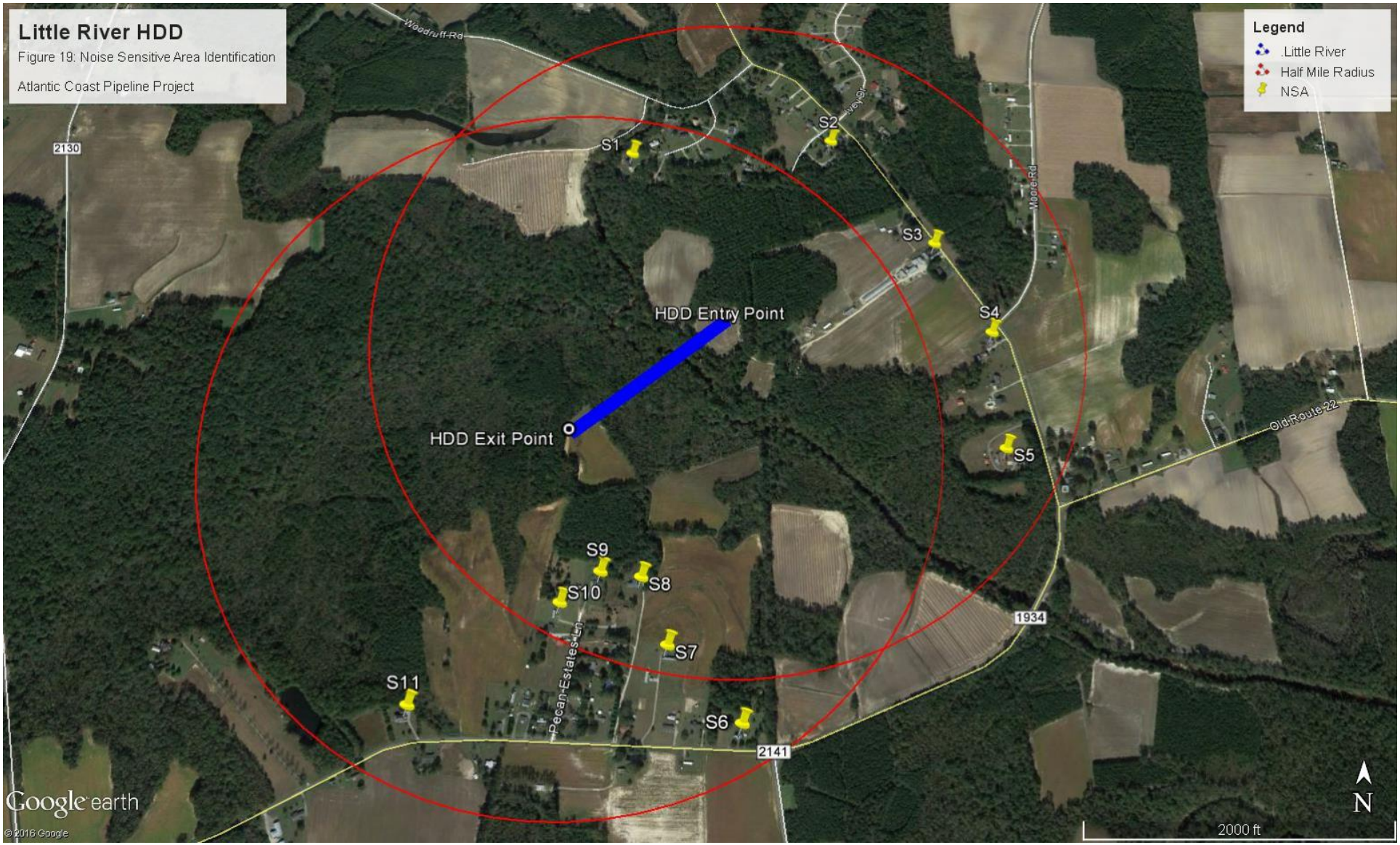

Roanoke River HDD
Figure 14: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
.Roanoke River
Half Mile Radius
NSA
HDD Entry Pt
HDD Exit Pt
Mush Island
Google earth
© 2016 Google
N
2000 ft

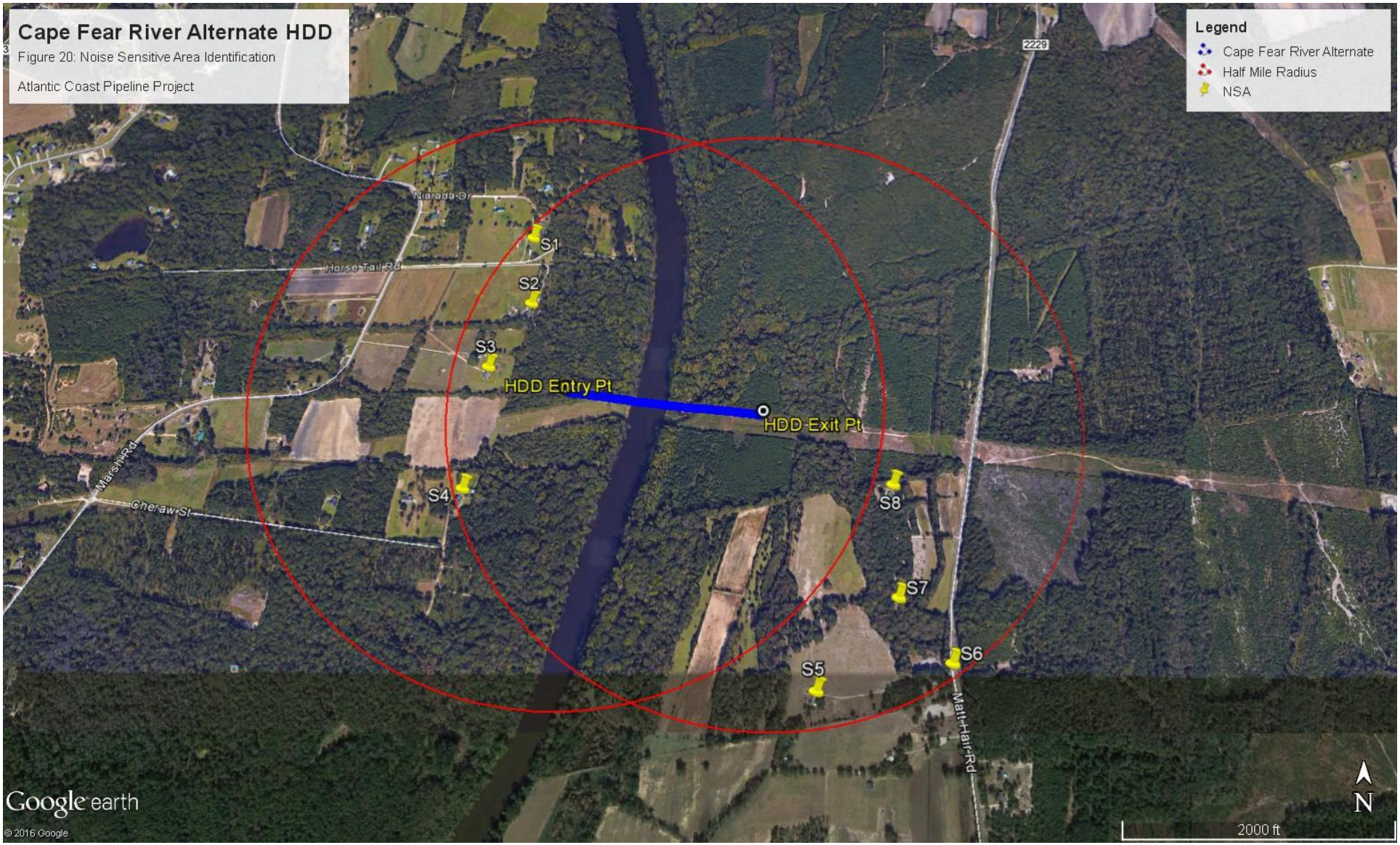

Fishing Creek HDD
Figure 15: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Fishing Creek
Half Mile Radius
NSA
Adcock Rd
Spell Branch Rd
HDD Exit Point
HDD Entry Point
S1
S2
S3
S4
S5
95
4
Google earth
© 2016 Google
N
3000 ft


Swift Creek HDD
Figure 16: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Swift Creek
Half Mile Radius
NSA
S7
S6
S5
S4
S3
S2
S1
S15
S14
S13
S11
S12
S10
S9
S8
HDD Exit Point
HDD Entry Point
1003
1510
Red Oak Rd
Massengale Rd
Watson Seed Farm Rd
Triangle Trail
Tall Cotton Rd
Burleigh Dr
N Browntown Rd
Google earth
© 2016 Google
N
2000 ft


Tar River HDD
Figure 17: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
.Tar River
Half Mile Radius
NSA
S1
S2
S3
S4
S5
S6
S7
S8
HDD Entry Point
HDD Exit Point
1745
1001
97
Bend of the River Rd
Old Bailey Hwy
Google earth
© 2016 Google
N
2000 ft


Contentnea Creek HDD
Figure 18: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Contentnea Creek
Half Mile Radius
NSA
HDD Exit Point
HDD Entry Point
S1
S2
S3
S4
S5
S6
S7
Renfrow Rd
Leonard Rd
Sadler Rd
Google earth
© 2016 Google
2000 ft
N


Little River HDD
Figure 19: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Little River
Half Mile Radius
NSA
Woodruff Rd
2130
S1
S2
Ivey Dr
Moore Rd
S3
HDD Entry Point
S4
HDD Exit Point
S5
Old Route 22
S9
S8
S10
1934
S7
S11
Pecan Estates Ln
S6
2141
Google earth
© 2016 Google
N
2000 ft


Cape Fear River Alternate HDD
Figure 20: Noise Sensitive Area Identification
Atlantic Coast Pipeline Project
Legend
Cape Fear River Alternate
Half Mile Radius
NSA
2229
Niarada Dr
Horse Tail Rd
Marsh Rd
Cheraw St
Matt Hair Rd
S1
S2
S3
S4
S5
S6
S7
S8
HDD Entry Pt
HDD Exit Pt
Google earth
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N
2000 ft