APPENDIX A: NO EFFECT SPECIES

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) is conducting an intra-Service consultation on the issuance of a section 10(a)(1)(B) permit (Incidental Take Permit; ITP) pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq), for the NiSource Multi-Species Conservation Plan (MSHCP). The MSHCP covers NiSource's construction, operation, and maintenance activities that may result in take of endangered or threatened species along its pipeline network. Because the MSHCP's covered activities are also Federal actions in many cases, inter-Service section 7 consultation is also necessary. The primary action evaluated in this consultation is the issuance of the ITP and implementation of the MSHCP, along with anticipated actions by cooperating Federal agencies including the U.S. Army Corps of Engineers, Federal Energy Regulatory Commission, U.S. Forest Service, National Park Service, and multiple National Wildlife Refuges.

DESCRIPTION OF THE PROPOSED ACTION

The MSHCP addresses the construction, operation, and maintenance activities of NiSource's pipeline and underground natural gas storage fields, and the effects of these actions on forty-two listed species. The MSHCP provides measures to avoid and minimize adverse effects to these species, and also to minimize and mitigate for the take of ten of these species. In general, covered activities include: (1) general operation and maintenance of NiSource's natural gas systems; (2) safety-related repairs, replacement, and maintenance of NiSource's natural gas systems; and (3) certain expansion activities related to NiSource's natural gas systems.

DESCRIPTION OF THE ACTION AREA

The action area for this consultation is the Covered Lands in the MSHCP, which overlay NiSource's onshore pipeline system in the states of Delaware, Indiana, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia. The onshore pipeline system is approximately 15,562 miles long. Lands that fall within a one-mile corridor – i.e., one-half mile (2,640 feet) on either side of the centerline of a NiSource pipeline or existing ancillary company structure or building – are part of the Covered Lands. In addition to the one-mile-wide corridor, the following counties are included in their entireties to permit potential expansion of the existing storage fields contained therein: Hocking, Fairfield, Ashland, Knox, and Richland counties, Ohio; Bedford County, Pennsylvania; Allegany County, Maryland; Kanawha, Jackson, Preston, Marshall, and Wetzel counties, West Virginia. The total area encompassed within the Covered Lands is approximately 9,783,200 in acres.

DETERMINATION OF NO EFFECT

During MSHCP development, the Service and NiSource compiled a list of all the species that occurred in counties crossed by Covered Lands. Not all listed, proposed, or candidate species that may occur within the Covered Lands were included in the MSHCP; however, pursuant to section 7 (and the Service's HCP Handbook), we must evaluate the impacts to any listed, proposed, or candidate species that may be present within the action area. There are 47 additional listed, proposed, or candidate species that may occur within the general area of the NiSource's pipeline system, but they are not currently addressed in the MSHCP (defined as non-MSHCP Species). As the lead Federal agency, the Service completed a Biological Assessment (BA) in June 2011 (amended in May 2013), to determine the effects of the MSHCP on these non-MSHCP species. More detail on NiSource's activities, the avoidance and minimization measures (AMMs), and the effects of the action can be found in the MSHCP and the BA.

After additional review, the Service and NiSource determined that 27 of these species do not occur within the Covered Lands (Table 1). As the lead Federal agency, the Service has therefore determined that the implementation of the MSHCP will have no effect on the following species or their designated or proposed critical habitat.

Table 1. Species that do not occur within the Covered Lands.

Common Name	Scientific Name	Federal Status	Species Included in the MSHCP?
Mammals			
Delmarva Peninsula fox squirrel	*Sciurus niger cinereus*	E[1]	Yes
West Indian manatee	*Trichechus manatus*	E	Yes
Amphibians			
Shenandoah salamander	*Plethodon shenandoah*	T[2]	Yes
Fish			
Blackside dace	*Phoxinus cumberlandensis*	T	Yes
Cumberland snubnose darter	*Etheostoma susanae*	C[3]	Yes
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	Yes
Maryland darter	*Etheostoma sellare*	E	Yes
Scioto madtom	*Noturus trautmani*	E	Yes
Slackwater darter	*Etheostoma boschungi*	T	Yes
Mollusks			
Cumberland bean pearlymussel	*Villosa trabalis*	E, XN[4]	Yes
Dromedary pearlymussel	*Dromus dromas*	E, XN	Yes
Louisiana pearlshell	*Margaritifera hembeli*	E	Yes
Pale Lilliput pearlymussel	*Toxolasma cylindrellus*	E	Yes
Purple cat's paw pearlymussel	*Epioblasma obliquata*	E	Yes
Tan riffleshell	*Epioblasma florentina walkeri*	E	Yes
White cat's paw pearlymussel	*Epioblasma obliquata perobliqua*	E	Yes
White wartyback pearlymussel	*Plethobasus cicatriocosus*	E	Yes
Insects			
Karner blue butterfly	*Lycaeides melissa samuelis*	E	Yes
Mitchell's satyr butterfly	*Neonympha mitchellii mitchellii*	E	Yes

Common Name	Scientific Name	Federal Status	Species Included in the MSHCP?
Puritan tiger beetle	*Cicindela puritana*	T	Yes
Plants			
Braun's rock cress	*Arabis perstellata*	E	Yes
Lakeside daisy	*Hymenoxy acaulis var. glabra*	T	No
Mead's milkweed	*Asclepias meadii*	T	Yes
Peter's Mountain mallow	*Iliamna corei*	E	No
Pitcher's (sand dune) thistle	*Cirsium pitcheri*	T	Yes
Price's potato-bean	*Apios priceana*	E	No
White-haired goldenrod	*Solidago albopilosa*	T	No

[1] E = Endangered
[2] T = Threatened
[3] C= Candidate
[4] XN = Experimental, Non-essential

No further consultation on these species is necessary unless: (1) the MSHCP or ITP is subsequently modified in a manner that causes an effect on these listed species or their proposed or designated critical habitat or (2) new information reveals the implementation of the MSHCP or ITP may affect these species or their designated or proposed critical habitat in a manner or to an extent not previously considered. Additional consultation has occurred on the action for the remaining 19 MSHCP species and 43 non-MSHCP species in the Service's BO and concurrence letter for this project.

APPENDIX B: SPECIES INFORMAL CONSULTATION CONCURRENCE LETTER

INTRODUCTION

The U.S. Fish and Wildlife Service (Service) is conducting an intra-Service consultation on the issuance of a section 10(a)(1)(B) permit (Incidental Take Permit; ITP) pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq) (ESA), for the NiSource Multi-Species Conservation Plan (MSHCP). The MSHCP covers NiSource's construction, operation, and maintenance activities that may result in take of endangered or threatened species along its pipeline network. Because the MSHCP's covered activities are also Federal actions in many cases, inter-Service section 7 consultation is also necessary. The primary action evaluated in this consultation is the issuance of the ITP and implementation of the MSHCP, along with anticipated actions by cooperating Federal agencies including the U.S. Army Corps of Engineers (USACE), Federal Energy Regulatory Commission (FERC), U.S. Forest Service (USFS), National Park Service, and multiple National Wildlife Refuges.

DESCRIPTION OF THE PROPOSED ACTION

The MSHCP addresses the construction, operation, and maintenance activities of NiSource's pipeline and underground natural gas storage fields, and the effects of these actions on 42 listed species. The MSHCP provides measures to avoid and minimize adverse effects to these species, and also to minimize and mitigate for the take of ten of these species. In general, covered activities include: (1) general operation and maintenance of NiSource's natural gas systems; (2) safety-related repairs, replacement, and maintenance of NiSource's natural gas systems; and (3) certain expansion activities related to NiSource's natural gas systems.

DESCRIPTION OF THE ACTION AREA

The action area for this consultation is the Covered Lands in the MSHCP, which overlay NiSource's onshore pipeline system in the states of Delaware, Indiana, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia. The onshore pipeline system is approximately 15,562 miles long. Lands that fall within a one-mile corridor – i.e., one-half mile (2,640 feet) on either side of the centerline of a NiSource pipeline or existing ancillary company structure or building – are part of the Covered Lands. In addition to the one-mile-wide corridor, the following counties are included in their entireties to permit potential expansion of the existing storage fields contained therein: Hocking, Fairfield, Ashland, Knox, and Richland counties, Ohio; Bedford County, Pennsylvania; Allegany County, Maryland; Kanawha, Jackson, Preston, Marshall, and Wetzel counties, West Virginia. The total area encompassed within the Covered Lands is approximately 9,783,200 in acres.

SPECIES INCLUDED THIS INFORMAL CONSULTATION

During MSHCP development, the Service and NiSource compiled a list of all the species that occurred in counties crossed by Covered Lands. Not all listed, proposed, or candidate species that may occur within the Covered Lands were included in the MSHCP; however, pursuant to section 7 (and the Service's HCP Handbook), we must evaluate the impacts to any listed, proposed, or candidate species that may be present within the action area. There are 47 additional listed, proposed, or candidate species that may occur within the general area of the NiSource's pipeline system, but they are not currently addressed in the MSHCP (defined as non-MSHCP Species). As the lead Federal agency, the Service completed a Biological Assessment (BA) in June 2011 (amended in May 2013), to determine the effects of the MSHCP on these non-MSHCP species. More detail on NiSource's activities, the avoidance and minimization measures (AMMs), and the effects of the action can be found in the MSHCP and the BA.

Both the MSHCP and the BA document the Service and NiSource's determination that the implementation of the MSHCP may affect, but is not likely to adversely affect (NLAA) the 42 species (and critical habitat where designated or proposed) listed in Table 1.

TABLE 2. SPECIES THAT THE SERVICE CONCLUDED ARE NOT LIKELY TO BE ADVERSELY AFFECTED BY IMPLEMENTATION OF NISOURCE'S MSHCP (SEE MSHCP AND BA).

Common Name	Scientific Name	Federal Status	Species Included in the MSHCP?
Mammals			
Gray bat	*Myotis grisescens*	E[1]	Yes
Louisiana black bear	*Ursus americanus luteolus*	T[2]	Yes
Virginia big-eared bat	*Plecotus townsendii virginianus*	E	Yes
West Virginia northern flying squirrel	*Glaucomys sabrinus fuscus*	DR[3]	No
Birds			
Interior least tern	*Sterna antillarum*	E	Yes
Kirtland's warbler	*Setophaga kirtlandii*	E	No
Piping plover	*Charadrius melodus*	E and T[4]	No
Red-cockaded woodpecker	*Picoides borealis*	E	No
Amphibians			
Cheat Mountain salamander	*Plethodon nettingi*	T	Yes
Fish			
Kentucky arrow darter	*Etheostoma sagitta spilotum*	C[5]	No
Pallid sturgeon	*Scapnirhynchus albus*	E	No
Pygmy madtom	*Noturus stanauli*	E	No
Spotfin chub	*Erimonax monachus*	T	No
Mollusks			
Birdwing pearlymussel	*Lemiox rimosus*	E	Yes
Cracking pearlymussel	*Hemistena lata*	E	Yes
Cumberland monkeyface	*Quadrula intermedia*	E	Yes
Oyster mussel	*Epioblasma capsaeformis*	E	Yes
Fat pocketbook	*Potamilus capax*	E	No

Common Name	Scientific Name	Federal Status	Species Included in the MSHCP?
Fluted kidneyshell	*Ptychobranchus subtentum*	PE[6]	No
Ring pink mussel	*Obovaria retusa*	E	No
Orangefoot pimpleback pearlymussel	*Plethobasus cooperianus*	E	No
Rough pigtoe	*Pleurobema plenum*	E	No
Slabside pearlymussel	*Lexingtonia dolabelloides*	PE	No
Plants			
American chaffseed	*Schwalbea americana*	E	No
Eastern prairie fringed orchid	*Platanthera leucophaea*	T	No
Globe (Short's) bladderpod	*Lesquerella globosa*	C	No
Harperella	*Ptilimnium nodosum*	E	No
Leafy-prairie clover	*Dalea foliosa*	E	No
Leedy's roseroot	*Rhodiola integrifolia leedyi*	T	No
Michaux's sumac	*Rhus michauxii*	E	No
Northern monkshood	*Aconitum noveboracense*	T	No
Pondberry	*Lindera melissifolia*	E	No
Running buffalo clover	*Trifolium stoloniferum*	E	No
Sensitive joint-vetch	*Aeschynomene sensitive*	T	No
Shale barren rock cress	*Arabis serotina*	E	No
Short's goldenrod	*Solidago shortii*	E	No
Small whorled pogonia	*Isotria medeoloides*	T	No
Smooth coneflower	*Echinacea laevigata*	E	No
Spring creek bladderpod	*Lesquerella perforate*	E	No
Swamp pink	*Helonias bullata*	T	No
Virginia sneezeweed	*Helenium virginicum*	T	No
Virginia spiraea	*Spiraea virginiana*	T	No

[1] E = Endangered
[2] T = Threatened
[3] D = Delisted due to recovery
[4] The piping plover is endangered in the Great Lakes watershed (Covered Lands in Ohio) and Threatened elsewhere (Covered Lands in Louisiana)
[5] C = Candidate
[6] PE = Proposed Endangered

ANALYSIS OF THE EFFECTS OF THE ACTION

This section includes an analysis of the effects of the action for each species. The AMMs included in Table 2 (attached) serve as the final version of the AMMs for all MSCHP and non-MSHCP species that NiSource and the Service concluded are not likely to be adversely affected by implementation of NiSource's MSHCP.

MAMMALS

GRAY BAT

The gray bat, Myotis grisescens, is restricted to regions in south central United States where large cave systems occur. The gray bat is restricted to roosting in cave habitats almost year-round with only rare exceptions. Gray bats forage primarily over water along river and reservoir edges (USFWS 1982). Forestlands located around caves, between caves and foraging habitats are important for gray bats. Gray bats utilize surrounding forest outside of cave entrances for shelter for young that have just begun to fly and for bats of any age to fly from the cave to feeding areas in the protection of the forest canopy (USFWS 1982).

As discussed in Appendix F of the HCP, the covered Lands overlap with the gray bat habitat in Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee. The distribution of gray bats is fragmented within one single range spanning several states. The planning area falls into habitat found only in counties within the states of Kentucky and Tennessee. Habitat is restricted to caves located in the karst topography of the southeastern United States. Potentially disturbed populations include summer roosting populations within the two states as well as known and potential hibernacula.

NiSource has developed AMMs that will apply to all known occupied locations (i.e., where individuals have been documented to occur) and suitable habitats where occurrence is presumed in those counties listed above in Kentucky and Tennessee (Table 2). These species-specific measures do not take the place of general best management practices (BMPs), including those outlined in the NGTS Environmental Construction Standards (ECS). General BMPs should be implemented in conjunction with species-specific measures unless BMPs are specifically contradictory. Measures to Avoid and Minimize Impacts to the Species in Summer Foraging Habitat (i.e., AMM's 11-18) have been identified within the ECS to provide additional conservation benefits to the species within known and assumed occupied habitat. Overall, the AMMs ensure that work is conducted in areas where or times when gray bats will not be present and that suitable roosting and foraging habitat remains.

Conclusion

We conclude that adverse impacts to this species are extremely unlikely to occur because NiSource has developed AMMs that significantly reduce the risk of exposing gray bats to stressors associated with both O&M and new construction activities. Therefore, the likelihood of adverse impacts is discountable, and we concur with the determination that the implementation of the MSHCP is not likely to adversely affect the gray bat.

Louisiana black bear

The Louisiana black bear (*Ursus americanus luteolus*) was listed as a threatened subspecies within its historic range under the ESA by the Service on January 7, 1992. The Service designated critical habitat for the Louisiana black bear on April 9, 2009, which may be defined as breeding habitat and corridors within bottomland and upland hardwood forests and adjacent vegetated areas.

MSHCP covered lands cross breeding and/or critical habitat for the Louisiana black bear in the following parishes: East Carroll, Franklin, Iberia, Madison, Richland, and St. Mary parishes, Louisiana. The Service concurs that the proposed HCP is not likely to adversely affect the Louisiana black bear and its critical habitat in those areas. Through the application of the NGTS ECS and the AMMs (Table 2), we believe that all potential impacts to the Louisiana black bear and its critical habitat will be either avoided or reduced to a level that will not cause negative impacts.

Conclusion

We conclude that adverse impacts to this species are extremely unlikely to occur because NiSource has developed AMMs that significantly reduce the risk of exposing Louisiana black bears to stressors associated with both O&M and new construction activities. Therefore, because all impacts will be insignificant or discountable, the Service concurs that the covered activities as described in the NiSource MSHCP may affect, but are not likely to adversely affect the Louisiana black bear or result in destruction or adverse modification of its critical habitat.

Virginia big-eared bat

As discussed in Appendix F of the HCP, Covered Lands overlap with Virginia big-eared bat habitat in Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Giles, and Rockingham counties, Virginia; and Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia. The distribution of big-eared bats is fragmented within one single range spanning several states. The planning areas fall into habitat found in counties within the states of Kentucky, Virginia, and West Virginia. Hibernacula and maternity habitat are restricted to caves, and to a lesser extent rock shelters, located in the karst regions typically dominated by beech-maple-hemlock-oak vegetation associations. Potentially disturbed populations include summer roosting populations within the three states as well as known and potential hibernacula.

Five colony sites have been designated as Critical Habitat (USFWS 1979) for the Virginia big-eared bat. These are Cave Mountain Cave, Hellhole Cave, Hoffman School Cave, and Sinnit Cave, each in Pendleton County, West Virginia, and Cave Hollow Cave in Tucker County, West Virginia. The present Critical Habitat designation, however, is incomplete.

The nearest hibernacula designated as Critical Habitat to the NiSource Covered Lands is Cave Mountain Cave, which is located approximately 1.2 miles from the Covered Lands footprint. In

the Federal Register notice designating this cave as Critical Habitat, a description of foraging habitat is not included; likewise, no primary constituent elements are described. The description solely entails the confines of the Cave Mountain Cave hibernacula.

Based on the Cave Mountain Cave description and the location of the cave outside of the Covered Lands footprint as described in the NiSource MSHCP, it is anticipated that the Project would not modify, and furthermore would have no impact on, Virginia big-eared bat Critical Habitat.

NiSource has developed AMMs that will apply to all known occupied locations (i.e., where individuals have been documented to occur) and suitable habitats where occurrence is presumed in those counties listed above in Kentucky, Virginia, and West Virginia. These species-specific measures do not take the place of general best management practices (BMPs), including those outlined in the NGTS Environmental Construction Standards (ECS). General BMPs should be implemented in conjunction with species-specific measures unless BMPs are specifically contradictory. Measures to Avoid and Minimize Impacts to the Species in Summer Foraging and/or Fall Swarming Habitat (i.e., AMMs 11-18) have been identified within the ECS, and otherwise, to provide additional conservation benefits to the species within known or presumed occupied habitat. Overall, the AMMs ensure that work is conducted in areas where or times when Virginia big-eared bats will not be present and that suitable roosting and foraging habitat remains.

Conclusion

We conclude that adverse impacts to this species are extremely unlikely to occur because NiSource has developed AMMs that significantly reduce the risk of exposing Virginia big-eared bats to stressors associated with both O&M and new construction activities. Therefore, the likelihood of adverse impacts is discountable, and we concur with the determination that the implementation of the MSHCP is not likely to adversely affect the Virginia big-eared bat.

West Virginia Northern Flying Squirrel

The northern flying squirrel, *Glaucomys sabrinus fuscus*, is comprised of 25 subspecies, including the Virginia northern flying squirrel, G. s. fuscus. The USFWS subsequently determined that a more suitable common name for G. s. fuscus is the West Virginia northern flying squirrel (WVNFS), because the majority of the range of the subspecies occurs in West Virginia. The subspecies will be referred to as such throughout the rest of this document.

The WVNFS is a small, nocturnal, gliding mammal endemic to the Alleghany Highlands of West Virginia and Virginia. The squirrel is relatively short-lived, with an average life span of about 4 years (USFWS 2006a). Adult WVNFS average 10 to 12 inches in total length and 3 to 5 ounces in weight (USFWS 2003).

Although the quantity and quality of WVNFS habitat may be reduced from historical levels, it is now known that the WVNFS is more widespread and more resilient in its habitat use than

formerly thought (USFWS 2006b). In addition, habitat trends are moving in a positive direction in terms of forest regeneration and conservation (USFWS 2006b). Indicators of WVNFS population persistence are currently stable and increasing in some locations (USFWS 2008) and the USFWS has considered this species to be recovered since 2008 (USFWS 2013).

On August 26, 2008, the USFWS issued a final rule (USFWS 2008) to remove the WVNFS from the Federal List of Endangered and Threatened Wildlife, due to recovery. This rule was challenged and the USFWS issued a final rule on June 17, 2011, to comply with a court order that reinstated the regulatory protections under the ESA for the WVNFS. On March 4, 2013, the USFWS issued a new final rule to reinstate the removal of the WVNFS from the List of Endangered and Threatened Wildlife (USFWS 2013). This rule remains in place as of the signing of this document and this species is officially recovered and no longer requires the protections of the ESA[1].

The project may affect this species in Pendleton, Pocahontas, Randolph, and Tucker counties, West Virginia. We anticipate the project will have no effect on this species in the West Virginia Covered Lands counties of Grant, Greenbrier, and Webster as the Covered Lands do not intersect with suitable WVNFS habitat. No other counties in West Virginia or Virginia with suitable WVNFS habitat are crossed by NiSource Covered Lands.

Based on federal, state and local agency coordination, known element occurrence data and other baseline information identifying WVNFS population centers within the NiSource MSHCP project area was obtained from the West Virginia Natural Heritage Program. The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are:

- Cheat Mountain (Pocahontas and Randolph counties, West Virginia)
- Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia)
- Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia)

The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela National Forest. NiSource has proposed to conduct the following AMMs to reduce the likelihood of impacts to WVNFS from their activities (Table 2). This includes all applicable standards form the Monongahela National Forest Plan.

<u>Conclusion</u>

We conclude that adverse impacts to this species are extremely unlikely to occur because NiSource has developed AMMs that significantly reduce the risk of exposing West Virginia northern flying squirrels to stressors and negative impacts associated with both O&M and new construction activities. Therefore, the potential adverse impacts are insignificant or

[1] The WVNFS is now delisted, but we are retaining this species in the concurrence letter. We believe that the BMPs developed for this species, although now discretionary, will still help conserve this species where it occurs in the action area. Further, some of the BMPs may still be required where NiSource activities occur on the Monongahela National Forest.

discountable, and we concur with the determination that the implementation of the MSHCP is not likely to adversely affect the West Virginia northern flying squirrel.

Birds

Interior Least Tern

Interior least terns depend on sand or gravel bars containing sparse vegetation, within an unobstructed river channel, or salt flats along lake shores for nesting. They often also nest on artificial habitats such as sand or gravel pits and dredge islands. Least terns often choose nest locations at higher elevations to prevent flooding that can occur during high flows (USFWS 1990). Interior least terns forage for fish, feeding in shallow waters of rivers, streams, and lakes. In riverine colonies, individuals forage in close proximity to the colony. However, when nesting in artificial habitats they may travel as far as 2.0 miles from the colony to fish (USFWS 1990).

As discussed in Appendix F, Section F-4 of the MSHCP, Covered Lands overlap with the interior least tern habitat in East Carroll Parish, Louisiana; and Issaquena County, Mississippi. These locations consist of breeding areas along the Mississippi River sandbars. According to Natural Heritage data, one observation of an interior least tern was made within the covered lands from 1990 to 1999 (Louisiana Natural Heritage Program [LNHP] 2007; Mississippi Natural Heritage Program [MNHP] 2007). The location of this observation occurs at the crossing of the Mississippi River on the border of East Carroll Parish, Louisiana, and Issaquena County, Mississippi. Multiple observations of interior least terns have occurred adjacent to the covered lands since 1990.

NiSource has developed AMMs that will apply to all known occupied locations (i.e., where individuals have been documented to occur) and suitable habitats where breeding occurrence is presumed in East Carroll Parish, Louisiana and Issaquena County, Mississippi (see Table 2). There are currently only four pipeline crossings of concern for this species, all near Pittman Island in the Mississippi River at the East Carroll Parish, Issaquena County border. While sandbars may migrate around these four crossings, AMMs will be applied whenever sandbars/islands are within 650 feet of the crossings. NiSource will further conduct surveys to evaluate the presence of the species or assume presence within suitable habitat. Suitable habitat will not be used for staging areas and sandbars will be restored to previous contours and substrate after any operations. No activities will occur within 650 feet of nesting colonies between May 15 and August 31 to avoid disturbing the birds. In summary, the AMMs ensure that work is conducted in areas where or times when least terns will not be present and that suitable nesting habitat remains.

Conclusion

NiSource's AMMs make the risk of exposing Interior least terns to stressors associated with both O&M and new construction activities extremely unlikely to occur. Therefore, we conclude that the likelihood of adverse impacts to this species is discountable, and we concur with the

determination that the implementation of the MSHCP is not likely to adversely affect the interior least tern.

Kirtland's warbler

The Kirtland's warbler (KW) migrates through Ohio in the spring and fall, traveling between its breeding grounds in Michigan, Wisconsin, and Ontario and its wintering grounds in the Bahamas. While migration occurs in a broad front across the entire state, approximately half of all observations in Ohio have occurred within 3 miles of the shore of Lake Erie. This area includes a small portion of the covered lands in this 3-mile zone. During migration, individual birds usually forage in shrub/scrub or forested habitat and may stay in one area for a few days.

NiSource O&M and new construction activities could impact migrating KWs and their migratory habitat by either direct disturbance of individual (e.g., noise and human activity) or destruction of migratory habitat. However, NiSource projects should only impact small areas of the total available migratory habitat along the Lake Erie shoreline zone. Although those areas may be avoided or abandoned by migrating birds, the impact area will be small and we expect that any KWs present will have access to nearby undisturbed habitat to meet their needs. Further, KWs use these areas on a transient basis and thus will only be exposed to these impacts temporarily. For these reasons, we do not expect that NiSource activities will cause measurable adverse impacts to the KW.

Conclusion

Due to the project type, location, and onsite habitat, this project is not expected to result in measurable adverse impacts to KWs. Therefore, we conclude that the likelihood of adverse impacts to this species is discountable, and we concur with the determination that the implementation of the MSHCP is not likely to adversely affect the KW.

Piping plover

The piping plover and its designated critical habitat occur within those portions of the NiSource project area located along the Louisiana Gulf coast. The piping plover and its designated critical habitat may be affected, but is unlikely to be adversely affected by the NiSource project. The piping plover is a small (7 inches long), pale, sand-colored shorebird that winters in Louisiana for 8 to 10 months annually. Piping plovers arrive from their northern breeding grounds as early as late July and remain until late March or April. They feed on polychaete marine worms, various crustaceans, insects and their larvae, and bivalve mollusks that they peck from the top of or just beneath the sand. Piping plovers forage on intertidal beaches, mudflats, sand flats, algal flats, and wash-over passes with no or very sparse emergent vegetation. They roost in unvegetated or sparsely vegetated areas, which may have debris, detritus, or micro-topographic relief offering refuge to plovers from high winds and cold weather. They also forage and roost in wrack (i.e., seaweed or other marine vegetation) deposited on beaches. In most areas, wintering piping plovers are dependent on a mosaic of sites distributed throughout the landscape, because the suitability of a particular site for foraging or roosting is dependent

on local weather and tidal conditions. Plovers move among sites as environmental conditions change, and studies have indicated that they generally remain within a 2-mile area. Major threats to this species include the loss and degradation of habitat due to development, disturbance by humans and pets, and predation.

On July 10, 2001, the Service designated critical habitat for wintering piping plovers (Federal Register Volume 66, No. 132); a map of the seven critical habitat units in Louisiana can be found at http://criticalhabitat.fws.gov/crithab. Their designated critical habitat identifies specific areas that are essential to the conservation of the species. The primary constituent elements for piping plover wintering habitat are those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support those habitat components. Constituent elements are found in geologically dynamic coastal areas that contain intertidal beaches and flats (between annual low tide and annual high tide), and associated dune systems and flats above annual high tide. Important components (or primary constituent elements) of intertidal flats include sand and/or mud flats with no or very sparse emergent vegetation. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting plovers.

Vehicle Operation and Foot Traffic for Any NiSource Actions

Vehicle operation and foot traffic exist within suitable piping plover habitat within road-accessible portions of the NiSource project area (e.g., Cameron Parish and Grand Isle). For areas that are only accessible by boat (e.g., barrier islands, disconnected barrier headlands such as *Cheniere Ronquille*) temporary use of tracked vehicles and foot traffic are less likely to occur on the shoreline during O&M activities because most work would likely be done from boats and/or barges in shallow coastal waters. Therefore, vehicle operation and foot traffic may result in temporary disturbance to birds roosting and/or foraging in nearby areas but would likely not rise above existing conditions; thus, any effects would be discountable and insignificant in nature.

Operations and Maintenance (O&M) Activities

Permanent facilities (e.g., communication facilities, tie-ins, meter valves, etc.), vegetation management, pipeline abandonment (no ground disturbance), well abandonment (no ground disturbance), and inspection activities are extremely unlikely to be located or occur within suitable habitat for the piping plover. Should any such activities be located or occur within wetland habitat adjacent to piping plover habitat, there is little likelihood of occasional noise or disturbance to birds that are roosting and/or foraging in nearby suitable habitat. Thus, the low likelihood of temporary disturbance would be discountable and insignificant. No effects to designated piping plover critical habitat would be anticipated.

Activities associated with access road maintenance, right-of-way (ROW) repair, general appurtenance and cathodic protection construction (requiring off-ROW clearing), pipeline removal, and well abandonment with ground disturbance may potentially occur within areas of suitable habitat for piping plovers. However, such activities would be temporary in nature,

disturb a relatively small area, and result in localized effects. Any disturbed areas would be restored to pre-project conditions to the maximum degree practicable. There is a chance of occasional, temporary disturbance to birds that are roosting and/or foraging in the area; however, birds could easily move a short distance to less disturbed areas. Thus, such temporary disturbance would be discountable and insignificant. Because any project-related effects would be localized to a relatively small area and site conditions would be restored, such activities are not likely to adversely affect designated piping plover critical habitat.

New Disturbance/Construction Activities

Vegetation clearing and disposal, compression facilities, communication facilities, stream crossings (all activities), and storage wells (all activities) are unlikely to be located within suitable habitat or designated critical habitat for the piping plover. Thus, those actions would not affect the species or its critical habitat.

Trenching, pipe stringing, hydrostatic testing, corridor restoration, access roads, and wetland crossings could potentially, but are highly unlikely to, occur within suitable habitat or designated critical habitat for the piping plover. Because of the ongoing shoreline erosion in Louisiana, the State and the USACE generally require that installation of new pipelines at the open water/shoreline interface be done using either a horizontal bore or the horizontal directional drill (HDD) method. Activities associated with those installation methods would likely occur in wetlands and/or open water adjacent to (but not within) suitable piping plover habitat. There is a small possibility of temporary disturbance to birds that are roosting and/or foraging in nearby areas; however, birds could easily move a short distance to less disturbed areas. Thus, such disturbance would be discountable and insignificant in nature. Such actions are also likely to avoid any impacts to designated piping plover critical habitat since by their nature those installation methods are designed to avoid puncturing the shoreline. Should any installation method(s) other than a horizontal bore or the HDD method be selected as a construction technique for work sites located within suitable piping plover habitat or critical habitat, then consultation with the Service should be reinitiated to determine project-related effects of the selected construction method(s).

Conclusion

In summary, because most of the NiSource actions would either occur outside of suitable piping plover habitat, or would result in short-term, temporary, and localized effects to a work site, the likelihood of any adverse impacts to the piping plover or its critical habitat is discountable and insignificant. Should a construction methodology (other than HDD or horizontal bore) be selected for installation of a new pipeline(s) within suitable piping plover habitat or designated critical habitat, consultation with the Service should be reinitiated.

RED-COCKADED WOODPECKER

The endangered red-cockaded woodpecker (RCW) nests in open, park-like stands of mature pine trees containing little hardwood understory or midstory in portions of the following MSHCP Covered Lands Parishes: Calcasieu, Catahoula, Evangeline, Grant, La Salle, and Rapides

Parishes, Louisiana. Additionally, the potential for rediscovery of the species within portions of its historic range exists in Southampton and Sussex Counties, Virginia. Populations in these areas would be found in association with open, mature pine woodlands (NatureServe 2010).

RCWs excavate roost and nest cavities in large living pines (i.e., greater than 60 years of age). The collection of cavity trees and the surrounding area within 200 feet of those trees are known as a cluster. Foraging habitat is defined as park-like pine and pine-hardwood stands 30 years of age or greater [i.e., 10 inches or greater in diameter at breast height (dbh)] that are located contiguous to and within one-half mile of the cluster boundary.

Some covered activities are not anticipated to result in any noticeable impacts to RCWs (e.g., those occurring at maintained facility yards or activities with minimal noise and disturbance). Infrequent, short duration (less than 2 hours) military training exercises that are in close proximity to active RCW nest sites have not been found to impact RCW fitness rates on military installations (Delaney et al. 2002), and we expect similar responses to activities by NiSource. However, many covered activities are expected to adversely affect the RCW, if they are adjacent to or within RCW habitat (BA, Table G). Portions of existing maintained ROWs may be located adjacent to habitat containing cavity trees used by RCWs for breeding. Noise disturbances to which resident RCWs have not become accustomed (e.g., new construction activities; the use of off-road vehicles, motorized logging equipment, and other vehicles that make excessive noise and disturbance; etc.) in cluster areas containing active nest cavities during the breeding season (April 15 – August 1) could potentially disrupt RCW nesting activities, decrease feeding and brooding rates, and cause nest abandonment (USFWS 2003). In addition, physical presence of people and equipment within proximity to active nest trees can also interfere with brood rearing and possibly decrease nesting success. Although this distance is not easily definable because it can vary among different RCW groups, generally, the closer to the nest tree equipment or activity occurs, the greater the likelihood of interference with brooding or nestling partitioning. Also, consideration must be given to the use of heavy equipment within 50 feet of cavity trees anytime during the year, as the use of vehicles and other activities may cause indirect impacts to red-cockaded woodpeckers through excessive soil compaction, damage to cavity tree roots, and disturbance of the groundcover (USFWS 2003).

To address these impacts, NiSource has committed to the AMMs listed in Table 2. In general, NiSource has agreed to either survey for potential RCW habitat or avoid prolonged O&M activities (e.g., >2 hours) between August 1 and April 14th. Further, NiSource will conduct surveys prior to all new construction activities within suitable habitat. If RCW nesting or foraging habitat is present, prolonged O&M activities will be avoided from August 1 and April 14th, and further coordination will be conducted with the Service prior to all new construction activities.

<u>Conclusion</u>

In summary, the AMMs ensure that work is conducted in areas where or times when RCWs will not be present and that suitable foraging and nesting habitat remains. These make the risk of exposing RCWs to stressors associated with both O&M and new construction activities

extremely unlikely to occur. Therefore, we conclude that the likelihood of adverse impacts to this species is discountable, and we concur with the determination that the implementation of the MSHCP is not likely to adversely affect RCWs.

AMPHIBIANS

CHEAT MOUNTAIN SALAMANDER

Cheat Mountain salamanders are typically found in red spruce or mixed-deciduous forests with moist soil and relatively cool temperatures at elevations above 2,000 feet north of Spruce Knob and at elevations above 3,500 feet south of Spruce Knob (USFWS 2009). They are found under rocks and logs during the day, or in rock crevices below the ground (USFWS 1989). At night, especially during rainy weather, the Cheat Mountain salamander forages on the forest floor in the damp cool climate (USFWS 1989). The Cheat Mountain salamander is found in an approximately 695 square mile area of Pendleton, Pocahontas, Randolph, Grant, and Tucker counties, West Virginia. The majority of the populations are found within the Monongahela National Forest (USFWS 1989). Populations in southeast Tucker and central Randolph counties fall within the action area and could potentially be impacted by the project.

As discussed in Appendix F, Section F-5 of the MSHCP, Cheat Mountain salamanders are unlikely to occupy existing maintained ROWs. To avoid or minimize impacts to Cheat Mountain salamanders, NiSource adjusted the extent of the covered lands for 103 miles to exclude the species range. In this 103 mile section, NiSource will not perform activities outside of the ROW, thereby avoiding direct impacts to salamander habitat. NiSource also agreed to employ additional AMMs (complete list in Table 2) to further reduce the likelihood that Cheat Mountain salamanders located off the ROW would be exposed to any effects of O&M activities. For example, NiSource will not use aerial application of herbicides and conduct other measures to ensure that herbicides do not extend beyond the ROW. NiSource has also developed AMMs for future routing of projects that occur off ROWs to avoid any impacts to Cheat Mountain salamanders associated with new construction activities. If any work will involve disturbances off existing ROWs or AMMs developed cannot be conducted within the mapped potential range of Cheat Mountain salamanders, further coordination with the Service will be necessary.

Conclusion

We conclude that adverse impacts to this species are extremely unlikely to occur because NiSource has (1) adjusted their covered lands to avoid direct impacts to salamander habitat and (2) developed AMMs that significantly reduce the risk of exposing Cheat Mountain salamanders to stressors associated with both O&M and new construction activities. Therefore, the likelihood of adverse impacts is discountable, and we concur with the determination that the implementation of the MSHCP is not likely to adversely affect the Cheat Mountain salamander.

FISH

KENTUCKY ARROW DARTER

The Kentucky arrow darter is restricted to 34 headwater streams in the upper Kentucky River basin of eastern Kentucky. Kentucky arrow darters occur in streams ranging from first to third order, but most individuals have been observed in second order streams with watersheds encompassing 20 square kilometers. The subspecies typically inhabits pools or transitional areas between riffles and pools (runs and glides) in moderate to high gradient streams, with substrates dominated by bedrock, boulder, and cobble substrates. The subspecies feeds on a variety of aquatic invertebrates, but mayflies are the primary food source.

The NiSource project may affect this subspecies in portions of its historic range in Clay, Lee, and Owsley counties, Kentucky. There are no known extant populations of Kentucky arrow darters in the action area; however, patches of suitable habitat may occur, and due to its historic presence, there is some potential for undocumented populations to occur within the action area (NatureServe 2010; USFWS 2012). To address its potential presence within the action area, we visited 16 streams in September 2012 that appeared to contain suitable habitat for the subspecies. No Kentucky arrow darters were observed, and several streams exhibited water quality and habitat conditions unsuitable for the subspecies. Based on these results, the Kentucky arrow darter appears to be absent or extremely rare with the action area and is unlikely to be impacted by NiSource activities. Therefore, the likelihood of adverse impacts to the subspecies is discountable.

Conclusion

We conclude that adverse impacts to this species are extremely unlikely to occur because the species is not currently known in the covered lands. Therefore, the likelihood of adverse impacts is discountable, and we concur with the determination that the implementation of the MSHCP is not likely to adversely affect the Kentucky arrow darter.

PALLID STURGEON

The endangered pallid sturgeon (*Scaphirhynchus albus*) is found in the lower Mississippi River, although it is rare throughout its range. These fish require large, turbid, free-flowing riverine habitats, and feed mainly on aquatic invertebrates and other small fish. They are usually found near the bottom of streams or rivers on sand flats or gravel bars. Little information is known on spawning or migration habits of these fish, although spawning likely occurs in the spring and summer months. The Nisource covered lands includes the following county that has potential suitable habitat for this species: Issaquena County.

The covered lands crosses pallid sturgeon habitat at the Mississippi River. Both the size and setting of the Mississippi where the covered lands crosses significantly diminishes the potential for adverse impact to the pallid sturgeon (e.g., HDD required). Given the size of the river, NiSource can do very little activities within the channel itself. Further, if some sedimentation

enter the system indirectly from one of these activities, the river at this point is a large, lowland system with a high volume flow and great capability to move sediments, greatly reducing the potential effects of sedimentation on this species.

Conclusion

We conclude that adverse impacts to this species should not have measurable impacts in the pallid sturgeon from both O&M and new construction activities. Therefore, the likelihood of adverse impacts is insignificant, and we concur with the determination that the implementation of the MSHCP is not likely to adversely affect the pallid sturgeon.

PYGMY MADTOM

The pygmy madtom occurs only in the Duck River within the covered lands. NiSource has agreed to apply all of the HCP mussel AMMs to this river (Table 2). These measures work to either completely avoid or significantly reduce potential effects on the stream and riparian habitats and the madtom. The AMMs will ensure that some activities do not occur in or near the habitat, making it unlikely that the madtom will be exposed to those activities. Where exposed to pipeline activities, these AMMs will reduce the potential impacts so that the madtom will only experience temporary disturbance and displacement for the duration of the activities.

Conclusion

We conclude that adverse impacts to this species are extremely unlikely to occur because NiSource has developed AMMs that significantly reduce the risk of exposing pygmy madtoms to stressors or causing measureable negative impacts associated with both O&M and new construction activities. Therefore, the likelihood of adverse impacts is insignificant or discountable, and we concur with the determination that the implementation of the MSHCP is not likely to adversely affect the pygmy madtom.

SPOTFIN CHUB

The SFC typically inhabits moderately flowing runs over bedrock, large boulders and other substrates in large, clear, warm, upland streams of the Tennessee River System (USFWS 2010). In winter, the species may move to pools with sand bottoms (Russ 2006). The SFC is generally sporadic or occasional in distribution and is present in discreet reaches of most streams where it occurs. Only in select stream reaches (e.g., lower Emory River, upper Little Tennessee River) is the species' occurrence considered to be widely distributed. In addition, the species occurrence in small tributaries in three of four population clusters (except the Buffalo River) is highly sporadic or may be seasonal (USFWS 2010).

The proposed project corridor traverses one county, Lewis County, Tennessee, supporting a SFC population. Within this county, the NiSource project corridor intersects two streams, Rush Branch, a tributary to Grinders Creek, and Grinders Creek, a tributary to the Buffalo River. These stream crossings have the potential to indirectly affect SFCs downstream in the Buffalo

River (Duck River Basin). The NiSource Pipeline crosses Rush Branch approximately 7.2 RKMs (4.5 stream miles) upstream of Grinders Creek's confluence with the Buffalo River (area of SFC occupation), and it crosses Grinders Creek approximately 10.5 RKMs (6.5 stream miles) upstream of the Grinders Creek/Buffalo River confluence. Grinders Creek historically supported SFCs (USFWS 2010), and the Buffalo River SFC population cluster persists within an approximate 1.0 RKM reach of the Buffalo River. Grinders Creek empties into the occupied Buffalo River reach with approximately half of this reach being located downstream of the Grinders Creek confluence. All remaining streams within the project corridor do not represent suitable habitat for SFCs, so proposed project activities in these areas are expected to have no effect on the species.

Conclusion

We have reviewed the proposed action and have determined that most subactivities will have "no effect" or are "not likely to adversely affect" the SFC. Many of these subactivities involve non-earth disturbing vegetation management (e.g., e.g., mowing, tree trimming, brush pile burning in uplands) and passive facilities operation that will have little to no effect on the species or its habitat. Other subactivities have the potential to adversely affect occupied SFC habitats, but application AMMs and strict adherence to the ECS will minimize indirect impacts such as sedimentation, increased turbidity, and increased stream temperature. We consider impacts from these subactivities to be insignificant or discountable.

Mussels

HCP and non-HCP mussels: Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel, Orangefoot Pimpleback Pearlymussel, Ring Pink Mussel, Rough Pigtoe Mussel, Fat Pocketbook Pearlymussel, Fluted Kidneyshell Pearlymussel, and Slabside Pearlymussel

NiSource has agreed to conduct surveys prior to work (except for HDD crossings) that could affect the following streams with known important mussel populations: Allegheny River (PA), Big Darby Creek (OH), Big Sunflower River (MS), Elk River (WV), Kanawha River (WV), Licking River (downstream crossing sites Nicholas-Robertson County, KY), Little Darby Creek (OH), Little Kanawha River (WV), Muskingum River (OH), and Swift Run (VA).

NiSource has agreed to avoid all stream channel disturbing activities in the areas specified for both the MSHCP and Non-MSHCP Species of NLAA mussels (birdwing pearlymussel, cracking pearlymussel, cumberland monkeyface pearlymussel, oyster mussel, orangefoot pimpleback pearlymussel, ring pink mussel, rough pigtoe mussel, fat pocketbook pearlymussel, fluted kidneyshell pearlymussel, and slabside pearlymussel). Direct stream channel impacts will be avoided by implementing mussel AMMs.

Where NiSource must implement a new stream crossing they will employ Mussel AMM #3 which requires the use of HDD and avoids all in-stream disturbance. Other activities (e.g., bank disturbance) are not expected to cause impacts to mussels that would rise to the level of take because of the restrictions required by implementation of other mandatory AMMs (see Table 2 for the list of mandatory and non-mandatory AMMs). For example, AMM # 4 requires pipeline

replacements to be extend beyond the high-water level to avoid exposure of the pipeline and latent bank erosion. Further, any AMM that could result in take of NLAA mussels will be implemented. For example, AMM #1 allows NiSource to translocate mussels that would be impacted by instream work would not be allowed for these NLAA mussels.
Some of the mussel AMMs are non-mandatory (i.e., #6,9,12,19). However, if any of these AMMs are not implemented we do not expect take of NLAA mussels because these AMMs (except AMM # 19) address impacts from construction in the stream channel, which is not permitted for the NLAA mussels. Non-mandatory mussel AMM # 19, which addresses driving across streams is expected to have an insignificant or discountable effect on both MSHCP and Non-MSHCP mussels for the following reasons: (a) the practice of driving across streams is comparatively rare, (b) crossing areas are commonly known fords that receive other traffic and are therefore unlikely to support mussels, (c) NLAA mussels often occur at low densities (widely dispersed within occupied habitat) and when implemented, this activity typically involves a single vehicle with a correspondingly small footprint resulting in low probability of take, and (d) many of the streams harboring NLAA mussels are too large or deep to be driven across.

NiSource will be required to mitigate for various impacts to the five species of mussels for which they are requesting take coverage. The mitigation varies somewhat among the species, but in most cases has a stream bank restoration component. Where NLAA mussels occur in the same reach as one or more of the take species, restoration of the riparian zone would be expected to benefit all mussels within that reach of stream. At this point, the specific locations of riparian mitigation are unknown, however the Green Infrastructure approach to mitigation developed by The Conservation Fund should help focus restoration on areas where benefits to other mussel species will accrue (for a discussion of the Green Infrastructure approach, see Chapter 1 of the MSHCP).

Conclusion

NiSource has developed these avoidance measures for the NLAA these mussels for both O&M and new construction activities. These measures make exposure of these species to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is insignificant or discountable. If for reasons currently unforeseen, impacts to occupied stream channels cannot be avoided, NiSource will reinitiate consultation for these species.

Plants

Riparian Plant Species

This section evaluates the effects of the proposed action on riparian plant species: Harperella, Spring creek bladderpod, and Virginia spiraea.

Harperella

There are two primary forms of the species based largely on habitat and habitat derived characteristics, with one form found in seasonally flooded rocky streams, and the second found in coastal plain ponds. The stream form grows on rocky and sandy shoals, or occasionally

muddy banks, of seasonally flooded and quickly moving streams; generally sheltered from rapidly moving water. The pond form is found on the edges of shallow pineland ponds, low savanna meadows, and along a granite outcrop in one site. Stream populations are found in portions of Maryland, Virginia, West Virginia, North Carolina, Alabama, and Arkansas. Pond populations are found in South Carolina and southern Georgia. The NiSource MSHCP may affect this species in portions of Allegany and Washington Counties, Maryland and Prince William, Frederick and Mecklenburg Counties, Virginia; however, it is extremely unlikely to be impacted by NiSource activities because it occurs in very localized areas outside the covered lands or in these very specific habitats in which NiSource does not work.

Conclusion

The likelihood of impacts to the species is discountable; therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect Harperella.

Spring Creek Bladderpod

Spring Creek bladderpod is found within the floodplain fields of three streams. The NiSource MSHCP may affect this species within floodplain habitats in Wilson County, Tennessee; however, it is extremely unlikely to be impacted by NiSource activities because it occurs in very localized areas outside the covered lands or in these very specific habitats in which NiSource does not work.

Conclusion

The likelihood of impacts to the species is discountable; therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the Spring Creek bladderpod.

Virginia spiraea

Virginia spiraea is widely scattered within seven states (OH, WV, VA, KY, TN, NC, and GA) and is recorded from historical localities in PA and AL. Its habitat includes the banks of high gradient sections of second and third order streams, along with meander scrolls and point bars, natural levees, and other braided features of lower stream reaches, often near the mouth of the stream. There are an estimated 236 element occurrences found in Georgia, Kentucky, North Carolina, Ohio, Tennessee, Virginia, and West Virginia in 2007 with the majority (109) in West Virginia (USFWS, unpublished data, 2008). Extant populations are found on streams that drain into the Ohio River, primarily within the Appalachian Plateau and Blue Ridge regions, though there is an outlier in the Bluegrass Region of Kentucky.

The NiSource project may affect this species in portions of McDowell, Mercer, Raleigh, Summers, Upshur, and Wyoming Counties, West Virginia. Overall, the covered lands intersect with approximately 44,768 acres of mapped suitable habitat. However, not all potential habitat within the covered lands is likely to be occupied by the species. We believe that new occurrences are most likely to be found in counties with known occurrences or within

connected patches of modeled suitable habitat and estimate there is approximately 18, 029 acres of potential habitat for the species within the covered lands. There are no known occurrences within the ROW proper in West Virginia, but it is possible that the species occurs in previously unsurveyed portions of the ROW in the above-listed counties. There are also no known occurrences within the broader covered lands in West Virginia. There are seven known occurrences in West Virginia counties crossed by the covered lands with the closest approximately 2.7 miles (4.3 km) from the covered lands in Raleigh County. Given several nearby populations, we believe that it is likely that other populations may occur within the covered lands in West Virginia.

While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in the extirpation of small unknown populations of this species. Impacts to Virginia spiraea would occur primarily from the replacement, removal, or installation of pipeline and building of new access roads across occupied habitat. Mowing, herbicide use, and vegetation disposal for pipeline O&M may also directly affect Virginia spiraea. Individuals may suffer decreased fitness resulting from indirect effects, such as introduction of invasive exotic plant competitors. Activities involving heavy equipment and machinery in or near species habitat may spread seeds of invasive plant species. Inspection activities could result in crushing of individuals, but the likelihood of this occurring is discountable as minimal impacts to riparian areas are anticipated. Access road maintenance and cathodic protection trenching activities may result in habitat degradation; however, the required buffer from riparian areas and the small amount of sedimentation expected from those activities should not result in any measurable impacts to the species.

To avoid impacts to Virginia spiraea, NiSource has developed AMMs specific to the species (see Table 2 for complete list). In general, NiSource will conduct surveys prior to construction of ROWs in new alignment or ≥1 acre of ground disturbing activities (e.g., pipeline replacement) within existing ROWs and either avoid impacts to those populations or tiered consultation between the FERC and Service will be required. In addition, NiSource will visually inspect stream crossings for bank destabilization and repair if needed, minimize impacts of equipment crossings to the stream bed through the use of half pipes, and restrict the use of fertilizers within 100 ft of documented or modeled Virginia spiraea habitat.

<u>Conclusion</u>

In considering that there are no known populations within the ROW proper or covered lands, most ongoing activities are not anticipated to affect the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of Virginia spiraea to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the Virginia spiraea.

Transitional Successive Plant Species

This section evaluates the effects of the proposed action on the transitional successive plant species: American chaffseed, Eastern prairie fringed orchid, leafy prairie-clover, and running buffalo clover. The BA details the pipeline activities and subactivities, the environmental impacts resulting from each subactivity, and the anticipated responses of individuals and populations exposed to those impacts. The first section of this analysis focuses on the impacts to individuals across all of the species in this grouping (individual impacts are anticipated to be the same or quite similar). We then conduct species-specific analyses to assess how these individual responses may affect the population to which these individuals belong and how the anticipated impacts, if any, at the population level will affect the fitness of the species rangewide.

NiSource's activities have a variety of impacts on transitional successive plants. Some subactivities are expected to have no detectable effects on transitional successive plants, usually because they are not expected to occur in transitional successive plant habitat. For example, transitional successive plants do not occur along streams or within wetlands, activities with all effects in those areas will not directly affect the species. In place pipeline abandonment, transfer of pipeline ownership, pipe stringing, compression facility noise, and communication facility operation would also have no effect on transitional successive plants. Running buffalo clover is the only transitional successive plant that occurs in a storage field expansion county (Hocking County, Ohio). Conversely, many subactivities are expected to adversely impact transitional successive plants, should they occur where the species are present.

The subactivities completed in transitional successive habitat may result in direct and indirect impacts to the exposed individuals. Direct impacts may cause individuals to experience temporary stress or decreased reproductive success (e.g., from minor physical damage or habitat disturbance) to death (e.g., from crushing, cutting, poisoning). These direct impacts to transitional successive plants would occur primarily from the replacement, removal, or installation of pipeline and building of new access roads across occupied habitat. Mowing, herbicide use, and vegetation disposal for pipeline O&M may also directly affect transitional successive plants. Individuals may suffer decreased fitness resulting from indirect effects, such as introduction of invasive exotic plant competitors. Activities involving heavy equipment and machinery in or near species habitat may spread seeds of invasive plant species.

To avoid impacts to transitional successive plants, NiSource has developed AMMs specific to the species (see Table 2 for complete list of AMMs). In general, NiSource will conduct surveys for Eastern prairie fringed orchid, leafy prairie-clover, and running buffalo clover prior to construction of ROWs in new alignment or ≥1 acre of ground disturbing activities (e.g., pipeline replacement) within existing ROWs and either avoid impacts to those populations or tiered consultation between the FERC and Service will be required. In addition, NiSource will route new ROW alignments to avoid impacts to known populations of Eastern prairie fringed clover and running buffalo clover.

To address the question of exposure to direct and indirect impacts, we will evaluate whether there are known occurrences of a species within the action area and whether there is potential for additional occurrences that have not been discovered due to lack of surveys in that area. We conducted this analysis by species.

American Chaffseed

The species is a monotypic perennial found in pine flatwoods, fire-maintained savannas, ecotonal areas between peaty wetlands and xeric sandy soils, and other open grass-sedge systems. It generally occurs in sandy (sandy peat, sandy loam), acidic, seasonally moist to dry soils. American chaffseed is considered shade intolerant, primarily occurring in areas maintained in an open to partially open condition, often due to frequent, naturally-occurring fires.

The NiSource project may affect this species in portions of its historic range in Greensville and Sussex Counties, Virginia. There are no known extant populations of American chaffseed in Virginia; however, patches of suitable habitat may occur, and due to its historic presence, there is some potential for undocumented populations within the project area (NatureServe 2010). Nevertheless, if present, the species is rare within the action area and we believe that it is extremely unlikely to be impacted by NiSource activities.

Conclusion

Therefore, the likelihood of adverse impacts to the species is discountable, and we concur with the determination that the implementation of the MSHCP is not likely to adversely affect the American chaffseed.

Eastern Prairie Fringed Orchid

The eastern prairie fringed orchid is a perennial herb in the orchid family primarily found in tall grass calcareous silt loams or sub-irrigated sand prairies, though it can also be found in open portions of fens, sedge meadows, marshes, and bogs.

The NiSource project may affect this species in portions of Clark, Holmes, Lucas, Ottawa, Sandusky and Wayne Counties in Ohio; and Augusta County in Virginia. There are no known occurrences within the ROW proper in Ohio or Virginia. There is one occurrence at the intersection of Wayne and Holmes counties, Ohio, and one occurrence at the edge of the covered lands in Augusta County, Virginia. We believe that it is likely that populations may occur within the covered lands given the presence of at least two populations within the covered lands.

While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in impacts to unknown populations of this species. However, NiSource will conduct surveys prior to construction of ROWs in new alignment or ≥1

acre of ground disturbing activities (e.g., pipeline replacement) within existing ROWs and either avoid impacts to those populations or further consultation between the FERC and Service will be required. Given the AMMs and the frequency of occurrence observed to date within the ROW and covered lands (two), impacts to Eastern prairie fringed orchid from NiSource are unanticipated.

Conclusion

In considering that there are no known populations within the ROW proper and only two known populations within the covered lands that will not be impacted by NiSource's activities, most ongoing activities are not anticipated to affect the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of Eastern prairie fringed orchid to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the Eastern prairie fringed orchid.

LEAFY PRAIRIE-CLOVER

The leafy prairie-clover is a perennial herb in the Pea family found in thin-soiled mesic and wet-mesic dolomite prairies, limestone cedar glades, and limestone barrens. The NiSource project may affect this species in portions of Davidson, Maury, Williamson, and Wilson Counties, Tennessee, along with the potential discovery of undocumented extant pockets of the species within its historic range in Sumner County, Tennessee. There are no known occurrences in ROWs or covered lands but there is suitable habitat within the ROW between Interstate 40 and Interstate 24 in Davidson County Tennessee.

While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in impacts to unknown populations of this species. However, NiSource will conduct surveys prior to construction of ROWs in new alignment or ≥1 acre of ground disturbing activities (e.g, pipeline replacement) within existing ROWs and either avoid impacts to those populations or further consultation between the FERC and Service will be required. Given the proposed avoidance and minimization measures and the frequency of occurrence observed to date within the ROW and covered lands (two), impacts to leafy prairie clover from NiSource are unanticipated.

Conclusion

In considering that there are no known populations within the ROW proper or covered lands, most ongoing activities are not anticipated to affect the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of leafy prairie clover to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the leafy prairie clover.

Running Buffalo Clover

The running buffalo clover is a perennial herb in the Pea family found on mesic habitats with partial to filtered sunlight, in areas where this is a long-term pattern of moderate, periodic disturbance such as mowing, trampling, or grazing. It is primarily, though not exclusively, found in areas underlain by limestone or other calcareous bedrocks. Habitat associations include mesic woodlands, savannahs, floodplains, stream banks, sandbars (especially in areas where old trails cross or parallel the intermittent stream), grazed woodlots, mowed paths (cemeteries, parks, lawns, etc), old logging roads, jeep trails, ATV trails, skid trails, mowed wildlife openings within mature forest, and steep ravines (USFWS 2007).

The NiSource project may affect this species in portions of Bourbon, Campbell, Clark, Fayette, Madison, and Montgomery Counties, Kentucky; Brown, Clermont, and Lawrence Counties, Ohio; and Pendleton, Pocahontas, Preston, Randolph, Tucker, and Webster Counties; West Virginia. Additionally, the potential for rediscovery of the species within portions of its historic range exists in Jackson County, Kentucky and Monongalia County, West Virginia. Overall, the covered lands intersect with 45,075 acres of suitable habitat in West Virginia and extensive suitable habitat in Ohio and Kentucky. There are no known occurrences within the ROW proper. There are also no known occurrences within the broader covered lands in Ohio but there are six known populations of running buffalo clover within covered lands in Augusta (1) and Hocking (1) counties Ohio, and Preston (2), Brooke (1), and Tucker (1) counties, West Virginia. In addition, there are several more occurrences within Randolph County, West Virginia that are located outside the covered lands solely because sections were removed for the protection of the Cheat Mountain salamander. Therefore, those conservations measures also benefit the running buffalo clover. We believe that it is likely that additional populations may occur within the covered lands given the presence of at least six populations within the covered lands.

While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in impacts to unknown populations of this species. However, NiSource will conduct surveys prior to construction of ROWs in new alignment or >1 acre ground disturbing activities (e.g., pipeline replacement) in existing ROWs and either avoid impacts to those populations or further consultation between the FERC and Service will be required. Given the proposed avoidance and minimization measures and the frequency of occurrence observed to date within the ROW (none) and covered lands (6), impacts to running buffalo clover from NiSource are unanticipated.

Conclusion

In considering that there are no known populations within the ROW proper and six known populations within the covered lands that will not be impacted by NiSource, most ongoing activities are not anticipated to affect the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of running buffalo clover to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the

determination that implementation of the MSHCP is not likely to adversely affect running buffalo clover.

Upland/Upland Successional Plant Species

This section evaluates the effects of the proposed action on the upland/upland successional plant species: globe (Short's) bladderpod, Leedy's roseroot, Michaux's sumac, northern monkshood, shale barren rock cress, Short's goldenrod, small whorled pogonia, and smooth coneflower. The BA details the pipeline activities and subactivities, the environmental impacts resulting from each subactivity, and the anticipated responses of individuals and populations exposed to those impacts.

The first section of this analysis focuses on the impacts to individuals across all of the species in this grouping (individual impacts are anticipated to be the same or quite similar). We then conduct species-specific analyses to assess how these individual responses may affect the population to which these individuals belong and how the anticipated impacts, if any, at the population level will affect the fitness of the species rangewide.

NiSource's activities have a variety of impacts on upland plants. Some subactivities are expected to have no detectable effects on upland plants, usually because they are not expected to occur in upland plant habitat. For example, wetlands and riparian areas are not upland plant habitat and thus, activities in those areas will not affect the species. In place pipeline abandonment, transfer of pipeline ownership, pipe stringing, compression facility noise, and communication facility operation would also have no effect on upland plants or their habitats. The upland plants do not occur in any of the storage field expansion counties and will not be impacted by those activities. Conversely, many subactivities are expected to adversely impact upland plants, should they occur where the species are present.

The subactivities completed in upland plant habitat may result in direct and indirect impacts to the exposed individuals. Direct impacts may cause individuals to experience temporary stress or decreased reproductive success (e.g., from minor physical damage or habitat disturbance) to death (e.g., from crushing, cutting, poisoning). These direct impacts to upland plants would occur primarily from the replacement, removal, or installation of pipeline and building of new access roads across occupied habitat. Mowing, herbicide use, and vegetation disposal for pipeline O&M may also directly affect upland plants. Individuals may suffer decreased fitness resulting from indirect effects, such as introduction of invasive exotic plant competitors. Activities involving heavy equipment and machinery in or near species habitat may spread seeds of invasive plant species. Vegetation management with chainsaw and mechanical tree clearing, as well as tree side trimming by bucket truck or helicopter may degrade habitat by altering sun/shade requirements or causing localized habitat erosion, but the small scale of these types of alterations should not result in any measurable impacts to these species.

To avoid impacts to upland plants, NiSource has developed AMMs specific to the species (see Table 2 for complete list of AMMs). In general, NiSource will avoid all activities in areas

specified for globe (Short's) bladderpod, Leedy's roseroot, northern monkshood, shale barren rock cress, and small-whorled pogonia. NiSource will conduct surveys for shale barren rockcress, small-whorled pogonia, smooth coneflower, and Michaux's sumac prior to construction of ROWs in new alignment or ≥1 acre of ground disturbing activities (e.g., pipeline replacement) within existing ROWs. They will either avoid impacts to all newly discovered upland plant populations or tiered consultation between the FERC and Service will be required.

To address the question of exposure to direct and indirect impacts, we will evaluate whether there are known occurrences of a species within the action area and whether there is potential for additional occurrences that have not been discovered due to lack of surveys in that area. We conducted this analysis by species.

Globe (Short's) Bladderpod

The bladderpod is primarily found on steep, rocky wooded slopes and talus areas, along with cliff tops, bases, and ledges. It is often found in close proximity to rivers or streams, and generally on south to west facing slopes, often in association with outcrops of calcareous rock. Endemic to the Interior Low Plateaus province, the globe bladderpod was historically found in 57 locations, stretching from middle Tennessee through north-central Kentucky, and into southern Indiana (NatureServe 2010). The NiSource project may affect this species in specific portions of its current range in Bourbon, Fayette, and Madison Counties, Kentucky. This species is not found in the covered lands in Tennessee.

Conclusion

NiSource has agreed to avoid all activities in the area specified for Globe bladderpod. If the area cannot be avoided, consultation will be reinitiated for this species. This measure makes exposure to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the Globe bladderpod.

Leedy's Roseroot

Leedy's roseroot is only found in specialized Cliffside habitats (USFWS 1998c). The species is found on north or east-facing talus slopes or cliff ledges. It is always found associated with areas where ground water or cool air constantly seep through the strata or between rocks, which effectively maintains a cool, wet microclimate throughout the summer (NatureServe 2010). Seven populations from four counties in two states, New York and Minnesota, have been recorded (USFWS 1998c). Five confirmed populations remain, three in the limestone cliffs of the Root and Whitewater River drainages in Fillmore and Olmstead Counties in southeastern Minnesota, and two over 800 miles away to the east on the cliff shores of Seneca Lake in Schuyler and Yates Counties of western New York (NatureServe 2010). The NiSource project may affect this species in one location in Schuyler County, New York.

Conclusion

NiSource has agreed to avoid all activities in the area specified for Leedy's roseroot. If the area cannot be avoided, consultation will be reinitiated for this species. This measure makes exposure to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the Leedy's roseroot.

Michaux's Sumac

Michaux's sumac is a rare shrub found primarily in sandy or rocky open woods. It is a species adapted to disturbance (e.g., fire and drought) to maintain the open quality of its habitat and is often located proximate to power line and highway ROWs, railroads, pine plantations, and agricultural fields.

The NiSource project may affect the Michaux's sumac in portions of Brunswick, Chesterfield, Dinwiddie, Greensville, Mechlenburg, and Sussex Counties, Virginia. Overall, the covered lands intersect with approximately 20,314 acres of mapped suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW within these counties. There are also no known occurrences within the broader covered lands in Virginia; however, we believe that it is likely that populations may occur within the covered lands given the amount of suitable habitat.

While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in impacts to unknown populations of this species. However, NiSource will conduct surveys prior to construction of ROWs in new alignment or ≥1 acre of ground disturbing activities (e.g., pipeline replacement) within existing ROWs and either avoid impacts to those populations or further consultation between the FERC and Service will be required. Given the proposed avoidance and minimization measures and the frequency of occurrence observed to date within the ROW and covered lands (none), impacts to Michaux's sumac from NiSource are unanticipated.

Conclusion

In considering that there are no known populations within the covered lands, most ongoing activities are not anticipated to the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of Michaux's sumac to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect Michaux's sumac.

Northern Monkshood

Midwestern populations are found on shaded or partially shaded cliffs and talus slopes. New York populations are found at high-elevation headwaters and in crevices along streams. While no rock substrate appears to be favored by the species, all inhabited areas have a generally cold

soil environment, with either active and continuous cold air drainage, or cold ground water flow seeping out of nearby bedrock, creating a cool, damp microclimate (NatureServe 2010). Northern Monkshood has only ever been found, even historically, in three general locations: the Catskill Mountains of New York, in portions of northeastern Ohio, and unglaciated portions of northeast Iowa and southwest Wisconsin. There are approximately 70 extant populations, with the majority of remaining occurrences found in the Iowa and Wisconsin ranges. This species may intersect the covered lands in one location in Hocking County, Ohio.

Conclusion

NiSource has agreed to avoid all activities in the area specified for northern monkshood. If the area cannot be avoided, consultation will be reinitiated for this species. This measure makes exposure to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the northern monkshood.

Shale Barren Rock Cress

Shale barren rock cress is a biennial herb that has only ever been found within portions of the western Virginia and eastern West Virginia part of the shale barrens, being one of the most restricted endemics of the shale barren community. Shale barren rock cress occurs between 1099-2500 feet in elevation on 20 degree south- to southwest-facing slopes. Most of the known shale barren rock cress populations are very small, containing 50 or fewer individuals (NatureServe 2010) with the number of individual plants within a population fluctuating widely (USFWS 1991). Thus, the populations are vulnerable to extirpation from due to their small size.

The NiSource project may affect the shale barren rock cress in portions of Alleghany, Augusta, Botetourt, Page, Rockbridge, Rockingham, Shenandoah, and Warren Counties, Virginia, and Greenbrier, Hardy, and Pendleton Counties, West Virginia. Overall, the covered lands intersect with 4,754 acres of mapped suitable habitat. There are no known occurrences within the ROW proper in West Virginia or Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW in the above-listed counties. There are also no known occurrences within the broader covered lands in West Virginia. There is one occupied site in Alleghany County, Virginia within the covered lands and two additional sites ¼ mile from the covered lands. Given at least one known occurrence within the covered lands and two nearby populations, we believe that it is likely that other populations may occur within the covered lands in Virginia and West Virginia.

At least some of the unknown populations are likely to occur on U.S. Forest Service lands. The one known population within the covered lands occurs within the George Washington National Forest and the Monongahela National Forest is also estimated to have 100 acres of potential habitat (USFWS 2006). We do not anticipate any impacts to newly discovered populations on the National Forest Lands because all known shale barren rock cress populations on the George Washington National Forest are designated as Special Biological Areas where the primary goal is to restore and maintain the rare community (USFS 2011). An objective of the Draft Revised

Land and Resource Management Plan for the George Washington National Forest (USFS 2011) is to maintain or increase populations/occurrences of northeastern bulrush, swamp pink, Virginia sneezeweed, shale barren rock cress, and smooth coneflower through protection and maintenance of existing sites. As a reminder, any future proposed impacts National Forest Lands will require additional consultation between the Service, U.S. Forest Service, and FERC. While no known populations or unknown populations found on USFS lands will be lost due to the NiSource project, the same level of protection for plants is not afforded to plants on private lands. We conclude that NiSource activities could conceivably result in impacts to unknown populations of this species on private lands. However, NiSource will conduct surveys prior to construction of ROWs in new alignment or ≥1 acre of ground disturbing activities (e.g., pipeline replacement) within existing ROWs and either avoid impacts to those populations or further consultation between the FERC and Service will be required. Given the proposed avoidance and minimization measures and the frequency of occurrence observed to date within the ROW (none) and covered lands (one), impacts to shale barren rock cress from NiSource are unanticipated.

Conclusion

In considering that there is only one known population within the covered lands and it will not be impacted by NiSource, most ongoing activities are not anticipated to affect the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of shale barren rock cress to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the shale barren rock cress.

SHORT'S GOLDENROD

Short's goldenrod is primarily found in cedar glades and glade-like habitats (e.g. road rights-of-way, roadside ledges, meadows/pastures) where droughty soils prevent habitat succession to trees/shrubs. The species is also found on roadsides, and on dry, rocky, overgrazed pastures. The species thrives in full sun or partially shaded environments, but it can persist for extended periods as succession from pasture to woodland occurs. Open habitats for the species were likely maintained historically through natural disturbances such as periodic fires and trampling and grazing by large herbivores (e.g. bison, elk, and deer) (USFWS 1988).

The species was historically known from only two areas: the Falls of the Ohio near Louisville, Kentucky (type locality) and the Blue Licks area in northeastern Kentucky (Fleming, Nicholas, and Robertson counties). The population at Falls of the Ohio has not been seen since the 1860s, but the populations around Blue Licks appear to be stable (USFWS 2007). In 2001, a new population was discovered along the Blue River in Harrison County, Indiana (USFWS 2007).

Within Kentucky, the project corridor traverses the entire length (north to south) of two Short's goldenrod counties: Nicholas and Robertson. The species has not been reported from this corridor, but the Blue Licks populations are located only about 2 miles to the east, potential

habitat for the species does exist within the project corridor, and the project corroder has not been searched extensively for the species.

Conclusion

In considering that there are only potential populations within the covered lands, most ongoing activities are not anticipated to affect the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of shale barren rock cress to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the shale barren rock cress.

Small whorled Pogonia

Small whorled pogonia is found primarily in mixed-deciduous or mixed deciduous/coniferous forests, often in second- or third-growth stages, occurring in both fairly young woodlands and in maturing stands. The historic range of the species included the Atlantic seaboard from Maine to Georgia along with the eastern Great Lakes states and outlying occurrences in the Midwest U.S. and Canada. The species is now considered extirpated in Vermont and the District of Columbia, and are potentially extirpated in Maryland and Missouri. The NiSource project may affect this species in portions of Califon Borough, Hunterdon County, and Morris County, New Jersey; Hocking County, Ohio; and Botetourt, Fairfax, Giles, Henrico, Madison, Rockbridge, and Prince William Counties, Virginia. Small whorled pogonia does not occur in any of the storage field expansion counties and will not be impacted by those activities. There are no known occurrences in ROWs or the entire covered lands in New Jersey or Virginia. Small whorled pogonia is not anticipated to occur in existing ROWs; therefore, activities that are wholly contained within the existing ROW should not affect this species.

Conclusion

NiSource has agreed to avoid all activities in the area specified for small whorled pogonia and to conduct surveys prior to new alignment in upland forests in Califon Borough, Hunterdon County, and Morris County, New Jersey; Centre and Chester, Greene, Monroe, and Montgomery Counties, Pennsylvania and Botetourt, Fairfax, Giles, Henrico, Madison, Rockbridge, and Prince William Counties, Virginia. If the area cannot be avoided, consultation will be reinitiated for this species. This measure makes exposure to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the small whorled pogonia.

Smooth Coneflower

Smooth coneflower populations are found in open woods, cedar barrens, along roadsides, within clear cuts, along dry limestone bluffs, and within power line right-of-ways. Soils are generally rich in magnesium or calcium. Optimal habitat for the species is characterized by abundant sunlight and little competition with other species in the herbaceous layer.

The NiSource project may affect this species in portions of Albermarle, Alleghany, Augusta, Botetourt, Chesterfield, Clarke, Culpeper, Frederick, Giles, Goochland, Louisa, Mecklenburg, Orange, Page, Powhatan, Rockbridge, Rockingham, Shenandoah, and Warren Counties, Virginia. Overall, the covered lands intersect with 32,770 acres of mapped suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW in the above-listed counties. There are no known occurrences along the existing ROW in Virginia. However, the ROW provides suitable habitat for the species and most of the ROW has not been surveyed for smooth coneflower. There are also no known occurrences within the broader covered lands in Virginia; however, we believe that it is likely that populations may occur within the covered lands given the amount of suitable habitat.

While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in impacts to unknown populations of this species. However, NiSource will conduct surveys prior to construction of ROWs in new alignment or ≥1 acre of ground disturbing activities (e.g., pipeline replacement) within existing ROWs and either avoid impacts to those populations or further consultation between the FERC and Service will be required. Given the proposed avoidance and minimization measures and the frequency of occurrence observed to date within the ROW and covered lands (none), impacts to smooth coneflower from NiSource are unanticipated.

<u>Conclusion</u>
In considering that there are no known populations within the covered lands, most ongoing activities are not anticipated to affect the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of smooth coneflower to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the smooth coneflower.

Wetland Plant Species

This section evaluates the effects of the proposed action on the wetland plant species: Northeastern bulrush, pondberry, swamp pink, sensitive joint-vetch, and Virginia sneezeweed. The BA details the pipeline activities and subactivities, , the environmental impacts resulting from each subactivity, and the anticipated responses of individuals and populations exposed to those impacts. The first section of this analysis focuses on the impacts to individuals across all

of the species in this grouping (individual impacts are anticipated to be the same or quite similar). We then conduct species-specific analyses to assess how these individual responses may affect the population to which these individuals belong and how the anticipated impacts, if any, at the population level will affect the fitness of the species rangewide.

NiSource's activities have a variety of impacts on wetland plants. Some subactivities are expected to have no detectable effects on wetland plants, usually because they are not expected to occur in wetland plant habitat. For example, upland areas are not wetland plant habitat and thus, activities with all effects in those areas will not directly affect the species. In place pipeline abandonment, transfer of pipeline ownership, pipe stringing, compression facility noise, and communication facility operation would also have no effect on wetland plants. One wetland plant species (northeastern bulrush) occurs in a storage field expansion county. The rest of the wetland plants will not be impacted by those activities. Conversely, many subactivities are expected to adversely impact upland plants, should they occur where the species are present.

The subactivities completed in wetland plant habitat may result in direct and indirect impacts to the exposed individuals. Direct impacts may cause individuals to experience temporary stress or decreased reproductive success (e.g., from minor physical damage or habitat disturbance) to death (e.g., from crushing, cutting, poisoning). These direct impacts to wetland plants would occur primarily from the replacement, removal, or installation of pipeline and building of new access roads across occupied habitat. Mowing, herbicide use, and vegetation disposal for pipeline O&M may also directly affect wetland plants. In-stream work and stream crossings may cause sedimentation that may bury plants (swamp pink) and/or alter their habitat. Vegetation management with chainsaw and mechanical tree clearing, as well as tree side trimming by bucket truck or helicopter may degrade habitat by altering sun/shade requirements. Individuals may suffer decreased fitness resulting from indirect effects, such as introduction of invasive exotic plant competitors. Activities involving heavy equipment and machinery in or near species habitat may spread seeds of invasive plant species.

To avoid impacts to wetland plants, NiSource has developed AMMs specific to the species (see Table 2 for complete list of AMMs). In general, NiSource will route new alignments to avoid known populations of northeastern bulrush, swamp pink, and Virginia sneezeweed, and the historic population of sensitive joint-vetch in Logan Township, Gloucester County, New Jersey. NiSource will conduct surveys for wetland species prior to construction of ROWs in new alignment or ≥1 acre of ground disturbing activities (e.g., pipeline replacement) within existing ROWs. They will either avoid impacts to all newly discovered wetland plant populations or tiered consultation between the FERC and Service will be required.

To address the question of exposure to direct and indirect impacts, we will evaluate whether there are known occurrences of a species within the action area and whether there is potential for additional occurrences that have not been discovered due to lack of surveys in that area. We conducted this analysis by species.

Pondberry

The pondberry is chiefly a coastal plain species, historically ranging from North Carolina south to Florida and west to Louisiana, along with populations in portions of the Mississippi Embayment in southern Missouri and Arkansas.

The NiSource project may affect this species in portions of Sharkey and Sunflower Counties, Mississippi. Overall, the covered lands intersect with approximately 6,800 acres of mapped suitable habitat. There are no known occurrences in ROW proper in Mississippi; however, it is possible that the species occurs in previously unsurveyed portions of the ROW within the above-listed counties. There are also no known occurrences within the broader covered lands in Mississippi; however, we believe that it is likely that populations may occur within the covered lands given the amount of suitable habitat.

While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in impacts to unknown populations of this species. However, NiSource will conduct surveys prior to construction of ROWs in new alignment or during ground disturbing activities (e.g., pipeline replacement) within wetlands in existing ROWs and either avoid impacts to those populations or further consultation between the FERC and Service will be required. Given the proposed avoidance and minimization measures and the frequency of occurrence observed to date within the ROW and covered lands (none), impacts to pondberry from NiSource are unanticipated.

Conclusion

In considering that there are no known populations within the ROW proper or broader covered lands, most ongoing activities are not anticipated to affect the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of pondberry to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the pondberry.

Sensitive Joint-vetch

The sensitive joint-vetch occurs in fresh to slightly brackish tidal river systems, within the intertidal zone where populations are flooded twice daily. It typically occurs at the outer fringe of marshes or shores; its presence in marsh interiors may be a result of nutrient deficiencies, ice scouring, or muskrat herbivory.

NiSource has agreed to avoid all impacts to the one historic location in Logan Township, Gloucester County, New Jersey, and no additional populations are anticipated to occur in the ROW proper or covered lands in New Jersey. Therefore, the NiSource project is not likely to adversely affect sensitive joint-vetch in New Jersey.

The NiSource project may affect this species in portions of Chesterfield, Fairfax, Henrico, Isle of Wight, Prince George, Prince William, Suffolk, and Surry Counties, Virginia. Overall, the covered lands intersect with 2,433 acres of suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW in the above-listed counties. There are also no known occurrences within the broader covered lands in Virginia; however, we believe that it is likely that populations may occur within the covered lands given the amount of suitable habitat.

While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in the impacts to unknown populations of this species. However, NiSource will conduct surveys prior to construction of ROWs in new alignment or during ground disturbing activities (e.g., pipeline replacement) within wetlands in existing ROWs and either avoid impacts to those populations or further consultation between the FERC and Service will be required. Given the proposed avoidance and minimization measures and the frequency of occurrence observed to date within the ROW and covered lands (none), impacts to sensitive joint-vetch from NiSource are unanticipated.

Conclusion

In considering that there are no known populations within the ROW proper and only one known population within the covered lands that will not be impacted by NiSource, most ongoing activities are not anticipated to affect the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of sensitive joint-vetch to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the sensitive joint-vetch.

SWAMP PINK

Swamp pink is found in forested wetlands that are groundwater influenced and perennially water-saturated. These wetlands occur at sites where the water table is at or very near the surface and maintains a relatively stable height throughout the spring and summer. The species is often found adjacent to streams, particularly along headwaters.

The NiSource project may affect this species in portions of Woolwich Township, Gloucester County, Mount Olive, Roxbury, and Randolph Townships, Morris County, and Salem County, New Jersey; and Albermarle, Augusta, Botetourt, Fairfax, Greene, Henrico, Prince George, Rockbridge, Rockingham, and Page Counties, Virginia. Overall, the covered lands intersect with approximately 5,097 acres of potential habitat in Virginia and 2,379 acres in New Jersey. There are no known occurrences in the ROW proper in New Jersey or Virginia; however, two sections of pipeline intersect historic populations of swamp pink in New Jersey. There are no swamp pink occurrences within the broader covered lands in New Jersey but there is one extant occurrence within the covered lands in Augusta County, Virginia. Given the historic and extant occurrences, we believe that additional populations may occur within the covered lands.

While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in impacts to unknown populations of this species. However, NiSource will conduct surveys prior to construction of ROWs in new alignment or during ground disturbing activities (e.g, pipeline replacement) within wetlands in existing ROWs and either avoid impacts to those populations or further consultation between the FERC and Service will be required. Given the proposed avoidance and minimization measures and the frequency of occurrence observed to date within the ROW (none) or covered lands (one), impacts to swamp pink from NiSource are unanticipated.

Conclusion

In considering that there are no known populations within the ROW proper and only one known population within the covered lands that will not be impacted by NiSource, most ongoing activities are not anticipated to affect the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of swamp pink to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the swamp pink.

VIRGINIA SNEEZEWEED

Virginia sneezeweed is an herbaceous perennial wetland plant which occurs in semi-permanent, shallow, seasonally inundated wetlands or in proximity to sinkholes.

The NiSource project may affect this species in portions of Augusta, Botetourt, Page, Rockbridge, and Rockingham Counties, Virginia. Overall, the covered lands intersect with approximately 600 acres of mapped suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW within the above-listed counties. There are five known occurrences within the broader covered lands in Virginia. Given the nearby occurrences, we believe that it is likely that other populations occur within the covered lands in Virginia.

While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in impacts to unknown populations of this species. However, NiSource will conduct surveys prior to construction of ROWs in new alignment or during ground disturbing activities (e.g., pipeline replacement) within wetlands in existing ROWs and either avoid impacts to those populations or further consultation between the FERC and Service will be required. Given the proposed avoidance and minimization measures and the frequency of occurrence observed to date within the ROW (none) and covered lands (five), impacts to sensitive joint-vetch from NiSource are unanticipated.

Conclusion

In considering that there are no known populations within the ROW proper and five within the covered lands that will not be impacted by NiSource, most ongoing activities are not anticipated to affect the species. NiSource has developed avoidance measures for both O&M and new construction activities. These measures make exposure of Virginia sneezeweed to NiSource activities and their stressors extremely unlikely and thus the likelihood of adverse impacts is discountable. Therefore, the Service concurs with the determination that implementation of the MSHCP is not likely to adversely affect the Virginia sneezeweed.

SUMMARY, REPORTING, AND REINITIATION NOTICE

The Service concurs with the determination that the implementation of NiSource's MSHCP may affect, but is not likely to adversely affect the species in Table 1. Due to the location of many of the species, many activities are not anticipated to affect these species. The AMMs developed for both O&M and new construction activities make exposure of species to NiSource activities and their stressors extremely unlikely.

This concurrence letter will be monitored in conjunction with the monitoring and reporting outlined for the MSHCP (see Chapter 7) and ITS (Section 3). This annual process will evaluate and report on the species in this concurrence letter for the following (1) the outcome of any surveys that are completed, (2) the accuracy of the determinations and concurrences, and (3) whether there is new information on any of the species that should be considered in these determinations.

No further consultation on the species in Table 1 is necessary unless: (1) the MSHCP or ITP is subsequently modified in a manner that causes an effect on these species or their proposed or designated critical habitat; or (2) new information reveals the implementation of the MSHCP or ITP may affect these species or their designated or proposed critical habitat in a manner or to an extent not previously considered.

Thank you for the information and cooperation provided by your offices in this consultation. Please refer any questions to Jessica Hogrefe (612-713-5346) of this office.

Sincerely,

Lynn Lewis

Lynn Lewis
Assistant Regional Director, Ecological Services

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Table 2. Final Avoidance and Minimization Measures (AMMs) for all MSHCP and non-MSHCP species that are not likely to be affected by NiSource's MSHCP. The AMMs in bold italics are not mandatory; however, the Service recommends NiSource implement the non-mandatory AMMs.

SPECIES	LOCATION	AMM #	AMM
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-1	NiSource will develop sufficient information as to whether potentially suitable summer and winter gray bat habitat exists within a proposed project area. This knowledge can be derived from several sources including, but not limited to, on-site visits, review of aerial photography and other maps, previous mining records (if applicable), forest inventories, previous species survey reports, and the work of NiSource's consultants or other designees. Gray bats have been documented using caves, quarries, bridges, and other man-made sites that act as summer and winter roosting and hibernation habitat. NiSource personnel or its consultants will determine whether potentially suitable summer and winter habitat exists within the project area by conducting "Summer/Winter Habitat Pre-Surveys" as described below. The results of such pre-surveys will be recorded and documented in NiSource's annual compliance report. Pre-survey results will be valid for at least 2 years. The Summer/Winter Habitat Pre-Survey Protocols are: i. The openings should be at least one (1) foot in diameter or larger. ii. The passage should continue beyond the dark zone and not have an obvious end within 40 feet of entrance (Note: This may not be verifiable by surveyor due to safety concerns.). iii. Entrances that are collapsed or otherwise inaccessible to bats will be excluded. iv. Abandoned mine (e.g., coal, limestone, etc...) openings that have occurred recently (i.e., within the past 12 months) due to creation or subsidence will be excluded however a written description and photographs of the opening must be included in the pre-survey report.
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and	AMM-2	If potentially suitable summer and/or winter habitat is discovered as a result of the pre-survey above, do not alter, modify, or otherwise disturb entrances or internal passages of caves, mines, or other entrances to underground voids (potential summer roosts/hibernacula) within the covered lands of the MSHCP until further investigation is completed to determine if the potential

SPECIES	LOCATION	AMM #	AMM
	Wilson counties, Tennessee		habitat is in fact, occupied habitat. The winter survey protocols would follow those for "Determination of Potential Winter Habitat for Indiana Bat" due to the comprehensive overlap of range and habitat for these two species; however, a summer survey must also be completed for gray bats because this is a cave obligate species. The summer surveys must be completed between the dates of June 15th and August 15th. Summer survey protocols to determine whether potential summer roosting habitat for gray bats is occupied are provided in Attachment 1. ***Otherwise, NiSource will assume presence of gray bats in this summer and/or winter habitat.*** If surveys (conducted using approved methodology) fail to detect gray bats, AMMs in summer and/or winter habitat are not mandatory. However, NiSource may employ some of the AMMs to maintain the viability of the potentially suitable habitat.
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-3	When burning brush piles within 0.25 miles of occupied summer roost and/or winter hibernacula, the brush piles can be no more than 25' by 25' and must be spaced at least 100 feet apart.
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-4	No woody vegetation or spoil (e.g., soil, rock, etc…) disposal within 100-feet of known summer roost and/or winter hibernacula entrances and associated sinkholes.
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-5	Protect recharge areas of cave streams and other karst features that are hydrologically connected to known summer roost and/or winter hibernacula by following relevant ECS standards such as Section III, Stream and Wetland Crossings; and Section IV, Spill Prevention, Containment and Control.
Gray bat	Covered lands within the following counties: Adair, Allen,	AMM-6	Blasting within ½ mile of known or presumed occupied summer

SPECIES	LOCATION	AMM #	AMM
	Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee		roost and/or winter hibernacula will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of known or presumed occupied site.
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-7	Drilling within ½ mile of known or presumed occupied summer roost and/or winter hibernacula will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of known or presumed occupied site.
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-8	If authorized by the landowner block (e.g., gate) access roads and ROW's leading to known summer roost and/or winter hibernacula from unauthorized access.
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-9	Equipment servicing and maintenance areas will be designated to areas away from streambeds, riparian zones, sinkholes, or areas draining into sinkholes.
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-10	Operators, employees, and contractors will be educated on the biology of the gray bat, identification of the bat, and its signs, activities that may affect bat behavior, and ways to avoid and minimize these effects.
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe,	AMM-11	***When performing vegetation management, tree clearing in known or presumed occupied summer habitat where gray bats forage (i.e., riparian corridors of perennial streams) should be***

SPECIES	LOCATION	AMM #	AMM
	Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee		***kept to a minimum in order to preserve as much foraging area and tree cover as possible.***
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-12	Restrict use of herbicides for vegetation management near known or presumed occupied gray bat foraging habitat to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands) in order to not endanger their food source.
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-13	***Abandon pipelines in place to avoid disturbance to perennial streams that would result from pipeline removal and thus affect potential gray bat prey.***
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-14	***For repairs on perennial streams, replace damaged pipeline using HDD - do not install in-channel repairs (bendway weirs, hardpoints, concrete mats, fill for channel relocation, etc.).***
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-15	***Conduct repairs from a lay barge or temporary work bridges of the minimum length necessary to conduct the repairs rather than operating heavy equipment (e.g., backhoes, bulldozers) in perennial streams. Temporary construction and equipment bridges are not to be confused with stone or fill causeways with pipe structures, which should not be employed in occupied habitat.***
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury,	AMM-16	***Remove equipment bridges as soon as possible after repair work and any site reseeding is completed on perennial streams.***

SPECIES	LOCATION	AMM #	AMM
	McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee		
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-17	***Site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway to reduce the potential for sediment and hazardous spills entering the waterway.***
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-18	***Perennial stream crossings should be conducted during low flow conditions between the months of June 1 and November 30.***
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-19	***Avoid conducting perennial stream crossing construction activities after sunset in known or presumed occupied summer habitat to avoid harassment of foraging gray bats.***
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-20	Contaminants, including but not limited to oils, solvents, smoke from brush piles, and others should be strictly controlled as provided for in the EMCS and ECS, Section II, C, 2; and Section IV so the quality, quantity, and timing of prey resources are not affected.
Gray bat	Covered lands within the following counties: Adair, Allen, Carter, Clark, Estill, Fayette, Garrard, Greenup, Lee, Letcher, Lincoln, Madison, Menifee, Metcalfe, Monroe, Montgomery, Morgan, Powell, and Rowan counties, Kentucky; and Davidson, Hardin, Lewis, Macon, Maury, McNairy, Sumner, Trousdale, Wayne, Williamson, and Wilson counties, Tennessee	AMM-21	Implement erosion control measures, ensure restoration of pre-existing topographic contours after any ground disturbance, and restore native vegetation (where possible) as specified in the ECS upon completion of work within 12-miles of known or presumed occupied summer roosts.

SPECIES	LOCATION	AMM #	AMM
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-1	NiSource will develop sufficient information as to whether potentially suitable summer and winter Virginia big-eared bat roosting habitat exists within a proposed project area. This knowledge can be derived from several sources including, but not limited to, on-site visits, review of aerial photography and other maps, previous mining records (if applicable), forest inventories, previous species survey reports, and the work of NiSource's consultants or other designees. Virginia big-eared bats have been documented using caves, quarries, and abandoned mine portals (and their associated underground workings) as summer and winter roosting and hibernation habitat. NiSource personnel or its consultants will determine whether potentially suitable summer and winter roosting habitat exists within the project area by conducting "Summer/Winter Habitat Pre-Surveys" as described below. The results of such pre-surveys will be recorded and documented in NiSource's annual compliance report. Pre-survey results will be valid for at least 2 years. The Winter Habitat Pre-Survey Protocols are: i. The openings should be at least one (1) foot in diameter or larger. ii. The passage should continue beyond the dark zone and not have an obvious end within 40 feet of entrance (Note: This may not be verifiable by surveyor due to safety concerns.). iii. Entrances that are flooded or prone to flooding (i.e., debris on ceiling), collapsed, or otherwise inaccessible to bats will be excluded. iv. Abandoned mine (e.g., coal, limestone, etc...) openings that have occurred recently (i.e., within the past 12 months) due to creation or subsidence will be excluded however a written description and photographs of the opening must be included in the pre-survey report.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West	AMM-2	If potentially suitable summer and/or winter roosting habitat is discovered as a result of the pre-survey above, do not alter, modify, or otherwise disturb entrances or internal passages of caves, mines, or other entrances to underground voids (potential summer roosts/hibernacula) within the Covered Lands of the MSHCP until further investigation is completed to determine if the

SPECIES	LOCATION	AMM #	AMM
	Virginia.		potential habitat is in fact, occupied habitat. The winter survey protocols would follow those for "Determination of Potential Winter Habitat for Indiana Bat" due to the comprehensive overlap of range and habitat for these two species; however, a summer survey must also be completed for Virginia big-eared bats because this is a cave obligate species. The summer surveys must be completed between the dates of June 15 and August 15 to document presence of or use by (i.e., guano) Virginia big-eared bats. Summer survey protocols to determine whether potential summer habitat for Virginia big-eared bat is occupied are attached. Otherwise, NiSource may assume presence of Virginia big-eared bats in this summer and/or winter habitat. ***If surveys (conducted using approved methodology) fail to detect Virginia big-eared bats, AMMs in summer and/or winter habitat are not mandatory.*** However, NiSource may employ some of the AMMs to maintain the viability of the potentially suitable habitat.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-3	When burning brush piles within 0.25 miles of known or presumed occupied summer roosts and/or winter hibernacula, the brush piles can be no more than 25' by 25' and must be spaced at least 100 feet apart.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-4	No woody vegetation or spoil (e.g., soil, rock, etc…) disposal within 100-feet of known or presumed occupied summers roost and/or winter hibernacula entrances and associated sinkholes.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-5	Protect recharge areas of cave streams and other karst features that are hydrologically connected to known or presumed occupied summer roosts and/or winter hibernacula by following relevant ECS standards such as Section III, Stream and Wetland Crossings; and Section IV, Spill Prevention, Containment and Control.

SPECIES	LOCATION	AMM #	AMM
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-6	Blasting within ½ mile of known or presumed occupied summer roosts and/or winter hibernacula will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of these habitats.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-7	Drilling within ½ mile of known or presumed occupied summer roosts and/or winter hibernacula will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of these habitats.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-8	If authorized by the landowner, block (e.g., gate) access roads and ROW's leading to known or presumed occupied summer roosts and/or winter hibernacula from unauthorized access.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-9	Equipment servicing and maintenance areas will be designated to areas away from streambeds, sinkholes, or areas draining into sinkholes.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-10	Operators, employees, and contractors will be educated on the biology of the Virginia big-eared bat, identification of the bat, and its signs, activities that may affect bat behavior, and ways to avoid and minimize these effects.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan,	AMM-11	Within six miles of known or presumed occupied summer roosts and/or winter hibernacula, create or maintain a diversity of open,

SPECIES	LOCATION	AMM #	AMM
	Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.		herbaceous habitats within the pipeline ROW.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-12	***Avoid new ROW and appurtenant facility construction is prohibited within 200 feet of known or presumed occupied summer roosts and/or winter hibernacula.***
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-13	Contaminants, including but not limited to oils, solvents, smoke from brush piles, and others should be strictly controlled as provided for in the EMCS and ECS, Section II, C, 2; and Section IV so the quality, quantity, and timing of prey resources are not affected.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-14	Implement erosion control measures, ensure restoration of pre-existing topographic contours after any ground disturbance, and restore native vegetation (where possible) as specified in the ECS upon completion of work within six miles of known or presumed occupied summer roosts and/or winter hibernacula.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-15	***Avoid conducting construction activities after sunset in known or presumed occupied summer habitat to avoid harassment of foraging Virginia big-eared bats.***
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah	AMM-16	Remove buildings within six miles of known or presumed occupied summer roosts and/or hibernacula between November 16th and March 31st. Buildings may be removed other times of the year once a Service approved bat biologist evaluates the buildings'

SPECIES	LOCATION	AMM #	AMM
	counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.		potential to serve as night roosting habitat and determines Virginia big-eared bats are not present and/or using the structure.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-17	***Site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway to reduce the potential for sediment and hazardous spills entering the waterway.***
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-18	Restrict use of herbicides for vegetation management within six miles of known or presumed occupied summer roosts and/or winter hibernacula to those specifically approved for use in karst (e.g., sinkholes) and water (e.g., streams, ponds, lakes, wetlands).
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-19	Between April 1st and November 16th and within six miles of known or presumed occupied summer roosts and/or winter hibernacula, use tanks to store waste fluids to ensure no loss of bats by entrapment in waste pits.
Virginia Big-eared Bat	Covered lands within the following counties: Bath, Carter, Estill, Lee, Madison, Menifee, Montgomery, Morgan, Owsley, Powell, Rowan, and Jackson counties, Kentucky; Augusta, Bland, Giles, Rockingham, and Shenandoah counties, Virginia; and Fayette, Grant, Hardy, McDowell, Pendleton, Preston, Randolph, and Tucker counties, West Virginia.	AMM-20	***Within six miles of known or presumed occupied summer roosts and/or winter hibernacula, avoid new construction through cliffline habitat to protect night roosts.***
Louisiana Black Bear	All known breeding habitat (i.e., where females have been documented to occur) and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-1	***Conduct all vegetative clearing activities in breeding habitat between May 1st and November 14th.***

SPECIES	LOCATION	AMM #	AMM
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-2	When conducting those activities identified as potentially causing take in breeding and critical habitat, NiSource shall ensure, through a program of continuing education and appropriate preventive actions, that all potential bear attractants (i.e., human garbage and food scraps) generated during both project construction, and subsequent operation and maintenance of the proposed facility, shall be strictly controlled by using "bear-proof" waste disposal containers specifically approved by the Louisiana Department for Wildlife and Fisheries, the installation of signs at work sites to remind workers they are in bear country, and providing brochures developed by the Service and the Louisiana Department of Wildlife and Fisheries that discuss the need for attractant control to all workers on-site. Implementation of these measures preclude the potential habituation of bears to human-associated food sources.
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-3	In breeding habitat (Figure 1, Appendix F of the MSHCP, LBB section), no actual den tree or candidate den tree (36 inches or more in dbh regardless of species with visible cavities) shall be removed or damaged. "Tree damage" includes the trunk, limbs, and the entire root system, including soil compaction from heavy equipment.
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-4	***Reserved.***
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-5	All woody vegetation (including trees and shrubs) proposed for removal shall be cut near ground level to the maximum extent practicable, leaving stumps and root systems in place. Examples of scenarios where stumps and root systems would be removed include side slopes, wet soils, the trench area, etc...
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-6	Revegetation success shall be monitored annually for the first three years following new pipeline construction or until revegetation is successful as described in the ECS. NiSource will include a monitoring report in its annual compliance report filed with the Service. Revegetation shall be considered successful if the vegetative coverage is at least 80 percent of the type, density, and distribution of the vegetation in adjacent areas not disturbed

SPECIES	LOCATION	AMM #	AMM
			by construction. If revegetation is not successful at the end of three years, NiSource shall develop (in consultation with the Service) and implement a remedial revegetation plan to actively revegetate the area, and continue to do so until revegetation is successful.
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-7	Any mowing or widespread clearing of breeding habitat within the existing ROW, beyond the 10-foot width centered over each pipeline, will occur between May 1 and November 14 unless the area has been mowed within the last two years to ensure that Louisiana black bears and cubs using ground dens are not impacted (i.e., the area as maintained is not suitable for denning).
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-8	Existing ROWs located within designated critical habitat will be maintained in accordance with the NGTS ECS standards for environmentally sensitive areas specified on page 28, Section V.C. "Waterbodies, Wetlands, and Environmentally Sensitive Areas" provided however that only the center 10 feet of the ROW centered on the pipeline will be kept in an herbaceous state. Any trees greater than 15 feet tall located in the remaining portion of the ROW will either be selectively cut or treated with herbicides per NiSource policies on herbicide use.
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-9	New pipeline ROW shall be replanted with an appropriate conservation seed mix. Species planted should be native to Louisiana, appropriate to the soils, and provide soft or hard mast for bears and useful to other wildlife species. Annual rye should be planted within the 10-foot wide grass strip centered over the pipeline for quick cover as natives will colonize the area as long as there is an adequate seed source present. Previously forested portions of the construction ROW that will not be part of the permanent ROW will be planted with woody species (i.e., any bare root or containerized plants that are native and provide soft or hard mast and cover [e.g., bottomland hardwood, upland hardwood, or cypress-gum swamp for bears] is adequate). Typical plant spacing for woody species is 10-12 feet.
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-10	New pipeline ROWs will be maintained in accordance with the NGTS ECS standards for environmentally sensitive areas specified on page 28, Section V.C. "Waterbodies, Wetlands, and Environmentally Sensitive Areas" provided however that only the

SPECIES	LOCATION	AMM #	AMM
			center 10 feet of the ROW centered on the pipeline will be kept in an herbaceous state. Any trees greater than 15 feet tall located in the remaining portion of the ROW will either be selectively cut or treated with herbicides per NiSource policies on herbicide use.
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-11	Critical forested bear travel corridors (Figure 2, Appendix F of the MSHCP, LBB section) intersected by new pipeline ROW will be crossed using trenchless construction techniques such as HDD or horizontal bore. Trees greater than 15 feet tall in these areas will not be removed. a) Priority 1 Critical Louisiana Black Bear Travel Corridors (blue polygons)- Lands within Priority 1 areas are extremely important to the bears (usually due to their already fragmented nature, narrow width or high quality habitat). i. These areas must be completely crossed using trenchless construction techniques with all entrance and exit holes outside of Priority 1 boundaries (i.e., no vegetation clearing). ii. No widening of an existing ROW will occur within Priority 1 corridors. iii. All Priority 1 lands, including those identified as non-bear habitat (e.g., agricultural lands), also identified by the Service and NRCS as WRP Special Project Areas will be crossed using trenchless technology should the landowners enroll those tracts into WRP or otherwise allow the tracts to revert or be restored to bear habitat. If WRP enrollment occurs after NiSource installs a pipeline, they will allow these tracts to revert or be restored to bear habitat provided however that only the center 10 feet of the ROW centered on the pipeline will be kept in an herbaceous state. b) Priority 2 Critical Louisiana Black Bear Travel Corridors (orange polygons)- Lands within Priority 2 areas are still very important to the bears, but tend to be more expansive and intact. i. Trenchless construction techniques are required through tracts whose cover is comprised of ≥ 50% woody vegetation. ii. Clearing vegetation for entrance and exit holes to accomplish the construction process is allowed within these areas as multiple bores may be required for expansive areas. iii. Existing ROW may be widened to allow additional pipeline(s), but only as close to existing pipelines as the safety

SPECIES	LOCATION	AMM #	AMM
			codes/requirements allow and not to exceed a 75-feet wide maintained ROW combined.
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-12	Prior to any clearing of breeding habitat, conduct a habitat assessment to record the number of potential den trees and amount of ground denning habitat that would be affected.
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-13	Construction-related activities within breeding Louisiana black bear habitat are permissible provided that the following AMM is implemented in addition to AMMs 1-12 during the denning season. Previously identified potential den sites/habitat will be cleared of vegetation outside of the denning season (i.e., work window is May 1 through November 14) to ensure no direct take of bears and/or cubs.
Louisiana Black Bear	All known breeding habitat and critical habitat as identified by the Service. Currently, these measures apply in the following parishes in Louisiana: East Carroll, Franklin, Iberia, Madison, Richland and St. Mary.	AMM-14	Construction-related activities within breeding Louisiana black bear habitat are permissible provided that the following AMM is implemented in addition to AMMs 1-12 during the denning season. A constant level of noise/disturbance (generally equivalent in type and volume to that created by the proposed covered activities) is maintained throughout the project area through the denning season (i.e., November 15 through April 30) until work has finished. The amount of disturbance/noise shall be generated for at least 24 continuous hours every 14 days in all portions of the project area that are within 750 feet of the active construction site.
Interior Least Tern	All known occupied locations (i.e., where individuals have been documented to occur) and/or suitable habitats where breeding occurrence may be presumed in East Carroll Parish, Louisiana; and Issaquena County, Mississippi, as indicated below. There are currently only four pipeline crossings of concern for this species near Pittman Island. Sandbars may migrate around these four crossings and AMMs should be applied whenever sandbars/islands are within 650 feet of the crossings.	AMM-1	Prior to initiation of activities, conduct least tern surveys within a 0.25-mile buffer of proposed activity within suitable habitat (i.e., sandbars, sandy shorelines, or islands) at 4 specified pipeline crossings of the Mississippi River. Surveys will be conducted by a biologist experienced in least tern surveys. If interior least terns are identified during surveys, implement AMMs #5-6. If no least terns are identified during surveys, proceed with proposed activities, implement AMM 3-4 and consider #7 regardless of any surveys. OR Follow AMM-2
Interior Least Tern	All known occupied locations (i.e., where individuals have been documented to occur) and/or suitable habitats where	AMM-2	Assume presence of interior least terns within suitable habitat (i.e., sandbars, sandy shorelines, or island along and within the 4

SPECIES	LOCATION	AMM #	AMM
	breeding occurrence may be presumed in East Carroll Parish, Louisiana; and Issaquena County, Mississippi, as indicated below. There are currently only four pipeline crossings of concern for this species near Pittman Island. Sandbars may migrate around these four crossings and AMMs should be applied whenever sandbars/islands are within 650 feet of the crossings.		specified pipeline crossings of the Mississippi River) and implement AMMs 3-7. (NiSource has the option of implementing either AMM#1 (surveys) or AMM#2 (assume presence), but one of these must be implemented).
Interior Least Tern	All known occupied locations (i.e., where individuals have been documented to occur) and/or suitable habitats where breeding occurrence may be presumed in East Carroll Parish, Louisiana; and Issaquena County, Mississippi, as indicated below. There are currently only four pipeline crossings of concern for this species near Pittman Island. Sandbars may migrate around these four crossings and AMMs should be applied whenever sandbars/islands are within 650 feet of the crossings.	AMM-3	Do not utilize occupied or suitable habitat for staging areas (i.e., sandbars, sandy shores, or islands). Use of staging area outside these areas will reduce direct impacts to potential nesting habitats.
Interior Least Tern	All known occupied locations (i.e., where individuals have been documented to occur) and/or suitable habitats where breeding occurrence may be presumed in East Carroll Parish, Louisiana; and Issaquena County, Mississippi, as indicated below. There are currently only four pipeline crossings of concern for this species near Pittman Island. Sandbars may migrate around these four crossings and AMMs should be applied whenever sandbars/islands are within 650 feet of the crossings.	AMM-4	Restore sandbar to previous contours and substrate after any operations and maintenance activities.
Interior Least Tern	All known occupied locations (i.e., where individuals have been documented to occur) and/or suitable habitats where breeding occurrence may be presumed in East Carroll Parish, Louisiana; and Issaquena County, Mississippi, as indicated below. There are currently only four pipeline crossings of concern for this species near Pittman Island. Sandbars may migrate around these four crossings and AMMs should be applied whenever sandbars/islands are within 650 feet of the crossings.	AMM-5	Avoid any activities within 650 feet of nesting colonies (sandbar/island) between May 15 and August 31.
Interior Least Tern	All known occupied locations (i.e., where individuals have been documented to occur) and/or suitable habitats where breeding occurrence may be presumed in East Carroll	AMM-6	***Install new or replacement pipelines and utility lines under the river bottom using horizontal directional drilling (HDD) rather than open trenching. Drilling should be carefully undertaken and***

SPECIES	LOCATION	AMM #	AMM
	Parish, Louisiana; and Issaquena County, Mississippi, as indicated below. There are currently only four pipeline crossings of concern for this species near Pittman Island. Sandbars may migrate around these four crossings and AMMs should be applied whenever sandbars/islands are within 650 feet of the crossings.		***a plan should be in place to minimize and address the risk of habitat disturbance due to frac-outs and the appropriate distance of the staging area from interior least tern nesting habitat. If, after detailed engineering studies (e.g., geotechnical, physiological, topographical, and economic studies), it is determined (and agreed to by NiSource Natural Resources Permitting personnel) that HDD is not feasible, a report will be prepared and included in the annual compliance report submitted to the Service.*** ***HDDs under the stream channel are permissible any time of the year. However, proximity of the HDD noise producing equipment should be placed at least 0.25 mile from the known or presumed occupied nest location (and preferably as far as possible from the nest as practical given the design of the drill).***
Interior Least Tern	All known occupied locations (i.e., where individuals have been documented to occur) and/or suitable habitats where breeding occurrence may be presumed in East Carroll Parish, Louisiana; and Issaquena County, Mississippi, as indicated below. There are currently only four pipeline crossings of concern for this species near Pittman Island. Sandbars may migrate around these four crossings and AMMs should be applied whenever sandbars/islands are within 650 feet of the crossings.	AMM-7	***Abandon pipelines in place to avoid suitable habitat disturbance that would result from pipeline removal***
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-1	Consider conducting field surveys within the mapped potential range of the Cheat Mountain salamander (Figure 1, Appendix F of the MSHCP, CMS section) for all previously unsurveyed areas to determine whether potential habitat occurs in the project vicinity (the project footprint and a 300-foot buffer). These surveys can be conducted by surveyors deemed to be qualified by the Service and the West Virginia Department of Natural Resources (as demonstrated by obtaining a valid WV State Collecting Permit for Cheat Mountain salamander). A list of currently recognized surveyors can be obtained from the West Virginia Field Office or the WVDNR on an annual basis. These habitat surveys will be accepted for ten years. NiSource will ensure that surveyors have information regarding known locations, 300-foot buffers, and potential habitat of Cheat Mountain salamanders.

SPECIES	LOCATION	AMM #	AMM
			If a field survey is not conducted, assume the entire project area as potential habitat, go to step 1. For any activity within the mapped potential range that involves disturbances within 300 feet of known or assumed habitat. Step 1. Consider conducting habitat surveys of project area that has not previously been surveyed. Maintain positive and negative findings in a GIS database. The results will be submitted to the Service in the annual compliance report. If the project area has been previously surveyed and no potential habitat is present, no further surveys, or AMMs are needed. If the project area has previously been surveyed and potential habitat is present, go to step 2. If project area has previously been surveyed and Cheat Mountain salamanders are known to be present, go to step 3. If a habitat survey is not conducted, assume the entire project area as potential habitat, go to step 2. Potential habitat present? • If no, document for future NiSource activities and annual compliance report and no further Cheat Mountain salamander AMMs are needed. • If yes, conduct Cheat Mountain salamander surveys or assume Cheat Mountain salamander presence. Step 2a. If conducting Cheat Mountain salamander surveys: Cheat Mountain salamander found? • If no, document for future NiSource activities and annual compliance report and no further Cheat Mountain salamander AMMs are needed. • If yes, conduct further Cheat Mountain salamander AMMs – go to step 3. • Submit both positive and negative survey reports to the Service annually. Step 2b. If assuming presence, employ further Cheat Mountain salamander AMMs – go to step 3. Step 3. Employ further Cheat Mountain salamander AMMs.
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-2	Conduct covered activities within existing ROWs.
Cheat	All known occupied and potential habitat within the	AMM-3	Minimize annual mowing of herbaceous layer to 10-foot width

SPECIES	LOCATION	AMM #	AMM
Mountain Salamander	covered lands.		directly over pipeline(s).
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-4	Minimize permanent ROW width mowed an approximate 5 year cycle near known or potential Cheat Mountain salamander sites to 50 feet or less.
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-5	Leave small piles of woody debris on ground along edge of (but within) existing ROW after side-trimming of trees to provide shade/cover for Cheat Mountain salamander.
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-6	Herbicide application: a. Apply herbicides in accordance with NiSource policy and procedures, EPA guidelines and requirements, state requirements, and the manufacturer's label. Prior to herbicide use, consult with the timing requirements specified previously. b. Avoid aerial herbicide application over mapped potential range. c. For application of herbicides (vehicle or hand) within known or presumed Cheat Mountain salamander sites, follow the following herbicide guidelines. i. All herbicide will be sprayed within existing ROW. Ensure that no "overspray" or drift goes off the existing ROW. ii. Apply herbicides during fall (after August 30) iii. Inject pellets of glyphosate or imazapyr directly into trunks of woody vegetation (red maple, alder, poison sumac) iv. Hack and squirt (frill or drill and fill) – cut trunk of tree and apply glyphosate using backpack sprayer, squirt bottle, syringe, or tree injector v. Cut stump/stem – cut tree or shrub and apply glyphosate to cut surface using spray bottle or wick applicator vi. Wick application – apply glyphosate directly to leaves and/or stem via "glove application" or paint stick with a contained reservoir to hold the herbicide vii. Spot spray – spray glyphosate directly onto leaves or stem via backpack sprayer, squirt bottle, or modified low volume hydraulic applicator – no high pressure sprayers viii. Herbicide will not be applied using an open container of herbicide for any application to reduce risk of spills ix. When conducting foliar application of glyphosate, the

SPECIES	LOCATION	AMM #	AMM
			surfactant LI-700 may be used in accordance with EPA-approved label instructions x. Filling and emptying of herbicide containers will occur in upland areas xi. All applicators will have a spill kit available xii. All hoses, tanks, and clamps will be inspected in uplands prior to use each treatment day xiii. Apply herbicide when wind speed at treatment height is ≤ 5 miles per hour.
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-7	Vegetation Disposal a. ***If clearing trees or other native woody vegetation in areas close to known Cheat Mountain salamander populations, shred or cut these materials into large chucks to create cover boards or slabs and then place them along the edge of and up to 20 feet from the edge of the ROW.*** b. Avoid dragging vegetation through known or assumed Cheat Mountain salamander habitat (carry pieces and if too large, cut into smaller pieces). c. Keep in any piles or stacks of vegetation in existing ROW. d. Avoid burning brush piles in the known or assumed Cheat Mountain salamander habitat.
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-8	***Reserved.***
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-9	Right of Way Repair - Conduct covered activities within existing ROW
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-10	Existing Access Road Maintenance and Culvert Replacement a. Avoid staging equipment in known or assumed habitat b. Avoid additional clearing of trees c. Avoid channelizing streams
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-11	Avoid abandoning pipe (leaving on surface) adjacent to or within Cheat Mountain salamander habitat. Below-grade abandonment is acceptable.
Cheat Mountain	All known occupied and potential habitat within the covered lands.	AMM-12	***Avoid vehicle-use in ROWs with enhancements for Cheat Mountain salamander. Conduct patrols, vegetative***

SPECIES	LOCATION	AMM #	AMM
Salamander			***maintenance, etc., by foot whenever practical.***
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-13	Conduct covered activities within existing ROW.
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-14	Employ silt fences around construction/soil disturbance activities adjacent to known or assumed Cheat Mountain salamander sites. The silt fencing should completely isolate the work area from adjacent Cheat Mountain salamander habitat, and to ensure silt does not enter un-disturbed parts of the habitat.
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-15	***Avoid pulling woody vegetation out by the roots to avoid destruction of potential nests.***
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-16	Avoid withdrawing water from sources that may affect known or assumed Cheat Mountain salamander habitat for hydrostatic testing.
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-17	Avoid discharging hydrostatic testing water into known or assumed Cheat Mountain salamander habitat. Discharge hydrostatic testing water down gradient of known or assumed Cheat Mountain salamander habitats. OR Discharge water >300 feet from known or assumed Cheat Mountain salamander habitat. OR Discharge water as far as practical from Cheat Mountain salamander habitats and utilize additional sediment and water flow control devices to minimize effects to the Cheat Mountain salamander habitat.
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-18	Re-vegetate all disturbed areas in accordance with the ECS (e.g., use indigenous, non-invasive species).
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-19	Avoid use of fertilizers within 100 feet of known or assumed Cheat Mountain salamander habitat.
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-20	Refuel equipment and check for leaks each day as described in the ECS section on “Spill Prevention, Containment and Control”.

SPECIES	LOCATION	AMM #	AMM
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands.	AMM-21	Construct loops entirely within existing ROW. OR Route new pipelines to avoid being within 300 feet of known or assumed Cheat Mountain salamander sites. OR Conduct horizontal directional drilling (HDD) or horizontal bore to install pipe under Cheat Mountain salamander sites. Boring should occur at least 8 feet below the surface. OR Further consultation with the Service is necessary.
Cheat Mountain Salamander	All known occupied and potential habitat within the covered lands as shown on Figure 1 (Appendix F of the MSHCP, CMS section).	AMM-22	Route new access roads at least 300 feet away from known or assumed Cheat Mountain salamander sites. If not feasible, further consultation with the Service is necessary.
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-1[2]	A survey can be conducted to determine the presence of this mussel species. Mussel survey protocols designed to detect endangered mussels that often occur in low densities; protocols as of 2009 are provided in Appendix L in the MSHCP. Survey methodologies must be evaluated at minimum every five years and be updated to the most effective survey methods currently available. If the most current methodology implemented by a biologist, qualified to conduct the survey, does not indicate the presence of the species, it will be classified as unoccupied habitat and the AMMs will not be mandatory. If a survey is not completed, presence will be assumed. In that case, all suitable habitat would be treated as occupied, and all mandatory AMMs must be followed. NiSource or its contractors will follow the Service approved relocation plan as referenced below. Survey and relocation may be implemented in the same time period (as one action) as long as both survey and relocation protocols are followed (general relocation protocols are identified in Appendix L, but may be modified in conjunction with Service Field Office based on conditions).

[2] If the relocation portion of this AMM is determined to be required for these species, additional consultation with the FWS will be required. There is no take being authorized for any of these species in this concurrence letter. Relocation necessarily results in take and requires proper consultation and authorization under section 7 of the ESA.

SPECIES	LOCATION	AMM #	AMM
			Relocation may be implemented only if: (1) all required permits are in place, (2) a Service-approved relocation plan documenting all relevant protocols including how and where the mussels will be moved is in place, (3) a contingency plan is in place to conduct additional consultation with the Service should the actual field survey not reflect the conditions identified in the approved relocation plan, and (4) a monitoring program to evaluate the effects of the relocation is in place. Relocation will include at least all individuals of the federally endangered species identified in the impact area and may include other species based on the assessment of the Service Field Office and other regulatory agencies. A copy of the survey and any reports will also be included in the annual report submitted to the Service.
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-2	A detailed EM&CP will be prepared for any activity with potential effects (e.g., streambed or stream bank disturbance, impacts to riparian habitat, activities causing sediment) within 100 feet of the ordinary high water mark of occupied mussel habitat. The plan will incorporate the relevant requirements of the NGTS ECS and include site-specific details particular to the project area and potential impact. The waterbody crossing will be considered as "high-quality" for the purpose of preparing this plan regardless of the actual classification. The plan will be strongly oriented towards minimizing streambed and riparian disturbance (including minimization of tree clearing within 25 feet of the crossing [Figure 24, ECS]), preventing downstream sedimentation (including redundant erosion and sediment control devices that would be designed to protect mussel resources as appropriate), and weather monitoring by the Environmental Inspector to ensure work is not begun with significant precipitation in the forecast. The plan will comprehensively address all activities needed to complete the work and minimize take of mussels in occupied habitat including crossing the streams during dry periods when practical and using dry-ditch crossing techniques for intermittent streams leading to mussel habitat. The EM&CP will include the frac-out avoidance and contingency plans described in AMM#3 below. The EM&CP will also include a sediment control component for uplands that drain to and impact occupied habitat.

SPECIES	LOCATION	AMM #	AMM
			Detailed erosion control plans will be developed specific to slopes greater than or equal to 30% leading directly to occupied habitat. These plans will include techniques such as hard or soft trench plugs, temporary sediment barriers, a wider trench at the slope base, and/or temporary slope drains (plastic). In areas with less than a 30% slope, ECS and AMM erosion control measures protective of mussels will be implemented. The plan will be approved in writing by NiSource NRP personnel prior to project implementation and will include a tailgate training session for all on-site project personnel to highlight the environmental sensitivity of the habitat and any mussel AMMs which must be implemented.
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-3	For activities in occupied habitat, install new or replacement pipelines and major repairs under the river bottom using horizontal directional drilling (HDD) or other trenchless methods rather than open trenching unless the crossing evaluation report prepared in accordance with Section 5.2.1.1 and Appendix J indicates otherwise. Drilling should be carefully undertaken and a plan should be in place to minimize and address the risk of in-stream disturbance due to frac-outs. The plan should also specifically reference mussel resources in the vicinity of the crossing as a key conservation concern and include specific measures identified in the NGTS ECS, from standard industry practices, or other mutually agreed-upon practices to protect this resource. The plan will also include a frac-out impact avoidance plan, which will evaluate the site in terms not only of feasibility of conducting HDD, but the likelihood of large scale frac-out and its effects on mussels, and actions to address a large-scale frac-out in occupied habitat. The plan should also consider the potential effects on mussels if drilling fluids are released into the environment. The plan must contain all information required for a FERC Section 7(c) filing at a minimum. If, after detailed engineering studies (e.g., geotechnical, physiological, topographical, and economic studies), it is determined (and agreed to by NRP) that HDD is not feasible, a report will be prepared and included in the annual report submitted to the Service. However, due to the significant listed

SPECIES	LOCATION	AMM #	AMM
			mussel assemblages known to occupy the Duck and Tennessee Rivers in the state of Tennessee, open trenching in these rivers is not a "covered activity" as part of the NiSource MSHCP.
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-4	Install pipeline to the minimum depth described in the ECS and maintain that depth at least 10 feet past the high water line to avoid exposure of pipeline by anticipated levels of erosion based on geology and watershed character. Additional distance may be required should on-site conditions (i.e., outside bend in the waterbody, highly erosive stream channel, anticipated future upstream development activities in the vicinity) dictate a reasonable expectation that the stream banks could erode and expose the pipeline facilities. Less distance may be utilized if terrain or geological conditions (long, steep bank or solid rock) will not allow for a 10-foot setback. These conditions and the response thereto will be documented in the EM&CP and provided as part of the annual report to the Service.
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-5	For repairs in occupied habitat, do not install in-channel repairs (bendway weirs, hardpoints, concrete mats, fill for channel relocation, or other channel disturbing measures) except when measures in AMM#3 above are not feasible from an engineering design perspective, and then, only in conjunction with a stream restoration plan based on Rosgen (see Wildland Hydrology 2009 http://www.wildlandhydrology.com/html/references_.html) or other techniques mutually agreed upon by NiSource and the Service that result in no direct or lethal take of listed mussels.
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-6	***Conduct replacements/repairs from a lay barge or temporary work bridges of the minimum length necessary to conduct the replacements/repairs rather than operating heavy equipment (e.g., backhoes, bulldozers) in-stream. Temporary construction and equipment bridges are not to be confused with stone or fill causeways with pipe structures, which should not be employed in known or presumed occupied waterbodies.***
Birdwing Pearlymussel, Cracking Pearlymussel,		AMM-7	Remove equipment bridges as soon as practicable (this is typically interpreted to be a few days to a few weeks unless there are extenuating circumstances) after repair work and any site restoration is completed

SPECIES	LOCATION	AMM #	AMM
Cumberland Monkeyface Pearlymussel, Oyster Mussel			
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-8	As part of the routine pipeline inspection patrols, visually inspect all stream crossings in occupied habitat at least yearly for early indications of erosion or bank destabilization associated with or affecting the pipeline crossing that is resulting, or would before the next inspection cycle, likely result in sediment impacts to mussel habitat beyond what would be expected from background stream processes. If such bank destabilization is observed, it will be corrected in accordance with the ECS. Follow-up inspections and restabilization will continue until the bank is stabilized (generally two growing seasons).
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-9	***Do not construct culvert and stone access roads and appurtenances (including equipment crossing) across the waterbody or within the riparian zone. Temporary equipment crossings utilizing equipment pads or other methods that span the waterbody are acceptable provided that in-stream pipe supports are not needed.***
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-10	For equipment crossings of small streams, use half pipes of sufficient number and size that both minimize impacts to streambed and minimize flow disruption to both upstream and downstream habitat (ECS, Figure 22).
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel,		AMM-11	***Reserved.***

SPECIES	LOCATION	AMM #	AMM
Oyster Mussel			
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-12	***Abandon pipelines in place to avoid in-stream disturbance that would result from pipeline removal unless the abandonment would be detrimental to endangered mussels.***
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-13	As described in the ECS section on "Spill Prevention, Containment and Control," site staging areas for equipment, fuel, materials, and personnel at least 300 feet from the waterway, if available, to reduce the potential for sediment and hazardous spills entering the waterway. If sufficient space is not available, a shorter distance can be used with additional control measures (e.g., redundant spill containment structures, on-site staging of spill containment/clean-up equipment and materials). If a reportable spill has impacted occupied habitat: a. follow spill response plan; and b. call the appropriate Service Field Office to report the release, in addition to the National Response Center (800-424-8802).
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-14	Ensure all imported fill material is free from contaminants (this would include washed rock or other materials that could significantly affect the pH of the stream) that could affect the species population or habitat through acquisition of materials at an appropriate quarry or other such measures.
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel,		AMM-15	For storage well activities, use enhanced and redundant measures to avoid and minimize the impact of spills from contaminant events in known or presumed occupied streams. These measures include, for example, waste pit protection, redundant spill containment structures, on-site staging of spill containment/clean-up equipment and materials, and a spill response plan provided to the Service as part of the annual report.

SPECIES	LOCATION	AMM #	AMM
Oyster Mussel			These measures will be included in the EM&CP prepared for the activity.
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-16	Do not use fertilizers or herbicides within 100 feet of known or presumed occupied habitat. Fertilizer and herbicides will not be applied if weather (e.g., impending storm) or other conditions (e.g., faulty equipment) would compromise the ability of NiSource or its contractors to apply the fertilizer or herbicide without impacting presumed occupied mussel habitat. The EM&CP prepared for this activity (AMM#2 above) will document relevant EPA guidelines for application.
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-17	Hydrostatic test water and/or water for storage well O&M will not be obtained from known or presumed occupied habitat unless other water sources are not reasonably available. To prevent desiccation of mussels, water from known or presumed occupied habitat will be withdrawn in a manner that will not visibly lower the water level as indicated by water level height on the stream channel bank. Employ appropriately sized screens, implement withdrawal rates, and maintain withdrawal point sufficiently above the substrate to minimize impacts to the species.
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-18	Do not discharge hydrostatic test water directly into known or presumed occupied habitat. Discharge water in the following manner (in order of priority and preference): a. Discharge water down gradient of occupied habitat unless on-the-ground circumstances (e.g., man-made structures, terrain, other sensitive resources) prevent such discharge. b. If those circumstances occur, discharge water into uplands >300 feet from occupied habitat unless on-the-ground circumstances (e.g., man-made structures, terrain, other sensitive resources) prevent such discharge. c. If those circumstances occur, discharge water as far from occupied habitat as practical and utilize additional sediment and water flow control devices (Figures 6A&B, 7, 8, 14A&B; ECS) to minimize effects to the waterbody.
Birdwing Pearlymussel, Cracking Pearlymussel,		AMM-19	***Do not drive across known or presumed occupied streams – walk these areas or visually inspect from bank and use closest available bridge to cross stream.***

SPECIES	LOCATION	AMM #	AMM
Cumberland Monkeyface Pearlymussel, Oyster Mussel			
Birdwing Pearlymussel, Cracking Pearlymussel, Cumberland Monkeyface Pearlymussel, Oyster Mussel		AMM-20	Clean all equipment (including pumps, hoses, etc.) that have been in a perennial waterbody for more than four hours within the previous seven days and will work in occupied or potential federally listed mussel habitat; following established guidelines to remove zebra mussels (and other potential exotic or invasive species) before entering a known or presumed occupied stream for a federally listed mussel, which is not known to be infested with zebra mussels (Appendix L). Do not discharge any water for other sources that might be contained in equipment (e.g. ballast water, hoses, sumps, or other containment). It is important to follow these guidelines even if work is not occurring in the immediate vicinity of these mussels since, once introduced into a watershed, invasive species could move and eventually affect the federally listed mussels.
Fat pocketbook, Fluted Kidney shell pearlymussel, Orangefoot pimpleback pearlymussel, Ring pink mussel, Rough pigtoe, Slabside pearlymussel	Multiple areas. See BA for more details.	AMM-1	Implement the HCP mussel AMMs for all projects in areas specified for these species.
Red-cockaded Woodpecker	Calcasieu, Catahoula, Evangeline, Grant, La Salle, and Rapides Parishes, Louisiana and Southampton and Sussex Counties, Virginia	AMM-1	For prolonged operations and maintenance activities (e.g., >2 hours) within existing ROWs that traverse mature (greater than 60 years of age), pine-dominated forests containing sparse hardwood understory or midstory within Calcasieu, Catahoula, Evangeline, Grant, La Salle, and Rapides Parishes, Louisiana and Southampton and Sussex Counties, Virginia, conduct work between August 1

SPECIES	LOCATION	AMM #	AMM
			and April 14th or conduct surveys following FWS survey guidance.
Red-cockaded Woodpecker	Calcasieu, Catahoula, Evangeline, Grant, La Salle, and Rapides Parishes, Louisiana and Southampton and Sussex Counties, Virginia	AMM-2	For new construction activities that traverse mature (greater than 60 years of age), pine-dominated forests containing sparse hardwood understory or midstory within Calcasieu, Catahoula, Evangeline, Grant, La Salle, and Rapides Parishes, Louisiana and Southampton and Sussex Counties, Virginia, conduct surveys following FWS survey guidance.

Red-cockaded Woodpecker	Calcasieu, Catahoula, Evangeline, Grant, La Salle, and Rapides Parishes, Louisiana and Southampton and Sussex Counties, Virginia	AMM-3	FWS survey guidance for RCW
			
			Step 1. Determine the presence/absence of suitable potential foraging or nesting habitat by correctly following the Survey Protocol described in Appendix 4 (pp. 288-290) of the Recovery Plan for the Red-cockaded Woodpecker - Second Revision (2003). These habitat surveys will be accepted for the life of NiSource's Incidental Take Permit Maintain survey reports (including entering both positive and negative findings in a GIS database to which the Service will have access).
			Potential nesting habitat present?
			• If no, is suitable foraging habitat present?
			  o If no, document for future NiSource activities and annual compliance report[1] and no further RCW AMMs are needed.
			  o If yes and will be impacted, conduct an additional survey effort to identify any suitable nesting habitat within 0.5 miles of the project area to determine if there could be potential use of that impacted foraging habitat by groups outside of the project area.
			  ▪ If no suitable nesting habitat is present within 0.5 miles of the project area, document for future NiSource activities and annual compliance report and no further RCW AMMs are needed.
			  ▪ If suitable nesting habitat is present, conduct surveys for cavity trees (Step 2) or coordinate with the Service
			• If yes, conduct surveys for cavity trees (Step 2) or

SPECIES	LOCATION	AMM #	AMM
			coordinate with the Service Step 2. Active cavity trees found? • If no, document for future NiSource activities and annual compliance report[1] and no further RCW AMMs are needed. Submit both positive and negative survey reports to the Service Field Office in the state in which the surveys were conducted. • If one or more active cavity trees are found: o For projects on existing ROWs- a foraging analysis (Step 3) should be conducted to determine whether sufficient amounts of foraging habitat will remain for each group post-project. o For new construction, further coordination/consultation with the Service is needed. Step 3. Adequate foraging habitat remaining post-project? (Adequate foraging habitat is described in Appendix 5 (pp. 292-294) of the Recovery Plan for the Red-cockaded Woodpecker - Second Revision (2003). • If yes, document for future NiSource activities and annual compliance report[8] and follow AMM 2. • If no, further coordination/consultation with the Service is needed. 1. Conduct operations and maintenance activities that may disturb RCW (i.e., would create a novel noise disturbance or any activity that would be ≥ 2 hours duration) within existing ROWs that traverse mature (greater than 60 years of age and 10 inches dbh), pine-dominated forests containing sparse hardwood understory or midstory in RCW parishes/counties between August 1 and April 14. ---------- [8] Survey reports should include the following details: 1. survey methodology including dates, qualifications of

SPECIES	LOCATION	AMM #	AMM
			survey personnel, size of survey area, and transect density; 2. pine stand characteristics including number of acres of suitable nesting and/or foraging habitat, tree species, basal area and number of pine stems 10 inches or greater per acre, percent cover of pine trees greater than 60 years of age, species of dominant vegetation within each canopy layer, understory conditions and species composition (several representative photographs should be included); 3. number of active and inactive RCW cavity trees observed and the condition of the cavities (e.g., resin flow, shape of cavity, start-holes); 4. presence or absence or RCWs; and 5. topographic quadrangle maps which illustrate areas of adequate RCW nesting and/or foraging habitat, cluster sites, and cavity tree locations relative to proposed construction activities.
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.	AMM-1	When within WVNFS habitat within the Monongahela National Forest, implement the Land and Resource Management Plan Forest-Wide Management Direction for WVNFS (TE63 to TE66).
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.	AMM-2	Employ all practical measures to minimize the area of disturbance when conducting O&M activities in occupied or potential habitat.

SPECIES	LOCATION	AMM #	AMM
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.	AMM-3	Avoid aerial application of herbicides within mapped WVNFS habitat.
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.	AMM-4	When possible select routes that avoid tree clearing in suitable habitat.
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.	AMM-5	When working within WVNFS habitat, all work will occur within existing ROW and a 25-foot temporary workspace without further consultation.
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia)	AMM-6	No new access roads will be constructed within WVNFS habitat without further consultation.

SPECIES	LOCATION	AMM #	AMM
	• Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.		
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.	AMM-7	No new storage well pits will be constructed within WVNFS habitat without further consultation
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.	AMM-8	Employ all practical measures to minimize the area of disturbance when conducting construction activities in occupied or potential habitat.
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia)	AMM-8	Avoid tree removal between April 1 and September 15 to avoid felling of potential nest trees (i.e., trees greater than 5 inches diameter at breast height) in occupied or potential habitat when young WVNFS may be present in nests.

SPECIES	LOCATION	AMM #	AMM
	The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.		
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.	AMM-10	Re-vegetate all disturbed WVNFS habitat within the non-permanent ROW with appropriate native species (red spruce).
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.	AMM-11	Monitor all restoration plantings for proper establishment and implement supplemental plantings as necessary.
West Virginia northern flying squirrel	The known WVNFS population centers which overlap or are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.	AMM-12	Establish an adequate number of nest boxes. Use 15 nest boxes per 50 acres of tree clearing and 1 box for each additional 5 acres.
West Virginia	The known WVNFS population centers which overlap or	AMM-13	Comply with the WVNFS Management Direction from the

SPECIES	LOCATION	AMM #	AMM
northern flying squirrel	are in close proximity to the NiSource MSHCP area are: • Cheat Mountain (Pocahontas and Randolph counties, West Virginia) • Spruce Knob/Laurel Fork (Pendleton, Pocahontas, and Randolph counties, West Virginia) • Blackwater Canyon/Dolly Sods (Grant, Randolph, and Tucker counties, West Virginia) The majority of the WVNFS population centers within the NiSource MSHCP area are found within the Monongahela NF.		Monongahela National Forest Plan (USFS 2006), as follows: TE63: Suitable habitat shall be determined using maps collaboratively produced by the Forest, USFWS, and WVDNR. These maps shall be reviewed during watershed or project analysis and refined when Forest, USFWS, and WVDNR biologists determine that suitable habitat is or is not present. All verified capture sites shall be included in the suitable habitat maps. TE64: Suitable habitat shall be considered occupied. Vegetation management activities in suitable habitat shall only be conducted after consultation with USFWS, and: a) Under an Endangered Species Act Section 10 research permit to determine the effects of an activity on WVNFS or to determine activities that would contribute to the recovery of the species, or b) To improve or maintain WVNFS or other TEP species habitat after research has demonstrated the beneficial effects of the proposed management, or c) When project-level assessment results in a no effect or may affect, not likely to adversely affect determination, or d) To address public safety concerns. TE65: New developed recreation facilities, such as visitor centers or campgrounds, shall not be constructed in suitable habitat. Smaller facilities—such as foot trails, trailheads, picnic sites, ¼ acre vistas—may be constructed if they result in a no effect or may affect, not likely to adversely affect determination. TE66: Development of federal gas and oil is generally allowed as long as: (a) it remains within the limits projected in the 1991 Environmental Assessment Oil and Gas Leasing and Development and (b) protection measures for WVNFS are developed through consultation with the USFWS prior to Forest Service approval of operations.
Kentucky arrow darter	Kentucky; Lee, Owsley, and Clay counties; 22 streams in 4 watersheds (S. Fork KY River, Sturgeon Creek, Sexton Creek, Goose Creek)	AMM-1	Establish species presence/absence: •Assume presence or demonstrate that the species is likely absent from the 22 streams within the project corridor that represent

SPECIES	LOCATION	AMM #	AMM
			suitable habitat for the subspecies. If KADs are not present, then adverse effects can be avoided and that stream can be excluded from any future consultation. Presence or absence of KAD is established through a two-step process for each stream following FWS-approved methods: (1) evaluate water quality for habitat suitability and (2) where water quality indicates suitable habitat, complete presence/absence surveys.
Kentucky arrow darter	Kentucky; Lee, Owsley, and Clay counties; 22 streams in 4 watersheds (S. Fork KY River, Sturgeon Creek, Sexton Creek, Goose Creek)	AMM-2	Where species may be present, either avoid the habitat or conduct all activities with implementation of the HCP mussel AMMs and timeframe below. •Avoid project activities at known or presumed occupied habitats from April to June. Implementation of this AMM would avoid instream habitat disturbance and sedimentation impacts during the spawning season.
Spotfin chub	Portions of the Buffalo River system, including the Rush branch and Grinder's Creek, in Lewis County, Tennessee.	AMM-1	Where species may be present, either avoid the habitat or conduct all activities with implementation of the HCP mussel AMMs.
Pygmy madtom	Duck River, Tennessee	AMM-1	Where species may be present, either avoid the habitat or conduct all activities with implementation of the HCP mussel AMMs.
Pygmy madtom	Duck River, Tennessee	AMM-2	NiSource will only use HDD for new crossings on the Duck River.
Virginia spiraea	Portions of McDowell, Mercer, Raleigh, Summers, Upshur, and Wyoming Counties, West Virginia. Overall, the covered lands intersect with approximately 44,768 acres of mapped suitable habitat. However, not all potential habitat within the covered lands is likely to be occupied by the species. We believe that new occurrences are most likely to be found in counties with known occurrences or within connected patches of modeled suitable habitat and estimate there is approximately 18, 029 acres of potential habitat for the species within the covered lands.	AMM-1	Conduct surveys for Virginia spiraea prior to construction of new alignment or ground disturbing (e.g., pipeline replacement) activities through riparian vegetation in modeled suitable habitat areas within McDowell, Mercer, Raleigh, Summers, Upshur, and Wyoming Counties, West Virginia. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period. Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office.
Virginia spiraea	Portions of McDowell, Mercer, Raleigh, Summers, Upshur, and Wyoming Counties, West Virginia. Overall, the covered lands intersect with approximately 44,768 acres of	AMM-2	Avoid impacts to newly discovered populations or further consultation with the Service will be needed.

SPECIES	LOCATION	AMM #	AMM
	mapped suitable habitat. However, not all potential habitat within the covered lands is likely to be occupied by the species. We believe that new occurrences are most likely to be found in counties with known occurrences or within connected patches of modeled suitable habitat and estimate there is approximately 18, 029 acres of potential habitat for the species within the covered lands.		
Eastern prairie fringed orchid	The NiSource project may affect this species in portions of Clark, Holmes, Lucas, Ottawa, Sandusky and Wayne Counties in Ohio; and Augusta County in Virginia. There are no known occurrences within the ROW proper in Ohio or Virginia. There is one occurrence at the intersection of Wayne and Holmes counties, Ohio, and one occurrence at the edge of the covered lands in Augusta County, Virginia. We believe that it is likely that populations may occur within the covered lands given the presence of at least two populations within the covered lands. While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in impacts to unknown populations of this species.	AMM-1	Route new ROW alignments to avoid impacts to the one known population of Eastern prairie fringed orchid in Augusta County, Virginia, and the one known population at the intersection of Wayne and Holmes counties, Ohio.
Eastern prairie fringed orchid	The NiSource project may affect this species in portions of Clark, Holmes, Lucas, Ottawa, Sandusky and Wayne Counties in Ohio; and Augusta County in Virginia. There are no known occurrences within the ROW proper in Ohio or Virginia. There is one occurrence at the intersection of Wayne and Holmes counties, Ohio, and one occurrence at the edge of the covered lands in Augusta County, Virginia. We believe that it is likely that populations may occur within the covered lands given the presence of at least two populations within the covered lands. While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in impacts to unknown populations of this species.	AMM-2	Conduct surveys for Eastern prairie fringed orchid prior to construction of new alignment or >1 acre of ground disturbing (e.g., pipeline replacement) activities on existing ROWs in Clark, Holmes, Lucas, Ottawa, Sandusky and Wayne Counties in Ohio; and in modeled suitable habitat in Augusta County in Virginia. Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period.
Eastern prairie fringed orchid	The NiSource project may affect this species in portions of Clark, Holmes, Lucas, Ottawa, Sandusky and Wayne Counties in Ohio; and Augusta County in Virginia. There are no known occurrences within the ROW proper in Ohio	BMP-3	Avoid impacts to newly discovered populations or further consultation with the Service will be needed.

SPECIES	LOCATION	AMM #	AMM
	or Virginia. There is one occurrence at the intersection of Wayne and Holmes counties, Ohio, and one occurrence at the edge of the covered lands in Augusta County, Virginia. We believe that it is likely that populations may occur within the covered lands given the presence of at least two populations within the covered lands. While no known populations will be impacted by the NiSource project, we conclude that NiSource activities could conceivably result in impacts to unknown populations of this species.		
Leafy prairie-clover	Portions of Davidson, Maury, Williamson, and Wilson Counties, Tennessee, along with the potential discovery of undocumented extant pockets of the species within its historic range in Sumner County, Tennessee. There are no known occurrences in ROWs or covered lands but there is suitable habitat within the ROW between Interstate 40 and Interstate 24 in Davidson County Tennessee.	BMP-1	Conduct surveys for leafy prairie-clover (in cedar glade areas only) prior to construction of new alignment or ground disturbing (e.g., pipeline replacement) activities on existing ROWs between Interstate 40 and Interstate 24 in Davidson County, Tennessee. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period. Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office.
Leafy prairie-clover	Portions of Davidson, Maury, Williamson, and Wilson Counties, Tennessee, along with the potential discovery of undocumented extant pockets of the species within its historic range in Sumner County, Tennessee. There are no known occurrences in ROWs or covered lands but there is suitable habitat within the ROW between Interstate 40 and Interstate 24 in Davidson County Tennessee.	BMP-2	Avoid impacts to newly discovered populations or further consultation with the Service will be needed.
Running buffalo clover	Portions of Bourbon, Campbell, Clark, Fayette, Madison, and Montgomery Counties, Kentucky; Brown, Clermont, and Lawrence Counties, Ohio; and Pendleton, Pocahontas, Preston, Randolph, Tucker, and Webster Counties; West Virginia. Additionally, the potential for rediscovery of the species within portions of its historic range exists in Jackson County, Kentucky and Monongalia County, West Virginia.	AMM-1	Route new ROW alignments to avoid impacts to six known populations of running buffalo clover within covered lands in Augusta (1) and Hocking (1) counties in Ohio, and Preston (2), Brooke (1), and Tucker (1) counties in West Virginia.
Running buffalo clover	Portions of Bourbon, Campbell, Clark, Fayette, Madison, and Montgomery Counties, Kentucky; Brown, Clermont,	AMM-2	Conduct surveys in modeled suitable habitat for running buffalo clover prior to construction of new alignment or >1 acre ground

SPECIES	LOCATION	AMM #	AMM
	and Lawrence Counties, Ohio; and Pendleton, Pocahontas, Preston, Randolph, Tucker, and Webster Counties; West Virginia. Additionally, the potential for rediscovery of the species within portions of its historic range exists in Jackson County, Kentucky and Monongalia County, West Virginia.		disturbing (e.g., pipeline replacement) activities on existing ROWs in Bourbon, Campbell, Clark, Fayette, Jackson, Madison, and Montgomery Counties, Kentucky; Brown, Clermont, and Lawrence Counties, Ohio; and Monongalia, Pendleton, Pocahontas, Preston, Randolph, Tucker, and Webster Counties West Virginia. Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period.
Running buffalo clover	Portions of Bourbon, Campbell, Clark, Fayette, Madison, and Montgomery Counties, Kentucky; Brown, Clermont, and Lawrence Counties, Ohio; and Pendleton, Pocahontas, Preston, Randolph, Tucker, and Webster Counties; West Virginia. Additionally, the potential for rediscovery of the species within portions of its historic range exists in Jackson County, Kentucky and Monongalia County, West Virginia.		Avoid impacts to newly discovered populations or further consultation with the Service will be needed.
Globe (Short's) Bladderpod,	Portions of its current range in Bourbon, Fayette, and Madison Counties, Kentucky. This species is not found in the covered lands in Tennessee. The species is also not found within existing ROWs.	AMM-1	Conduct surveys for Globe bladderpod prior to construction of new alignments in Bourbon, Fayette, and Madison Counties, Kentucky Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period. If the species is present, NiSource will design project subactivities to avoid impacts via consultation with the Service. If adverse effects would be likely, NiSource would need to reinitiate consultation with the Kentucky Ecological Services Field Office. NiSource has agreed to avoid all activities in the area specified. If the area cannot be avoided, consultation will need to be reinitiated for this species.

SPECIES	LOCATION	AMM #	AMM
			-Globe (Short's) Bladderpod Avoidance Area: All areas designated by the Kentucky Natural Heritage Database.
Leedy's Roseroot,	one location in Schuyler County, New York.	AMM-1	Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species. Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office. Avoidance Area: Area designated by the NY Heritage Database, with a 50 meter buffer on all sides.
Northern Monkshood,	One location in Hocking County, Ohio. Populations in these areas would be found in association with high-elevation headwaters and stream crevices in New York, and in association with shaded or partially shaded cliffs and talus slopes in Ohio.	AMM-1	Avoid all activities in the area specified for this species. If the area cannot be avoided, consultation will need to be reinitiated for this species. Surveys should be coordinated with the local FWS field office. Avoidance Area: Crane Hollow State Nature Preserve, Laurel Township, Hocking County, Ohio.
Small whorled Pogonia	Portions of Califon Borough, Hunterdon County, and Morris County, New Jersey; Hocking County, Ohio; and Botetourt, Fairfax, Giles, Henrico, Madison, Rockbridge, and Prince William Counties, Virginia. Small whorled pogonia does not occur in any of the storage field expansion counties and will not be impacted by those activities. There are no known occurrences in ROWs or the entire covered lands in New Jersey or Virginia. Small whorled pogonia is not anticipated to occur in existing ROWs; therefore, activities that are wholly contained within the existing ROW should not affect this species.	BMP-1	NiSource has agreed to avoid all activities in the area specified. If the area cannot be avoided, consultation will need to be reinitiated for this species. - Avoidance Area: Camp OtyOkwa, Benton Township, Hocking County, Ohio.
Small whorled Pogonia	Portions of Califon Borough, Hunterdon County, and Morris County, New Jersey; Hocking County, Ohio; and Botetourt, Fairfax, Giles, Henrico, Madison, Rockbridge, and Prince William Counties, Virginia. Small whorled pogonia does not occur in any of the storage field expansion counties and will not be impacted by those activities. There are no known occurrences in ROWs or the entire covered lands in New Jersey or Virginia. Small whorled pogonia is not anticipated to occur in existing ROWs; therefore, activities that are wholly contained	AMM-2	Conduct surveys for small whorled pogonia prior to construction of new alignment in upland forest in Califon Borough, Hunterdon County, and Morris County, New Jersey; Centre and Chester, Greene, Monroe, and Montgomery Counties, Pennsylvania and in modeled suitable habitat in Botetourt, Fairfax, Giles, Henrico, Madison, Rockbridge, and Prince William Counties, Virginia. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be

SPECIES	LOCATION	AMM #	AMM
	within the existing ROW should not affect this species.		required for that period. Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office.
Small whorled Pogonia	Portions of Califon Borough, Hunterdon County, and Morris County, New Jersey; Hocking County, Ohio; and Botetourt, Fairfax, Giles, Henrico, Madison, Rockbridge, and Prince William Counties, Virginia. Small whorled pogonia does not occur in any of the storage field expansion counties and will not be impacted by those activities. There are no known occurrences in ROWs or the entire covered lands in New Jersey or Virginia. Small whorled pogonia is not anticipated to occur in existing ROWs; therefore, activities that are wholly contained within the existing ROW should not affect this species.	AMM-3	Avoid impacts to newly discovered populations or further consultation with the Service will be needed.
Shale barren rock cress	Portions of Alleghany, Augusta, Botetourt, Page, Rockbridge, Rockingham, Shenandoah, and Warren Counties in Virginia; Greenbrier, Hardy, and Pendleton Counties in West Virginia. There is one occupied site in Alleghany County, Virginia (on the George Washington National Forest) within the covered lands and two additional sites ¼ mile from the covered lands. We believe that it is likely that other populations may occur within the covered lands in Virginia and West Virginia.	AMM-1	Avoid impacts to known population(s) of shale barren rock cress within covered lands (one currently within George Washington National Forest).
Shale barren rock cress	Portions of Alleghany, Augusta, Botetourt, Page, Rockbridge, Rockingham, Shenandoah, and Warren Counties in Virginia; Greenbrier, Hardy, and Pendleton Counties in West Virginia. There is one occupied site in Alleghany County, Virginia (on the George Washington National Forest) within the covered lands and two additional sites ¼ mile from the covered lands. We believe that it is likely that other populations may occur within the covered lands in Virginia and West Virginia.	AMM-2	NiSource will conduct surveys in modeled suitable habitat for shale barren rock cress prior to construction of new alignment or ground disturbing (e.g., pipeline replacement) activities ≥1 acre on existing ROWs in xeric shale areas 1099-2500 feet in elevation on 20 degree south- to southwest-facing slopes in Alleghany, Augusta, Botetourt, Page, Rockbridge, Rockingham, Shenandoah, and Warren Counties, Virginia, and Greenbrier, Hardy, and Pendleton Counties, West Virginia. Where the species is present, NiSource will avoid the habitat. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period. Survey protocols should be coordinated with the local FWS field office

SPECIES	LOCATION	AMM #	AMM
			and survey results provided to the local FWS field office.
Shale barren rock cress	Portions of Alleghany, Augusta, Botetourt, Page, Rockbridge, Rockingham, Shenandoah, and Warren Counties in Virginia; Greenbrier, Hardy, and Pendleton Counties in West Virginia. There is one occupied site in Alleghany County, Virginia (on the George Washington National Forest) within the covered lands and two additional sites ¼ mile from the covered lands. We believe that it is likely that other populations may occur within the covered lands in Virginia and West Virginia.	AMM-3	Avoid impacts to newly discovered populations or further consultation with the Service will be needed.
Smooth coneflower	Portions of Albermarle, Alleghany, Augusta, Botetourt, Chesterfield, Clarke, Culpeper, Frederick, Giles, Goochland, Louisa, Mecklenburg, Orange, Page, Powhatan, Rockbridge, Rockingham, Shenandoah, and Warren Counties, Virginia. Overall, the covered lands intersect with 32,770 acres of mapped suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW in the above-listed counties. There are no known occurrences along the existing ROW in Virginia. However, the ROW provides suitable habitat for the species and most of the ROW has not been surveyed for smooth coneflower. There are also no known occurrences within the broader covered lands in Virginia; however, we believe that it is likely that populations may occur within the covered lands given the amount of suitable habitat.	AMM-1	Conduct surveys in modeled suitable habitat for smooth coneflower prior to construction of new alignment or ground disturbing (e.g., pipeline replacement) activities ≥1 acre on existing ROWs in Albermarle, Allegheny, Augusta, Botetourt, Chesterfield, Clarke, Culpeper, Frederick, Giles, Goochland, Louisa, Mecklenburg, Orange, Page, Powhatan, Rockbridge, Rockingham, Shenandoah, and Warren Counties, Virginia. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period. Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office.
Smooth coneflower	Portions of Albermarle, Alleghany, Augusta, Botetourt, Chesterfield, Clarke, Culpeper, Frederick, Giles, Goochland, Louisa, Mecklenburg, Orange, Page, Powhatan, Rockbridge, Rockingham, Shenandoah, and Warren Counties, Virginia. Overall, the covered lands intersect with 32,770 acres of mapped suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW in the above-listed counties. There are no known occurrences along the	AMM-2	Avoid impacts to newly discovered populations or further consultation with the Service will be needed.

SPECIES	LOCATION	AMM #	AMM
	existing ROW in Virginia. However, the ROW provides suitable habitat for the species and most of the ROW has not been surveyed for smooth coneflower. There are also no known occurrences within the broader covered lands in Virginia; however, we believe that it is likely that populations may occur within the covered lands given the amount of suitable habitat.		
Michaux's sumac	portions of Brunswick, Chesterfield, Dinwiddie, Greensville, Mecklenburg, and Sussex Counties, Virginia. Overall, the covered lands intersect with approximately 20,314 acres of mapped suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW within these counties.	AMM-1	Conduct surveys in modeled suitable habitat for Michaux's sumac prior to construction of new alignment or ground disturbing (e.g., pipeline replacement) activities ≥1 acre on existing ROWs in Brunswick, Chesterfield, Dinwiddie, Greensville, Mecklenburg, and Sussex Counties, Virginia. Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period.
Michaux's sumac	portions of Brunswick, Chesterfield, Dinwiddie, Greensville, Mecklenburg, and Sussex Counties, Virginia. Overall, the covered lands intersect with approximately 20,314 acres of mapped suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW within these counties.	AMM-2	Avoid impacts to newly discovered upland plant populations or further consultation with the Service will be needed
Sensitive joint-vetch	Portions of Chesterfield, Fairfax, Henrico, Isle of Wight, Prince George, Prince William, Suffolk, and Surry Counties, Virginia. Logan Township, Gloucester County, New Jersey. Overall, the covered lands intersect with 2,433 acres of suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW in the above-listed counties. There are also no known occurrences within the broader covered lands in Virginia; however, we believe that it is likely that populations may occur within the covered lands given the amount of suitable habitat.	AMM-1	Route new ROW alignments to avoid historic location of sensitive joint-vetch in Logan Township, Gloucester County, New Jersey (beginning approx. 75°23'22.992"W, 39°46'51.094"N).

SPECIES	LOCATION	AMM #	AMM
Sensitive joint-vetch	Portions of Chesterfield, Fairfax, Henrico, Isle of Wight, Prince George, Prince William, Suffolk, and Surry Counties, Virginia. Logan Township, Gloucester County, New Jersey. Overall, the covered lands intersect with 2,433 acres of suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW in the above-listed counties. There are also no known occurrences within the broader covered lands in Virginia; however, we believe that it is likely that populations may occur within the covered lands given the amount of suitable habitat.	AMM-2	Conduct surveys in modeled suitable habitat for sensitive joint-vetch prior to construction of new alignment or ground disturbing (e.g., pipeline replacement) activities within close proximity to tidal wetlands on existing ROWs in Chesterfield, Henrico, Fairfax, Prince George, Prince William, Isle of Wight, Suffolk, Surry Counties, Virginia. Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period.
Sensitive joint-vetch	Portions of Chesterfield, Fairfax, Henrico, Isle of Wight, Prince George, Prince William, Suffolk, and Surry Counties, Virginia. Logan Township, Gloucester County, New Jersey. Overall, the covered lands intersect with 2,433 acres of suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW in the above-listed counties. There are also no known occurrences within the broader covered lands in Virginia; however, we believe that it is likely that populations may occur within the covered lands given the amount of suitable habitat.	AMM-3	Route new ROW alignments to avoid impacts to known population of swamp pink within covered lands in Augusta County, Virginia.
Swamp pink	Portions of Woolwich Township, Gloucester County, Mount Olive, Roxbury, and Randolph Townships, Morris County, and Salem County, New Jersey; and Albemarle, Augusta, Botetourt, Fairfax, Greene, Henrico, Prince George, Rockbridge, Rockingham, and Page Counties, Virginia. Overall, the covered lands intersect with approximately 5,097 acres of potential habitat in Virginia and 2,379 acres in New Jersey. There are no known occurrences in the ROW proper in New Jersey or Virginia; however, two sections of pipeline intersect historic populations of swamp pink in New Jersey. There are no swamp pink occurrences within the broader covered lands in New Jersey but there is one extant occurrence within	AMM-1	Route new ROW alignments to avoid impacts to known population of swamp pink within covered lands in Augusta County, Virginia.

SPECIES	LOCATION	AMM #	AMM
	the covered lands in Augusta County, Virginia. Given the historic and extant occurrences, we believe that additional populations may occur within the covered lands.		
Swamp pink	Portions of Woolwich Township, Gloucester County, Mount Olive, Roxbury, and Randolph Townships, Morris County, and Salem County, New Jersey; and Albemarle, Augusta, Botetourt, Fairfax, Greene, Henrico, Prince George, Rockbridge, Rockingham, and Page Counties, Virginia. Overall, the covered lands intersect with approximately 5,097 acres of potential habitat in Virginia and 2,379 acres in New Jersey. There are no known occurrences in the ROW proper in New Jersey or Virginia; however, two sections of pipeline intersect historic populations of swamp pink in New Jersey. There are no swamp pink occurrences within the broader covered lands in New Jersey but there is one extant occurrence within the covered lands in Augusta County, Virginia. Given the historic and extant occurrences, we believe that additional populations may occur within the covered lands.	AMM-2	Conduct surveys for swamp pink prior to construction of new alignment or ground disturbing (e.g., pipeline replacement) activities within 100 feet of forested wetlands on existing ROWs in Woolwich Township, Gloucester County, Mount Olive, Roxbury, and Randolph Townships, Morris County, and West Deptford, East Greenwich, and Woolwich Townships, Salem County, New Jersey, and in modeled suitable habitat in Rockbridge, Henrico, Botetourt, Rockingham, Greene, Fairfax, Prince George, Albemarle, Chesterfield, Augusta, Page Counties, Virginia. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period. Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office.
Swamp pink	Portions of Woolwich Township, Gloucester County, Mount Olive, Roxbury, and Randolph Townships, Morris County, and Salem County, New Jersey; and Albemarle, Augusta, Botetourt, Fairfax, Greene, Henrico, Prince George, Rockbridge, Rockingham, and Page Counties, Virginia. Overall, the covered lands intersect with approximately 5,097 acres of potential habitat in Virginia and 2,379 acres in New Jersey. There are no known occurrences in the ROW proper in New Jersey or Virginia; however, two sections of pipeline intersect historic populations of swamp pink in New Jersey. There are no swamp pink occurrences within the broader covered lands in New Jersey but there is one extant occurrence within the covered lands in Augusta County, Virginia. Given the historic and extant occurrences, we believe that additional populations may occur within the covered lands.	AMM-3	Avoid impacts to newly discovered populations or further consultation with the Service will be needed.
Virginia sneezeweed	Portions of Augusta, Botetourt, Page, Rockbridge, and Rockingham Counties, Virginia. Overall, the covered lands	AMM-1	Route new ROW alignments to avoid impacts to known population of Virginia sneezeweed within covered lands in Augusta,

SPECIES	LOCATION	AMM #	AMM
	intersect with approximately 600 acres of mapped suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW within the above-listed counties. There are five known occurrences within the broader covered lands in Virginia. Given the nearby occurrences, we believe that it is likely that other populations occur within the covered lands in Virginia.		Botetourt, Page, Rockbridge, and Rockingham Counties, Virginia.
Virginia sneezeweed	Portions of Augusta, Botetourt, Page, Rockbridge, and Rockingham Counties, Virginia. Overall, the covered lands intersect with approximately 600 acres of mapped suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW within the above-listed counties. There are five known occurrences within the broader covered lands in Virginia. Given the nearby occurrences, we believe that it is likely that other populations occur within the covered lands in Virginia.	AMM-2	Conduct surveys in modeled suitable habitat for Virginia sneezeweed prior to construction of new alignment or > 1 acre ground disturbing (e.g., pipeline replacement) activities within close proximity to sinkhole ponds on existing ROWs in Augusta, Rockbridge, Botetourt, Rockingham, Page Counties, Virginia. Survey protocols should be coordinated with the local FWS field office and survey results provided to the local FWS field office. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period.
Virginia sneezeweed	Portions of Augusta, Botetourt, Page, Rockbridge, and Rockingham Counties, Virginia. Overall, the covered lands intersect with approximately 600 acres of mapped suitable habitat. There are no known occurrences within the ROW proper in Virginia; however, it is possible that the species occurs in previously unsurveyed portions of the ROW within the above-listed counties. There are five known occurrences within the broader covered lands in Virginia. Given the nearby occurrences, we believe that it is likely that other populations occur within the covered lands in Virginia.	AMM-3	Avoid impacts to newly discovered populations or further consultation with the Service will be needed.
Pondberry	Sharkey and Sunflower Counties, Mississippi. While no known populations will be impacted by the NiSource project, surveys for this species are incomplete and NiSource activities may impact unknown populations.	AMM-1	Conduct surveys for pondberry prior to construction of new alignment or ground disturbing (e.g., pipeline replacement) activities within 100 feet of bottomland hardwood wetlands on existing ROWs in Sharkey and Sunflower Counties, Mississippi. Survey protocols should be coordinated with the local FWS field

SPECIES	LOCATION	AMM #	AMM
			office and survey results provided to the local FWS field office. If suitable habitat is absent, adverse effects would be avoided and that area could be excluded from any future consultation. If suitable habitat is present but the species is absent, the survey would be valid for 5 years and further consultation would not be required for that period.
Pondberry	Sharkey and Sunflower Counties, Mississippi. While no known populations will be impacted by the NiSource project, surveys for this species are incomplete and NiSource activities may impact unknown populations.	AMM-2	Avoid impacts to newly discovered populations or further consultation with the Service will be needed.

APPENDIX C: SPECIES EFFECTS ANALYSIS TABLES

Table C1: Analysis of effects on Indiana bat

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	increased human activity/disturbance	increased daytime arousal	human presence	all life stages, (not hibernation)	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees, nor would it impact foraging bats or bats using travel corridors; NOTE vehicle impacts for all O&M subactivities are evaluated here (i.e., vehicle impacts will not be considered under the remaining O&M subactivities)
Operation & Maintenance	Vegetation Management - mowing	loss or alteration of forested habitat; increased human activity/disturbance;	decreased foraging & travel efficiency; increased predation	alteration of spring-summer-fall travel corridors; vegetation removal	all life stages, (not hibernation)	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees, nor would it impact foraging bats or bats using travel corridors.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	loss or alteration of forested habitat;	alteration of travel corridors, summer roosting/foraging habitat, & staging/swarming habitat; increased arousal, daytime disturbance, roost abandonment, increased predation due to daytime activity	vegetation removal; human disturbance	all life stages, (not hibernation)	Kill, harm, harass	breeding, sheltering	numbers, reproduction	LAA	AMMs minimize potential effects; vegetation alterations to travel corridors and foraging habitat should be extremely small; Noise and activity levels are anticipated to be so low as to not cause bats to flush from adjacent roost trees;
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	chemical contamination; vegetation loss	lethal or sublethal exposure to toxins; alteration of travel corridors, summer roosting/foraging habitat, & staging/swarming habitat;	contamination of water & vegetation; loss of herbaceous vegetation	unlikely				NLAA	implementation of AMM 12 makes potential impacts to hibernating bats extremely unlikely to occur; the amount of area to be treated that could be Ibat roosting, foraging, or travelling habitat is very small, making potential exposure extremely unlikely to occur
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	human activity & disturbance; obstructed cave entrances or vents	loss or alteration of hibernation conditions; hibernacula no longer suitable; daytime arousal	alteration of water or air flow in/out of hibernacula; human presence	all life stages; spring-fall	none expected			NLAA	AMMs avoid potential impacts to hibernacula; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees;

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	human activity & disturbance; smoke disturbance	smoke inhalation during hibernation; increased arousal, daytime disturbance, roost abandonment, increased predation due to daytime activity	smoke in hibernacula or roosting habitat	all life stages; all seasons	none expected			NLAA	The harassment and resultant flushing of bats from smoke caused by burning brush piles in summer is insignificant because the effects are difficult to detect and measure; AMMs will prevent smoke from entering hibernacula in the winter
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	tree removal; loss or alteration of forested habitat; human disturbance	alteration of summer roosting/foraging habitat, & staging/swarming habitat; increased arousal, daytime disturbance, roost abandonment, increased predation due to daytime activity	vegetation removal; human disturbance	unlikely	kill, harm, harass	breeding, sheltering	numbers, reproduction	NLAA	AMMs minimize potential effects; vegetation alterations to travel corridors and foraging habitat should be extremely small; Noise and activity levels are anticipated to be so low as to not cause bats to flush from adjacent roost trees; Although some roosting habitat may be taken during side trimming during the winter, we do not expect indirect effects to occur because the majority of the tree and therefore roosting habitat will not be removed. Thus, the effects are insignificant.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	tree removal; loss or alteration of forested habitat; human disturbance	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal	vegetation removal; human disturbance	unlikely	none expected			NLAA	The small area and level of impact from these activities is not expected to have noticeable or measurable impacts on Ibat or their habitat; ROW repairs occur in areas of soil erosion where roost trees are unlikely to occur.
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	tree removal; loss or alteration of forested habitat; human disturbance	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal	vegetation removal; human disturbance	unlikely	none expected			NLAA	The small area and level of impact from these activities is not expected to have noticeable or measurable impacts on Ibat or their habitat; ROW repairs occur in areas of soil erosion where roost trees are unlikely to occur.
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	tree removal; loss or alteration of forested habitat; human disturbance	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal	vegetation removal; human disturbance	unlikely	none expected			NLAA	The small area and level of impact from these activities is not expected to have noticeable or measurable impacts on Ibat or their habitat.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Access Road Maintenance - grading, graveling	tree removal; loss or alteration of forested habitat; human disturbance	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal	vegetation removal; human disturbance	unlikely	kill, harm, harass	breeding, sheltering	numbers, reproduction	NLAA	AMMs minimize potential effects; vegetation alterations to travel corridors and foraging habitat should be extremely small; Noise and activity levels are anticipated to be so low as to not cause bats to flush from adjacent roost trees; Although some roosting habitat may be taken during side trimming during the winter, we do not expect indirect effects to occur because the majority of the tree and therefore roosting habitat will not be removed. Thus, the effects are insignificant.
Operation & Maintenance	Access Road Maintenance - culvert replacement	tree removal; loss or alteration of forested habitat; human disturbance	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal	vegetation removal; human presence	all life stages	none expected			NLAA	The small area and level of impact from these activities is not expected to have noticeable or measurable impacts on Ibat or their habitat.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	tree removal; loss or alteration of forested habitat; human disturbance	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal	vegetation removal; human presence	all life stages	kill, harm, harass	breeding, sheltering	numbers, reproduction	LAA	AMMs minimize potential effects; vegetation alterations to travel corridors and foraging habitat should be extremely small; Noise and activity levels are anticipated to be so low as to not cause bats to flush from adjacent roost trees;
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	human disturbance	increased daytime arousal	human presence	all life stages	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees, nor would it impact foraging bats or bats using travel corridors.
Operation & Maintenance	Pipeline Abandonment - in place	human disturbance	increased daytime arousal	human presence	all life stages	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees, nor would it impact foraging bats or bats using travel corridors.
Operation & Maintenance	Pipeline Abandonment - removal	human disturbance	increased daytime arousal	human presence	all life stages	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees, nor would it impact foraging bats or bats using travel corridors.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	chemical contamination; clearing of forested habitat	lethal or sublethal exposure to toxins	contaminants exposed in open waste pits; vegetation removal		Kill			LAA	Bats might get stuck in the pit while drinking- anticipated to occur only infrequently; impacts to habitat would be insignificant due to the small forested area removed;
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	clearing of forested habitat; human activity & disturbance	alteration of summer roosting habitat, & staging/swarming habitat; daytime arousal	vegetation removal; human presence	all life stages; spring-fall	Kill, harm, harass	breeding, sheltering	numbers, reproduction	LAA	AMMs minimize potential effects; vegetation alterations to travel corridors and foraging habitat should be extremely small; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; The flushing of bats from roost trees as they are being cut during daylight hours would increase the likelihood that the bats would become prey for predators.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Abandonment - Ownership transfer	none	none	none					NE	
Operation & Maintenance	Inspection Activities - ground and aerial	human activity & disturbance	daytime arousal	human presence	all life stages; spring-fall	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees
New Disturbance - Construction	Vehicle Operation and Foot Traffic	human activity & disturbance	daytime arousal	human presence	all life stages; spring-fall	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	clearing of forested habitat; human activity & disturbance	alteration of summer roosting habitat, & staging/swarming habitat; daytime arousal	vegetation removal; human presence	all life stages; spring-fall	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; Mowing of herbaceous veg while bats are present in habitat is expected to have a direct effect on the quality, quantity, and timing of prey resources; however, the affect on bats foraging is considered insignificant due to the small area of impact within a bats ~2.5 mile home range
New Disturbance - Construction	Clearing - trees and shrubs	clearing of forested habitat; human activity & disturbance	alteration of summer roosting habitat, & staging/swarming habitat; daytime arousal	vegetation removal; human presence	all life stages; spring-fall	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; amount of habitat loss from this type of clearing is not expected to have a noticeable impact on Ibat habitat
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	human activity & disturbance; obstructed cave entrances or vents	loss or alteration of hibernation conditions; hibernacula no longer suitable; daytime arousal	alteration of water or air flow in/out of caves; human presence	all life stages; all seasons	none expected			NLAA	AMMs avoid potential impacts to hibernacula; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees;
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	human activity & disturbance; smoke	daytime arousal	smoke; human presence & noise	all life stages; all seasons	none expected			NLAA	The direct loss of bats from smoke caused by burning brush piles in summer is insignificant because the effects are difficult to detect and measure; AMMs will prevent smoke from entering hibernacula in the winter
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	No side trimming occurs for new construction.							NE	
New Disturbance - Construction	Grading, erosion control devices	alteration of water flow; vegetation removal; human activity	altered water flow & humidity in hibernacula	altered water flow	all life stages; all seasons	none expected			NLAA	Noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; AMMs prevent discharge of a significant amount of water into the recharge area of known hibernacula potentially flooding hibernating bats

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	human activity; ground disturbance; instream & riparian disturbance; temporary dewatering	decreased aquatic invertebrates; daytime arousal	instream sedimentation & water flow disruption; human presence & noise	all life stages; all seasons	none expected			NLAA	AMMs limit potential impacts to hibernacula by restricting blasting within 1/2 mile of hibernacula; ECS requirements limit loss of aquatic invertebrates so that any loss of Ibat forage is insignificant
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	human activity	daytime arousal	human presence & noise	all life stages; spring-fall	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees,
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	withdrawal/discharge of water into aquatic habitats; human activity	decreased aquatic invertebrates; daytime arousal	water alterations; human presence & noise	all life stages; all seasons	none expected			NLAA	AMMs prevent discharge of a significant amount of water into the recharge area of known hibernacula potentially flooding hibernating bats; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees, ECS requirements limit loss of aquatic invertebrates so that any loss of Ibat forage is insignificant
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	withdrawal/discharge of water into aquatic habitats; human activity	decreased aquatic invertebrates; daytime arousal	water alterations; human presence & noise	all life stages; all seasons	none expected			NLAA	AMMs prevent discharge of a significant amount of water into the recharge area of known hibernacula potentially flooding hibernating bats; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees, ECS requirements limit loss of aquatic invertebrates so that any loss of Ibat forage is insignificant
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	human activity & disturbance; obstructed cave entrances or vents	loss or alteration of hibernation conditions; daytime arousal	alteration of water or air flow in/out of caves; human presence	all life stages; all seasons				NLAA	AMMs avoid potential impacts to hibernacula; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees;
New Disturbance - Construction	Compression Facility, noise	noise disturbance	daytime arousal	human presence	all life stages; spring-fall	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	human activity and facilities	daytime arousal	human presence	all life stages; spring-fall	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	alteration of surface water flow; vegetation removal; human activity	altered water flow & humidity in hibernacula; alteration of summer roosting habitat, & staging/swarming habitat; daytime arousal	removal of forested habitat; altered surface water flow into caves; human presence	all life stages;	kill, harm, harass	breeding, sheltering	numbers, reproduction	LAA	AMMs limit potential impacts to hibernacula; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; The flushing of bats from roost trees as they are being cut during daylight hours would increase the likelihood that the bats would become prey for predators.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	tree removal; loss or alteration of forested habitat; human disturbance	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal	vegetation removal; human presence	all life stages	none expected			NLAA	The small area and level of impact from these activities on Ibat forested habitat is not expected to have noticeable or measurable impacts on Ibat or their habitat.
New Disturbance - Construction	Stream Crossings, wet ditch	tree removal; loss or alteration of forested habitat; human disturbance; instream & riparian disturbance;	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal; decreased aquatic invertebrates;	vegetation removal; instream sedimentation & water flow disruption; human presence & noise	all life stages; all seasons	none expected			NLAA	AMMs will limit blasting activity so that karst features will not be altered or destroyed; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; impacts to stream biota would be temporary and limited & localized and not expected to cause any noticeable decrease in ibat forage
New Disturbance - Construction	Stream Crossings, dry ditch	tree removal; loss or alteration of forested habitat; human disturbance; instream & riparian disturbance;	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal; decreased aquatic invertebrates;	vegetation removal; instream sedimentation & water flow disruption; human presence & noise	all life stages	none expected			NLAA	AMMs will limit blasting activity so that karst features will not be altered or destroyed; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; impacts to stream biota would be temporary and limited & localized and not expected to cause any noticeable decrease in ibat forage
New Disturbance - Construction	Stream Crossings, steel dam & culvert	tree removal; loss or alteration of forested habitat; human disturbance; instream & riparian disturbance;	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal; decreased aquatic invertebrates;	vegetation removal; instream sedimentation & water flow disruption; human presence & noise	all life stages	none expected			NLAA	AMMs will limit blasting activity so that karst features will not be altered or destroyed; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; impacts to stream biota would be temporary and limited & localized and not expected to cause any noticeable decrease in ibat forage
New Disturbance - Construction	Stream Crossings, dam & pump	tree removal; loss or alteration of forested habitat; human disturbance; instream & riparian disturbance;	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal; decreased aquatic invertebrates;	vegetation removal; instream sedimentation & water flow disruption; human presence & noise	all life stages	none expected			NLAA	AMMs will limit potential impacts to hibernacula; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; impacts to stream biota would be temporary and limited & localized and not expected to cause any noticeable decrease in ibat forage

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	alteration of surface water flow; vegetation removal; human activity; instream & riparian disturbance	alteration of summer roosting habitat, & staging/swarming habitat; increased daytime arousal; decreased aquatic invertebrates;	vegetation removal; instream drilling fluids; human presence & noise	all life stages;	none expected			NLAA	AMMs will limit potential impacts to hibernacula; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; impacts to stream biota would be temporary and limited & localized and not expected to cause any noticeable decrease in ibat forage
New Disturbance - Construction	Stream Equipment Crossing Structures	instream & riparian disturbance; human activity	increased daytime arousal; decreased aquatic invertebrates;	instream sedimentation & changes in waterflow; human presence & noise	all life stages;	none expected			NLAA	It is extremely unlikely that this activity would result in a modification to recharge areas of cave streams and other karst features that are hydrologically connected to known hibernacula; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; impacts to stream biota would be temporary and limited & localized and not expected to cause any noticeable decrease in ibat forage
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	clearing of forested habitat; human activity & disturbance	alteration of summer roosting habitat, & staging/swarming habitat; daytime arousal	vegetation removal; human presence	all life stages; spring-fall	kill, harm, harass	breeding, sheltering	numbers, reproduction	LAA	noise created from clearing of ROW is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; The flushing of bats from roost trees as they are being cut during daylight hours would increase the likelihood that the bats would become prey for predators.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	No side trimming occurs for new construction.							NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	alteration of surface water flow; vegetation removal; human activity; wetland disturbance	flooding hibernacula; decreased aquatic invertebrates; alteration of staging/swarming habitat; daytime arousal	removal of wetland vegetation; water disruption; alteration of water or air flow in/out of caves; human presence & noise	all life stages; all seasons	none expected			NLAA	AMMs will limit potential impacts to hibernacula; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; impacts to wetland biota would be temporary and limited & localized and not expected to cause any noticeable decrease in ibat forage
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	human activity	daytime arousal	human presence & noise	all life stages; spring-fall	none expected			NLAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees,

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	alteration of surface water flow; vegetation removal; human activity; wetland disturbance	flooding hibernacula; decreased aquatic invertebrates; alteration of staging/swarming habitat; daytime arousal	removal of wetland vegetation; water disruption; drilling fluids in wetland; increased water flow into caves; human presence & noise	all life stages;	none expected			NLAA	AMMs will limit potential impacts to hibernacula; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; impacts to wetland biota would be temporary and limited & localized and not expected to cause any noticeable decrease in ibat forage
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	alteration of surface water flow; vegetation removal; human activity; wetland disturbance	flooding hibernacula; decreased aquatic invertebrates; alteration of staging/swarming habitat; daytime arousal	removal of wetland vegetation; water disruption; drilling fluids in wetland; increased water flow into caves; human presence & noise	all life stages;	none expected			NLAA	AMMs will limit potential impacts to hibernacula; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; impacts to wetland biota would be temporary and limited & localized and not expected to cause any noticeable decrease in ibat forage
New Disturbance - Construction	Storage wells - clearing and drilling	alteration of surface water flow; vegetation removal; clearing of forested habitat; human activity;	flooding hibernacula; decreased aquatic invertebrates; alteration of summer & staging/swarming habitat; daytime arousal	removal of vegetation; water disruption; increased water flow into caves; human presence & noise	all life stages;	kill, harm, harass	breeding, sheltering	numbers, reproduction	LAA	AMMs will limit potential impacts to hibernacula (potential impacts are from drilling only); Noise created from chainsaw clearing of ROW is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees.; Although drilling noise is significant (<75 db), we expect the effects to be insignificant because the noise levels would not reach the scale where take occurs;
New Disturbance - Construction	Storage wells - reconditioning	alteration of surface water flow; vegetation removal; human activity;	flooding hibernacula; decreased aquatic invertebrates; alteration of staging/swarming habitat; daytime arousal	removal of vegetation; water disruption; increased water flow into caves; human presence & noise	all life stages;	none expected			NLAA	AMMs will limit potential impacts to hibernacula; noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees; impacts to wetland biota would be temporary and limited & localized and not expected to cause any noticeable decrease in ibat forage
New Disturbance - Construction	Storage wells - waste pits	chemical contamination; vegetation removal; human activity	exposure to toxins; alteration of summer & staging/swarming habitat; daytime arousal	removal of vegetation; use of contaminated water or prey;	all life stages;	kill, harm, harass	breeding, sheltering	numbers, reproduction	LAA	noise created from this activity is anticipated to be insignificant and would not result in the flushing of bats from adjacent roost trees;

Table C2. Analysis of effects on Bog Turtle

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	physical impacts to individuals, habitat alteration	direct physical impact, contaminants, compaction of habitat, noise	drive on top of turtles or nests, hydrocarbons from vehicles, driving over habitat and compacting or tearing up	individuals	disturbance to mortality	feeding, breeding, sheltering	numbers	LAA	Foot traffic- No adverse impacts with AMMs. Vehicles- No adverse impacts anticipated from indirect effects to habitat through implementation of AMMs. No contaminant exposure anticipated through use of AMMs. Crushing of turtles is primary concern. General vehicle use may result in loss of 0-2 turtles/site over the life of the permit; NOTE vehicle impacts for all O&M subactivities are evaluated here (i.e., vehicle impacts will not be considered under the remaining O&M subactivities)
Operation & Maintenance	Vegetation Management - mowing	physical impacts to individuals, habitat alteration	direct physical impact, noise	mow over turtles	individuals	disturbance to mortality	feeding, breeding, sheltering	numbers	LAA	No indirect effects anticipated. Only the potential for crushing turtles. AMMs remove risk to turtles during most of the active season. Mowing may result in one turtle wounded or killed per vegetation management cycle for every 20 sites mowed for a maximum of 9 turtles across 25 sites.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	physical impacts to individuals, habitat alteration	direct physical impact, loss of hibernacula	felling trees onto turtles, pulling up tree roots that served as wintering sites	NA				NLAA	AMMs to avoid stepping on hummocks and tussocks.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	physical impacts to individuals, habitat alteration	direct physical impact, contaminants, compaction of habitat, change in vegetation	spray of herbicide onto beneficial bog turtle vegetation, vehicles crushing turtles, spray of herbicide onto turtles or nests	individuals	disturbance to mortality	feeding, breeding, sheltering	numbers, reproduction	LAA	Herbicide use may result in one turtle harassed/harmed (non-lethal) per round of vegetation management (every seven years for a total of 7 turtles/site)
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	physical impacts to individuals, habitat alteration, habitat loss	direct physical impact, trampling of vegetation, fill	piling material in habitat or on turtles/nests	NA				NLAA	No piling of materials in wetlands. AMMs to avoid dragging vegetation through bog turtle habitat.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	physical impacts to individuals, habitat alteration	direct physical impacts, removal of vegetation	fire burning the animals, nests, habitat	NA				NLAA	AMMs to avoid burning brush piles near bog turtle habitat.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter								NE	vehicle impacts addressed above.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	physical impacts to individuals, habitat alteration	direct physical impacts, removal of vegetation		NA				NLAA	AMMs address potential impacts to individuals and to habitat from invasive species and changes in hydrology.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	physical impacts to individuals, habitat alteration	direct physical impacts, removal of vegetation		NA				NLAA	AMMs address potential impacts to individuals and to habitat from invasive species and changes in hydrology.
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	physical impacts to individuals, habitat alteration	direct physical impacts, altered hydrology of adjacent wetlands		NA				NLAA	AMMs address potential impacts to individuals and to habitat from invasive species and changes in hydrology.
Operation & Maintenance	Access Road Maintenance - grading, graveling	physical impacts to individuals, habitat alteration	direct physical impacts, altered hydrology of adjacent wetlands		NA				NLAA	AMMs address potential impacts to individuals and to habitat from invasive species and changes in hydrology.
Operation & Maintenance	Access Road Maintenance - culvert replacement	physical impacts to individuals, habitat alteration	direct physical impacts, altered hydrology of adjacent wetlands		NA				NLAA	AMMs address potential impacts to individuals and to habitat from invasive species and changes in hydrology.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	physical impacts to individuals, habitat alteration	direct physical impacts, removal of vegetation		NA				NLAA	AMMs avoid construction of bell holes in bog turtle habitat.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	physical impacts to individuals, habitat alteration	direct physical impacts, entrapment, loss of hibernacula, soil compaction		NA				NLAA	AMMs avoid construction of bell holes in bog turtle habitat.
Operation & Maintenance	Pipeline Abandonment - in place								NE	no effect from in-place abandonment
Operation & Maintenance	Pipeline Abandonment - removal	physical impacts to individuals, habitat alteration	direct physical impacts, removal of vegetation		NA				NLAA	AMMs avoid abandonment of pipeline on the surface within bog turtle habitat
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration								NE	no storage wells near bog turtle habitat
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration								NE	no storage wells near bog turtle habitat
Operation & Maintenance	Abandonment - Ownership transfer								NE	no effects from transfer
Operation & Maintenance	Inspection Activities - ground and aerial	physical impacts to individuals	direct physical impacts	walking on turtles	NA				NLAA	No effect from aerial. NLTAA with AMMs for ground.
New Disturbance - Construction	Vehicle Operation and Foot Traffic	physical impacts to individuals, habitat alteration	direct physical impact, contaminants, compaction of habitat, noise	driving over turtles and through habitat	individuals	disturbance to mortality	feeding, breeding, sheltering	numbers	LAA	0-5 turtles/site (for all new construction) over life of the permit

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	physical impacts to individuals, habitat alteration	removal of vegetation, soil compaction		nesting, foraging, hibernation habitat	annoyed to decreased reproduction	feeding, breeding, sheltering	reproduction	LAA	all turtles at sites harassment/harm- no direct impacts to individuals beyond that addressed in vehicle line. This addresses indirect effects from short or long-term habitat alteration.
New Disturbance - Construction	Clearing - trees and shrubs	physical impacts to individuals, habitat alteration	removal of vegetation, soil compaction		nesting, foraging, hibernation habitat	annoyed to decreased reproduction	feeding, breeding, sheltering	reproduction	LAA	all turtles at sites harassment/harm- no direct impacts to individuals beyond that addressed in vehicle line. This addresses indirect effects from short or long-term habitat alteration.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	physical impacts to individuals, habitat alteration	direct physical impact, trampling of vegetation, fill	piling material in habitat or on turtles/nests	NA				NLAA	No piling of materials in wetlands. AMMs to avoid dragging vegetation through bog turtle habitat.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	physical impacts to individuals, habitat alteration	direct physical impacts, removal of vegetation	fire burning the animals, nests, habitat	NA				NLAA	AMMs to avoid burning brush piles near bog turtle habitat.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	physical impacts to individuals, habitat alteration	direct physical impact, contaminants, compaction of habitat, noise	driving over turtles and through habitat	individuals	disturbance to mortality	feeding, breeding, sheltering	numbers	LAA	Vehicle impacts addressed above under subactivity "Vehicle Operation and Foot Traffic".
New Disturbance - Construction	Grading, erosion control devices	physical impacts to individuals, habitat alteration	sedimentation	soil disturbance, potential for soil being pushed directly into habitat or moved through water/wind	nesting, foraging, hibernation habitat	annoyed to decreased reproduction	feeding, breeding, sheltering	reproduction	LAA	This addresses indirect effects from short or long-term habitat alteration; all turtles at sites harassment/harm- no direct impacts to individuals beyond that addressed in vehicle line. Vehicle impacts addressed above under subactivity "Vehicle Operation and Foot Traffic".
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	physical impacts to individuals, habitat alteration	loss of hibernacula, removal of vegetation	digging through vegetation roots, digging through hibernacula	nesting, foraging, hibernation habitat	annoyed to decreased reproduction	feeding, breeding, sheltering	reproduction	LAA	This addresses indirect effects from short or long-term habitat alteration; all turtles at sites harassment/harm- no direct impacts to individuals beyond that addressed in vehicle line. Vehicle impacts addressed above under subactivity "Vehicle Operation and Foot Traffic".
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling								NE	no effect from this component of new construction

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	physical impacts to individuals, habitat alteration	contaminants, altered water levels, direct physical impact	withdraw water and lower water in wetland, dry out wetland temporarily, discharge water and increase water level, flood site temporarily, disturb turtles, contaminants released during discharge of water in pipe that has had natural gas	NA				NLAA	AMMs address hydrostatic testing
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	physical impacts to individuals, habitat alteration	altered water levels, direct physical impact	withdraw water and lower water in wetland, dry out wetland temporarily, discharge water and increase water level, flood site temporarily, disturb turtles	NA				NLAA	AMMs address hydrostatic testing
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	physical impacts to individuals, habitat alteration	direct physical impacts, removal of vegetation		NA				NLAA	AMMs address potential impacts to individuals and to habitat from invasive species and changes in hydrology.
New Disturbance - Construction	Compression Facility, noise								NE	no information to suggest noise from facilities is a concern
New Disturbance - Construction	Communication Facility - guy lines, noise, lights								NE	no construction of towers in wetlands. Lighting not known to be concern from towers
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	physical impacts to individuals, habitat alteration	altered hydrology of adjacent wetlands, direct physical impact, removal of vegetation, soil compaction		individuals, nesting, foraging, hibernation habitat	disturbance to mortality	feeding, breeding, sheltering	numbers, reproduction	LAA	new roads- LAA- same type of impact as new ROW

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	physical impacts to individuals, habitat alteration	altered hydrology of adjacent wetlands, direct physical impacts	crushing of turtles when putting in culvert, wrong size culvert or improper location may alter hydrology of stream or wetland	individuals, nesting, foraging, hibernation habitat	disturbance to mortality	feeding, breeding, sheltering	numbers, reproduction	LAA	new roads- LAA- same type of impact as new ROW
New Disturbance - Construction	Stream Crossings, wet ditch	physical impacts to individuals, habitat alteration	altered hydrology of adjacent wetlands, direct physical impact	chance of turtles in stream and directly impacted, change in flow in stream may result in changes to connected wetlands	NA				NLAA	AMMs address potential impacts to individuals and to habitat from invasive species and changes in hydrology.
New Disturbance - Construction	Stream Crossings, dry ditch	physical impacts to individuals, habitat alteration	altered hydrology of adjacent wetlands, direct physical impact	chance of turtles in stream and directly impacted, change in flow in stream may result in changes to connected wetlands	NA				NLAA	AMMs address potential impacts to individuals and to habitat from invasive species and changes in hydrology.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	physical impacts to individuals, habitat alteration	altered hydrology of adjacent wetlands, direct physical impact	chance of turtles in stream and directly impacted, change in flow in stream may result in changes to connected wetlands	NA				NLAA	AMMs address potential impacts to individuals and to habitat from invasive species and changes in hydrology.
New Disturbance - Construction	Stream Crossings, dam & pump	physical impacts to individuals, habitat alteration	altered hydrology of adjacent wetlands, direct physical impact	chance of turtles in stream and directly impacted, change in flow in stream may result in changes to connected wetlands	NA				NLAA	AMMs address potential impacts to individuals and to habitat from invasive species and changes in hydrology.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	habitat alteration	sedimentation, contaminants	frac out during HDD may release fluids and stir up soils	NA				NLAA	Not anticipated that any frac out in would result in deposition of sediments into adjacent wetlands

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
New Disturbance - Construction	Stream Equipment Crossing Structures	physical impacts to individuals, habitat alteration	altered hydrology of adjacent wetlands, direct physical impact	chance of turtles in stream and directly impacted, change in flow in stream may result in changes to connected wetlands	NA				NLAA	AMMs address potential impacts to individuals and to habitat from invasive species and changes in hydrology.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	physical impacts to individuals, habitat alteration	removal of vegetation, soil compaction		nesting, foraging, hibernation habitat	annoyed to decreased reproduction	feeding, breeding, sheltering	reproduction	LAA	same type of effect as addressed above in upland clearing - included in take calculation
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	physical impacts to individuals, habitat alteration	direct physical impact, contaminants, compaction of habitat, noise	driving over turtles and through habitat	individuals	disturbance to mortality	feeding, breeding, sheltering	numbers	LAA	Vehicle impacts addressed above under subactivity "Vehicle Operation and Foot Traffic".
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	physical impacts to individuals, habitat alteration	sedimentation, loss of hibernacula, removal of vegetation		nesting, foraging, hibernation habitat	annoyed to decreased reproduction	feeding, breeding, sheltering	reproduction	LAA	same type of effect as addressed above in upland grading - included in take calculation
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing								NE	no effect from this component of new construction
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	habitat alteration	sedimentation, contaminants	frac out during HDD may release fluids and stir up soils	NA				NLAA	Not anticipated that any frac out in would result in any significant deposition of sediments into wetlands
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore								NE	
New Disturbance - Construction	Storage wells - clearing and drilling								NE	no storage wells near bog turtle habitat
New Disturbance - Construction	Storage wells - reconditioning								NE	no storage wells near bog turtle habitat
New Disturbance - Construction	Storage wells - waste pits								NE	no storage wells near bog turtle habitat

Table C3: Analysis of effects on Madison Cave Isopod

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	physical impacts to individuals	chemical contaminants, sedimentation		NA				NLAA	no impacts from foot traffic. AMMs address contaminants and sedimentation from general vehicle-use; NOTE vehicle impacts for all O&M subactivities are evaluated here (i.e., vehicle impacts will not be considered under the remaining O&M subactivities)
Operation & Maintenance	Vegetation Management - mowing	NA							NE	mowing is not an earth disturbing activity- no expected increased sedimentation from mowing
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	physical impacts to individuals, habitat alteration	sedimentation		NA				NLAA	No impact from selective tree removal. AMMs address sedimentation
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	physical impacts to individuals	chemical contaminants		NA				NLAA	AMMs address herbicides
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	physical impacts to individuals	chemical contaminants, smothering		NA				NLAA	AMMs address potential contaminants from chipper. No stacking or piling will be done in potential MCI habitat
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	NA							NE	no impacts from brush burning
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	NA							NE	no impacts from tree trimming
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	physical impacts to individuals	smothering, sedimentation		NA				NLAA	no impacts from hand repair. Mechanical repair impacts are addressed by AMMs
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	physical impacts to individuals	smothering, sedimentation		NA				NLAA	no impacts from hand repair. Mechanical repair impacts are addressed by AMMs
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	physical impacts to individuals, habitat alteration	smothering, sedimentation, chemical contaminants, changes in hydrology		NA				NLAA	AMMs address sedimentation, contaminants and impacts to karst features.
Operation & Maintenance	Access Road Maintenance - grading, graveling	physical impacts to individuals, habitat alteration	smothering, sedimentation, chemical contaminants		NA				NLAA	AMMs address sedimentation, contaminants and impacts to karst features.
Operation & Maintenance	Access Road Maintenance - culvert replacement	physical impacts to individuals, habitat alteration	smothering, sedimentation		NA				NLAA	AMMs address sedimentation, contaminants and impacts to karst features.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	habitat alteration	sedimentation		NA				NLAA	AMMs address sedimentation and impacts to karst features.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	habitat alteration	sedimentation		NA				NLAA	AMMs address sedimentation and impacts to karst features.
Operation & Maintenance	Pipeline Abandonment - in place	NA							NE	no impacts from leaving pipe in place

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
Operation & Maintenance	Pipeline Abandonment - removal	physical impacts, habitat degradation	smothering, sedimentation, contaminants	equipment can cause crushing, activity disturbs the ground and if there is a hydrologic connection with MCI habitat MCI may be smothered or habitat degraded	individuals, habitat	harass to mortality	breeding, feeding, sheltering	numbers, repro	LAA	no impacts from contaminants anticipated. For all activities that may cause adv. effects- Individuals associated with up to two populations may experience impacts that causes take ranging from harassment to death (poisoning, smothering) NiSource and the Service do not anticipate extirpation of any populations, as populations likely have larger geographic extents than currently mapped. However, take of individuals from populations is anticipated. NiSource activities may contribute towards many other ongoing stressors to Madison Cave isopods which cumulatively could result in extirpation of one population.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	NA							NE	no wells in MCI counties
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	NA							NE	no wells in MCI counties
Operation & Maintenance	Abandonment - Ownership transfer	NA							NE	no impacts from land transfer
Operation & Maintenance	Inspection Activities - ground and aerial	NA							NE	no impacts from inspections
New Disturbance - Construction	Vehicle Operation and Foot Traffic	physical impacts to individuals	chemical contaminants		NA				NLAA	no impacts from foot traffic. AMMs address contaminants from vehicles.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	physical impacts to individuals, habitat alteration	smothering, sedimentation, changes in hydrology		NA				NLAA	primary impact from new construction is from earth disturbing actions (grading and trenching) not from the veg removal
New Disturbance - Construction	Clearing - trees and shrubs	physical impacts to individuals, habitat alteration	smothering, sedimentation, changes in hydrology		NA				NLAA	primary impact from new construction is from earth disturbing actions (grading and trenching) not from the veg removal
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	physical impacts to individuals	chemical contaminants, smothering		NA				NLAA	AMMs address potential contaminants from chipper. No stacking or piling will be done in potential MCI habitat
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	NA							NE	no impacts from burning
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	NA							NE	no impacts from tree trimming.
New Disturbance - Construction	Grading, erosion control devices	Physical Impacts to Individuals, habitat degradation	smothering, sedimentation, contaminants	grading near the karst "caves" disturbs the ground, may cave in sinkholes, displaced topsoil and vegetation may be placed in karst features	individuals, habitat	harass to mortality	breeding, feeding, sheltering	numbers, repro	LAA	impact is from grading.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Physical Impacts to Individuals, habitat degradation	smothering, sedimentation, contaminants	digging into karst areas causes direct movement of sediments into MCI habitat and may smother MCI, blasting fractures the rock and materials may fall onto MCI either smothering or crushing	individuals, habitat	harass to mortality	breeding, feeding, sheltering	numbers, repro	LAA	impacts from digging/blasting.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	NA			NA				NE	
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Physical Impacts to Individuals, habitat degradation	smothering, sedimentation, changes in hydrology		NA				NLAA	Hydro test water AMMs reduce any impacts to insignificant/discountable
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	physical impacts to individuals, habitat degradation	smothering, sedimentation, chemical contaminants, changes in hydrology		NA				NLAA	Hydro test water AMMs reduce any impacts to insignificant/discountable
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	physical impacts to individuals, habitat degradation	smothering, sedimentation, chemical contaminants, changes in hydrology		NA				NLAA	AMMs address sedimentation, contaminants and impacts to karst features.
New Disturbance - Construction	Compression Facility, noise	NA							NE	no impacts from noise anticipated
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	NA							NE	no impacts from communication towers
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	physical impacts to individuals, habitat degradation	smothering, sedimentation, changes in hydrology, contaminants		individuals, habitat	mortality	breeding, feeding, sheltering	numbers, repro	LAA	concerned about new access roads. Grading impacts are similar to ROWs. Creation of new surface features may alter hydrology
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	physical impacts to individuals, habitat degradation	smothering, sedimentation, changes in hydrology, contaminants		individuals, habitat	mortality	breeding, feeding, sheltering	numbers, repro	LAA	concerned about new access roads. Grading impacts are similar to ROWs. Creation of new surface features may alter hydrology
New Disturbance - Construction	Stream Crossings, wet ditch	physical impacts to individuals, habitat degradation	smothering, sedimentation, chemical contaminants, changes in hydrology		NA				NLAA	AMMs address sedimentation, contaminants and impacts to karst features.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
New Disturbance - Construction	Stream Crossings, dry ditch	physical impacts to individuals, habitat degradation	smothering, sedimentation, chemical contaminants, changes in hydrology		NA				NLAA	AMMs address sedimentation, contaminants and impacts to karst features.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	physical impacts to individuals, habitat degradation	smothering, sedimentation, chemical contaminants, changes in hydrology		NA				NLAA	AMMs address sedimentation, contaminants and impacts to karst features.
New Disturbance - Construction	Stream Crossings, dam & pump	physical impacts to individuals, habitat degradation	smothering, sedimentation, chemical contaminants, changes in hydrology		NA				NLAA	AMMs address sedimentation, contaminants and impacts to karst features.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	physical impacts to individuals, habitat degradation	smothering, sedimentation, chemical contaminants, changes in hydrology		NA				NLAA	HDD will not be used within mapped MCI potential habitat zone
New Disturbance - Construction	Stream Equipment Crossing Structures	NA							NE	impacts from stream crossings considered above
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	physical impacts to individuals, habitat degradation	smothering, sedimentation		NA				NLAA	AMMs address sedimentation, contaminants and impacts to karst features.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	NA							NE	no impacts from tree trimming.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Physical Impacts to Individuals, habitat degradation	smothering, sedimentation, contaminants	grading activity disturbs the ground and sedimentation into possible connections to MCI habitat. Trenching may result in connections with subsurface habitat	individuals, habitat	harass to mortality	breeding, feeding, sheltering	numbers, repro	LAA	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	NA							NE	no impacts from pipe stringing component of activity
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Physical Impacts to Individuals, habitat degradation	smothering, sedimentation, chemical contaminants, changes in hydrology		NA				NLAA	HDD will not be used within mapped MCI potential habitat zone

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Physical Impacts to Individuals	chemical contaminants		NA				NLAA	no drilling muds.
New Disturbance - Construction	Storage wells - clearing and drilling	NA							NE	No storage wells in MCI counties
New Disturbance - Construction	Storage wells - reconditioning	NA							NE	No storage wells in MCI counties
New Disturbance - Construction	Storage wells - waste pits	NA							NE	No storage wells in MCI counties

Table C4: Analysis of effects on Nashville Crayfish

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities, pipeline corridor presence	habitat degradation	altering habitat (terrestrial and aquatic)	increased sedimentation, alteration of riparian habitat, invasives	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction and numbers	LAA	These activities involve aggregate take from riparian corridor impacts, invasives and sediment from the presence of the pipeline corridor; NOTE vehicle impacts for all O&M subactivities are evaluated here (i.e., vehicle impacts will not be considered under the remaining O&M subactivities)
Operation & Maintenance	Vegetation Management - mowing	neutral	none						NE	
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	habitat degradation	altering habitat	sedimentation, alteration of riparian habitat	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	stress to individuals	chemical contaminants	intake of herbicides that reach aquatic environment	NA				NLAA	Herbicides will not be sprayed immediately adjacent to aquatic resources and not when weather or other factors are likely to facilitate contamination
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	neutral	none						NE	Impacts from vehicular traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities, pipeline corridor presence"
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	neutral	none						NE	
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	neutral	none						NE	
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take is assumed through impacts to habitat with mandatory AMMs in place
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	habitat degradation	altering habitat	increased sedimentation	NA				NLAA	Physical impacts to wetlands would not likely transport to streams with AMM 3.
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	physical impacts to individuals, habitat degradation	direct impacts to individuals, altering habitat	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	feeding, sheltering	numbers and range	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit and potentially making the habitat more suitable for invasive species.
Operation & Maintenance	Access Road Maintenance - grading, graveling	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
Operation & Maintenance	Access Road Maintenance - culvert replacement	stress to individuals, habitat degradation	indirect impacts to individuals, altering habitat	increased sedimentation, invasive species	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit and potentially making the habitat more suitable for invasive species.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	neutral	none						NE	
Operation & Maintenance	Pipeline Abandonment - in place	neutral	none						NE	
Operation & Maintenance	Pipeline Abandonment - removal	physical impacts to individuals	direct impacts to individuals	dislocating and crushing individuals	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers and range	LAA	Take from removal of pipeline within a stream channel would likely be commensurate with a non-HDD installation.
Operation & Maintenance	Well Abandonment - plugging, waste pits, facilities/building removal	none	neutral						NE	There are no well fields within Nashville crayfish habitat.
Operation & Maintenance	Well Abandonment - site restoration	none	neutral						NE	There are no well fields within Nashville crayfish habitat.
Operation & Maintenance	Abandonment - Ownership transfer	neutral	none						NE	
Operation & Maintenance	Inspection Activities - ground and aerial	neutral	none						NE	
New Disturbance - Construction	Vehicle Operation and Foot Traffic	neutral	none						NE	
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
New Disturbance - Construction	Clearing - trees and shrubs	habitat degradation	altering habitat	increased sedimentation, loss or riparian corridor	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments and loss of riparian corridor contributing to comparatively minor degradation of habitat over the life of the permit.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	physical impacts to individuals	direct impacts to individuals	NA					NLAA	Implementation of AMM 17 ensures no crushing of crayfish would occur incidental to vegetation disposal.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	neutral	none						NE	
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	habitat degradation	altering habitat	NA					NLAA	Implementation of AMM 13 ensures no impacts to riparian corridor.
New Disturbance - Construction	Grading, erosion control devices	stress to individuals, habitat degradation,	indirect impacts to individuals, altering habitat	increased sedimentation, invasive species	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit and potentially making the habitat more suitable for invasive species.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	stress to individuals, habitat degradation,	indirect impacts to individuals, altering habitat	increased sedimentation, invasive species	NA				NLAA	Implementation of AMM 3 moves this to NLAA.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	neutral	none						NE	
New Disturbance - Construction	Hydrostatic Testing (water withdrawal) existing and new line	physical impacts to individuals, invasive species	direct impacts to individuals and invasive species	NA					NLAA	Hydrostatic water withdrawal could cause entrainment of young crayfish, alter flow, expose crayfish and habitat to some contaminants, and potentially make the habitat more suitable for invasive species. but AMMs limit the impact to NLAA.
New Disturbance - Construction	Hydrostatic Testing (water discharge) existing and new line	stress to individuals, habitat degradation, invasive species	direct and indirect impacts to individuals, altering habitat	increased sedimentation, contaminants, invasive species	juveniles, adults	harm, harass	breeding, feeding, sheltering	numbers, reproduction	LAA	Aggregate take. Hydrostatic water discharge could cause aggregate take from minor sediment and contaminants entering habitat through in-service lines. AMMs reduce this to aggregate.
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	stress to individuals, habitat degradation, invasive species	direct impacts to individuals, altering habitat	increased sedimentation and contaminant impacts to habitat	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments impacts, and potentially make the habitat more suitable for invasive species, and herbicide impact to habitat contributing to comparatively minor degradation of habitat over the life of the permit.
New Disturbance - Construction	Compression Facility, noise	neutral	none						NE	
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	neutral	none						NE	
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent (grading, graveling) (new road construction)	physical impact to individuals, habitat degradation, invasive species	direct and indirect impacts to individuals, altering habitat	dislocating and crushing individuals, alteration of aquatic habitat, sedimentation, invasive species	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers, reproduction	LAA	Take and aggregate take from roads across streams directly and indirectly affecting Nashville crayfish - significant localized take could result as well as lesser impacts over a larger area.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation (culvert installation only)	stress to individuals, habitat degradation	indirect impacts to individuals, altering habitat	increased sedimentation, invasive species	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit and potentially making the habitat more suitable for invasive species.
New Disturbance - Construction	Stream Crossings, wet ditch									Not Applicable to Nashville crayfish.
New Disturbance - Construction	Stream Crossings, dry ditch dam and pump	physical impact to individuals, habitat degradation	direct impacts to individuals, altering habitat	dislocating and crushing individuals, alteration of aquatic habitat, sedimentation	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers, reproduction	LAA	Take and aggregate take from ditch crossing activities directly and indirectly affects Nashville crayfish -significant but localized take could result as well as lesser impacts over a larger area.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, dry ditch (dam & culvert)	physical impact to individuals, habitat degradation	direct impacts to individuals, altering habitat	dislocating and crushing individuals, alteration of aquatic habitat, sedimentation	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers, reproduction	LAA	Take and aggregate take from ditch crossing activities directly and indirectly affects Nashville crayfish -significant but localized take could result as well as lesser impacts over a larger area.
New Disturbance - Construction	Stream Crossings, dry ditch (steel dam & culvert)	physical impact to individuals, habitat degradation	direct impacts to individuals, altering habitat	dislocating and crushing individuals, alteration of aquatic habitat, sedimentation	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers, reproduction	LAA	Take and aggregate take from ditch crossing activities directly and indirectly affects Nashville crayfish -significant but localized take could result as well as lesser impacts over a larger area.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	physical impact to individuals, habitat degradation	direct impacts to individuals, altering habitat	exposing individuals to sediments, contaminants and localized habitat impacts	juveniles, adults	harm, harass	breeding, feeding, sheltering	numbers, reproduction	LAA	Aggregate take would be limited and localized from small frac-outs, large frac-outs handled outside context of HCP.
New Disturbance - Construction	Stream Equipment Crossing Structures	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading, dewatering, restoration	habitat degradation, invasive species	indirect impacts to individuals, altering habitat	increased sedimentation, invasive species	NA				NLAA	Potential sediments and fertilizer making the habitat more suitable for invasive species implementation of AMM moves to NLAA.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	neutral	none						NE	Potential contaminants from fertilizer application implementation of AMMs moves to NLAA.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	neutral	none						NE	
New Disturbance - Construction	Storage wells - clearing and drilling	neutral	none						NE	There are no storage wells or proposed wells within the range of the Nashville crayfish.
New Disturbance - Construction	Storage wells - reconditioning	neutral	none						NE	
New Disturbance - Construction	Storage wells - waste pits	neutral	none						NE	

Table C5: Analysis of effects on the MSHCP Mussels: Clubshell Mussel, Northern Riffleshell Mussel, Fanshell Mussel and Sheepnose Mussel

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	physical impacts to individuals, habitat degradation	direct impacts to individuals, altering habitat (terrestrial and aquatic)	crushing of individuals, increased sedimentation, alteration of riparian habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	reproduction and numbers	LAA	Direct take (crushing) will be very limited both unlikely and affecting small numbers of individuals - aggregate take is assumed through sediment impacts of the pipeline corridor; NOTE vehicle impacts for all O&M subactivities are evaluated here (i.e., vehicle impacts will not be considered under the remaining O&M subactivities)
Operation & Maintenance	Vegetation Management - mowing	neutral	none						NE	
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	habitat degradation	altering habitat	sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	stress to individuals	chemical contaminants	intake of herbicides that reach aquatic environment by mussels and host fish	NA				NLAA	Herbicides will not be sprayed immediately adjacent to aquatic resources and not when weather or other factors are likely to facilitate contamination
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	neutral	none						NE	
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	neutral	none						NE	
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	neutral	none						NE	
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take is assumed through impacts to habitat with mandatory AMMs in place
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	habitat degradation	altering habitat	sedimentation	NA				NLAA	Physical impacts to wetlands would not likely transport to streams
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	habitat degradation	direct impacts to individuals, altering habitat	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	feeding, sheltering	numbers and range	LAA	Aggregate take from Instream stabilization and fill could involve rebuilding/relocating channel segments where erosion has caused damage indirectly affecting mussels (AMM # 5 specifically requires no take therefore no direct take).
Operation & Maintenance	Access Road Maintenance - grading, graveling	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
Operation & Maintenance	Access Road Maintenance - culvert replacement	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	neutral	none						NE	
Operation & Maintenance	Pipeline Abandonment - in place	neutral	none						NE	
Operation & Maintenance	Pipeline Abandonment - removal	physical impacts to individuals, habitat degradation	direct impacts to individuals, altering habitat	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers and range	LAA	Take from removal of pipeline within a stream channel would likely be commensurate with a non-HDD installation.
Operation & Maintenance	Well Abandonment - plugging, waste pits, facilities/building removal	habitat degradation	altering habitat	increased sedimentation	NA				NLAA	AMMs 2 and 15 move this to NLAA
Operation & Maintenance	Well Abandonment - site restoration	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
Operation & Maintenance	Abandonment - Ownership transfer	neutral	none						NE	
Operation & Maintenance	Inspection Activities - ground and aerial	neutral	none						NE	
New Disturbance - Construction	Vehicle Operation and Foot Traffic								NE	Impacts of vehicle traffic are analyzed in the other subactivities, where applicable, for these species.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
New Disturbance - Construction	Clearing - trees and shrubs	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments and loss of riparian corridor contributing to comparatively minor degradation of habitat over the life of the permit.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	physical impacts to individuals	direct impacts to individuals	crushing	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers	LAA	Take would be unlikely and when occurring kill a small number of individuals if haul trucks crossed an occupied stream segment.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	neutral	none						NE	
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	neutral	none						NE	

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Grading, erosion control devices	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments and loss of riparian corridor contributing to comparatively minor degradation of habitat over the life of the permit.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	habitat degradation	altering habitat	increased sedimentation	NA				NLAA	Some sediment impacts could result but implementation of AMM 2 moves this to NLAA.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	neutral	none						NE	
New Disturbance - Construction	Hydrostatic Testing (water withdrawal), existing or new line	physical impact to individuals	direct impacts to individuals,	entrainment, invasive species, contaminant exposure	juveniles, gametes	kill, harm, harass	breeding, feeding, sheltering	numbers, reproduction	LAA	Hydrostatic water withdrawal could cause take particularly young life history stages but AMMs limit the impact and reduce this impact significantly.
New Disturbance - Construction	Hydrostatic Testing (water discharge), new or existing line	habitat degradation	altering habitat	contaminants exposure from in-service pipelines	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Hydrostatic water discharge could cause aggregate from minor sediment and contaminants entering habitat through in-service lines. AMMs reduce this to aggregate.
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	habitat degradation	altering habitat	increased sedimentation and contaminant impacts to habitat	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments impacts and herbicide impact to habitat contributing to comparatively minor degradation of habitat over the life of the permit.
New Disturbance - Construction	Compression Facility, noise	neutral	none						NE	
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	neutral	none						NE	
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling (new road construction)	physical impact to individuals, habitat degradation	direct impacts to individuals, altering habitat	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers	LAA	Take and aggregate take from roads across streams directly and indirectly affecting mussels - localized extirpation could result as well as lesser impacts over a larger area.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation (culvert installation only)	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take from sediments released from changes to culverts minimized by AMM 2.
New Disturbance - Construction	Stream Crossings, wet ditch	physical impact to individuals, habitat degradation	direct impacts to individuals	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers	LAA	Take and aggregate take wet ditch crossings will directly and indirectly affect mussels - localized extirpation could result as well as lesser impacts over a larger area.
New Disturbance - Construction	Stream Crossings, dry ditch - basic (sand bag coffer dams)	physical impact to individuals, habitat degradation	direct impacts to individuals	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers	LAA	Take and aggregate dry wet ditch crossings will directly and indirectly affect mussels - localized extirpation could result as well as lesser impacts over a larger area.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, dry ditch -steel dam & culvert	physical impact to individuals, habitat degradation	direct impacts to individuals	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers	LAA	Take and aggregate take, dry ditch crossings will directly and indirectly affect mussels - localized extirpation could result as well as lesser impacts over a larger area.
New Disturbance - Construction	Stream Crossings, dry ditch - dam & pump	physical impact to individuals, habitat degradation	direct impacts to individuals	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers	LAA	Take and aggregate take dry ditch crossings will directly and indirectly affect mussels - localized extirpation could result as well as lesser impacts over a larger area.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	physical impact to individuals, habitat degradation	direct impacts to individuals, altering habitat	exposing mussels to sediments, contaminants and localized habitat impacts	juveniles, adults	harm, harass	breeding, feeding, sheltering	numbers, reproduction	LAA	Aggregate take would be limited and localized from small frac-outs, large frac-outs handled outside context of HCP.
New Disturbance - Construction	Stream Equipment Crossing Structures	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading, dewatering, restoration	habitat degradation	altering habitat	increased sedimentation	NA				NLAA	Potential sediments and fertilizer from dewatering and restoration AMMs 2 and 16 move to NLAA.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	neutral	none						NE	
New Disturbance - Construction	Storage wells - clearing and drilling	Habitat degradation, Degradation of host fish habitat	Sedimentation	Sedimentation in water column and streambed; downstream	All Mussel Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	Proposed well field locations do not overlap species habitat for the ; impact is NE for those species. This would be considered aggregate sediment impacts for species in or adjacent to storage well counties.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Storage wells - reconditioning	Habitat degradation, Degradation of host fish habitat	Sedimentation, contaminants, invasive species, water level reduction	Sediments introduced from ground disturbance, chemical contaminants from flow back and well field work, invasive species from equipment, water level reduction from water withdrawal	All Mussel Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered to have aggregate impacts from sediment with AMM 2. AMMs 13, 15, and 17 reduce other impacts to insignificant or discountable. Note major contaminant event would be addressed outside the context of the HCP.
New Disturbance - Construction	Storage wells - waste pits	Habitat degradation, Degradation of host fish habitat	Sedimentation, contaminants	Sediment in water column and streambed, contaminants;	All Mussel Life stages and habitat; Host Fish and habitat	Harass, Harm,	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	NLAA	Proposed well field locations do not overlap species habitat for the ; impact is NE for those species. For other species implementing AMMs 2 and 15 moves this to NLAA.

Table C6: Analysis of effects on James Spinymussel

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	physical impacts to individuals, habitat degradation	direct impacts to individuals, altering habitat (terrestrial and aquatic)	crushing of individuals, increased sedimentation, alteration of riparian habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	reproduction and numbers	LAA	Direct take (crushing) will be very limited both unlikely and affecting small numbers of individuals - aggregate take is assumed through sediment impacts of the pipeline corridor; NOTE vehicle impacts for all O&M subactivities are evaluated here (i.e., vehicle impacts will not be considered under the remaining O&M subactivities)
Operation & Maintenance	Vegetation Management - mowing	neutral	none						NE	
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	habitat degradation	altering habitat	sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	stress to individuals	chemical contaminants	intake of herbicides that reach aquatic environment by mussels and host fish	NA				NLAA	Herbicides will not be sprayed immediately adjacent to aquatic resources and not when weather or other factors are likely to facilitate contamination
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	neutral	none						NE	
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	neutral	none						NE	
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	neutral	none						NE	
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take is assumed through impacts to habitat with mandatory AMMs in place
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	habitat degradation	altering habitat	sedimentation	NA				NLAA	Physical impacts to wetlands would not likely transport to streams
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	habitat degradation	direct impacts to individuals, altering habitat	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	feeding, sheltering	numbers and range	LAA	Aggregate take from Instream stabilization and fill could involve rebuilding/relocating channel segments where erosion has caused damage indirectly affecting mussels (AMM # 5 specifically requires no take therefore no direct take).
Operation & Maintenance	Access Road Maintenance - grading, graveling	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
Operation & Maintenance	Access Road Maintenance - culvert replacement	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	neutral	none						NE	
Operation & Maintenance	Pipeline Abandonment - in place	neutral	none						NE	
Operation & Maintenance	Pipeline Abandonment - removal	physical impacts to individuals, habitat degradation	direct impacts to individuals, altering habitat	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers and range	LAA	Take from removal of pipeline within a stream channel would likely be commensurate with a non-HDD installation.
Operation & Maintenance	Well Abandonment - plugging, waste pits, facilities/building removal	NA								Not Applicable - no storage wells in James spinymussel habitat.
Operation & Maintenance	Well Abandonment - site restoration	NA								
Operation & Maintenance	Abandonment - Ownership transfer	NA							NE	
Operation & Maintenance	Inspection Activities - ground and aerial	neutral	none						NE	
New Disturbance - Construction	Vehicle Operation and Foot Traffic								NE	Impacts of vehicle traffic are analyzed in the other subactivities, where applicable, for this species.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments contributing to comparatively minor degradation of habitat over the life of the permit.
New Disturbance - Construction	Clearing - trees and shrubs	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments and loss of riparian corridor contributing to comparatively minor degradation of habitat over the life of the permit.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	physical impacts to individuals	direct impacts to individuals	crushing	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers	LAA	Take would be unlikely and when occurring kill a small number of individuals if haul trucks crossed an occupied stream segment.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	neutral	none						NE	
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	neutral	none						NE	
New Disturbance - Construction	Grading, erosion control devices	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments and loss of riparian corridor contributing to comparatively minor degradation of habitat over the life of the permit.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench)	habitat degradation	altering habitat	increased sedimentation	NA				NLAA	Some sediment impacts could result but implementation of AMM 2 moves this to NLAA.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	neutral	none						NE	
New Disturbance - Construction	Hydrostatic Testing (water withdrawal), existing or new line	physical impact to individuals	direct impacts to individuals,	entrainment, invasive species, contaminant exposure	juveniles, gametes	kill, harm, harass	breeding, feeding, sheltering	numbers, reproduction	LAA	Hydrostatic water withdrawal could cause take particularly young life history stages but AMMs limit the impact and reduce this impact significantly including even further reductions with AMM # 11 TOY restriction.
New Disturbance - Construction	Hydrostatic Testing (water discharge), new or existing line	habitat degradation	altering habitat	contaminants exposure from in-service pipelines	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Hydrostatic water discharge could cause aggregate from minor sediment and contaminants entering habitat through in-service lines. AMMs reduce this to aggregate.
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	habitat degradation	altering habitat	increased sedimentation and contaminant impacts to habitat	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take with sediments impacts and herbicide impact to habitat contributing to comparatively minor degradation of habitat over the life of the permit.
New Disturbance - Construction	Compression Facility, noise	neutral	none						NE	
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	neutral	none						NE	
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling (new road construction)	physical impact to individuals, habitat degradation	direct impacts to individuals, altering habitat	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers	LAA	Take and aggregate take from roads across streams directly and indirectly affecting mussels - localized extirpation could result as well as lesser impacts over a larger area.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation (culvert installation only)	habitat degradation	altering habitat	increased sedimentation	juveniles, adults	harm, harass	breeding, feeding, sheltering	reproduction	LAA	Aggregate take from sediments released from changes to culverts minimized by AMM 2.
New Disturbance - Construction	Stream Crossings, wet ditch	NA								Not Applicable - NiSource will use only dry-ditch methodology in James spinymussel habitat.
New Disturbance - Construction	Stream Crossings, dry ditch, basic (sand bag coffer dams)	physical impact to individuals, habitat degradation	direct impacts to individuals	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers	LAA	Take and aggregate take wet ditch crossings will directly and indirectly affect mussels - localized extirpation could result as well as lesser impacts over a larger area.
New Disturbance - Construction	Stream Crossings, dry ditch, steel dam & culvert	physical impact to individuals, habitat degradation	direct impacts to individuals	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers	LAA	Take and aggregate take wet ditch crossings will directly and indirectly affect mussels - localized extirpation could result as well as lesser impacts over a larger area.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, dry ditch, dam & pump	physical impact to individuals, habitat degradation	direct impacts to individuals	dislocating and crushing individuals, alteration of aquatic habitat	juveniles, adults	kill, harm, harass	breeding, feeding, sheltering	numbers	LAA	Take and aggregate take wet ditch crossings will directly and indirectly affect mussels - localized extirpation could result as well as lesser impacts over a larger area.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	physical impact to individuals, habitat degradation	direct impacts to individuals, altering habitat	exposing mussels to sediments, contaminants and localized habitat impacts	juveniles, adults	harm, harass	breeding, feeding, sheltering	numbers, reproduction	LAA	Aggregate take would be limited and localized from small frac-outs, large frac-outs handled outside context of HCP.
New Disturbance - Construction	Stream Equipment Crossing Structures	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading, dewatering, restoration	habitat degradation	altering habitat	increased sedimentation	NA				NLAA	Potential sediments and fertilizer from dewatering and restoration AMMs 2 and 16 move to NLAA.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	neutral	none						NE	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	neutral	none						NE	
New Disturbance - Construction	Storage wells - clearing and drilling	NA								Not Applicable - No storage wells in James spinymussel habitat.
New Disturbance - Construction	Storage wells - reconditioning	NA								
New Disturbance - Construction	Storage wells - waste pits	NA								

Table C7. Analysis of effects on American burying beetle.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	Vegetation Management - mowing	Neutral	none						NE	Activities DO NOT occur from April 15-August 1; No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Neutral	none						NE	Activities DO NOT occur from April 15-August 1; No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	contaminants, habitat degredation	chemical toxicity, loss of vegetation		adults, young	none expected			NLAA	Activities DO NOT occur from April 15-August 1; the level of exposure to the effects of these actions is not expected to result in detectable impacts to individuals or populations.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	none						NE	Activities DO NOT occur from April 15-August 1; No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	none						NE	Activities DO NOT occur from April 15-August 1; No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Neutral	none						NE	Activities DO NOT occur from April 15-August 1; No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	Access Road Maintenance - grading, graveling	Neutral	none						NE	No impacts to ABB habitat are expected from this activity; (herbicide use extremely rare, generally within existing disturbance)- restoration of temporary roads unlikely due to landowner request
Operation & Maintenance	Access Road Maintenance - culvert replacement	Neutral	none						NE	No impacts to ABB habitat are expected from this activity; (herbicide use extremely rare, generally within existing disturbance)- restoration of temporary roads unlikely due to landowner request
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	habitat degredation	increased competition	increase in edge habitat	Adults	harm, harass	breeding, feeding	numbers, reproduction	LAA	Vegetation management may create more "edge" habitat which can promote the existence of other carrion-dependent species; implementation of AMMs would reduce impacts, but activity would still be LAA.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	Pipeline Abandonment - removal	contaminants	chemical toxicity	chemicals leaching from pipiline on surface	unlikely				NLAA	Although pipelines are likely to be abandoned in ABB habitat, the potential for chemical exposure is unlikely.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	contaminants, habitat degredation	chemical toxicity, loss of vegetation		unlikely				NLAA	Although waste pits are expected in ABB habitat, we do not expect that these potential impacts are likely to occur.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Neutral	none						NE	No impacts to ABB habitat are expected from this activity. This activity could benefit the ABB if designed to create suitable habitat.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	habitat loss	decreased food resources, increased competition	vegetation removal, increase in edge habitat	adults, young	kill, harm, harass	feeding, breeding, sheltering	numbers	LAA	Vegetation management may create more "edge" habitat which can promote the existence of other carrion-dependent species and loss of prey species; habitat fragmentation could reach a level that causes the loss of individuals; implementation of AMMs would reduce impacts, but activity would still be LAA.
New Disturbance - Construction	Clearing - trees and shrubs	habitat loss	decreased food resources, increased competition	vegetation removal, increase in edge habitat	adults, young	kill, harm, harass	feeding, breeding, sheltering	numbers	LAA	Vegetation management may create more "edge" habitat which can promote the existence of other carrion-dependent species and loss of prey species; habitat fragmentation could reach a level that causes the loss of individuals; implementation of AMMs would reduce impacts, but activity would still be LAA.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Grading, erosion control devices	habitat degredation	decreased food resources, increased competition	vegetation removal, increase in edge habitat	adults, young	kill, harm, harass	feeding, breeding, sheltering	numbers	LAA	Vegetation management may create more "edge" habitat which can promote the existence of other carrion-dependent species and loss of prey species; habitat fragmentation could reach a level that causes the loss of individuals; implementation of AMMs would reduce impacts and may reach NLAA.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Compression Facility, noise	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	habitat degredation	decreased food resources, increased competition	vegetation removal, increase in edge habitat	adults, young	kill, harm, harass	feeding, breeding, sheltering	numbers	LAA	Vegetation management may create more "edge" habitat which can promote the existence of other carrion-dependent species and loss of prey species; habitat fragmentation could reach a level that causes the loss of individuals; implementation of AMMs would reduce impacts and may reach NLAA.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Stream Crossings, wet ditch	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Stream Crossings, dry ditch	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA, or LAA	Comments
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Stream Crossings, dam & pump	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Stream Equipment Crossing Structures	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Storage wells - clearing and drilling	habitat loss	decreased food resources, increased competition	vegetation removal, increase in edge habitat	adults, young	kill, harm, harass	feeding, breeding, sheltering	numbers	LAA	Vegetation management may create more "edge" habitat which can promote the existence of other carrion-dependent species (reduction of prey is unlikely to occur and thus discountable); habitat fragmentation could reach a level that causes the loss of individuals; implementation of AMMs would reduce impacts, but activity would still be LAA.
New Disturbance - Construction	Storage wells - reconditioning	Neutral	none						NE	No impacts to ABB habitat are expected from this activity.
New Disturbance - Construction	Storage wells - waste pits	Habitat loss, chemical contaminants	chemical toxicity, loss of vegetation		unlikely				NLAA	Although storage wells are expected in ABB habitat, we do not expect that these potential impacts are likely to occur.

Table C8. Analysis of effects on the non-HCP mussel species (Dwarf Wedgemussel, Pink Mucket, Rabbitsfoot, Rayed Bean, Spectaclecase, Snuffbox).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities, pipeline corridor presence	Physical impacts to individuals, Habitat loss and degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Alteration of Flow, Scouring	Crushing by Vehicles, Stream Bed and Bank Erosion	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced feeding, breeding, recruitment)	LAA	AMMs 2, 4, and 8 reduce the probability and magnitude of impacts - aggregate take. AMM 19 precludes driving across occupied habitat and would eliminate crushing and habitat impacts from that activity when implemented. Recommend for dwarf wedge mussel or other small stream species that AMM # 19 (do not drive across stream) be mandatory.
Operation & Maintenance	Vegetation Management - mowing	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat degradation, Degradation of host fish habitat	Sedimentation, Increase in Water Temperatures	denuding bank, grubbing with heavy equipment, disturbing soil	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment / temperature impact.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Habitat degradation, Degradation of host fish habitat	Chemical Contaminants	algae blooms, impacts to individuals (surfactants and other constituents)	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment / contaminant impact with AMMs 2 and16 in place. Recommend developing a list of approved herbicides (note herbicides mixtures may contain surfactants and other potentially harmful constituents)
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None						NE	Recommend an AMM that would avoid these activities within a certain distance of stream. Note that impacts from hauling are covered under "Facilities" which covers all vehicle related impacts for O&M
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	None						NE	Recommend an AMM that would avoid these activities within a certain distance of stream.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Neutral	None						NE	Anticipate no effect from this activity. This may require further discussion (possibly LAA if significant impacts to riparian corridor)
Operation & Maintenance	ROW repair, regrading, revegetation **(upland)** - hand, mechanical	Habitat degradation, loss of host fish, Loss and degradation of host fish habitat	Sedimentation	Vehicles causing earth disturbance in uplands and near stream	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation **(wetland)** - hand, mechanical	Habitat degradation, loss of host fish, Loss and degradation of host fish habitat	Sedimentation	Vehicles causing earth disturbance in uplands and near stream	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact (note that wetland and uplands are not separated in the matrix for mussels and wetland impacts might actually be less - potentially NLAA with AMMs). Recommend using a severe weather avoidance AMM.
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	Physical impacts to individuals, Permanent or temporary loss of occupied habitat, Habitat degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Altered Flow	Equipment crushes mussels crushed, riprap or structures cover suitable substrate, Altered flow result in sedimentation in water column and streambed, Stream channel width changes to increase velocity, changes in food availability, Change in host fish habitat, loss due to relocation of small segments of the channel	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced recruitment, feeding, breeding, displacement, sheltering)	LAA	AMMs 2, 3, 5, 7, 8, 13, 14, and 20 and non-mandatory AMM 6 reduce the impact of this activity. Aggregate take from Instream stabilization and fill could involve rebuilding/relocating channel segments where erosion has caused damage indirectly affecting mussels (AMM # 5 specifically requires no take therefore no direct take).
Operation & Maintenance	Access Road Maintenance - grading, graveling	Habitat degradation; Loss and degradation of Host fish Habitat	Sedimentation	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	Mussell habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact.
Operation & Maintenance	Access Road Maintenance - culvert replacement	Habitat degradation, Loss and degradation of host fish habitat	Sedimentation	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	Mussell habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - off ROW clearing	Habitat degradation, Degradation of host fish habitat	Sedimentation	tributary and/or near stream earth disturbance - sedimentation in water column and on stream bed	Mussell habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Neutral	None						NLAA	This is considered this insiginificant or discountable.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None						NE	No impacts to stream habitats are anticipated from this action. Not always the best scenario - could produce significant impacts if pipeline is unstable (consider AMM addition to evaluate condition of pipeline before abandonment).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Pipeline Abandonment - removal	Physical Impacts to Individuals, Habitat degradation and loss, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Altered Flow	Equipment crushes imussels; Downstream degradation; Host fish leave so less chance of glochidia to attach to gills, Sedimentation downstream, Habitat impacts	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced recruitment, feeding, breeding, displacement, sheltering)	LAA	This activity would cause direct impacts minimized by implementation of both mandatory and non-mandatory AMMs.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Habitat degradation, ,Degradation of host fish habitat	Sedimentation	Vegetation removal for site restoration. Host fish leave so less chance for glochidia to attach to gills	unlikely				NLAA	NLAA because of implementation of AMMs 2 and 15. Wells can be close to streams within floodplain, consider LAA.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Habitat degradation, Degradation of host fish habitat	Sedimentation	Vegetation removal for site restoration. Host fish leave so less chance for glochidia to attach to gills	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	None						NE	Driving across streams as part of inspection is figured into vehicle traffic above (line 3) .
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Neutral	None						NE	Impacts are included as part of other activities (e.g., stream crossing).
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Habitat degradation; Degradation of host fish habitat	Sedimentation	Near stream earth disturbance - minor sedimentation in water column and on stream bed; host fish leave so less chance for glochidia to attach to gills	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact.
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation; Loss and degradation of host fish habitat	Sedimentation; Increase in Water Temperature	Near stream earth disturbance - sedimentation in water column and on stream bed; host fish leave so less chance for glochidia to attach to gills; low DO since vegetation no longer provides shade to stream	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Vegetation Disposal (upland) - hauling (**driving across stream**)	Physical Impacts to Individuals, Habitat degradation, Loss of host fish, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants,	Impacts from trucks driving across stream, crushing individuals, sediment in water column, potential comtaminants from vehicles	All Mussell Life stages and habitat; Host Fish habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction (reduced recruitment, feeding, breeding, displacement, sheltering)	LAA	Hauling could involve driving across streams and therefore impacts to mussels - if non-mandatory AMM 19 is implemented this goes to NE.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, piling, brush pile burning	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Grading, erosion control devices	Habitat degradation, Degradation of host fish habitat	Sedimentation	Near stream earth disturbance - sedimentation in water column and on stream bed;	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact.
New Disturbance - Construction	Trenching **(out of stream) -** digging, blasting, dewatering, open trench, sedimentation	Habitat degradation, Degradation of host fish habitat	Sedimentation	Near stream earth disturbance - sedimentation in water column and on stream bed;	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Neutral	None						NE	No impacts are anticipated from this activity.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal)	Habitat degradation, Degradation of host fish habitat, impacts to gametes	Sedimentation, impacts to sperm during reproduction	Gametes sucked into pipe during reproduction, minor sediment impacts	Habitat and gametes	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	AMM 17 does not preclude taking water from an occupied stream, however, its provisions do move this ito minor / aggregate impacts.
New Disturbance - Construction	Hydrostatic Testing (water discharge), new or existing line	Habitat degradation, Degradation of host fish habitat,	Sedimentation, Chemical contaminants	Sediments introduced from discharge, chemical contaminants introduction from used pipeline	All Mussell Life stages; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, displacement, and recruitment)	LAA	Aggregate sediment and contaminant impacts. Work with applicant to revise AMM # 20 (see material from Bob Anderson 11/2010).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Habitat degradation, Loss and degradation of host fish habitat	Sedimentation	Near stream earth disturbance - minor sedimentation in water column and on stream bed; host fish leave so less chance for glochidia to attach to gills	Mussell habitat; Host Fish habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact.
New Disturbance - Construction	Compression Facility - noise	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Access Roads (not crossing streams) - upgrading, graveling, and culverts existing roads	Habitat degradation, Degradation of host fish habitat	Sedimentation	Near stream earth disturbance - sedimentation in water column and on stream bed	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered an aggregate sediment impact.
New Disturbance - Construction	Access Roads (temporary or permanent can cross streams) - new road construction	Physical Impacts to Individuals, Permanent or temporary loss of occupied habitat, altered flow, Habitat degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Altered Flow	Crushing of mussels by equipment, replacement of habitat by bridge, altered flow, sedimentation in water column and on stream bed; host fish leave so less chance for glochidia to attach to gills, changes in flow affect food availability	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers & reproduction (reduced recruitment)	LAA	This activity will cause direct and indirect impacts. Implementation of listed non-mandatory BMPs (in particular AMM 9) may reduce impacts to aggregate impacts.
New Disturbance - Construction	Stream Crossings, wet ditch (note that all stream crossings should be evaluated as wet-ditch crossings unless otherwise specified)	Physical Impacts to Individuals, Temporary loss of occupied habitat, Habitat degradation, riparina habitat loss, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Increase in Water Temperatures	Equipment crushes individuals; sedimentation in water column and streambed; downstream degradation; host fish and attached glochidia die; host fish leave so less chance of glochidia to attach to gills, changes in stream teperature	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers & reproduction (reduced recruitment)	LAA	This activity will have direct and indirect impacts. Implementation of listed non-mandatory BMPs (in particular AMM 9) will minimize those impacts.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, dry ditch	Physical Impacts to Individuals, Temporary loss of occupied habitat, Habitat degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Increase in Water Temperatures, Altered Flow	Equipment crushes individuals; sedimentation in water column and streambed; downstream degradation; host fish leave so less chance of glochidia to attach to gills	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers & reproduction (reduced recruitment)	LAA	This activity will have direct and indirect impacts. Implementation of listed non-mandatory BMPs (in particular AMM 9) will minimize those impacts.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Physical Impacts to Individuals, Temporary loss of occupied habitat, Habitat degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Increase in Water Temperatures, Altered Flow	Equipment crushes individuals; sedimentation in water column and streambed; downstream degradation; host fish leave so less chance of glochidia to attach to gills	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers & reproduction (reduced recruitment)	LAA	This activity will have direct and indirect impacts. Implementation of listed non-mandatory BMPs (in particular AMM 9) will minimize those impacts.
New Disturbance - Construction	Stream Crossings, dam & pump	Physical Impacts to Individuals, Temporary loss of occupied habitat, Habitat degradation, Loss and degradation of host fish habitat	Crushing, Sedimentation, Chemical Contaminants, Increase in Water Temperatures, Altered Flow	Equipment crushes individuals; sedimentation in water column and streambed; downstream degradation; host fish leave so less chance of glochidia to attach to gills	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers & reproduction (reduced recruitment)	LAA	This activity will have direct and indirect impacts. Implementation of listed non-mandatory BMPs (in particular AMM 9) will minimize those impacts.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Habitat degradation, Degradation of host fish habitat	Sedimentation	Sediment in water column and streambed	All Mussell Life stages; Host Fish and habitat; stream bed	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered aggregate sediment impacts; Survey, relocate, and evaluate HDD for the Delaware River and avoid impacts to the Neversink River in New York to minimize impacts to Dwarf wedgemussel.
New Disturbance - Construction	Stream Equipment Crossing Structures	Neutral	None						NE	No effect is anticipated from this activity (note impacts are evaluated under and as part of construction activities, no individual impacts)

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Neutral	No Effect						NE	Action would not have significant impacts and would in most cases not be adjacent to occupied habitat.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Neutral	No Effect						NE	Action would not have significant impacts and would in most cases not be adjacent to occupied habitat.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading, dewatering	Habitat degradation, Degradation of host fish habitat	Sedimentation	Sedimentation in water column and streambed; downstream	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	NLAA	Implementing AMM 2 moves this to NLAA.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Neutral	None						NE	No impacts are anticipate from this activity.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Neutral	None						NE	No impacts are anticipated from this activity.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Neutral	None						NE	No impacts are anticipate from this activity.
New Disturbance - Construction	Storage wells - clearing and drilling	Habitat degradation, Degradation of host fish habitat	Sedimentation	Sedimentation in water column and streambed; downstream	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	Proposed well field locations do not overlap species habitat for the Dwarf Wedgemussel, Fat Pocketbook, Fluted Kidneyshell, Orangefoot Pimpleback, Rayed Bean, Ring Pink Mussel, Rough Pigtoe, Slabside Pearlymussel, or Spectaclecas; impact is NE for those species. This would be considered aggregate sediment impacts for species in or adjacent to storage well counties.
New Disturbance - Construction	Storage wells - reconditioning	Habitat degradation, Degradation of host fish habitat	Sedimentation, contaminants, invasive species, water level reduction	Sediments introduced from ground disturbance, chemical contaminants from flow back and well field work, invasive species from equipment, water level reduction from water withdrawal	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	LAA	This is considered to have aggregate impacts from sediment with AMM 2. AMMs 13, 15, and 17 reduce other impacts to insignificant or discountable. Note major contaminant event would be addressed outside the context of the HCP. (Note follow up with NiSource on on salinity of treated wastewater and radiation to surface waters).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Storage wells - waste pits	Habitat degradation, Degradation of host fish habitat	Sedimentation, contaminants	Sediment in water column and streambed, contaminants;	All Mussell Life stages and habitat; Host Fish and habitat	Harass, Harm,	Breeding, Feeding, Sheltering	Reproduction (reduced feeding, breeding, recruitment)	NLAA	Proposed well field locations do not overlap species habitat for the Dwarf Wedgemussel, Fat Pocketbook, Fluted Kidneyshell, Orangefoot Pimpleback, Rayed Bean, Ring Pink Mussel, Rough Pigtoe, Slabside Pearlymussel, or Spectaclecas; impact is NE for those species. For other species implementing AMMs 2 and 15 moves this to NLAA.

Table C9. Analysis of effects on Northeastern bulrush (PA/VA only).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Physical impacts to individuals	Collection, Crushing	Foot traffic in occupied areas, Vehicles operated in occupied areas, spread of invasive plant species	individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	Vehicle impacts for all O&M subactivities are evaluated here (i.e., vehicle impacts will not be considered under the remaining O&M subactivities)
Operation & Maintenance	Vegetation Management - mowing	Physical impacts to individuals	Cutting, Crushing	Mowing in occupied areas	individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction,	LAA	
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Physical impacts to individuals, Habitat degradation	crushing, Changes to sunlight regime, downslope erosion	Removal of overstory vegetation, dropping of vegetation on plants	individuals, habitat	beneficial or neutral (northeastern bulrush may benefit from increased light exposure)			NLAA	Amount of tree removal on existing ROW is unlikely to result in erosion at the level where impacts to plants will occur. Trees cut in upland areas would not be felled into wetlands.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Physical impacts to individuals, Habitat alteration	Altered sun/shade requirements, Chemical Contaminants		Habitat, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction,	LAA	
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral							NE	Not in wetlands
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral							NE	Not in wetlands
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Physical impacts to individuals, Habitat degradation	Crushing, Changes to sunlight regime	Removal of overstory vegetation, dropping of vegetation on plants	Habitat, Individuals	beneficial or neutral (northeastern bulrush may benefit from increased light exposure)	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	habitat degradation	Sedimentation, Chemical contaminants	erosion, spraying of herbicide adjacent to wetlands	Habitat, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Burying, Soil compaction, Introduction of invasives	Heavy equipment and machinery, Imported fill and materials, Storm water runoff	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	Neutral	None						NE	No impacts to individuals or habitat are expected from this activity.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Access Road Maintenance - grading, graveling	physical impacts to individuals	chemical contaminants		habitat, population, individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	
Operation & Maintenance	Access Road Maintenance - culvert replacement	physical impacts to individuals	altered hydrology, digging up plants, crushing		habitat, population, individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Physical impacts to individuals, Habitat degradation	Crushing, Burying, Soil compaction, Introduction of invasives		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Physical impacts to individuals, Habitat degradation	Digging up, Crushing, Burying, Soil compaction, , Chemical contaminants, Introduction of invasives		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None						NE	No impacts to individuals or habitat are expected from this activity.
Operation & Maintenance	Pipeline Abandonment - removal	Physical impacts to individuals, Habitat degradation	Crushing, Burying, Soil compaction, Introduction of invasives	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Physical impacts to individuals, Habitat degradation	Habitat Alteration, Chemical contaminants, Introduction of invasives in occupied habitat	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Physical impacts to individuals, Habitat degradation	Crushing, Burying, Soil compaction, , Chemical contaminants, Introduction of invasives in occupied habitat	Heavy equipment and machinery destruction of individuals or habitat, equipment spills, spread of invasives by equipment	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None						NE	No impacts to individuals or habitat are expected from this activity.
Operation & Maintenance	Inspection Activities - ground and aerial	Physical impacts to individuals	Crushing	Vehicles	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Physical impacts to individuals,	Crushing, Soil compaction	Vehicles	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Physical impacts to individuals, habitat degradation	Burying, Soil compaction, introduction of invasive species, cutting and crushing,		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation	burying	erosion	Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None						NE	No impacts to riparian habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	None						NE	No impacts to riparian habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation	Altered sun/shade requirements		Discountable				NLAA	Amount of tree removal on existing ROW is unlikely to result in erosion at the level where impacts to plants will occur. Primary impacts from the original clearing of new ROW- not side trimming along ROW.
New Disturbance - Construction	Grading, erosion control devices	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	crushing, burying, cutting roots		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Neutral	None						NE	no additional impacts after clearing and grading
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Neutral	None						NE	no additional impacts after clearing and grading
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Physical impacts to individuals, Habitat degradation	altered hydrology, contaminants		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Physical impacts to individuals, Habitat degradation	altered hydrology		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Neutral	None						NE	No impacts to this species are anticipated from this action.
New Disturbance - Construction	Compression Facility, noise	Neutral	None						NE	No impacts to this species are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None						NE	No impacts to this species are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Burying, Soil compaction, contamination		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	crushing, burying, digging up, altered hydrology		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	
New Disturbance - Construction	Stream Crossings, wet ditch	Neutral	None						NE	wetland species
New Disturbance - Construction	Stream Crossings, dry ditch	Neutral	None						NE	wetland species
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Neutral	None						NE	wetland species
New Disturbance - Construction	Stream Crossings, dam & pump	Neutral	None						NE	wetland species
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Neutral	None						NE	Clearing associated with staging areas addressed above
New Disturbance - Construction	Stream Equipment Crossing Structures	Neutral	None						NE	wetland species

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Physical impacts to individuals, habitat degradation	Burying, Soil compaction, introduction of invasive species, cutting and crushing,		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Habitat degradation	Altered sun/shade requirements		Discountable				NLAA	Amount of tree removal on existing ROW is unlikely to result in erosion at the level where impacts to plants will occur. Primary impacts from the original clearing of new ROW- not side trimming along ROW.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	cutting root systems, digging up plants, burying		Habitat, Population, Individuals	injury, death	Reproduction, Nutrition, Habitat	numbers, reproduction	LAA	
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Neutral	None						NE	no additional impacts after clearing and grading
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Sedimentation	Frac-out	Limited to Some Habitat, Population, Few to Some Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	Clearing for HDD addressed in upland/wetland clearing activities.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Neutral	None						NE	
New Disturbance - Construction	Storage wells - clearing and drilling	Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Cutting, Crushing, Soil disturbance, Soil compaction		Limited to Some Habitat, Population, Few to Some Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	NE Bulrush is only plant that overlaps with new storage field areas.
New Disturbance - Construction	Storage wells - reconditioning	Physical impacts to individuals, Habitat degradation, Temporary loss of habitat	Crushing, Soil disturbance, Soil compaction, Chemical contaminants		Limited to Some Habitat, Population, Few to Some Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	NE Bulrush is only plant that overlaps with new storage field areas.
New Disturbance - Construction	Storage wells - waste pits	Physical impacts to individuals, Habitat degradation, Temporary or permanent loss of habitat	Crushing, Soil disturbance, Soil compaction, Chemical contaminants		Limited to Some Habitat, Population, Few to Some Individuals	injury, death	Reproduction, Nutrition, Habitat	Numbers, Reproduction	LAA	NE Bulrush is only plant that overlaps with new storage field areas.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Habitat degradation and water quality degradation.	water quality degradation	Stormwater runoff from pollution generating pavement. Stormwater erosion	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS III would "attempt to maintain at least 15 feet of undisturbed vegetation " when facilities parallel waterbodies; however, erosion and runoff from impervious surfaces could affect occupied habitat. In addition to implementation of the listed suggested BMPs, maintaining a wider riparian buffer near occupied streams (at least 25 feet, pursuant to local development regulations) and managing runoff may reduce the impact to NLAA.
Operation & Maintenance	Vegetation Management - mowing	Neutral	none						NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat degradation and water quality degradation.	sedimentation, water quality degradation, removal of riparian vegationation	Denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream.	Habitat				NLAA	BMP 3 requires avoidance and minimization of clearing of riparian vegetation within 25 feet of the Elk River, and development of sediment and erosion control measures. With implementation of methods described in ECS, impact is considered NLAA due to establishment of an undisturbed riparian buffer along streams during vegetation management. In addition, ground disturbance will not occur as part of this action.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Water quality degradation.	water quality degradation, removal of riparian vegetation	Direct exposure to chemicals from spills and stormwater runoff.	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers. Reproduction	NLAA	BMP 14 requires that herbicides will not be used within 100 feet of the Elk River.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Habitat degradation and water quality degradation.	removal of riparian vegetation	Habitat and water quality degradation since vegetation no longer provides shade to stream.	Unlikely	Harm		Numbers, Reproduction	NLAA	BMP 3 requires avoidance and minimization of clearing of riparian vegetation within 25 feet of the Elk River. With implementation of methods described in ECS, impact is considered NLAA due to establishment of an undisturbed riparian buffer along streams during vegetation management. In addition, ground disturbance will not occur as part of this action.
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Habitat degradation, Water quality impacts	sedimentation, water quality degradation, invasive species	Wind or storm water erosion, Storm water runoff, Algae blooms	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed BMPs may result in lower impact (NLAA or NE).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Permanent or temporary loss of habitat, Habitat degradation, Water quality impacts, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation, invasive species	Wind or storm water erosion, Storm water runoff, Algae blooms, Surface water connections between wetlands and occupied habitat	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed BMPs may result in lower impact (NLAA or NE).
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	Permanent or temporary loss of habitat, Habitat degradation, Water quality impacts, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation, invasive species	Wind and/or storm water erosion; Algae blooms, Equipment in stream, Fill placed in stream	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed BMPs may result in lower impact (NLAA).
Operation & Maintenance	Access Road Maintenance - grading, graveling	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation	Wind or storm water erosion	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed BMPs may result in lower impact (NLAA).
Operation & Maintenance	Access Road Maintenance - culvert replacement	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation	Wind or storm water erosion; Equipment placed in stream; In-stream construction	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed BMPs may result in lower impact (NLAA).
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Habitat degradation	sedimentation, water quality degradation	Wind or storm water erosion from cleared areas outside of riparian buffer	Habitat	Harm	N/A	Numbers, Reproduction	NLAA	With implementation of methods described in ECS II and V, impact is considered NLAA due to use of erosion control measures, restoration of graded areas, and establishment of an undisturbed riparian buffer along streams during vegetation clearing. Implementation of listed suggested BMP may reduce impact to NE.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation	Wind or storm water erosion	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Implementation of methods described in ECS II and V would provide erosion control and minimize riparian disturbance. However, species habitat is highly susceptible to impacts from sedimentation. Implementation of listed suggested BMPs may reduce impact to NLAA or NE.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None						NLAA	No impacts to diamond darters or its habitats are anticipated from this action. BMP 10 requires abandonment in place unless it would have adverse effects to the diamond darter
Operation & Maintenance	Pipeline Abandonment - removal	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	direct instream disturbance, sedimentation, water quality degradation, removal of riparian vegetation, invasive species	Wind or storm water erosion; Equipment/materials in stream; In-stream construction	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction, Distributation	LAA	With implementation of BMP 10 in the Elk River watershed, impacts would likely be reduced to NE. BMP 10 require pipeline be abandoned in place unless it would be detrimental to the diamond darter. If abandoned line is causing erosion/stream destabilization other BMPs would reduce effects from remedial activites - there would be short-term adverse effects, long-term beneficial.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Habitat degradation, Water quality impacts, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation, spills, invasive species	Wind or storm water erosion, algae blooms	Habitat	Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA).
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Habitat degradation, Water quality impacts, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation, spills, invasive species	Wind or storm water erosion, algae blooms	Habiitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and V would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA).
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Inspection Activities - ground and aerial	Habitat degradation, water quality impacts, physical impacts to individuals	sedimentation, water quality degradation	in-stream vehical operation	Unlikely	N/A	N/A	N/A	NLAA	With implementation of the listed suggested BMPs, impact may be reduced to NE.
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Neutral	None						NE	Stream impacts are not expected from this activity. BMP 16 prohibits vehicle operation within the Elk River, and BMP 9 requires construction of approprite stream crossings in Elk River tributaries.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Reduction of prey population, Physical impacts to individuals	sedimentation, removal of riparian vegetation	Erosion from lack of vegetation	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Increased potential from erosion due to vegetation clearing is considered LAA, because of risk of sedimentation and species' high susceptibility to these effects. In addition to implementation of the listed suggested BMP, maintaining a 25' undisturbed riparian buffer in presumed habitat could lower impact to NLAA.
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation, Water quality impacts, Reduction of prey population, Physical impacts to individuals	sedimentation, removal of riparian vegetation	Erosion from lack of vegetation, removal of riparian vegetation that provides shade to stream	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Increased potential from erosion due to vegetation clearing is considered LAA, because of risk of sedimentation and species' high susceptibility to these effects. In addition to implementation of the listed suggested BMP, maintaining a 25' undisturbed riparian buffer in presumed habitat could lower impact to NLAA.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None						NE	No impacts to stream habitats are anticipated from this action. BMP 2 requires evaluation of any activities that will occur with 100 feet of ccupied habitat and the development of sediment and erosion control measures.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation and loss, Water quality impacts	removal of riparian vegetation	Removal of riparian vegetation that provided shade to stream	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Establishment of a 25' undisturbed riparian buffer may lower impact to NLAA or NE.
New Disturbance - Construction	Grading, erosion control devices	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation	Wind or storm water erosion	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed BMPs may result in lower impact (NLAA).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation, invasive species	Wind or storm water erosion, Equipment placed in stream, In-stream construction	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA).
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation	Altered flow results in sedimentation, Equipment placed in stream, In-stream construction	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA).
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Temporary loss of habitat, Habitat degradation	sedimentation, water withdrawals and entrainment	Withdrawal and discharge of water	Habitat	Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Impacts may be reduced to a NLAA with implementation of listed suggested BMPs, which would avoid the withdrawal and discharge of water at presumed occupied habitat.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Temporary loss of habitat, Habitat degradation	sedimentation, water withdrawals and entrainment	Withdrawal and discharge of water	Habitat	Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Impacts may be reduced to a NLAA with implementation of listed suggested BMPs, which would avoid the withdrawal and discharge of water at presumed occupied habitat.
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Permanent or temporary loss of habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation	Wind or storm water erosion; Equipment use in proximity to stream, Storm water runoff of contaminants used during construction (fuels) and restoration (fertilizers), Algae blooms	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Impacts may be reduced to an NLAA through the implementation of listed suggested BMPs that would avoid the use of contaminants near waterbodies. However, any ground disturbance that may result in sedimentation in occupied habitat is considered LAA.
New Disturbance - Construction	Compression Facility, noise	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation, removal of riparian vegetation, invasive species	Wind or storm water erosion; Equipment use in proximity to stream, Storm water runoff of contaminants used during construction (fuels)	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA or NE).
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation, removal of riparian vegetation, invasive species	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA or NE).
New Disturbance - Construction	Stream Crossings, wet ditch	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation, removal of riparian vegetation, invasive species	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction, Distribution	NLAA	would only occur in tributaries more than 1/2 mile away from mainstem Elk River
New Disturbance - Construction	Stream Crossings, dry ditch	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation, removal of riparian vegetation, invasive species	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction, Distribution	LAA	

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation, removal of riparian vegetation, invasive species	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction, Distribution	LAA	would only occur in tributaries more than 1/2 mile away from mainstem Elk River
New Disturbance - Construction	Stream Crossings, dam & pump	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation, removal of riparian vegetation, invasive species	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction, Distribution	LAA	would only occur in tributaries more than 1/2 mile away from mainstem Elk River
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	frac-outs, sedimentation, water quality degradation, removal of riparian vegetation, invasive species	Frac-out, Wind or storm water erosion, Near stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction, Distribution	LAA	
New Disturbance - Construction	Stream Equipment Crossing Structures	Permanent or temporary loss of occupied habitat, Water quality impacts, Habitat degradation, Physical impacts to individuals, Reduction of prey population diversity and abundance	sedimentation, water quality degradation	Wind or storm water erosion, Altered streamflow through culvert, Equipment placed in stream, In-stream construction, Storm water runoff of contaminants used during construction (fuels)	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction, Distribution	LAA	Impacts may be reduced to NLAA through implementation of the listed suggested BMPs.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Habitat degradation and loss, Water quality impacts	sedimentation, water quality degradation	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA or NE).
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Habitat degradation and loss, Water quality impacts	sedimentation, water quality degradation	Removal of vegetation that provided shade to non-riparian waterbodies connected to occupied habitat	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA or NE).
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Habitat degradation and loss, Water quality impacts	sedimentation, water quality degradation, invasive species	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA or NE).
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Habitat degradation and loss, Water quality impacts	sedimentation, water quality degradation, invasive species	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA or NE).
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Habitat degradation and loss, Water quality impacts	frac-outs, sedimentation, water quality degradation, invasive species	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA or NE).
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Habitat degradation and loss, Water quality impacts	frac-outs, sedimentation, water quality degradation, invasive species	Wind or storm water erosion, Surface water connection with wetlands/other waters affected	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Methods described in ECS II and III would minimize impacts through erosion control and restoration of graded areas; however this species habitat is highly susceptible to sedimentation effects. Implementation of the listed suggested BMPs may result in lower impact (NLAA or NE).

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Storage wells - clearing and drilling	Habitat degradation and loss, Water quality impacts	sedimentation, water quality degradation, invasive species	Wind or storm water erosion, Ground water connection	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Impacts may be reduced to NLAA through implementation of listed suggested BMPs. Proposed well field locations do not overlap species habitat in Clay County West Virginia.
New Disturbance - Construction	Storage wells - reconditioning	Habitat degradation and loss, Water quality impacts	sedimentation, water quality degradation, invasive species	Wind or storm water erosion	Habitat	Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Impacts may be reduced to NLAA through implementation of listed suggested BMPs. Proposed well field locations do not overlap species habitat in Clay County West Virginia.
New Disturbance - Construction	Storage wells - waste pits	Habitat degradation and loss, Water quality impacts	sedimentation, water quality degradation, spills	Ground water connection	Habitat, Population, Individuals	Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction	LAA	Impacts may be reduced to NLAA through implementation of listed suggested BMPs. Proposed well field locations do not overlap species habitat in Clay County West Virginia.

Table C11. Analysis of effects on Roanoke logperch

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	Habitat degradation, Water quality degradation	Sedimentation, Contaminants	Stormwater runoff from pollution generating pavement, Stormwater erosion	Unlikely				NLAA	If BMP 17 is implemented, a NLAA decision can be considered.
Operation & Maintenance	Vegetation Management - mowing	Neutral	None						NE	No impacts to stream habitats are anticipated from this action (ECS II).
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream	Unlikely				NLAA	The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance.
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Chemical Contaminants	direct exposure to chemicals from spills and stormwater runoff	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction	LAA	If BMPs 16 is implemented near stream crossings with known or presumed habitat the determination of effect would likely be NLAA.
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None						NE	No impacts to stream habitats are anticipated from this action (ECS II).
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	Neutral	None						NE	No impacts to stream habitats are anticipated from this action (ECS II).
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	Habitat degradation and water quality degradation, stress on eggs,	Increase in Water Temperatures, Decrease of dissolved oxygen	habitat and water quality degradation since vegetation no longer provides shade to stream	Unlikely				NLAA	The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	Habitat degradation, Water quality degradation	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegetation can cause algae blooms which will lower dissolved oxygen	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	ECS measures will minimize impacts through erosion control and restoration of graded areas; In addition, the ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. If implementation of listed BMPs occur a NLAA finding can be made.
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	Permanent or temporary loss of habitat, Habitat degradation, Water quality degradation, Physical impacts to individuals, Reduction of prey	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegetation can cause algae blooms which will lower dissolved oxygen, Equipment located in connected wetland can increase chance of spills	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	Although there is a chance for contaminant spills from equipment, this would not likely jeopardize this species as spills would take place outside of habitat. In addition, contaminant spill impacts should be minimal in any habitat if BMPs outlined in the ECS are followed. Sedimentation will also be minimal as the ECS states that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition, sedimentation occurring in an adjacent wetland would likely dissipate before reaching occupied habitat. A NLAA finding can be made with the Implementation of listed BMPs.
Operation & Maintenance	ROW repair, regrading, revegetation - instream stabilization and/or fill	Permanent or temporary loss of habitat, Habitat degradation, Water quality degradation, Physical impacts to individuals, Reduction of prey	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition the ECS outlines the use of erosion control measures and restoration of graded areas. A NLAA finding can be made with the Implementation of listed BMPs.
Operation & Maintenance	Access Road Maintenance - grading, graveling	Temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation	tributary and in stream earth disturbance can cause increase in sedimentation	Unlikely	N/A	N/A	N/A	NLAA	The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition the ECS outlines the use of erosion control measures and restoration of graded areas.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Access Road Maintenance - culvert replacement	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition the ECS outlines the use of erosion control measures and restoration of graded areas. A NLAA finding can be made with the Implementation of listed BMPs.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream	Unlikely				LAA	The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition the ECS outlines the use of erosion control measures and restoration of graded areas. A NLAA finding can be made with the Implementation of listed BMP.
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed. In addition, if implementation of the listed BMP's occur, a NLAA finding can be made.
Operation & Maintenance	Pipeline Abandonment - in place	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
Operation & Maintenance	Pipeline Abandonment - removal	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed. In addition, if implementation of the listed BMP's occur, a NLAA finding can be made. If management option #12 is implemented the finding of NE can be made.
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	Habitat degradation, Water quality degradation	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegetation can cause algae blooms which will lower dissolved oxygen	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	ECS measures will minimize impacts through erosion control and restoration of graded areas; In addition, the ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. If implementation of the listed BMP's occur, a NLAA finding can be made.
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	Habitat degradation, Water quality degradation	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegetation can cause algae blooms which will lower dissolved oxygen	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	ECS measures will minimize impacts through erosion control and restoration of graded areas; In addition, the ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. If implementation of the listed BMP's occur, a NLAA finding can be made.
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Vehicle Operation and Foot Traffic	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides stormwater filter or shade to stream	Discountable	N/A	N/A	N/A	NLAA	Temperature increases from herbaceous vegetation removal would be slight. If BMP 2 is implemented to prevent vegetation and ground disturbance near the riparian zones of any stream crossings the determination would likely be NE.
New Disturbance - Construction	Clearing - trees and shrubs	Habitat degradation and water quality degradation, stress on individuals, reduction in prey population	Sedimentation, Increase in Water Temperatures, Decrease of dissolved oxygen	denuding bank, grubbing with heavy equipment, disturbing soil, water quality degradation since vegetation no longer provides shade to stream	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	Maintaining a 25' undisturbed riparian buffer in presumed habitat could lower impact to NLAA.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Vegetation Clearing - tree side trimming by bucket truck or helicopter	Habitat degradation and water quality degradation, stress on eggs,	Increase in Water Temperatures, Decrease of dissolved oxygen	habitat and water quality degradation since vegetation no longer provides shade to stream	Unlikely				NLAA	Establishment of a 25' undisturbed riparian buffer may lower impact to NE.
New Disturbance - Construction	Grading, erosion control devices	Temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation	Wind or storm water erosion	Unlikely				NLAA	If BMP 2 is implemented to prevent vegetation and ground disturbance near the riparian zones of any stream crossings the determination would likely be NE.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation,, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction distribution	LAA	Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed. In addition, if implementation of the listed BMP's occur, a NLAA finding can be made.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation,, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction distribution	LAA	Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed. In addition, if implementation of the listed BMP's occur, a NLAA finding can be made.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	Temporary loss of habitat, Habitat degradation	Minor sedimentation, Altered flow	Withdrawal and discharge of water	Discountable				NLAA	Impacts may be reduced with implementation of BMPs 18 and 19, which would avoid the withdrawal and discharge of water at presumed occupied habitat.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	Temporary loss of habitat, Habitat degradation	Minor sedimentation, Altered flow	Withdrawal and discharge of water	Discountable				NLAA	Impacts may be reduced with implementation of BMPs 18 and 19, which would avoid the withdrawal and discharge of water at presumed occupied habitat.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	Permanent or temporary loss of habitat, Habitat degradation, Water quality degradation, Physical impacts to individuals, Reduction of prey	Minor sedimentation, Lowered dissolved oxygen, Contaminants	tributary and/or near stream earth disturbance can cause minor increase in sedimentation , Storm water runoff, fertilizers used in revegetation can cause algae blooms which will lower dissolved oxygen,	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	Impacts may be reduced with implementation of ECS III, which would minimize potential impacts from grading and BMPs 13 and 16, which would avoid the use of contaminants near waterbodies. However, any ground disturbance that may result in sedimentation in occupied habitat is considered LAA.
New Disturbance - Construction	Compression Facility, noise	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None						NE	No impacts to stream habitats are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	Temporary loss of habitat, water quality degradation, physical impacts, Reduction of prey population	Sedimentation, short-term altered flow, contaminants, noise	near, in-stream, and tributary earth disturbance may result in increased sedimentation, altered flow result in increased sedimentation and short-term impoundment, contaminant spills from equipment located in-stream and tributary, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction	LAA	Contaminant spill impacts should be minimal if BMPs outlined in the ECS are followed. In addition, if implementation of the listed BMP's occur, a NLAA finding can be made.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	The ECS state that vegetation maintenance will be limited in the 25 feet adjacent to waterbodies, minimizing ground and vegetation disturbance. In addition the ECS outlines the use of erosion control measures and restoration of graded areas. A NLAA finding can be made with the implementation of listed BMPs . In addition, if replace culverts with a fish friendly passage there will be a net benefit from this action.
New Disturbance - Construction	Stream Crossings, wet ditch	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	Impacts may be reduced to a NLAA through implementation of BMP 3, which would require the use of HDD in occupied habitat. If occupied habitat cannot be avoided implementation of listed suggested BMPs will reduce the chance of potential take.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, dry ditch	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	Impacts may be reduced to a NLAA through implementation of BMP 3, which would require the use of HDD in occupied habitat. If occupied habitat cannot be avoided implementation of listed suggested BMPs will reduce the chance of potential take.
New Disturbance - Construction	Stream Crossings, steel dam & culvert	Temporary loss of occupied habitat, Physical impacts to individuals, Habitat degradation and water quality degradation, reduction of prey population	Sedimentation, altered flow, contaminants, impoundment, noise	tributary and near stream earth disturbance may result in increased sedimentation altered flow may result in increased sedimentation, contaminant spills from equipment located in tributary stream, dam could restrict up/down stream movement of species, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	Impacts may be reduced to a NLAA through implementation of BMP 3, which would require the use of HDD in occupied habitat. If occupied habitat cannot be avoided implementation of listed suggested BMPs will reduce the chance of potential take.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, dam & pump	Temporary loss of occupied habitat, Physical impacts to individuals, Habitat degradation and water quality degradation, reduction of prey population	Sedimentation, altered flow, contaminants, impoundment, noise	tributary and near stream earth disturbance may result in increased sedimentation altered flow may result in increased sedimentation, contaminant spills from equipment located in tributary stream, dam could restrict up/down stream movement of species, noise from in water work	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	Impacts may be reduced to a NLAA through implementation of BMP 3, which would require the use of HDD in occupied habitat. If occupied habitat cannot be avoided implementation of listed suggested BMPs will reduce the chance of potential take.
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	Water quality degradation, Physical Impacts to Individuals, reduction of prey population	Sedimentation, Frac-out, Noise	tributary, near and in stream earth disturbance may result in increased sedimentation, risk of frac-out during drilling operations, noise from drilling activities	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	Implementation of listed BMPs may reduce finding to NLAA.
New Disturbance - Construction	Stream Equipment Crossing Structures	Permanent or temporary loss of habitat, Habitat degradation, Physical impacts to individuals, Reduction of prey population	Sedimentation, Contaminants, Altered flow, Noise	tributary and in stream earth disturbance can cause increase in sedimentation and turbidity , Equipment located in stream or tributary can increase chance of spills, altered flow velocities and temporary impoundment from in-water work, minor noise from construction activities in water.	Habitat, Population, Individuals	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction, distribution	LAA	Impacts may be reduced to a NLAA through implementation of BMP 3, which would require the use of HDD in occupied habitat. If occupied habitat cannot be avoided implementation of listed suggested BMPs will reduce the chance of potential take.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE, NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	Neutral	None						NE	Activity is not located in streams or rivers. In addition, if non-riparian then activity would not be adjacent to occupied habitat and therefore this would be a no effect.
New Disturbance - Construction	Storage wells - clearing and drilling	Neutral	None						NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.
New Disturbance - Construction	Storage wells - reconditioning	Neutral	None						NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.
New Disturbance - Construction	Storage wells - waste pits	Neutral	None						NE	No impacts are anticipated from this action, proposed well field locations do not overlap species habitat.

Table C12. Analysis of effects on eastern massasauga rattlesnake

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
Operation & Maintenance	Facilities - vehicles, foot traffic, noise, communication facilities	injury or death; decreased winter survival	Crushing; killing; loss of crayfish; decreased hibernacula	vehicle traffic; human persecution; vehicle contaminants	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	numbers	LAA	This subactivity refers to cars/trucks and not construction or heavy equipment, vehicle traffic is a significant threat to EMR; persecution is a risk by NiSource staff is reduced with BMP 17,18,& 31 (discountable); ECS requirements for spill prevention plus BMPs 19-23 significantly limits potential for contamination in wetland/stream habitats (Insignificant or discountable); the combines BMPs that reduce vehicle speed (BMP 5) and restricts and monitors overall activity in EMR habitat significantly reduce potential vehicle strikes to nearly zero; NOTE vehicle impacts for all O&M subactivities are evaluated here (i.e., vehicle impacts will not be considered under the remaining O&M subactivities)
Operation & Maintenance	Vegetation Management - mowing	injury or death	mower blade contact, increased predation, temporary loss of habitat;	mower, vegetation removal; decreased habitat cover	adults, subadults	Harass, Harm, Kill	Breeding, Feeding, Sheltering	numbers	LAA	BMPs 8-10 work to reduce impacts significantly, but the potential for take remains; where BMP 9 is implemented, take would be discountable
Operation & Maintenance	Vegetation Management - chainsaw and tree clearing	death or injury, habitat loss	contact with equipment; vegetation removal	equipment use	few adults & subadults	none			NLAA	the extent of tree clearing around the pipeline & facilities would likely be too little to measurably impact EMR or its habitat (insignificant); Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities";
Operation & Maintenance	Vegetation Management - herbicides - hand, vehicle mounted, aerial applications	death or harm from chemical exposure; decreased winter survival	exposure of snakes and crayfish to chemical contaminants; decreased hibernacula	chemicals application or spills	all life stages	none			NLAA	BMPs 19-23 significantly limits potential for contamination in wetland/stream habitats (Insignificant or discountable); potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	death or injury	contact with equipment or vegetation	large equipment use	few adults & subadults	none			NLAA	Numerous BMPs include consideration for avoiding and minimizing impacts to massasauga habitats, but take remains likely for this activity; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Vegetation Disposal (upland) - brush pile burning	death or injury	Burning	burning of brushpiles occupied by snakes	adults, subadults	none			NLAA	BMP 8 makes take unlikely; brushpiles left in place will benefit snakes by providing cover/habitat
Operation & Maintenance	Vegetation Management - tree side trimming by bucket truck or helicopter	None	None	none					NLAA	The extent of tree clearing around the pipeline & facilities from this method would likely be too little to measurably impact EMR or its habitat; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	ROW repair, regrading, revegetation (upland) - hand, mechanical	injury, disturbance	contact with equipment	equipment use	few adults & subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Numerous BMPs include consideration for avoiding and minimizing impacts to massasauga habitats, BMPs 17 & 18 minimize potential take of individuals to harm or harassment; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
Operation & Maintenance	ROW repair, regrading, revegetation (wetland) - hand, mechanical	injury, disturbance	loss of hibernation sites hibernacula	earth disturbance, use of large equipment in hibernation areas	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Numerous BMPs include consideration for avoiding and minimizing impacts to massasauga habitats, BMPs 17 & 18 minimize potential take of individuals to harm or harassment; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	ROW repair, regrading, revegetation - in stream stabilization and/or fill	injury, disturbance	flooding or desiccation during hibernation; loss (burying, desiccation) of hibernacula	alteration of water levels; earth disturbance, use of large equipment in hibernation areas	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Numerous BMPs include consideration for avoiding and minimizing impacts to massasauga habitats, BMPs 17 & 18 minimize potential take of individuals to harm or harassment; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Access Road Maintenance - grading, graveling	injury, disturbance	flooding or desiccation during hibernation; loss of hibernacula	earth disturbance, use of large equipment in hibernation areas; alteration of water levels	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Numerous BMPs include consideration for avoiding and minimizing impacts to massasauga habitats, BMPs 17 & 18 minimize potential take of individuals to harm or harassment; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Access Road Maintenance - culvert replacement	injury, disturbance	flooding or desiccation during hibernation; loss of hibernacula	earth disturbance, use of large equipment in hibernation areas; alteration of water levels	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Numerous BMPs include consideration for avoiding and minimizing impacts to massasauga habitats, BMPs 17 & 18 minimize potential take of individuals to harm or harassment; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - Off ROW Clearing	injury, disturbance	contact with equipment	equipment use	few adults & subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Numerous BMPs include consideration for avoiding and minimizing impacts to massasauga habitats, BMPs 17 & 18 minimize potential take of individuals to harm or harassment; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	General Appurtenance and Cathodic Protection Construction - trenching, anode, bell hole	injury, disturbance	alteration of site hydrology, presence of open trench	trenching, equipment use	all life stages	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Numerous BMPs include consideration for avoiding and minimizing impacts to massasauga habitats, BMPs 17 & 18 minimize potential take of individuals to harm or harassment; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Pipeline Abandonment - in place	None	None	None					NE	In-place abandonment is preferred, to avoid impacts from removal, provided the pipeline is not adversely impacting the habitat
Operation & Maintenance	Pipeline Abandonment - removal	injury, disturbance	water alteration; open trench; contact with equipment	digging; use of large equipment	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Numerous BMPs include consideration for avoiding and minimizing impacts to massasauga habitats, BMPs 17 & 18 minimize potential take of individuals to harm or harassment; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
Operation & Maintenance	Well Abandonment - plugging, waste pits, site restoration	injury, disturbance	contact with equipment	large equipment use	adults, subadults	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Numerous BMPs include consideration for avoiding and minimizing impacts to massasauga habitats, BMPs 17 & 18 minimize potential take of individuals to harm or harassment; BMPs 26-29 reduce potential negative impacts of site restoration; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Well Abandonment - facilities/building removal and site restoration	injury, disturbance	contact with equipment	large equipment use	adults, subadults	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Numerous BMPs include consideration for avoiding and minimizing impacts to massasauga habitats, BMPs 17 & 18 minimize potential take of individuals to harm or harassment; BMPs 26-29 reduce potential negative impacts of site restoration; Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
Operation & Maintenance	Abandonment - Ownership transfer	Neutral	None						NE	
Operation & Maintenance	Inspection Activities - ground and aerial	Neutral	None						NE	Potential take of individuals due to vehicle/foot traffic considered under subactivity "Facilities - vehicles, foot traffic, noise, communication facilities"
New Disturbance - Construction	Vehicle Operation and Foot Traffic	injury or death;	direct contact with vehicles;	vehicle traffic; human persecution; vehicle contaminants	all life stages	Harass, Harm, Kill	Breeding, Feeding, Sheltering	Numbers, reproduction	LAA	This subactivity refers to cars/trucks and not construction or heavy equipment, persecution is a risk by NiSource staff is reduced with BMP 17 & 31 (discountable); ECS requirements for spill prevention plus BMPs 19-23 significantly limits potential for contamination in wetland/stream habitats (Insignificant or discountable); vehicle traffic is a significant threat to EMR, BMP 5 requiring reduced speeds significantly reduces potential vehicle strikes, plus BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely.
New Disturbance - Construction	Clearing - herbaceous vegetation and ground cover	injury or death;	contact with vehicles and equipment; vehicles & equipment in hibernation areas	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm,	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Most vegetation removal for ROW/AFS will not be enough to measurably affect snakes (insignificant); persecution is a risk by NiSource staff is reduced with BMP 17 & 31 (discountable); ECS requirements for spill prevention plus BMPs 19-23 significantly limits potential for contamination in wetland/stream habitats (Insignificant or discountable); vehicle traffic is a significant threat to EMR, BMP 5 requiring reduced speeds significantly reduces potential vehicle strikes, plus BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely.
New Disturbance - Construction	Clearing - trees and shrubs	injury or death;	contact with vehicles and equipment; vehicles in hibernation areas; alteration of site hydrology	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm,	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Most vegetation removal for ROW/AFS will not be enough to measurably affect snakes (insignificant); persecution is a risk by NiSource staff is reduced with BMP 17 & 31 (discountable); ECS requirements for spill prevention plus BMPs 19-23 significantly limits potential for contamination in wetland/stream habitats (Insignificant or discountable); vehicle traffic is a significant threat to EMR, BMP 5 requiring reduced speeds significantly reduces potential vehicle strikes, plus BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely.
New Disturbance - Construction	Vegetation Disposal (upland) - dragging, chipping, hauling, piling, stacking	disturbance, injury	contact with vehicles and equipment	vegetation removal; vehicle and large equipment use	few adults & subadults	Harass, Harm,	Breeding, Feeding, Sheltering	Numbers, reproduction	LAA	vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Vegetation Disposal (upland) - brush pile burning	death or injury	Burning	burning of brushpiles occupied by snakes	adults, subadults	none			NLAA	BMP 8 makes take unlikely; brushpiles left in place will benefit snakes by providing cover/habitat
New Disturbance - Construction	Vegetation Management - tree side trimming by bucket truck or helicopter	none	none	none					NE	This activity is not done for new construction.
New Disturbance - Construction	Grading, erosion control devices	injury or death;	contact with vehicles and equipment; vehicles in hibernation areas	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely.
New Disturbance - Construction	Trenching (digging, blasting, dewatering, open trench, sedimentation)	injury or death; loss of hibernacula; decreased winter survival	contact with vehicles and equipment; vehicles in hibernation areas; alteration of site hydrology; presence of trench	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	BMPs 4&7 reduce potential impacts on hibernacula (insignificant, discountable); vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely.
New Disturbance - Construction	Pipe Stringing - bending, welding, coating, padding and backfilling	injury or death; loss of hibernacula; decreased winter survival	contact with vehicles and equipment; vehicles in hibernation areas; alteration of site hydrology	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	BMPs 4&7 reduce potential impacts on hibernacula (insignificant, discountable); vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely.
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), existing line	death, decreased overwinter survival, loss of hibernacula	flooding or desiccation of hibernation areas	water withdrawal or discharge	all life stages	none			NLAA	BMPs 24&25 significantly reduce potential impacts of hydrostatic testing on EMR (discountable, insignificant)
New Disturbance - Construction	Hydrostatic Testing (water withdrawal and discharge), new line	death, decreased overwinter survival, loss of hibernacula	flooding or desiccation of hibernation areas	water withdrawal or discharge	all life stages	none			NLAA	BMPs 24&25 significantly reduce potential impacts of hydrostatic testing on EMR (discountable, insignificant)
New Disturbance - Construction	Regrading and Stabilization - restoration of corridor	injury or death; decreased winter survival	direct contact with vehicles; vehicles in hibernation areas	vehicle traffic; vehicle contaminants	all life stages	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 26-28 reduce potential negative impacts of site restoration
New Disturbance - Construction	Compression Facility, noise	Neutral	None						NE	No impacts to individuals or habitats are anticipated from this action.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Communication Facility - guy lines, noise, lights	Neutral	None						NE	No impacts to individuals or habitats are anticipated from this action.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - grading, graveling	death or harm; decreased overwinter survival	flooding or desiccation during hibernation; loss of hibernacula	earth disturbance, use of large equipment in hibernation areas; alteration of water levels	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely.
New Disturbance - Construction	Access Roads - upgrading existing roads, new roads temp and permanent - culvert installation	death or harm; decreased overwinter survival	flooding or desiccation during hibernation; loss of hibernacula	earth disturbance, use of large equipment in hibernation areas; alteration of water levels	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	BMPs 4&7 reduce potential impacts on hibernacula (insignificant, discountable); vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely.
New Disturbance - Construction	Stream Crossings, wet ditch	injury or death; loss of hibernacula; decreased winter survival	contact with vehicles and equipment; vehicles in hibernation areas; alteration of site hydrology; presence of trench	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	BMPs 4&7 reduce potential impacts on hibernacula (insignificant, discountable); vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 12-15 will reduce impacts in EMR habitat by decreasing the routing of new pipeline in EMR habitat and minimizing the use of open-trench techniques for new lines
New Disturbance - Construction	Stream Crossings, dry ditch	injury or death; loss of hibernacula; decreased winter survival	contact with vehicles and equipment; vehicles in hibernation areas; alteration of site hydrology; presence of trench	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	BMPs 4&7 reduce potential impacts on hibernacula (insignificant, discountable); vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 12-15 will reduce impacts in EMR habitat by decreasing the routing of new pipeline in EMR habitat and minimizing the use of open-trench techniques for new lines
New Disturbance - Construction	Stream Crossings, steel dam & culvert	injury or death; loss of hibernacula; decreased winter survival	contact with vehicles and equipment; vehicles in hibernation areas; alteration of site hydrology; presence of trench	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	BMPs 4&7 reduce potential impacts on hibernacula (insignificant, discountable); vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely.

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Stream Crossings, dam & pump	injury or death; loss of hibernacula; decreased winter survival	contact with vehicles and equipment; vehicles in hibernation areas; alteration of site hydrology; presence of trench	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	BMPs 4&7 reduce potential impacts on hibernacula (insignificant, discountable); vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 12-15 will reduce impacts in EMR habitat by decreasing the routing of new pipeline in EMR habitat and minimizing the use of open-trench techniques for new lines
New Disturbance - Construction	Stream Crossings, Horizontal Directional Drill (HDD)	injury or death; decreased winter survival	contact with vehicles and equipment; vehicles & equipment in hibernation areas	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	The use of HDD significantly decreases the likely impacts on the habitat from drilling (insignificant); however, the short-term impacts and activity in the staging areas during the drill may impact snakes; vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 12-15 will reduce impacts in EMR habitat by decreasing the routing of new pipeline in EMR habitat and minimizing the use of open-trench techniques for new lines
New Disturbance - Construction	Stream Equipment Crossing Structures	injury or death; loss of hibernacula; decreased winter survival	contact with vehicles and equipment; vehicles in hibernation areas; alteration of site hydrology	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	BMPs 4&7 reduce potential impacts on hibernacula (insignificant, discountable); vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 12-15 will reduce impacts in EMR habitat by decreasing the routing of new pipeline in EMR habitat and minimizing the use of open-trench techniques for new lines
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - clearing	injury or death; decreased winter survival	contact with vehicles and equipment; vehicles & equipment in hibernation areas	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm,	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Most vegetation removal for ROW/AFS will not be enough to measurably affect snakes (insignificant); persecution is a risk by NiSource staff is reduced with BMP 17 & 31 (discountable); ECS requirements for spill prevention plus BMPs 19-23 significantly limits potential for contamination in wetland/stream habitats (Insignificant or discountable); vehicle traffic is a significant threat to EMR, BMP 5 requiring reduced speeds significantly reduces potential vehicle strikes, plus BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 12-15 will reduce impacts in EMR habitat by decreasing the routing of new pipeline in EMR habitat
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - tree side trimming	injury or death; loss of hibernacula; decreased winter survival	contact with vehicles and equipment; vehicles in hibernation areas; alteration of site hydrology	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm,	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Most vegetation removal for ROW/AFS will not be enough to measurably affect snakes (insignificant); persecution is a risk by NiSource staff is reduced with BMP 17 & 31 (discountable); ECS requirements for spill prevention plus BMPs 19-23 significantly limits potential for contamination in wetland/stream habitats (Insignificant or discountable); vehicle traffic is a significant threat to EMR, BMP 5 requiring reduced speeds significantly reduces potential vehicle strikes, plus BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 12-15 will reduce impacts in EMR habitat by decreasing the routing of new pipeline in EMR habitat

Pipeline Activity	Subactivity	Environmental Impact or Threat	Stressor	Stressor Pathway (optional)	Exposure (Resource Affected)	Range of Response	Conservation Need Affected	Demographic Consequences	NE or NLAA or LAA	Comments
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - grading, trenching, regrading	injury or death; loss of hibernacula; decreased winter survival	contact with vehicles and equipment; vehicles in hibernation areas; alteration of site hydrology; presence of trench	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 12-15 will reduce impacts in EMR habitat by decreasing the routing of new pipeline in EMR habitat
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - pipe stringing	injury or death; loss of hibernacula; decreased winter survival	contact with vehicles and equipment; vehicles in hibernation areas; alteration of site hydrology	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	BMPs 4&7 reduce potential impacts on hibernacula (insignificant, discountable); vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 12-15 will reduce impacts in EMR habitat by decreasing the routing of new pipeline in EMR habitat
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - HDD	injury or death; decreased winter survival	contact with vehicles and equipment; vehicles & equipment in hibernation areas	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	The use of HDD significantly decreases the likely impacts on the habitat from drilling (insignificant); however, the short-term impacts and activity in the staging areas during the drill may impact snakes; vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 12-15 will reduce impacts in EMR habitat by decreasing the routing of new pipeline in EMR habitat and minimizing the use of open-trench techniques for new lines
New Disturbance - Construction	Crossings, wetlands and other water bodies (non-riparian) - Horizontal bore	injury or death; decreased winter survival	contact with vehicles and equipment; vehicles & equipment in hibernation areas	vegetation removal; vehicle and large equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	The use of horizontal bore significantly decreases the likely impacts on the habitat from drilling (insignificant); however, the short-term impacts and activity in the staging areas during the drill may impact snakes; vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMPs 12-15 will reduce impacts in EMR habitat by decreasing the routing of new pipeline in EMR habitat and minimizing the use of open-trench techniques for new lines
New Disturbance - Construction	Storage wells - clearing and drilling	Individual injury or mortality, increased Predation, decreased survival	Chemical exposure, contact with equipment, decreased habitat connectivity and cover	chemical use and spills, vehicle-equipment use, vegetation clearing	all life stages	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	BMPs 4&7 reduce potential impacts on hibernacula (insignificant, discountable); vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely; BMP #15 will avoids impacts in EMR habitat by preventing new storage wells in known/presumed EMR habitat unless site-specific analysis indicates that the impacts could be adequately compensated for.
New Disturbance - Construction	Storage wells - reconditioning	Individual, disturbance, injury or mortality	Chemical exposure, contact with equipment	chemical use and spills, vehicle-equipment use	all life stages	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	Storage wells in known/presumed EMR habitat unless site-specific analysis indicates that the impacts could be adequately compensated for; BMP 21 limits impacts from this activity; vehicle and equipment traffic is a significant threat to EMR; BMPs 17&18 requirement for snake monitor during projects makes potential lethal take unlikely
New Disturbance - Construction	Storage wells - waste pits	Individual, disturbance, injury or mortality	Chemical exposure, drowning, contact with equipment	open waste pits; equipment use	adults, subadults	Harass, Harm	Breeding, Feeding, Sheltering	Numbers, Reproduction,	LAA	BMP 21 limits impacts from this activity, but the potential for take remains likely

APPENDIX D: DIAMOND DARTER DOCUMENTS

NiSource Plan for Construction, Operation, and Maintenance Near the Elk River

INTRODUCTION

Five subsidiaries of NiSource Inc. (Columbia Gas Transmission, LLC, Columbia Gulf Transmission Company, Crossroads Pipeline Company, Central Kentucky Transmission Company, and NiSource Gas Transmission and Storage Company) have applied for an Incidental Take Permit (ITP) from the U.S. Fish and Wildlife Service (FWS or USFWS) and have prepared a Multispecies Habitat Conservation Plan (MSHCP). The final MSHCP was submitted to the Service on December 21, 2012.

NiSource and the Service identified a list of 88 species believed by the Service to be potentially present within any county intersected by the proposed NiSource covered lands footprint. As more fully presented in MSHCP Chapter 4 (Species Analyzed in the MSHCP), NiSource ultimately decided to analyze 42 species in its permit application and MSHCP. The 42 species were selected based upon the frequency with which NiSource encounters species in pursuing the covered activities, and the ability to develop adequate measures which would completely avoid or minimize effects on the species. NiSource recognized that the Service would evaluate effects of the MSHCP on all species that occur within the covered lands footprint (action area), regardless of whether they are included in the MSHCP, and that the analysis would be included in the Service's Biological Opinion written for the requested ITP and MSHCP.

One of the non-MSHCP species is the diamond darter, *Crystallaria cincotta*. The diamond darter is only found in the Elk River of West Virginia. In July, 2012 the Service proposed to list the diamond darter as endangered under the ESA and proposed to designate approximately 28 miles of the Elk River as critical habitat. The NiSource MSHCP covered lands intersect the proposed critical habitat in Kanawha County, W.V. At a minimum, all NiSource activities within this area will utilize the Environmental Construction Standards (ECS) (MSHCP, Appendix B) and the attached Best Management Practices (BMPs) for diamond darter. Provisions for emergency response are described in the MSHCP Chapter 2.5.4.

NiSource has approximately 320 miles of pipeline, seven (7) compressor stations, and five (5) storage fields containing approximately 161 wells in Kanawha County. These facilities were constructed over the last 136 years, operation and maintenance of them is ongoing. All of these facilities are operated and maintained in accordance with federal Department of Transportation standards. NiSource does not have any current plans to increase the overall capacity of any of these facilities.

Of these facilities, there are only six (6) pipeline crossings directly affecting the Elk River. Each performs a separate specific function that cannot be provided by or consolidated with the other facilities. All of these crossings are needed to provide continued natural gas service for NiSource's customers. For example, the crossings near Walgrove are the suction and discharge

pipelines for the Walgrove Compressor Station. Similarly, the two crossings at NiSource's Cobb compressor station perform a separate function as well. The pipeline designations for the Elk River crossings are: Line SM-1027, Line M-11, Line SM-79, Line S, Line N (three lines but only one in service), and Line X52M1. The crossing locations are shown on the attached aerial and topographic maps.

ANTICIPATED ACTIVITIES WITHIN THE ELK RIVER

NiSource does not anticipate the need for new crossing locations. Three of the eight crossings are relatively new (Line X52M1 - replaced in 1997; Line SM-1027 - replaced in early 2000s; Line SM-79 - plastic insert in 2007) and thus NiSource does not anticipate that additional repair and/or replacement work will be needed for the foreseeable future. The remaining three (3) crossings will all likely need future maintenance and/or replacement. The attached diamond darter compliance flowchart will be used to determine the location and type of crossing to be performed. NiSource will solely make the decision as to whether the pipeline will be repaired or replaced. As discussed in detail below, all of these activities can be accomplished using dry techniques should an HDD or other methods that avoid instream work not be feasible. NiSource has had success in completing medium size river crossings using dry techniques. For example, the Tygart River crossing in Randolph County, WV (over 100 feet wide and 5+ feet deep with moderate water flow) was successfully crossed in 2008 using a dry-ditch technique.

ELK RIVER PIPELINE CROSSING MAINTENANCE METHODS

NiSource anticipates that each of remaining three (3) Elk River pipeline crossings will require maintenance in the foreseeable future. Since these activities are simply repairs to the existing facilities, the pipeline itself would not be realigned. Maintenance consists of activities such as:

- repairs to the pipeline coating,
- installing clamps over small leaks,
- replacing washed out cover over the pipeline; and,
- repair/restoration of eroded stream banks.

As described in the attached diamond darter BMPs, NiSource will use dry techniques to conduct any maintenance activity that has the potential to cause significant turbidity within the Elk River. The dry techniques will typically consist of placing a coffer dam (typically sand bags) around the area requiring repair, pumping the water out of the coffer dam, and completing the repair. These repairs will typically be completed within 24 hours. The repair area is typically less than 30 feet by 15 feet. Leak clamp installation will consist of excavating a small hole (usually 3-foot wide and 3-foot deep) by hand around the leak, fastening the clamp around the pipe, and backfilling the hole. Planned repair work will not be conducted between January 1 and July 31.

Prior to in-stream repair activities, NiSource will prepare a site-specific plan and coordinate with the Service about the repair activity.

ELK RIVER PIPELINE CROSSING REPLACEMENTS

NiSource anticipates that 3 of the 6 Elk River pipeline crossings will require replacement in the foreseeable future. These are Lines M-11, S, and N (1 crossing). NiSource and an independent pipeline construction contractor have recently reviewed each of these crossings to determine the most appropriate crossing method consistent with the attached planning flowchart. The results of this effort and additional information about each crossing location are provided in detail below.

Although impacts from a pipeline crossing could be significant, NiSource will use crossing techniques that will dramatically reduce the affects. Should plastic pipe insertion or HDDs be feasible (including design mitigation for any potential frac-out concerns – see attached sample frac-out contingency plan), no in-stream impacts are expected. If NiSource must utilize a dry-ditch crossing technique, the directly affected area per crossing will be relatively small; approximately 75 feet in width. Because excavation is constructed in dry conditions, this should reduce the amount of downstream sedimentation that is expected. All in-stream activities will be completed quickly (typically within 4 days) and in conjunction with reservoir managers at Sutton Dam to control stream flows during construction activities. Finally, although NiSource cannot predict when pipeline replacements will be required, it is unlikely that multiple crossings will require replacement during the same time period so there should be no cumulative impacts from these activities.

Prior to any pipeline replacement activities, whether a dry-ditch, plastic insertion, or HDD method is proposed, NiSource will prepare a site-specific plan in accordance with the attached BMPs and coordinate with the Service (as detailed in the attached flowchart) about the replacement activity. For all line replacements, site-specific habitat information will be gathered to confirm assumptions on diamond darter habitat suitability before making determinations of realignment or construction locations.

RESEARCH TO VALIDATE ASSUMPTIONS ON DIAMOND DARTER EFFECTS

To implement the best management practices and appropriately avoid and minimize adverse effects, NiSource needs to know the precise location of high-quality habitat to implement the avoidance measures. Since complete information regarding diamond darter distribution and habitat usage on the Elk River is not available, NiSource will fund research that will provide this information and help to validate current assumptions about distribution and habitat usage. A report will be provided promptly after the survey is complete. These surveys are to be completed by qualified researchers familiar with the diamond darter and in conjunction with staff and students associated with West Virginia University (WVU). The Service's West Virginia Field Office will provide technical support and oversight to ensure that the surveys are completed satisfactorily. All results will be provided to NiSource, the Service, and, if appropriate, the WV Division of Natural Resources. Funding will be provided on an annual basis

once NiSource executes the Incidental Take Permit for the MSHCP. The project proposal totaling $181,290.56 over three years is attached.

MITIGATION FOR EFFECTS ON DIAMOND DARTERS

In order to mitigate for aggregate adverse effects from sedimentation and water quality degradation that may occur from disturbances throughout the Elk River watershed, NiSource will protect or restore 6.1 acres of riparian habitat either along the Elk River mainstem or its primary tributaries within the range of the diamond darter. NiSource will coordinate its mitigation efforts for diamond darter with the aggregate mitigation requirements (MSHCP Chapter 6.2.5.6) for the northern riffle shell mussel. As more fully detailed in the MSHCP, NiSource will use habitat protection/restoration as the preferred mitigation option for aggregate effects, and the same sideboards regarding the minimum requirements for this mitigation option described for the northern riffleshell will also apply to the diamond darter. The protection or restoration of 6.1 acres of riparian habitat will be designed to reduce the sediment impacts to diamond darter and northern riffleshell by buffering the Elk River or its primary tributaries. NiSource expects this to result in improved survival and reproduction of mussels and darters in the Elk River including other federally listed and common species.

Mitigation for any unavoidable impacts to the diamond darter from direct impacts to diamond darters or their habitat as a result of pipeline repairs or replacements will be determined during project-specific coordination. NiSource may conduct this mitigation concurrent with mitigation requirements for the northern riffleshell and/or the clubshell mussel if the mitigation option selected will benefit both mussel and darter species. If Mitigation Option B for the northern riffleshell (MHCP Chapter 6.2.5.6) is selected, consisting of protection and enhancement of habitat along the Elk River, the same sideboards regarding this mitigation option described for the northern riffleshell will also apply to the diamond darter.
If sufficient habitat protection and restoration alternatives in the Elk River watershed can not be found, NiSource will develop and implement alternative mitigation options for effects to the diamond darter. Alternative mitigation options may include but are not limited to: 1) propagation, augmentation, expansion, or reintroduction of the diamond darter; or 2) conservation, restoration, and enhancement of habitat for the diamond darter in areas within the historic range of the species. All mitigation efforts for the diamond darter will be developed under coordination with the WVFO.

LINE M-11 REPLACEMENT PLAN FOR THE ELK RIVER CROSSING

1) Description of crossing: Line M-11 is a 16 inch pipeline constructed in 1923. It is the suction for Walgrove CS. The crossing location is shown on the attached topographic map and aerial photography. The line has received routine maintenance since installation. There two pipes in the vicinity; one was abandoned to a water company. NiSource anticipates replacement within the next 5 to 20 years.
2) Description of Elk River at crossing: The Elk River is approximately 100 feet wide and 4-6 feet deep during normal flow. The river bottom consists of gravel/rock and is in a shoal-riffle area. It is within an area described by the Service as high quality habitat for diamond darter.
3) Potential for realignment: The pipeline could be realigned as much as 100 feet upstream or downstream of the high quality habitat, or potentially moved to a downstream location adjacent to line SM-1027.
4) Potential for HDD: Based upon an initial review of the crossing with a pipeline construction contractor, this crossing potentially can be installed using HDD techniques.
5) Repair: Described in the *Elk River Pipeline Maintenance Methods* section above.
6) Replacement: NiSource will prepare a site-specific plan and coordinate with the Service (as detailed in the attached flowchart) prior to any pipeline replacement activity. If NiSource determines that a plastic insertion or an HDD installation is feasible, impacts to the river bed will be minimal. The primary concern is an in-stream frac-out of the bentonite clay solution used to facilitate the drilling and pipe pulling activities. The potential for a frac-out and any design specifications (such as using reduced pressures and volumes, monitor by the environmental inspector, etc.) to minimize that potential will be evaluated by NiSource during the planning phase for this crossing. NiSource will not attempt an HDD crossing if the frac-out potential cannot be addressed. If NiSource determines that a plastic insertion or an HDD are not feasible, the crossing will be relocated below the high quality habitat and installed using dry-ditch techniques as described in the ECS beginning on page 15 and in Figures 18 and 19. As part of the planning effort, NiSource will cooperate with reservoir managers at Sutton Dam to control stream flows during construction activities. NiSource expects that the crossing will take approximately four (4) days, one day to place the coffer dams and water flow devices, two days to install the pipeline, and one day to remove the coffer dams and stabilize the river banks.

LINE S REPLACEMENT PLAN FOR THE ELK RIVER CROSSING

1) Description of crossing: Line S is a 12-inch pipeline constructed in 1910. It is a gathering line but also connects the Walgrove CS discharge to the suction of Cobb CS. The crossing location is shown on the attached topographic map and aerial photography. The line has received routine maintenance since installation. NiSource anticipates replacement within the next 5 to 20 years.
2) Description of Elk River at crossing: The Elk River is approximately 100 feet wide and 4-6 feet deep during normal flow. This line is located near the downstream end of a long pool in an area not currently anticipated to be high quality habitat for diamond darter.
3) Potential for realignment: The pipeline could be realigned as much as 50 feet upstream and 50 feet downstream. Further realignment is not possible because of residential areas on the banks.
4) Potential for HDD: Based upon an initial review of the crossing with a pipeline construction contractor, this crossing potentially can be installed using HDD techniques.
5) Repair: Described in the *Elk River Pipeline Maintenance Methods* section above.
6) Replacement: NiSource will prepare a site-specific plan and coordinate with the Service (as detailed in the attached flowchart) prior to any pipeline replacement activity. If NiSource determines that an HDD installation is feasible, impacts to the river bed will be minimal. The primary concern is an in-stream frac-out of the bentonite clay solution used to facilitate the drilling and pipe pulling activities. The potential for a frac-out and any design specifications (such as using reduced pressures and volumes, monitor by the environmental inspector, etc.) to minimize that potential will be evaluated by NiSource during the planning phase for this crossing. NiSource will not attempt an HDD crossing if the frac-out potential cannot be addressed. If NiSource determines that an HDD is not feasible, the crossing will be installed using dry-ditch techniques as described in the ECS beginning on page 15 and in Figures 18 and 19. As part of the planning effort, NiSource will cooperate with reservoir managers at Sutton Dam to control stream flows during construction activities. NiSource expects that the crossing will take approximately four (4) days, one day to place the coffer dams and water flow devices, two days to install the pipeline, and one day to remove the coffer dams and stabilize the river banks.

LINE N REPLACEMENT PLAN FOR THE ELK RIVER CROSSING

1) Description of crossing: Line N is a 16- inch pipeline that ties into three 10-inch pipelines that cross the Elk River. Only one (1) of these 10-lines is still in service. It was constructed in the early 1900s. It is the suction to Cobb CS. The crossing location is shown on the attached topographic map and aerial photography. The line has received routine maintenance since installation. NiSource anticipates replacement of line within the next 5 to 20 years.
2) Description of Elk River at crossing: The Elk River is approximately 100 feet wide and 4-7 feet deep during normal flow. The river bottom consists of gravel/rock and is in a shoal-riffle area. It is within the area described by the Service as high quality habitat for diamond darter.
3) Potential for realignment: The pipeline will be realigned slightly downstream to avoid the high quality habitat. A habitat survey will be conducted prior to the relocation to confirm the habitat boundary. Further realignment is not possible because required tie-ins in the station lot.
4) Potential for HDD: Based upon an initial review of the crossing with a pipeline construction contractor, this crossing could not be installed using HDD techniques due to steep terrain on the southeast side of the river.
5) Repair: Described in the *Elk River Pipeline Maintenance Methods* section above.
6) Replacement: NiSource will prepare a site-specific plan and coordinate with the Service (as detailed in the attached flowchart) prior to any pipeline replacement activity. The crossing will be installed using dry-ditch techniques as described in the ECS beginning on page 15 and in Figures 18 and 19. As part of the planning effort, NiSource will cooperate with reservoir managers at Sutton Dam to control stream flows during construction activities. NiSource expects that the crossing will take approximately four (4) days, one day to place the coffer dams and water flow devices, two days to install the pipeline, and one day to remove the coffer dams and stabilize the river banks.

DIAMOND DARTER COMPLIANCE FLOW CHART

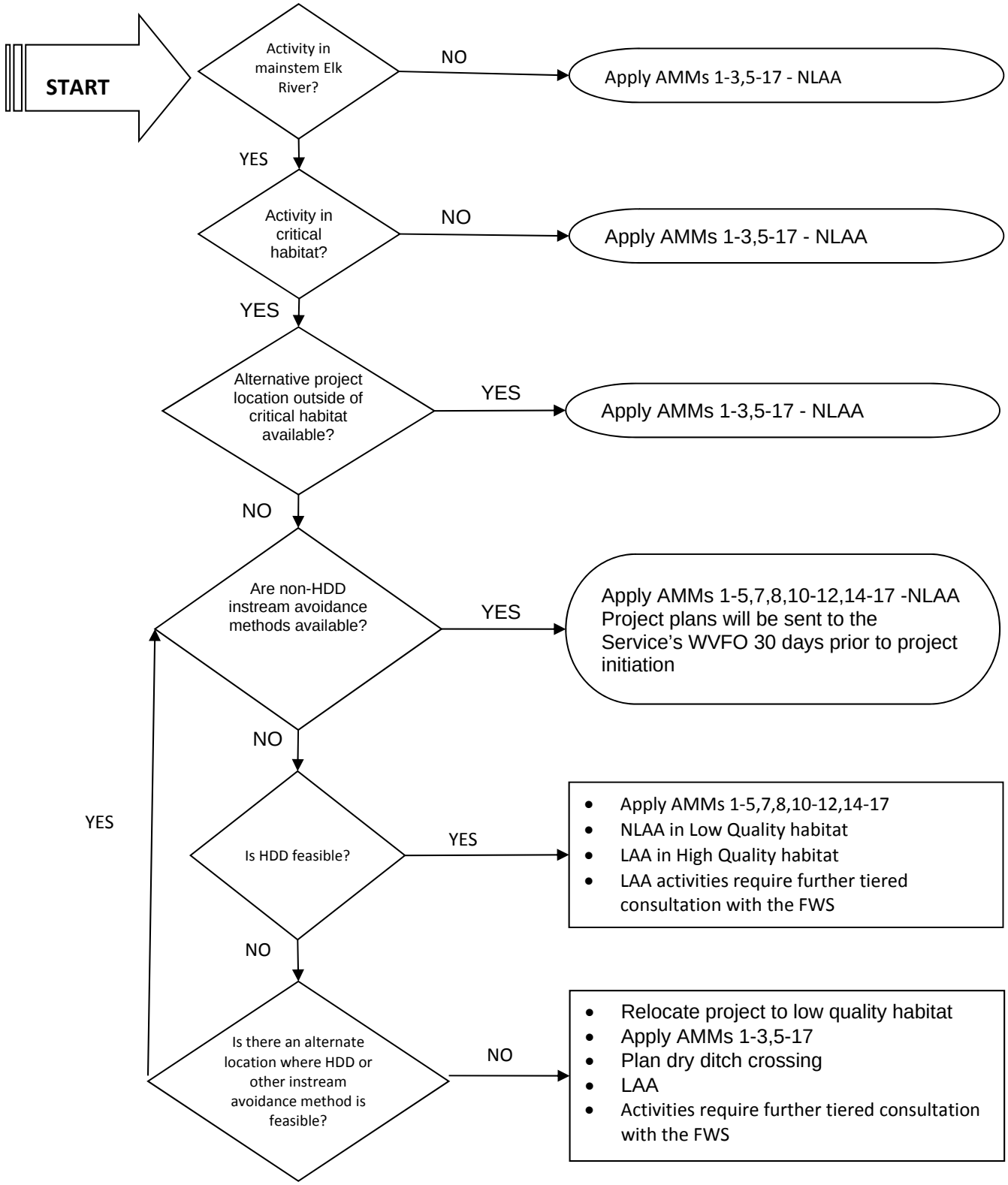
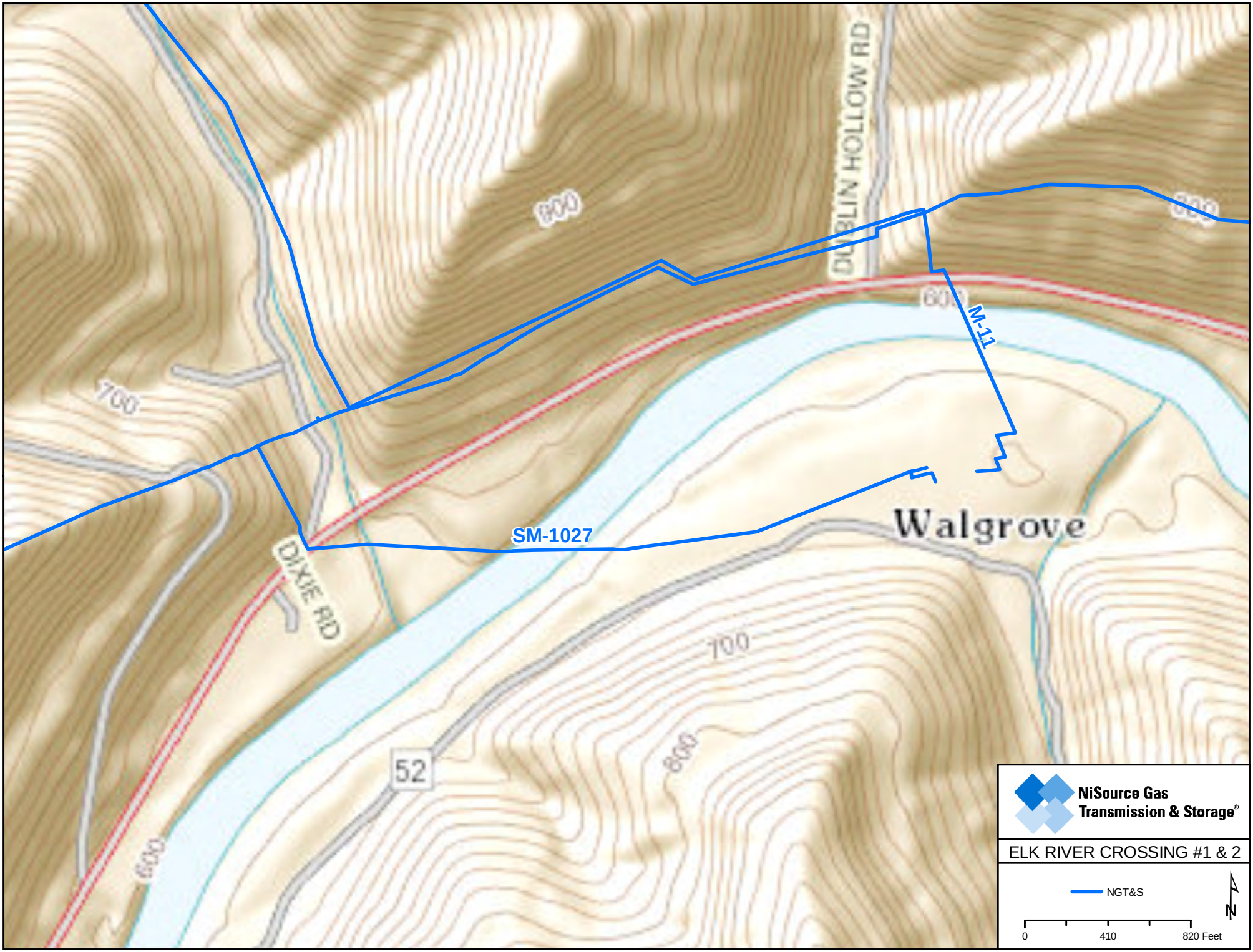


Table D1. Diamond Darter Potential Effects by Life Stage - Instream Activities Only

Life Stage	Habitat Type Used	Time of Year / Life Stage is Present	Potential Effects	Required Avoidance/Minimization Measures	Will Effect Occur with HDD?	Conclusion
Spawning & Eggs	Spawning and egg laying most likely occurs within portions of shoals with relatively gentle flows (not extremely swift portions), may also occur in ends of pools with good substrates. Non-compacted clean sand and gravel substrates with low levels of fines and a good amount of interstitial flow are important to egg survival. Important or high quality diamond darter spawning/egg laying sites are not known. We do not know if spawning areas are the same as foraging areas.	Spawning may occur from late Jan through May. Eggs may be present from March 1 through June 30.	Crushing and killing eggs in the direct impact area if instream work is conducted when eggs are present.	BMP 4 requires that no in-stream (or under stream) activities will be conducted between January 1 and July 31 when eggs may be present.	No	Use of mandatory BMPS will ensure that this potential effect has been avoided.
			Smothering and killing eggs with silt and sediment washed downstream during instream work conducted when eggs are present.	BMP 4 requires that no in-stream (or under stream) activities will be conducted between January 1 and July 31 when eggs may be present.	No - if use avoidance measures listed to left.	Use of mandatory BMPS will ensure that this potential effect has been avoided.
			Displacing diamond darters from spawning areas when instream work is conducted in or near spawning areas during spawning season. This will result in the loss of that spawning area and all associated reproduction for at least that season/year. Diamond darters may have distinct territories/home ranges (Spawning areas likely controlled by females). Displacing females from established home ranges would reduce survival and fitness of those adults, and result in loss of their reproductive capacity for that year and potentially future years if that female dies or its fitness is impaired. Diamond darters spawning in adjacent areas may face increased competition for resources from displaced individuals and reduced survival of eggs that year.	BMP 4 requires that no in-stream (or under stream) activities will be conducted between January 1 and July 31 during spawning season.	No - if use avoidance measures listed to left.	Use of mandatory BMPS will ensure that this potential effect has been avoided.
			Instream work causes substrate compaction and sediment deposition within the direct and downstream impact areas that fills interstitial spaces and reduces water flow through the substrate. This results in reduction or loss of habitat suitability in that spawning area and reduced survival of eggs and larvae. This reduced or lost suitability could last at least through the next spawning season post-construction and for an additional 2-4 years.	BMP 3 requires selecting alternatives that avoid instream work, when practicable, and avoiding high quality spawning areas. BMP 4 requires use of dry ditching when instream avoidance not practicable, reducing downstream sediment deposition. Elk River Plan commits NiSource to conducting habitat surveys to identify likely spawning areas in vicinity of proposed crossings.	No, unless there is a frac-out. In this case, due to the small particle size of material discharged, effects to habitat within the area affected by frac-out material might persist longer than with instream work. Unsure what length of habitat may be affected. BMP 4 requires development of frac-out avoidance plan	Use of mandatory BMPs will minimize the extent of this potential effect.
Larvae	Diamond darter larvae are pelagic (they float in the water column). Larvae likely require fairly extensive stable pool habitats so that they can hold position to feed and not be swept away by the current. Clear, low turbidity, water is likely required to that they can see to feed. We do not know what they eat, but suspect that they eat other smaller fish larvae, so good populations of other breeding fish are important. They are likely fragile and subject to crushing, desiccation, etc.	Estimate potentially April through July. It is unknown how long diamond darters may remain in the larval stage, but other big river fish take 15-30 days.	Larvae may be trapped, crushed, and killed when construction area is dewatered, or could be trapped, crushed, and killed as they are carried downstream and hit instream structures. Impacts would be restricted to the duration of instream construction - which is estimated to typically last four days.	BMP 4 requires that no in-stream (or under stream) activities will be conducted between January 1 and July 31 when larvae may be present.	No	Use of mandatory BMPS will ensure that this potential effect has been avoided.
			Increased sedimentation and turbidity downstream of the construction area may be kill larvae or impair their ability to breathe or feed. Impacts would occur during construction and may persist for up to a few weeks post construction.	BMP 4 requires that no in-stream (or under stream) activities will be conducted between January 1 and July 31 when larvae may be present. BMP 4 and 6 also require the use of techniques methods to avoid instream work first and if not possible use dry-ditch techniques that minimize potential for increased turbidity during and post-construction.	No - if use avoidance measures listed to left.	Use of mandatory BMPS will ensure that this potential effect has been avoided.
			Larvae may be blocked from entering suitable habitat, and thus killed if instream construction occurs while larvae are hatching and being carried downstream from spawning areas to pools, and the construction occurs between these two habitat types. Impacts would be restricted to the duration of instream construction - which is typically estimated to last four days.	BMP 4 requires that no in-stream (or under stream) activities will be conducted between January 1 and July 31 when larvae may be present.	No	Use of mandatory BMPS will ensure that this potential effect has been avoided.

Life Stage	Habitat Type Used	Time of Year / Life Stage is Present	Potential Effects	Required Avoidance/Minimization Measures	Will Effect Occur with HDD?	Conclusion
Juveniles & Adults	Adults forage for benthic invertebrates at night in shoals. Some shoals have been surveyed and are known to be used as foraging areas. During the day they bury themselves in clean sand and gravel substrates. We do not know if they use the same habitat areas during the day as they do at night. They may move into deeper pools to take cover during the day. Diamond darters are noted to be particularly sensitive to sedimentation. We know almost nothing about juvenile diamond darters. We can assume that they are similar to adults, but may be more sensitive to effects.	Adults present year round. Juveniles may be present starting around May.	Individuals could be killed if they are present in the construction zone, and could be trapped or crushed as area is dewatered. It is not known how and when darters will flush from area as it is dewatered.	BMP 3 requires selecting alternatives that avoid instream work, when practicable, and avoiding high quality foraging areas. BMP 4 requires use measures to minimize entrapment of adults. Elk River Plan commits NiSource to conducting habitat surveys to identify likely foraging areas in vicinity of proposed crossings.	No	Use of mandatory BMPs will minimize the extent of this potential effect.
			Diamond darters would be displaced from foraging or resting areas affected by construction. Diamond darters may have distinct territories/home ranges. Displacing individuals from established home ranges would reduce survival and fitness of those adults as they attempt to move to other nearby areas. Displaced darters may be forced to relocate into less suitable habitat, and may be subject to increased predation, reduced foraging efficiency, and increased stress, increased energetic costs, and reduced reproductive ability. Other Diamond darters in adjacent areas may face increased competition for resources from displaced individuals and reduced survival and fitness. It is not known how long it would take for diamond darters to recolonize areas after disturbance. If individuals are killed during displacement, they would not be available to recolonize the area.	BMP 3 requires selecting alternatives that avoid instream work, when practicable, and avoiding high quality foraging areas. BMP 4 requires use of dry ditching when instream avoidance not practicable, minimizing the length of habitat that will be affected and that diamond darters would be displaced from. Elk River Plan commits NiSource to conducting habitat surveys to identify likely foraging and resting areas in vicinity of proposed crossings.	No, unless there is a frac-out. In this case, due to the small particle size of material discharged, effects to habitat within the area affected by frac-out material might persist longer than with instream work. Unsure what length of habitat may be affected. BMP 4 requires the development of a frac-out avoidance plan.	Use of mandatory BMPs would minimize the extent of this effect.
			Increased sedimentation and turbidity downstream of the construction area may be kill adults and juveniles or impair their ability to breathe and feed. Impacts would occur during construction and may persist for up to a few weeks post construction.	BMP 3 requires selecting alternatives that avoid instream work, when practicable, and avoiding high quality foraging areas. BMP 4 requires use of dry ditching when instream avoidance not practicable, minimizing the amount of sedimentation and turbidity downstream during and post-construction. Elk River Plan commits NiSource to conducting habitat surveys to identify likely foraging and resting areas in vicinity of proposed crossings.	No, unless there is a frac-out. In this case, due to the small particle size of material discharged, effects to habitat within the area affected by frac-out material might persist longer than with instream work. Unsure what length of habitat may be affected. BMP 4 requires the development of a frac-out avoidance plan.	Use of mandatory BMPs would minimize the extent of this effect.
			Diamond darters may be blocked from moving between foraging and resting areas if instream construction occurs between these two habitat types. Darters may not be able to effectively forage during this time period or may be subject to increased risk of predation and increased energetic costs if they cannot reach resting areas. Impacts would be restricted to the duration of instream construction.	BMP 3 requires selecting alternatives that avoid instream work, when practicable. NiSource estimates instream construction will typically last approximately four days.	No	Use of mandatory BMPs would minimize the extent of this effect.
			Substrates within the work area may be more compacted following construction, and substrate composition may change (as substrate material and deeper material from the trench is mixed and then replaced). This may reduce suitability of the area for resting because it may be more difficult for diamond darters to bury into the substrates if they are compacted, or if larger or material is present near the surface. Substrates may also be unstable and settle or erode over time. Types of effects are similar to displacement. This reduced or lost suitability may last for 2-4 years.	BMP 3 requires selecting alternatives that avoid instream work, when practicable. BMP 4 requires use of dry ditching when instream avoidance not practicable, minimizing the length of habitat that will be affected. Elk River Plan commits NiSource to conducting habitat surveys to identify likely foraging and resting areas in vicinity of proposed crossings.	No, unless there is a frac-out. In this case, due to the small particle size of material discharged, effects to habitat within the area affected by frac-out material might persist longer than with instream work. Unsure what length of habitat may be affected. BMP 4 requires the development of a frac-out avoidance plan.	Use of mandatory BMPs would minimize the extent of this effect.
			Direct disturbance of the substrate and sedimentation downstream would kill, displace, or smother benthic invertebrate populations within direct and indirect impact area, thus removing diamond darter prey items from these areas. If construction occurs in diamond darter foraging areas, then the affected area would no longer be suitable for feeding. Effects would be similar to displacement. Overtime diamond darters may attempt to recolonize the area but may have reduced foraging success. This reduced or lost suitability of benthic populations and foraging habitat may last for 2-4 years.	BMP 3 requires selecting alternatives that avoid instream work, when practicable, and avoiding high quality foraging areas. BMP 4 requires use of dry ditching when instream avoidance not practicable, minimizing the length of stream that would be affected and amount of sedimentation and turbidity downstream during and post-construction - which should minimize impacts to prey. Elk River Plan commits NiSource to conducting habitat surveys to identify likely foraging and resting areas in vicinity of proposed crossings.	No, unless there is a frac-out. In this case, due to the small particle size of material discharged, effects to habitat within the area affected by frac-out material might persist longer than with instream work. Unsure what length of habitat may be affected. BMP 4 requires the development of a frac-out avoidance plan.	Use of mandatory BMPs would minimize the extent of this effect.



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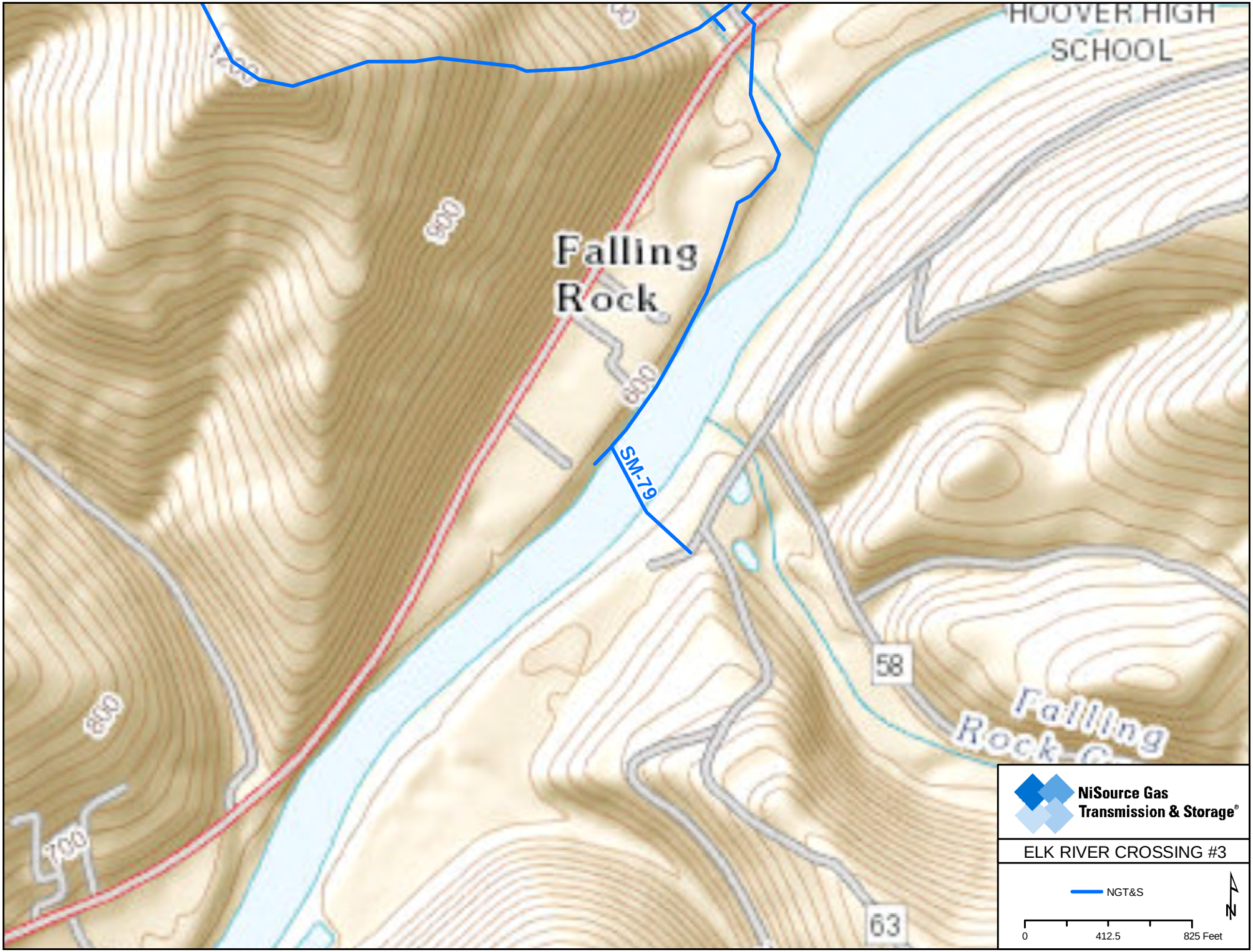

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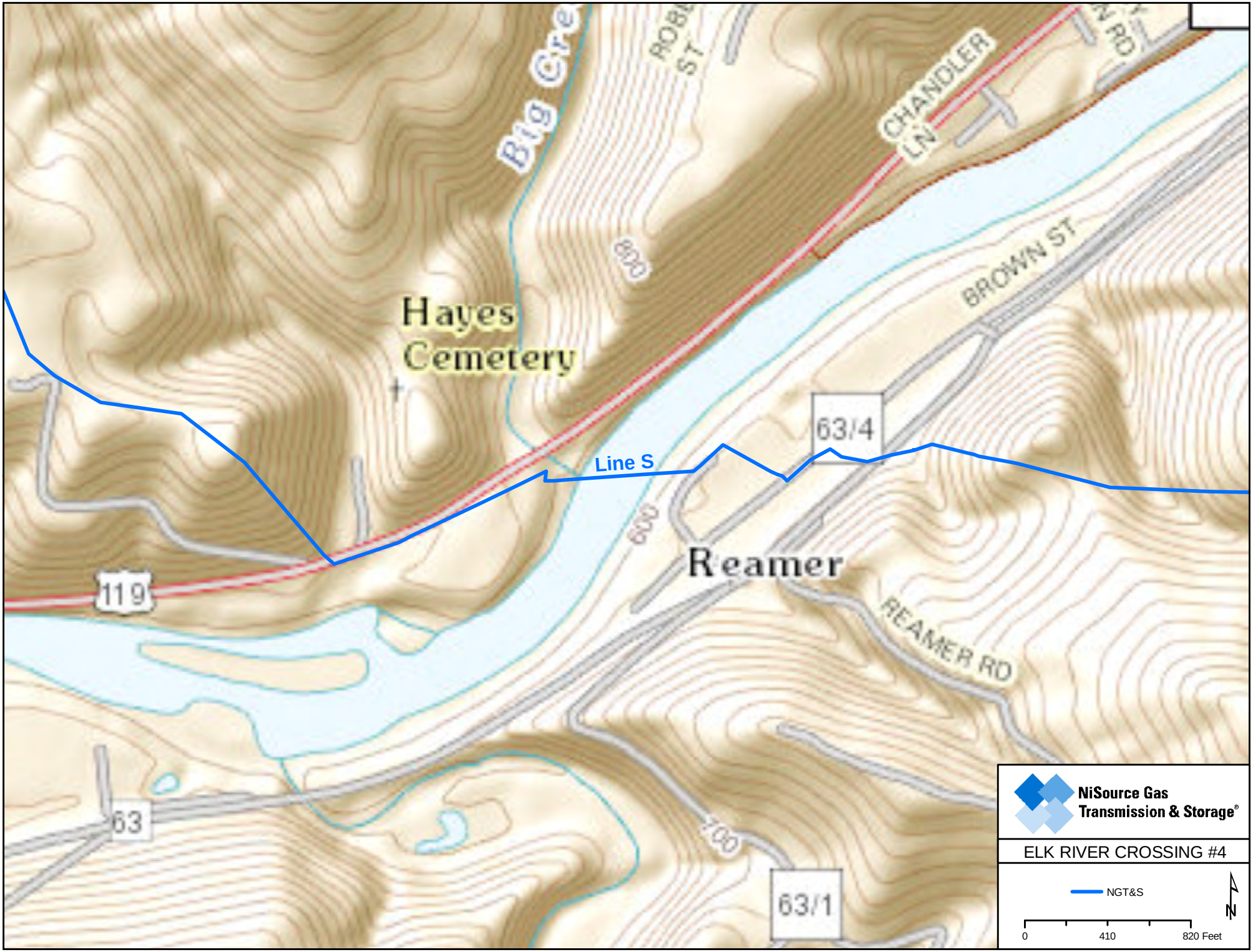

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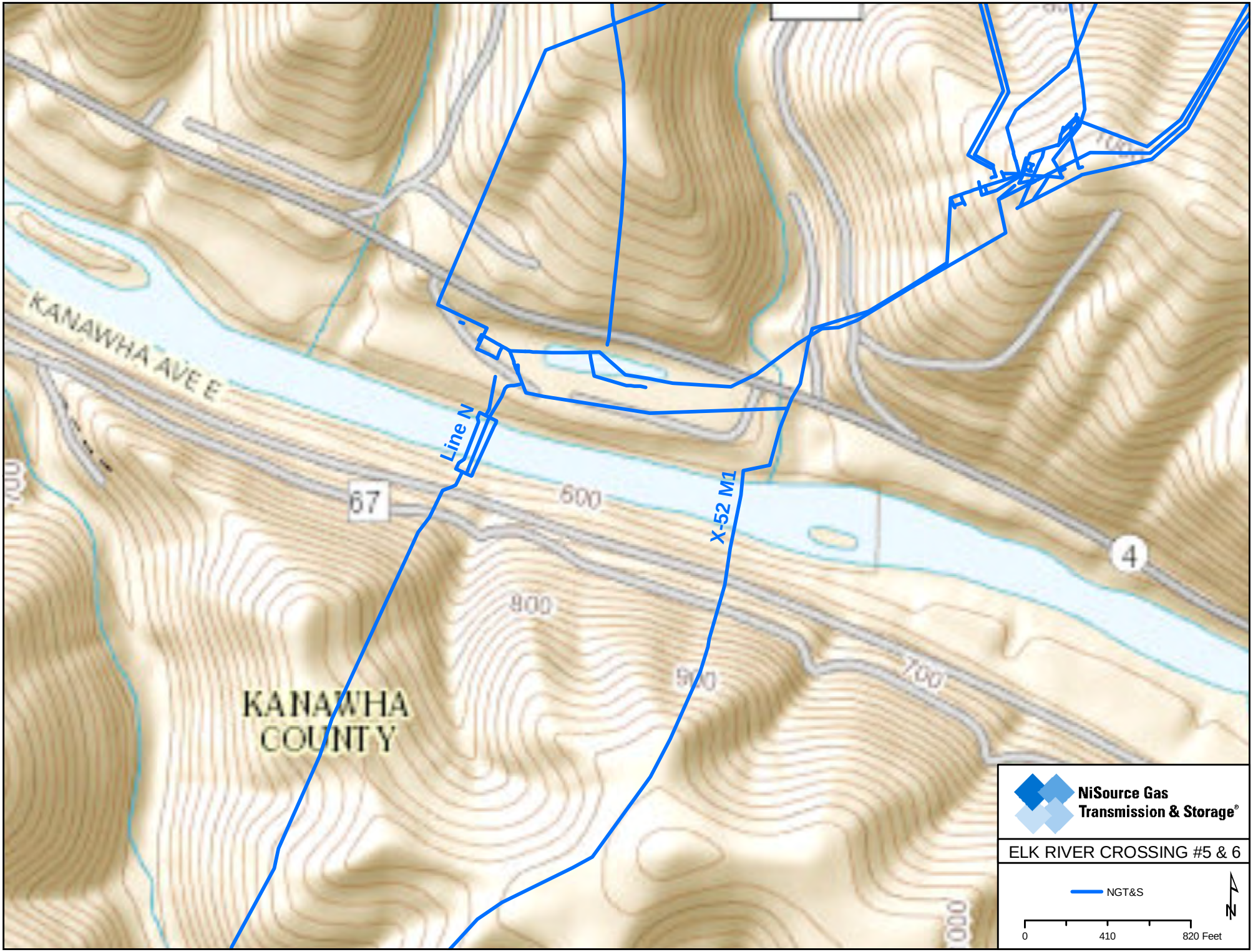

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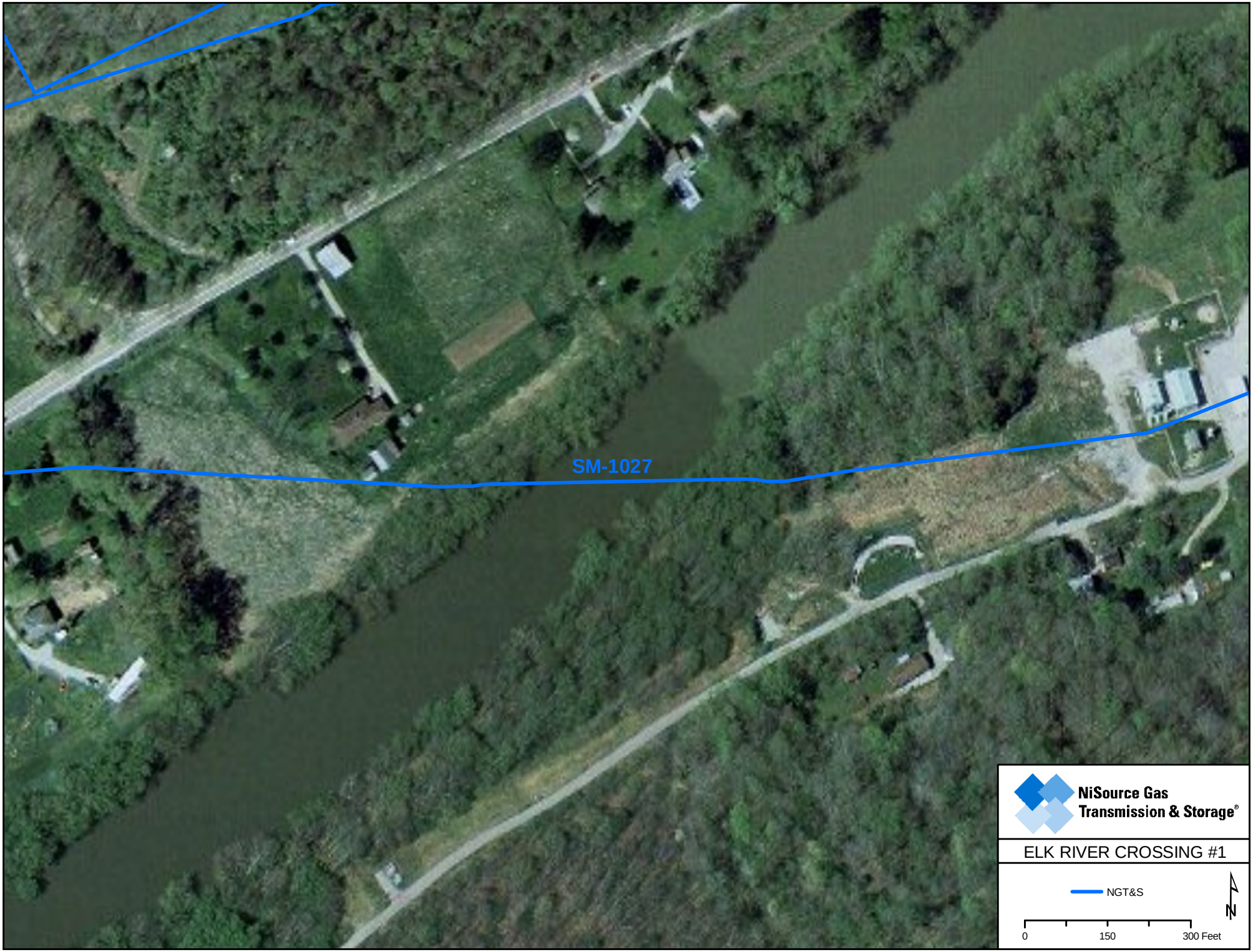

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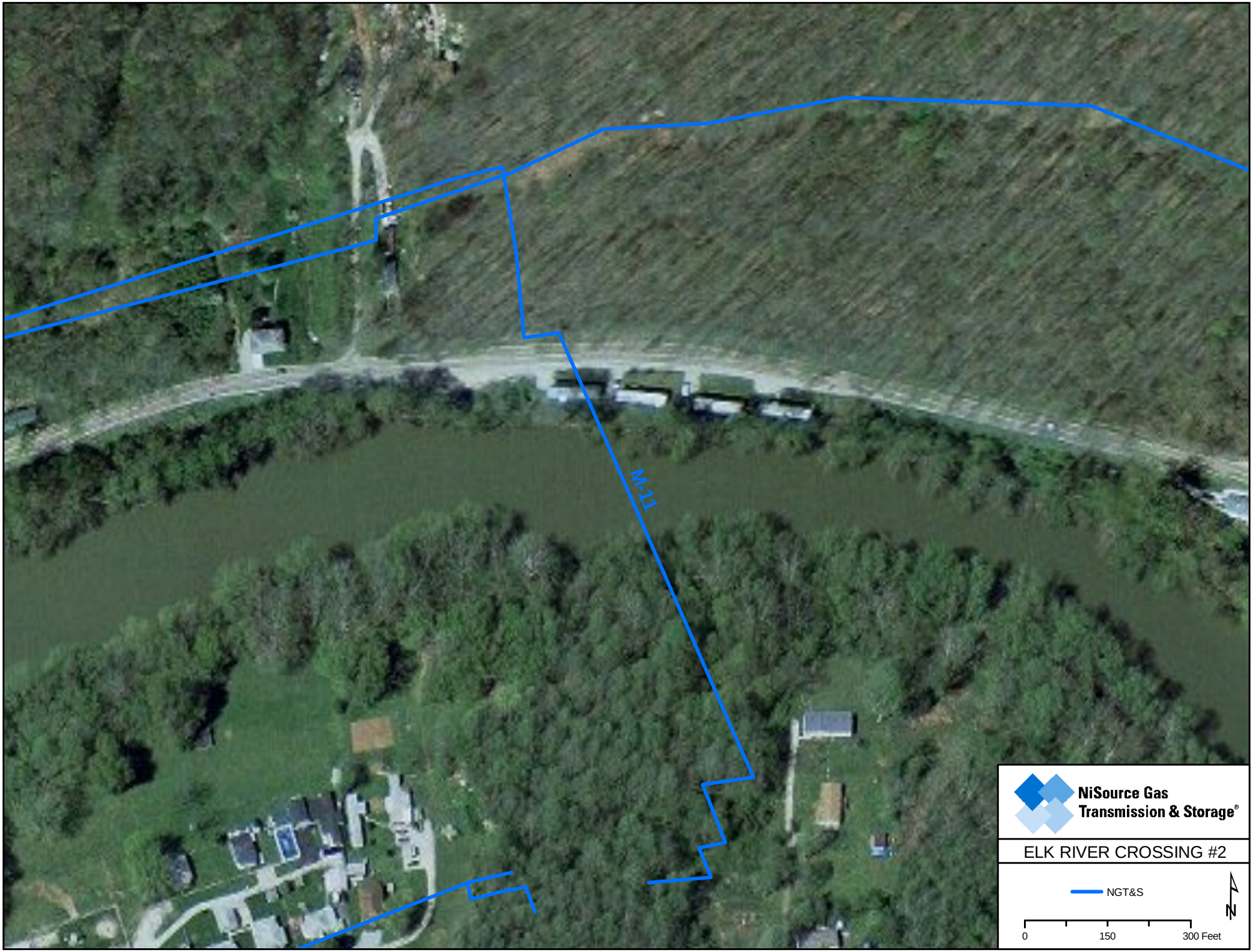

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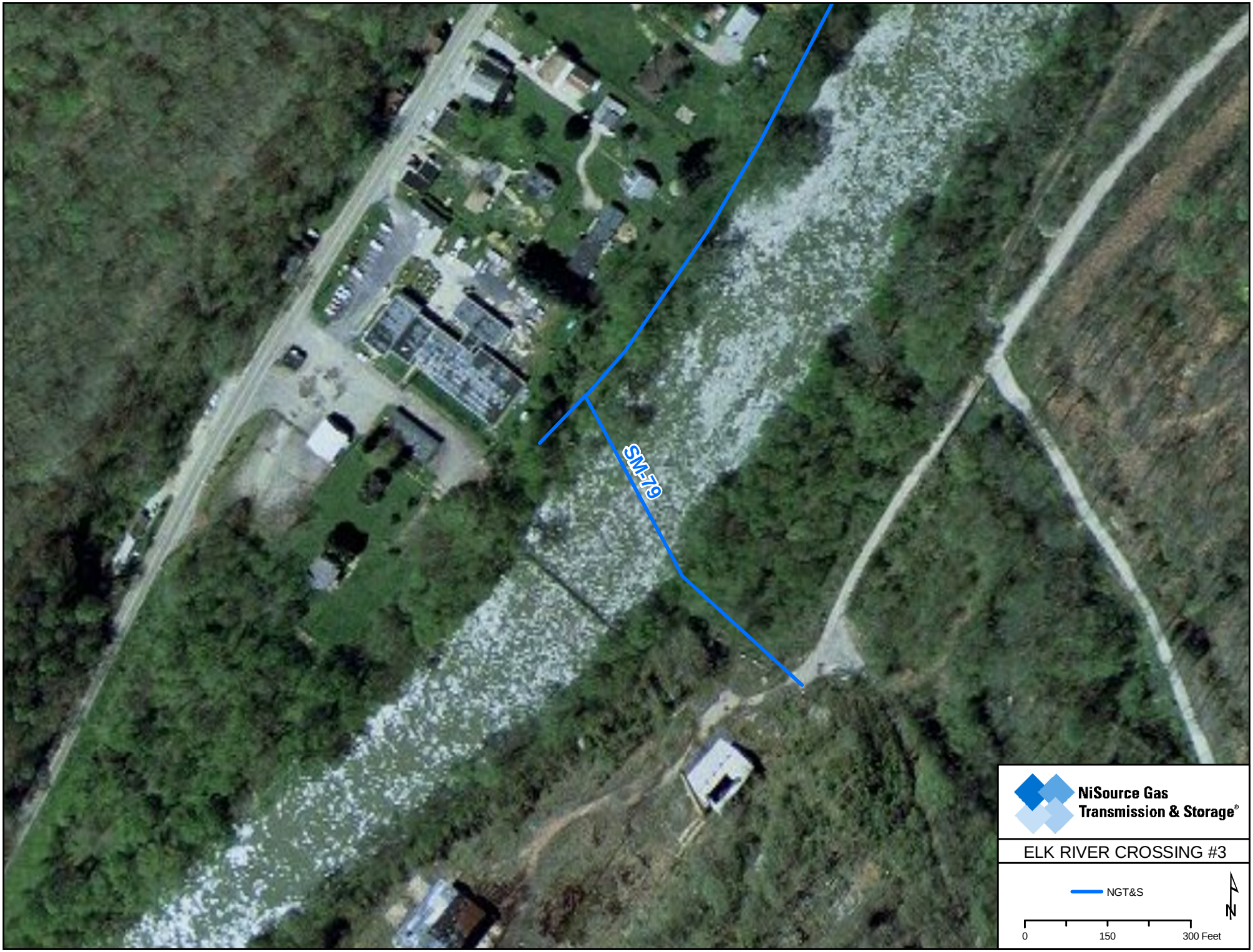

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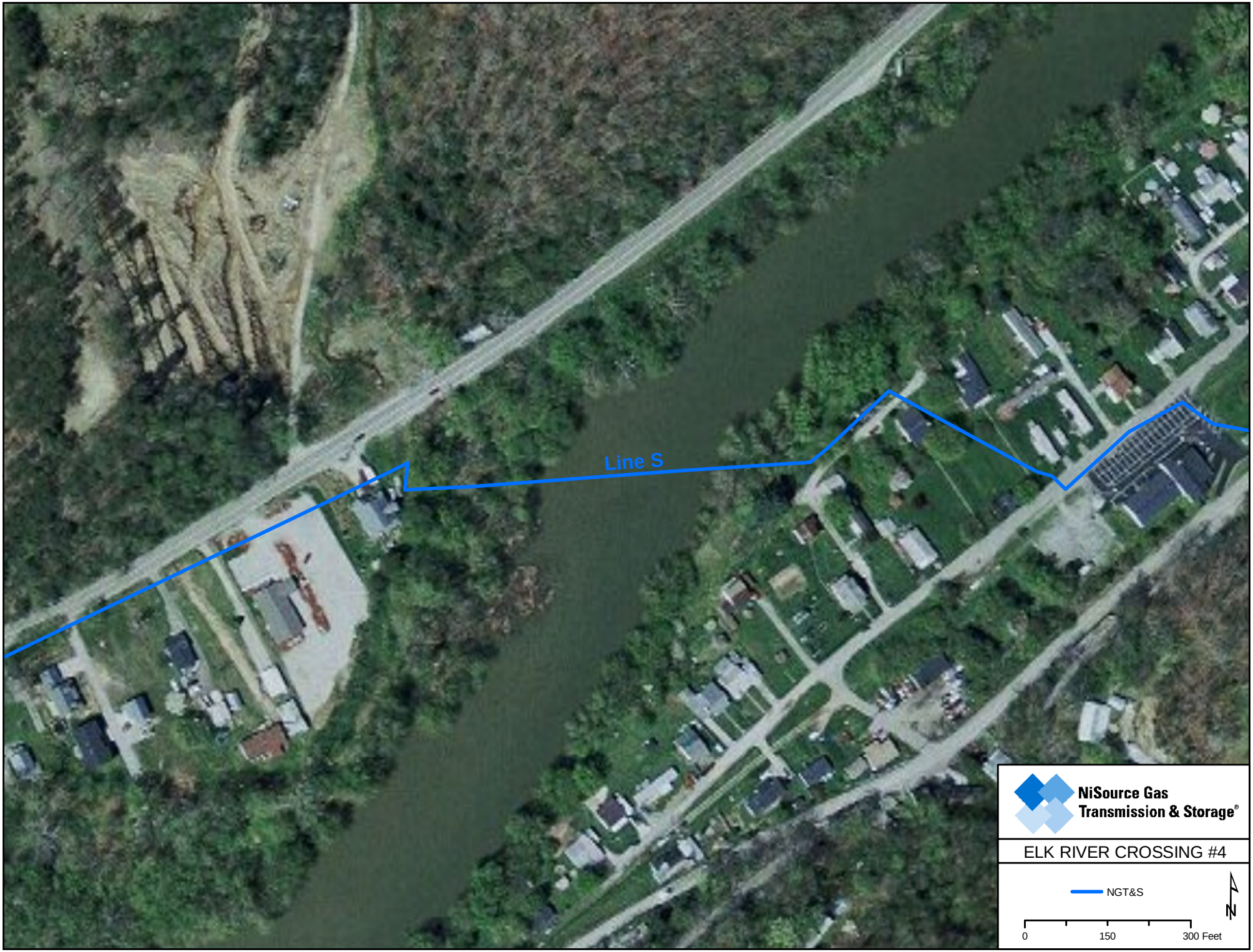

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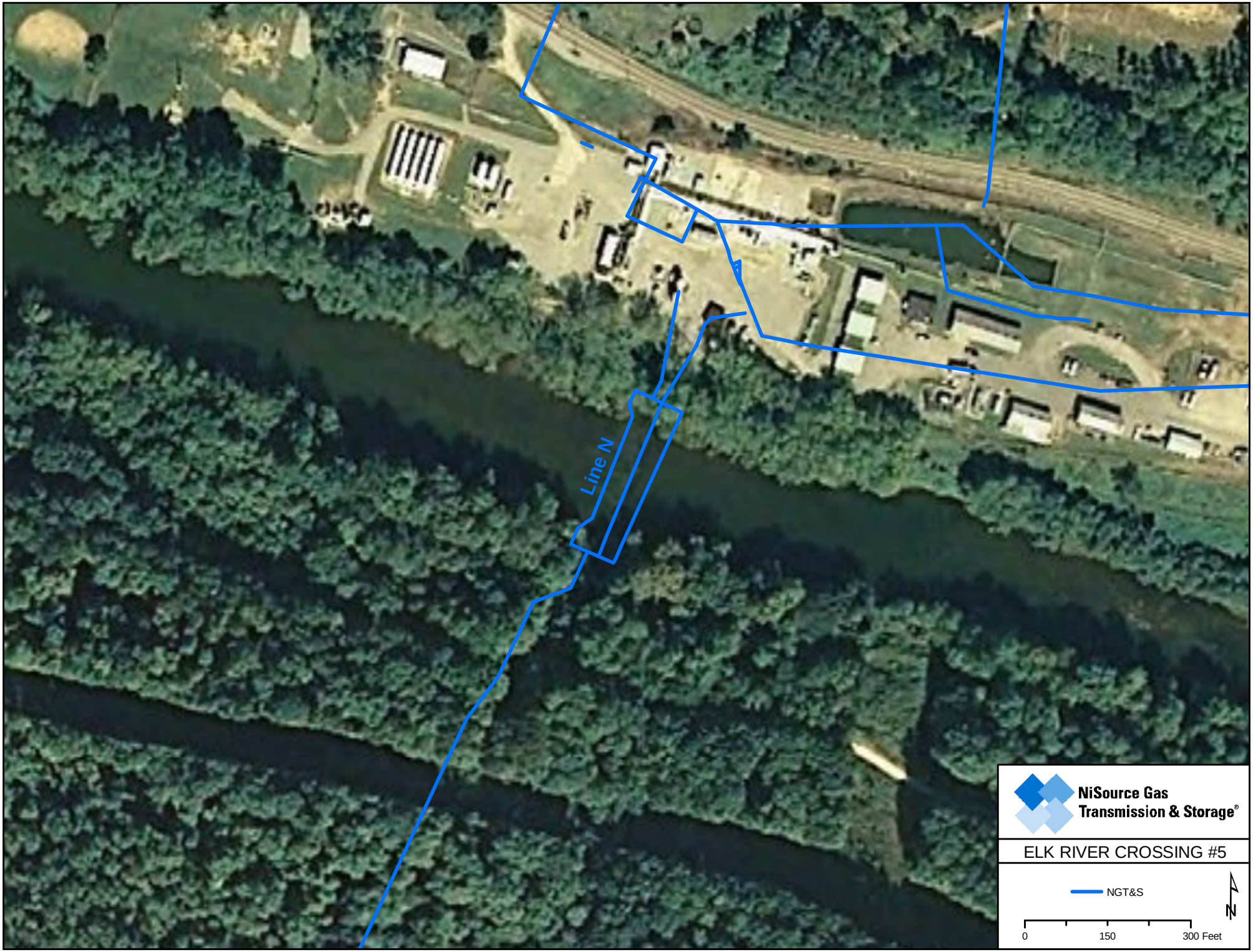

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