IROQUOIS GAS TRANSMISSION SYSTEM, L.P.

08/09 EXPANSION PROJECT

DRAFT
RESOURCE REPORT 7

SOILS

PUBLIC

Prepared for:

Iroquois Gas Transmission System, L.P.
One Corporate Drive, Suite 600
Shelton, CT 06484

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RESOURCE REPORT 7 – SOILS
FERC ENVIRONMENTAL CHECKLIST

Part 380 – Minimum Filing Requirements for Environmental Reports	**Company Compliance or Inapplicability of Requirement**
Identify, describe, and group by milepost the soils affected by the proposed pipeline and aboveground facilities. (§ 380.12 (i)(1)).	Section 7.1 and 7.2 Tables 7.1-1, 7.1-2 and 7.1-3
For aboveground facilities that would occupy sites over 5.0 acres, determine the acreage of prime farmland soils that would be affected by construction and operation. (§ 380.12 (i)(2)).	Not Applicable
Describe, by milepost, potential impacts on soils. (§ 380.12 (i)(3 and 4)).	Section 7.3 and 7.4 Tables 7.3-1, 7.3-2, 7.3-3, 7.3-4, and 7.3-5
Identify proposed mitigation to minimize impact on soils, and compare with the staff's Upland Erosion Control, Revegetation and Maintenance Plan. (§ 380.12 (i)(5)).	Section 7.4

RESOURCE REPORT 7: SOILS

TABLE OF CONTENTS

LIST OF TABLES

(Table numbers need revision)

LIST OF FIGURES

Non Internet Public Information – Please Refer to Volume III – Appendix J

7.0 SOILS

Resource Report 7 describes the soil resources for the pipeline and aboveground facilities proposed within the 08/09 Expansion Project. These facilities consist of pipeline loop segments in the Towns of Boonville and Wright, New York and the Town of Newtown, Connecticut, and the proposed Milford Compressor Station in the City of Milford, Connecticut and the proposed Brookfield Compressor Station modifications in the Town of Brookfield, Connecticut. Soil information for the project area was obtained from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey webpage available online (NRCS 2006a-d). The assessment of project-related effects on soil resources represented in this report are the opinions of ENSR environmental scientists, and are based on the assumption that the FERC (2003) Plan and Procedures and Iroquois' Spill Prevention, Control and Countermeasure (SPCC) Plan are implemented properly. Copies of these documents are available in Volume II.

Resource Report 7 is organized into four sections. Section 7.1 describes the soils traversed by the proposed Boonville, Wright and Newtown loop pipeline facilities. Section 7.2 describes the soils affected by the Milford Compressor Station and Brookfield Compressor Station modifications. Sections 7.3, 7.4, and 7.5 provide a description of the potential impacts of the Projects on soil resources. Section 7.6 presents mitigation measures proposed to minimize soil impacts and Section 7.7 lists references used in the preparation of this report.

7.1 PIPELINE FACILITIES

7.1.1 Boonville Loop

The proposed Boonville Loop Segment crosses a total of 20 unique soil-mapping units (See Figure 7.1-1a, Volume III – Appendix J). Soil map units presented in this report are phases of various soil series, associations and complexes. Soil series are groups of soils having similar parent material such as glacial till, loess or alluvium and are differentiated mainly on the basis of significant variations in morphological features of the soil profile. A soil association is comprised of a group of soil series that occur together in a characteristic pattern that allow for mapping as a cohesive unit. Table 7.1-1 identifies the location of these soil units along the pipeline route by milepost.

Soils that may cause potential limitations during construction and / or operation of the proposed facilities are identified by soil map unit and milepost and presented within Table 7.3-1. Potential soil limitations identified in the Project vicinity include prime farmland, hydric soils, soils with potential for poor revegetation, soils prone to compaction and soils that occur on steep slopes and are susceptible to severe erosion.

A brief description of each soil association and series crossed by the proposed pipeline is provided and based on the information obtained from the USDA NRCS Web Soil Survey webpage (NRCS 2006a). This information is the most up-to-date survey information available to the public from the NRCS and supersedes all soil surveys published prior to 2005.

7.1.1.1 Affected Soils

Fluvaquents – Borosaprists Complex (13)

The Fluvaquents – Borosaprists complex consists of frequently flooded fluvaquents and frequently ponded borosaprists located on floodplains and depressions with slopes of zero to two percent. The natural drainage class is poorly to very poorly drained with seasonal high water table at zero inches. The parent material of the fluvaquents consists of alluvium with highly variable textures, while the parent material of the borosaprists consists of organic material. Both soil types meet the hydric soil criteria.

Adams loamy sand (55A, 0 to 3 percent slopes; 55B, 3 to 8 percent slopes; 55C, 8 to 15 percent slopes)

The Adams series consists of very deep, excessively and somewhat excessively drained soils formed in glacial-fluvial or glacio-lacustrine sand. They are located on outwash plains, deltas, lake plains, moraines, terraces, and eskers, with a depth to bedrock of greater than five feet. Extensive areas are idle and support aspen, birch, and pine seedlings or sweet fern, spirea, and brambles. Forested areas support maple, beech, spruce, and pine. Farmed areas are used mainly for hay or pasture with limited acreages of corn and small grain. This soil does not meet the hydric soil criteria.

Croghan loamy fine sand (57A, 0 to 3 percent slopes; 57B, 3 to 8 percent slopes)

The Croghan series consists of very deep, moderately well drained soils formed in deltaic or glacial outwash sand that was deposited in or next to pro-glacial lake basins. They are located on terraces and sand plains. Textures are predominantly sandy but include fine sandy loam within a depth of 10 inches from the mineral soil surface which can include all or part of the A horizon, the E horizon, if present, and the upper part of the B horizon. The somewhat excessively drained Adams soils and the poorly and somewhat poorly drained Naumburg soils are in a drainage sequence with Croghan soils. Depth to bedrock is greater than 60 inches. While the series is dominantly forested or idle, some areas are cropped and the soil is considered to be farmland of State-wide importance. Cropped areas are mainly used for hay or for blueberry production, but in some locations oats or corn for silage is grown. Eastern white pine, hemlock, balsam, red pine, sugar maple, and yellow birch are in woodlots. Brushy aspen and birch are on idle land. The Croghan series experiences a seasonal high water table at 18 to 24 inches below the soil surface, but does not meet the hydric soil criteria.

Adirondack fine sandy loam, very bouldery (60B, 3 to 8 percent slopes)

The Adirondack Series consists of very deep, somewhat poorly drained, loamy soils overlying dense till. They are located in shallow depressions, on foot-slopes, and along drainage ways on till plains in uplands and mountainous areas. The potential for surface runoff is high to very high. Almost exclusively forested with red maple, yellow birch, balsam fir, eastern hemlock, black spruce, and red spruce, this soil is not considered to be prime farmland. The seasonal high water table is located from zero to six inches below the soil surface and this soil does meet the hydric criteria.

Naumburg loamy sand (94)

The Naumburg series consists of very deep, poorly and somewhat poorly drained soils that formed in sandy deltaic or glaciofluvial deposits. These soils are on low sand plains and terraces. Slope ranges from 0 to 8 percent with a depth to bedrock of more than 60 inches. Runoff ranges from high or very high. Though predominantly wooded or idle, the Naumburg series is considered to be farmland of State-wide importance. A few areas are used for growing hay or pasture and idle areas support poplar and birch saplings or are covered by sparse stands of grass with Spirea and similar shrubs. Forested areas support spruce, pine, balsam fir, hemlock, and some hardwoods such as maples. Seasonal high water table is within a foot of the soil surface and this soil meets the hydric criteria.

Pyrities loam (119B, 3 to 8 percent slopes)

The Pyrities series consists of very deep well drained soils on the convex tops of ridges and hills in glaciated uplands. The soils formed in loamy till dominated by dolomitic limestone, sandstone, calcareous shale, and limestone materials. Bedrock is deeper than 60 inches and the potential for surface runoff is low to high. This soil is a farmland of State-wide importance and most areas have been cleared and are cultivated or used for pasture. Common trees in wooded areas are sugar maple, American beech, white oak, and red oak. This soil does not meet the hydric criteria.

Bice fine sandy loam (200B, 3 to 8 percent slopes; 200C, 8 to 15 percent slopes)

The Bice series consists of very deep, well drained, loamy soils located on hills, ridges and other convex landforms on till uplands. The soils formed in till commonly from gneiss and granite with variable components of sandstone and shale. In some places the soils formed in till that includes schist. Depth to bedrock is commonly more than 72 inches. The potential for surface runoff is medium to high. This soil is considered a farmland of statewide importance. Most areas are in forest or reverting to brush. Common trees in forested areas are American beech, sugar maple, red oak, red maple, Eastern white pine, red pine, red spruce and shagbark hickory. Some areas have been reforested with tree species of red pine, white spruce, scotch pine and European larch. Some areas are in hay, oats, and corn for silage or are in pasture. This soil does not meet hydric criteria.

Kalurah silt loam (221B, 3 to 8 percent slopes)

The Kalurah series consists of very deep, moderately well drained soils located on the back slopes and broad tops of well defined hills in glaciated uplands. Kalurah soils formed in till derived mainly from limestone, dolomite, sandstone, and calcareous shale. Depth to bedrock is greater than 60 inches. The potential for surface runoff ranges from low to high. This soil is considered to be prime farmland with most areas cleared and used for hay and corn. Stony areas are used for pasture or remain as woodland. Wood lots contain sugar maple, basswood, white ash, white pine, red oak and aspen. A seasonal zone of water saturation is at 18 inches below the soil surface; however this soil does not meet the hydric criteria.

Malone loam (223B, 3 to 8 percent slopes)

The Malone series consists of very deep, somewhat poorly drained soils on till plain uplands. They formed in till deposits derived mainly from limestone and dolomite with some component of sandstone and gneiss. Depth to bedrock is greater than 60 inches. The potential for surface runoff ranges from high or very high. Malone soils have a seasonal high water table at 14 inches below the soil surface, but are considered prime farmland if they are drained. Most areas are in crops or used for pasture. Hay and corn are the principal crops. Wooded areas support a variety of hardwoods which include red maple, birch, elm, northern white cedar, and aspen. This soil does not meet the hydric criteria.

Runeberg loam (462)

The Runeberg series consists of very deep, poorly drained and very poorly drained soils formed in loamy glacial till in drumlin fields and glacial moraines. Slopes range from 0 to 2 percent. Runoff is low or very low. The poorly drained phases have a perched water table at six to 24 inches during November to July in most years. The very poorly drained phase has an apparent water table at plus 12 to six inches from January to December in most years. These soils are used primarily for growing pasture. Small areas are cropped. Native vegetation was mostly grasses and sedges with scattered elm and black ash. This soil meets the hydric criteria and is not considered to be prime farmland.

Galway silt loams (845A, 0 to 3 percent slopes; 845B, 3 to 8 percent slopes)

The Galway series consists of moderately deep, well drained and moderately well drained soils formed in till that is 20 to 40 inches deep over calcareous sedimentary bedrock. Galway soils are on nearly level to steep, smooth to step-like landforms which are mantled with till with or without an admixture of silty eolian deposits. The potential for surface runoff is low to high. The more gently sloping areas are mainly cultivated for corn, small grains, and hay, or are pastured or idle. Where these soils are rocky or steep, they are largely in wood lots composed of sugar maple, white ash, basswood, yellow poplar, red and white oak, white pine, and hemlock. Galway silt loams do not meet the hydric criteria and are not considered to be prime farmland.

TABLE 7.1-1
SOIL TYPES CROSSED BY THE PROPOSED BOONVILLE LOOP PIPELINE FACILITIES

Beginning MP	Ending MP	Soil Unit	Soil Unit Symbol	Approx. Crossing Length (feet)
0.00	0.21	Adirondack fine sandy loam, 2-8 percent slopes, very bouldery	60B	1120
0.21	0.37	Bice fine sandy loam, 8-15 percent slopes	200C	839
0.37	0.65	Adirondack fine sandy loam, 2-8 percent slopes, very bouldery	60B	1474
0.65	1.02	Pyrites loam, 3-8 percent slopes	119B	1942
1.02	1.27	Naumburg loamy sand	94	1327
1.27	1.37	Croghan loamy fine sand, 0-3 percent slopes	57A	549
1.37	1.43	Adams loamy sand, 0-3 percent slopes	55A	283
1.43	1.46	Croghan loamy fine sand, 0-3 percent slopes	57A	190
1.46	1.79	Adams loamy sand, 0-3 percent slopes	55A	1712
1.79	1.83	Naumburg loamy sand	94	229
1.83	1.88	Adams loamy sand, 3-8 percent slopes	55B	246
1.88	1.92	Naumburg loamy sand	94	226
1.92	2.22	Adams loamy sand, 3-8 percent slopes	55B	1563
2.22	2.25	Naumburg loamy sand	94	187
2.25	2.28	Croghan loamy fine sand, 0-3 percent slopes	57A	140
2.28	2.38	Naumburg loamy sand	94	519
2.38	2.63	Adams loamy sand, 3-8 percent slopes	55B	1345
2.63	2.67	Fluvaquents – Borosaprists Complex	13	200
2.67	2.99	Bice fine sandy loam, 8-15 percent slopes	200C	1694
2.99	3.07	Malone loam, 3-8 percent slopes	223B	417
3.07	3.17	Bice fine sandy loam, 3-8 percent slopes	200B	536

TABLE 7.1-1 SOIL TYPES CROSSED BY THE PROPOSED BOONVILLE LOOP PIPELINE FACILITIES				
Beginning MP	**Ending MP**	**Soil Unit**	**Soil Unit Symbol**	**Approx. Crossing Length (feet)**
3.17	3.23	Galway silt loam, 3-8 percent slopes	845B	295
3.23	3.26	Galway silt loam, 0-3 percent slopes	845A	170
3.26	3.30	Bice fine sandy loam, 3-8 percent slopes	200B	206
3.30	3.35	Galway silt loam, 0-3 percent slopes	845A	274
3.35	3.43	Bice fine sandy loam, 3-8 percent slopes	200B	425
3.43	3.54	Croghan loamy fine sand, 0-3 percent slopes	57A	566
3.54	3.62	Bice fine sandy loam, 3-8 percent slopes	200B	451
3.62	3.75	Malone loam, 3-8 percent slopes	223B	669
3.75	3.83	Bice fine sandy loam, 3-8 percent slopes	200B	449
3.83	3.93	Runeberg loam	462	506
3.93	4.03	Bice fine sandy loam, 8-15 percent slopes	200C	553
4.03	4.11	Naumburg loamy sand	94	385
4.11	4.14	Croghan loamy fine sand, 3-8 percent slopes	57B	156
4.14	4.17	Fluvaquents – Borosaprists Complex	13	165
4.17	4.24	Croghan loamy fine sand, 0-3 percent slopes	57A	360
4.24	4.28	Naumburg loamy sand	94	246
4.28	4.34	Croghan loamy fine sand, 0-3 percent slopes	57A	318
4.34	4.42	Fluvaquents – Borosaprists Complex	13	406
4.42	4.48	Adams loamy sand, 8-15 percent slopes	55C	314
4.48	4.67	Adams loamy sand, 3-8 percent slopes	55B	999
4.67	4.81	Croghan loamy fine sand, 0-3 percent slopes	57A	735
4.81	4.83	Adams loamy sand, 3-8 percent slopes	55B	109
4.83	5.36	Pyrites loam, 3-8 percent slopes	119B	2832
5.36	5.40	Malone loam, 3-8 percent slopes	223B	198
5.40	5.45	Fluvaquents – Borosaprists Complex	13	258

TABLE 7.1-1
SOIL TYPES CROSSED BY THE PROPOSED BOONVILLE LOOP PIPELINE FACILITIES

Beginning MP	Ending MP	Soil Unit	Soil Unit Symbol	Approx. Crossing Length (feet)
5.45	5.50	Pyrites loam, 3-8 percent slopes	119B	247
5.50	5.52	Fluvaquents – Borosaprists Complex	13	124
5.52	5.63	Pyrites loam, 3-8 percent slopes	119B	567
5.63	5.70	Kalurah silt loam, 3-8 percent slopes	221B	388
5.70	5.81	Pyrites loam, 3-8 percent slopes	119B	581

Source: Web Soil Survey of Oneida County, New York (NRCS 2006a)

7.1.2 WRIGHT LOOP SEGMENT

The proposed Wright Loop segment crosses a total of 11 unique soil-mapping units (See Figure 7.1-1b in Volume III – Appendix J). Soil map units presented in this report are phases of various soil series, associations and complexes. Soil series are groups of soils having similar parent material such as glacial till, loess or alluvium and are differentiated mainly on the basis of significant variations in morphological features of the soil profile. A soil association is comprised of a group of soil series that occur together in a characteristic pattern that allow for mapping as a cohesive unit. Table 7.1-2 identifies the location of the affected soil types along the pipeline route by milepost.

Soils that may cause potential limitations during construction and / or operation of the proposed facilities are identified by soil map unit and milepost and presented within Table 7.3-2. Potential soil limitations identified in the Project vicinity include prime farmland, hydric soils, soils with potential for poor revegetation, soils prone to compaction and soils that occur on steep slopes and are susceptible to severe erosion.

A brief description of each soil series or complex crossed by the proposed pipeline is provided and based on the information obtained from the USDA NRCS Web Soil Survey (NRCS 2006b). This information is the most up-to-date survey information available to the public from the NRCS and supersedes all soil surveys published prior to 2005.

7.1.2.1 Affected Soils

Honeoye-Farmington complex (HfB, 2 to 10 percent slopes)

The Honeoye-Farmington complex consists of the very deep and well drained Honeoye soil along with the shallow and somewhat excessively drained Farmington soil located on drumlins, benches, ridges, and till plains. Depth to bedrock within the Farmington Soil is 10 to 20 inches. Both soils are considered to be prime farmland. Depth to seasonal high water table is greater than 60 inches for both soils and neither is considered to have hydric soil characteristics. Erosion potential is classified as slight to moderate for this soil series.

Ilion and Appleton silt loams (IaB, 3 to 8 percent slopes)

The Ilion and Appleton silt loams consist of the very deep and poorly drained Ilion soil located in depressions and the very deep and somewhat poorly drained Appleton soil located on drumlins and till plains. Depth to the seasonal high water table is zero to six inches with occasional ponding for the Ilion soil, which is considered hydric, and six to 18 inches in the Appleton soil, which is not considered to be hydric. Both soils are considered farmlands of State-wide importance. Slope erodibility potential for this soil series is considered to be slight to moderate.

Lansing channery silt loam (LhB, 2 to 10 percent slopes; LhC, 10 to 20 percent slopes)

The Lansing channery silt loam soil series consists of a very deep well drained soil located on drumlinoid ridges, hills, and till plains with a seasonal high water table depth at greater than 60 inches. This soil is not considered to be hydric, and is classified as prime farmland, however percent slope is limiting for farming and any slope over 10 percent is not considered to be prime farmland. Erosion potential within this soils series is moderate to severe.

TABLE 7.1-2
SOIL TYPES CROSSED BY THE PROPOSED WRIGHT LOOP PIPELINE FACILITIES

Beginning MP	Ending MP	Soil Unit	Soil Unit Symbol	Approx. Crossing Length (feet)
0.00	0.72	Honeoye-Farmington complex , 2 to 10 percent slopes	HfB	3793
0.72	0.74	Ilion and Appleton silt loams, 3 to 8 percent slopes	IaB	130
0.74	0.93	Honeoye-Farmington complex , 2 to 10 percent slopes	HfB	1006
0.93	0.97	Lansing channery silt loam, 2 to 10 percent slopes	LhB	194
0.97	0.98	Lansing channery silt loam, 10 to 20 percent slopes	LhC	53

Source: Web Soil Survey of Schoharie County, New York (NRCS 2006b)

7.1.3 NEWTOWN LOOP SEGMENT

The proposed Newtown Loop segment crosses a total of nine unique soil-mapping units (See Figure 7.1-1c in Volume III – Appendix J). Soil map units presented in this report are phases of various soil series, associations and complexes. Soil series are groups of soils having similar parent material such as glacial till, loess or alluvium and are differentiated mainly on the basis of significant variations in morphological features of the soil profile. A soil association is comprised of a group of soil series that occur together in a characteristic pattern that allow for mapping as a cohesive unit. Table 7.1-3 identifies the location of these soil units along the pipeline route by milepost. Following the table are brief descriptions of each soil series.

Soils that may cause potential limitations during construction and / or operation of the proposed facilities are identified by soil map unit and milepost and presented within Table 7.3-3.

Potential soil limitations identified in the Project vicinity include prime farmland, hydric soils, soils with potential for poor revegetation, soils prone to compaction and soils that occur on steep slopes and are susceptible to severe erosion.

A brief description of each soil association and series crossed by the proposed pipeline is provided and based on the information obtained from the USDA NRCS Web Soil Survey (NRCS 2006d). This information is the most up-to-date survey information available to the public from the NRCS and supersedes all soil surveys published prior to 2005.

7.1.3.1 Affected Soils

Ridgebury, Leicester, and Whitman soils, extremely stony (3)

The Ridgebury, Leicester and Whitman soils, extremely stony unit is comprised of approximately 40% Ridgebury soils, 35% Leicester soils, and 15% Whitman soils located in depressions and drainageways on uplands. Slopes are zero to five percent in this poorly drained and very poorly drained soil with seasonal zone of water saturation at zero to nine inches below the soil surface. Depth to bedrock is typically greater than five feet. This unit meets hydric criteria and is considered a wetland soil in the State of Connecticut.

Catden and Freetown soils (18)

The Catden and Freetown soils unit is comprised of approximately 40% Catden muck and 40% Freetown muck located in depressions and bogs on lake plains, outwash plains, moraines, and flood plains. Slopes range from zero to two percent and the parent material for these very poorly drained, frequently ponded soils consists of woody organic material. Depth to seasonal high water table ranges from one foot above to one foot below the soil surface. These soils meet hydric criteria and are considered wetland soils in the State of Connecticut. Depth to bedrock is greater than five feet.

Canton and Charlton soils, very stony (61B, 3 to 8 percent slopes)

The Canton and Charlton soils, very stony unit consists of very deep well drained soils located on nearly level to very steep glaciated upland plains, hills, and ridges. Runoff is negligible to medium with medium internal drainage. Depth to bedrock is commonly more than 6 feet. Depth to seasonal high water table is typically greater than five feet. This soil unit does not meet hydric criteria and is not considered to be a hydric soil in the State of Connecticut, though the soils can exhibit hydric characteristics when located in depressions and drainage ways.

Canton and Charlton soils, extremely stony (62C, 3 to 15 percent slopes)

The Canton and Charlton soils, extremely stony unit consists of very deep well drained soils located on hills and uplands. Runoff is negligible to medium with medium internal drainage. Depth to bedrock is greater than 6 feet. Depth to seasonal high water table is typically greater than six feet. This soil unit does not meet hydric criteria and is not considered to be a hydric soil in the State of Connecticut, though the soils can exhibit hydric characteristics when located in depressions and drainage ways.

Charlton – Chatfield complex, very rocky (73C, 3 to 15 percent slopes)

The Charlton – Chatfield series consists of moderately to very deep, well drained and somewhat excessively drained loamy soils formed in till. They are nearly level to very steep soils on glaciated plains, hills, and ridges. Crystalline bedrock is at depths of 20 to 40 inches with rock outcrops rare to common. Potential for surface runoff ranges from low to high within this well drained to somewhat excessively drained soil complex. Areas of Charlton soils cleared of stones are used for cultivated crops, specialty crops, hay, and pasture, while many scattered areas are used for community development. Most areas of Chatfield soils remain in woodland, while some small cleared areas are used for pasture, are idle, or are sites for residential and recreational development. Common trees are red, white, and black oak, hickory, sugar maple, red maple, black and gray birch, white ash, beech, white pine, hemlock, and Eastern red cedar, and Atlantic white cedar. While this soil complex does not meet hydric criteria, small areas of hydric soils are typically located in depressions and along drainage ways.

Hollis – Chatfield – Rock outcrop complex (75C, 3 to 15 percent slopes; 75E, 15 to 45 percent slopes)

The Hollis – Chatfield – Rock outcrop complex consists of shallow to moderately deep, well drained and somewhat excessively drained soils formed in a thin mantle of till derived mainly from gneiss, schist, and granite. They are nearly level to very steep upland soils on bedrock-controlled hills and ridges. Depth to hard bedrock ranges from 10 to 40 inches, with rock outcrops ranging from few to many. Well drained and somewhat excessively drained, surface runoff is negligible to very high. Most areas of this complex remain forested with small areas with few rock outcrops cleared of stones and utilized for hay or pasture land. Scattered areas are used for residential or community development. While this soil complex does not meet hydric criteria, small areas of hydric soils are typically located in depressions and along drainage ways.

TABLE 7.1-3
SOIL TYPES CROSSED BY THE PROPOSED NEWTOWN LOOP PIPELINE FACILITIES

Beginning MP	Ending MP	Soil Unit	Soil Unit Symbol	Approx. Crossing Length (feet)
0.00	009	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	62C	480
0.09	0.18	Hollis – Chatfield – Rock outcrop complex, 15 to 45 percent slopes	75E	470
0.18	0.26	Catden and Freetown soils	18	400
0.26	0.30	Hollis – Chatfield – Rock outcrop complex, 3 to 15 percent slopes	75C	224
0.30	0.38	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	73C	401
0.38	0.42	Hollis – Chatfield – Rock outcrop complex, 15 to 45 percent slopes	75E	206
0.42	0.56	Ridgebury, Leicester, and Whitman soils, extremely stony	3	758
0.56	0.71	Hollis – Chatfield – Rock outcrop complex, 3 to 15 percent slopes	75C	805
0.71	0.72	Hollis – Chatfield – Rock outcrop complex, 15 to 45 percent slopes	75E	42
0.72	0.95	Hollis – Chatfield – Rock outcrop complex, 3 to 15 percent slopes	75C	1206
0.95	1.22	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	62C	1444

TABLE 7.1-3
SOIL TYPES CROSSED BY THE PROPOSED NEWTOWN LOOP PIPELINE FACILITIES

Beginning MP	Ending MP	Soil Unit	Soil Unit Symbol	Approx. Crossing Length (feet)
1.22	1.27	Ridgebury, Leicester, and Whitman soils, extremely stony	3	246
1.27	1.32	Canton and Charlton soils, 3 to 8 percent slopes, very stony	61B	257
1.32	1.59	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	62C	1448
1.59	1.61	Ridgebury, Leicester, and Whitman soils, extremely stony	3	78
1.61	1.62	Hollis – Chatfield – Rock outcrop complex, 3 to 15 percent slopes	75C	29

Source: Web Soil Survey of Fairfield County, Connecticut (NRCS 2006d)

7.2 ABOVEGROUND FACILITIES

7.2.1 Milford Compressor Station

Iroquois proposes to construct a new compressor station on the site of its existing Milford Sales Meter Station in the City of Milford, New Haven County, Connecticut. The proposed facilities will include the construction of two, 10,310 [nominal] horsepower ("hp") turbine driven centrifugal compressor packages two each housed in its own turbo-compressor buildings; the control building; two unit control enclosures ; a domestic gas building and associated paved parking and access areas. The permanent fencing for the compressor station and existing sales meter station is estimated to occupy approximately 3.86 acres of the total 4.8 acres that would be affected by construction. Areas that are expected to be affected by construction include the station yard, temporary work and staging areas, and an access road. The security fenced yard area will be large enough to accommodate the existing sales meter station and the additional buildings: the two turbo-compressor buildings; two unit control enclosures; and a domestic gas building, and parking areas.

7.2.1.1 Soil Associations and Soil Series

The evaluation of soil characteristics to be encountered during construction of aboveground facilities is based on local soils mapping and soil descriptions from the Soil Survey for New Haven County, Connecticut (SCS 1979). For reference, a soil association is comprised of a group of soil series that occur together in a characteristic pattern that allow for mapping as a cohesive unit. Soil series are groups of soils having similar parent material such as glacial outwash and are differentiated mainly on the basis of morphological variations of the soil profile. The soil map units are generally defined by phases, such as slope ranges, of each soil series.

The Soil Survey of New Haven County (SCS 1979) identifies the soils in the project area as Udorthents, smooth (Ud) soils (See Figure 7.1-1d in Volume III – Appendix J). These soils are mapped for well drained to excessively drained areas where at least 20 inches of topsoil and subsoil has been removed and/or where 20 inches of soil material has been placed on the ground surface. The complex arrangements of cut and fill areas in Ud soils are the result of efforts to smooth the landscape and, therefore, slopes are generally less than 15 percent. Ud soils mainly range in texture from sandy loam to silt loam or the gravelly analogs, though in many places the texture is sand or sand and gravel. Due to the texture changes in Ud soils, the permeability ranges from very rapid to slow.

The proposed project is expected to have minimal impact on soil resources. The proposed aboveground facility site would not result in a temporary or permanent disturbance of five acres and does not occur within any soils designated as prime farmland. The Ud soils at the site are the result of extensive human disturbances, and are not hydric or prime farmland soils. A majority of the project area is planned to be used as staging areas during construction, which should not be subject to significant ground disturbances, and would be restored to a vegetative cover. Approximately 0.55 acres of Ud soils would be permanently covered by impervious surfaces from the construction of the compressor buildings, parking lot, and site drive, in addition to the 0.22 acres of Ud soils already covered by the meter station facilities.

7.2.2 Brookfield Compressor Station Modifications

This section describes the soil resources for the proposed Brookfield Compressor Station modifications project in the Town of Brookfield, Fairfield County, Connecticut. Soil information for the project area was obtained from the Soil Survey of Fairfield County, Connecticut (SCS 1981), Official Soil Series Descriptions provided by the USDA – NRCS Soil Survey Division (NRCS 2006c), field surveys, and information obtained from the NRCS Tolland field office. The assessment of project-related effects on soil resources represented in this report are the opinions of ENSR environmental scientists, and are based on the assumption that the FERC (2003) Plan and Procedures and Iroquois' SWPPP and SPCC Plans are implemented properly.

7.2.2.1 Soil Associations and Soil Series

The evaluation of soil characteristics to be encountered during construction of aboveground facilities is based on local soils mapping and soil descriptions from the Soil Survey for Fairfield County, Connecticut (SCS 1981).

For reference, a soil association is comprised of a group of soil series that occur together in a characteristic pattern that allow for mapping as a cohesive unit. Soil series are groups of soils having similar parent material such as glacial outwash and are differentiated mainly on the basis of morphological variations of the soil profile. The soil map units are generally defined by phases, such as slope ranges, of each soil series. As discussed below, the soil survey mapping reflects the fact that the project site has been previously excavated for sand and gravel.

The NRCS (formerly the Soil Conservation Service) (1981) identifies the proposed Brookfield Compressor Station site as occurring along the divide between two associations: the Paxton-Woodbridge-Ridgebury association and the Carlisle-Adrian-Saco association. The former association consists of nearly level to steep, well drained moderately well drained, loamy soils and areas of exposed bedrock, on glacial till uplands. The latter association is identifies nearly level, very poorly drained, organic and loamy soils, on outwash plains; on glacial outwash plains, and terraces. The NRCS mapping shows the entire 7.3-acre site consisting of Pits, gravel (Ps) soils, which defines areas that have been excavated for sand and gravel (See Figure 7.1-1d in Volume III – Appendix J,). Soil mapping done by Soil Resource Consultants in 1998 and 1999 classifies the site as Udorthents, which is the proper soil classification term for Ps soils. Updated NRCS soils mapping also identifies the soils on the project site as Udorthents (DeRisi, 2006).

Udorthent soils typically consist of moderately well drained to well drained soils that have been extensively disturbed by grading and; therefore, generally have the same soil conditions as Ps soils.

Because of their porous nature, Ps soils have a rapid or very rapid permeability. Field surveys by ENSR in November 2005 have determined that no part of the project area has hydric soils and therefore, should not experience a water table within a foot of the ground surface for prolonged periods during the growing season. The NRCS does not consider Ps soils or Udorthent soils to be prime farmland soils.

7.3 CONSTRUCTION AND OPERATION IMPACTS

7.3.1 Pipeline Facilities

Pipeline construction activities generally result in temporary impacts to soils. Potential impacts include encountering a high water table during trenching, soil compaction and rutting from construction equipment, the loss of excavated soil from water and wind erosion, and mixing of topsoil and subsoil. The characteristics of soil types, vegetative cover, and slope are important factors in determining the potential for these construction related soil impacts to occur. Tables 7.3-1, 7.3-2 and 7.3-3 list potential soil limitations by Loop Segment each soil type, slope, depth to seasonal mean high water table, re-vegetation potential, erosion hazard, depth to bedrock.

7.3.1.1 Severe Erosion Potential

Construction of the proposed Boonville, Wright, and Newtown Loop segments will remove existing vegetation and temporarily destabilize soils. This situation increases the potential for soil erosion caused by stormwater, which will be mitigated as described in Section 7.4 during the construction and operation of the proposed project. Water erosion is strongly related to the permeability of the soil, the cohesion of the soil particles that comprise it as well as soil texture, percentage of organic matter, soil structure, and soil infiltration capacity. Soils containing high percentages of silt and very fine sand are most erodible. Well-drained and well-graded gravels and gravel-sand mixtures with little or no silt are the least erodible soils. Other soil properties that influence erosion can include slope length and gradient.

The erosion hazard in Tables 7.3-1, 7.3-2 and 7.3-3 refers to the degree of potential soil loss in well-managed woodlands that would occur as a result of site preparation and cutting where the soil is exposed. Ratings of the erosion hazard are based on the slope aspect. The hazard potential is slight if expected losses are small, indicating that no particular preventive measures are needed under ordinary conditions; moderate if some soil losses are expected and care is needed during clearing and construction to reduce soil losses; and severe if special methods of operation and precaution are required to prevent excessive soil losses.

As summarized in Table 7.3-1, the following soils along the Boonville Loop segment may be subject to a higher degree for severe erosion: Fluvaquents – Borosaprists (13). As summarized in Table 7.3-2, the following soils along the Wright Loop segment may be subject to a higher degree for severe erosion: Lansing channery silt loams (LhB, LhC). For the Newtown Loop segment, the following soils as summarized in Table 7.3-3 may be subject to a higher degree for severe erosion: Catden and Freetown soils (18), Canton and Charlton soils (62C), and Hollis – Chatfield – Rock outcrop complex (75E). Each of these series has slopes of eight percent or greater that are subject to the possibility of severe erosion.

7.3.1.2 Soil Compaction

A concern in agricultural areas is the potential for soil compaction resulting from the movement of heavy construction equipment. Soil characteristics that affect soil compaction include soil texture, soil moisture, grain size distribution, and porosity. Soil compaction has a restrictive action on water penetration, root development and the rate of diffusion of oxygen into soils, which can, in turn, reduce crop yields. For the purposes of this report, soils with a mean high water table of 1.5 feet or less below the surface elevation and having a surface texture of sandy clay loam, or finer, are likely to be susceptible to compaction.

As noted in Table 7.3-1, the following soil types along the Boonville Loop segment have a high susceptibility for compaction: Fluvaquents – Borosaprists (13), Kalurah silt loams (221B), Malone loams (223B), Runeberg loam (462). Soil types mapped for the Wright Loop segment that may be susceptible to compaction include Ilion and Appleton silt loams (IaB)(See Table 7.3-2). As noted in Table 7.3-3, the following soil types along the Newtown Loop segment have a high susceptibility for compaction: Ridgebury, Leicester, and Whitman soils (3), and Catden and Freetown soils (18).

7.3.1.3 Shallow Bedrock/Introduction of Rock into the Topsoil

The depth to bedrock indicates the depth from the ground surface at which bedrock is typically present for each soil type. Bedrock refers to the solid rock that underlies the soil and other unconsolidated material that is exposed at the ground surface. Bedrock within proximity to the ground surface constrains trenching and backfilling operations associated with pipeline construction. The introduction of rock to the surface layer from pipeline construction activities, resulting from activities such as ripping and blasting, may cause damage to agricultural equipment and possibly result in a reduction of crop productivity.

Only one soil type (Galway silt loam 845A, 845B) along the Boonville Loop segment contains lithic bedrock at a sufficient depth that may require removal for proper pipeline installation (See Table 7.1-3). For the Wright Loop segment, only the Honeoye-Farmington complex soil type is noted for shallow bedrock depth. The NRCS lists the depth to bedrock at 10 to 20 inches for the Farmington component of this soil type (See Table 7.3-3).

Along the Newtown Loop segment, three soil types were identified that have bedrock within close proximity to the soil surface. As noted in Table 7.3-2, the Charlton – Chatfield complex, very rocky (73C) and Hollis – Chatfield – Rock outcrop complex (75C, 75E) both have bedrock at a depth that will likely interfere with trenching, pipeline installation and backfill operations.

For all areas where bedrock is encountered and interferes with pipeline installation, the technique used for bedrock removal would depend on factors such as strength and hardness of the rock. Iroquois would attempt to use mechanical methods such as ripping or conventional excavation to remove the bedrock where possible. If required, bedrock blasting would be conducted in accordance with all applicable state and local regulations to ensure that it is done in a safe manner and that off-site wells are not affected. In addition, Iroquois will follow mitigation measures in the FERC Plan and Procedures during construction of the Boonville, Wright, and Newtown Loop segments.

7.3.1.4 Poor Revegetation Potential

Construction will temporarily remove existing vegetation within the proposed workspace areas. Vegetative cover is important in controlling erosion by lessening the impact of rainfall through interception and slowing the velocity of runoff. The rate of erosion and runoff has a potential to increase in the proposed work area due to the removal of existing vegetation. These rates may be greater in steeper sloping areas where the velocity of the runoff is increased. The re-vegetation potential in Table 7.3-1, 7.3-2 and 7.3-3 is based upon the ability of grasses and legumes in upland areas and wetland plants in wetland areas to become easily established without significant levels of management. In most instances, these vegetative covers would be used to restore the project area upon completion of construction activities. Major soil properties that may affect the growth of grasses, legumes, and wetland vegetation include depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, soil temperature and slope. The potential of the soils are rated 1: well suited; 2: suited; 3 poorly suited; and 4: unsuited.

As summarized in Table 7.3-1 for the Boonville Loop segment, with the exception of Fluvaquents – Borosaprists (13), the remaining soils along the proposed pipeline route have no limitations relative to re-vegetation potential. Fluvaquents and Borosaprists are associated with wetland and floodplain areas and are poorly suited for re-vegetation due to the highly variable nature of sediments and parent materials within Fluvaquents and the high water tables for both Fluvaquents and Borosaprists. Re-vegetation in poorly suited soils may be difficult and would require more management to ensure successful re-vegetation of the project area.

The remaining soils along the proposed Wright Loop pipeline route have no limitations relative to re-vegetation potential (See Table 7.3-2). Currently, the majority of the project location is actively in use for agricultural production, primarily for hay.

For the Newtown Loop segment, soils with poor re-vegetation potential are noted in Table 7.3-3. The Ridgebury, Leicester, and Whitman soils as well as the Catden and Freetown soils have a high groundwater table and will require specialized plant species, specifically hydrophytic species, to ensure successful re-vegetation.

Re-vegetation in poorly suited soils may be difficult and would require more management to ensure successful re-vegetation of the project area. Iroquois will adhere to the FERC Plan and Procedures and will restore vegetative cover in the project area in accordance with the seed mix specifications provided by the NRCS and applicable landowner requests. The seed mixes recommended by the NRCS in New York are available in Volume II – Appendix B. Consultation with the local field office of the NRCS in Connecticut has been initiated to obtain recommended seed mixes, application rates, and planting dates, though no response has been received to date.

7.3.1.5 Shallow Depth to Groundwater

During construction, there is the possibility of intercepting the groundwater table during trenching operations. The depth to groundwater indicates the depth from the ground surface to the seasonal mean high water table typical for each soil type. Seasonal high water tables at or near the surface constrains trenching and backfilling operations associated with pipeline construction. Iroquois will follow mitigation measures in the 2003 FERC Plan and Procedures, NYSDEC Standards for Erosion and Sediment Control (2005), and the CTDEP 2002 Connecticut Guidelines for Soil Erosion and Sediment Control during construction of the proposed Boonville, Wright, and Newtown Loop segments, respectively.

TABLE 7.3-1

POTENTIAL LIMITATIONS OF SOIL TYPES CROSSED BY THE 08/09 EXPANSION PROJECT LOOP SEGMENTS

Soil Name	Map Unit	Slope (%)	Severe Compaction a/	Depth to Ground water (ft)	Revegetation Potential[a]	Severe Erosion Potential	Depth to Bedrock (ft)
Boonville, NY Loop Segment							
Fluvaquents – Borosaprists complex	13	0-2	Yes	0-1.5	3	Yes	>5
Adams loamy sand	55A 55B 55C	0-3 3-8 8-15	No No No	>5 >5 >5	2 2 2	No Moderate Moderate	>5 >5 >5
Croghan loamy fine sand	57A 57B	0-3 3-8	No No	1.5-2 1.5-2	2 2	No Moderate	>5 >5
Adirondack fine sandy loam, very bouldery	60B	2-8	No	0-1.5	2	Moderate	>5
Naumburg loamy sand	94	0-3	No	0-1.5	2	No	>5
Pyrites loam	119B	3-8	No	>5	1	Moderate	>5
Bice fine sandy loam	200B	3-8	No	>5	1	Moderate	>5
Kalurah silt loam	221B	3-8	Yes	1.5-2	1	Moderate	>5
Malone loam	223B	3-8	Yes	0.5-1.5	2	Moderate	>5
Runeberg loam	462	0-2	Yes	0-0.5	2	No	>5
Galway silt loam	845A 845B	0-3 3-8	No No	>5 >5	1	No Moderate	1.5-3.5 1.5-3.5
Wright, NY Loop Segment							
Honeoye-Farmington complex	HfB	2-10	--	>6	1	Slight	10-20
Ilion and Appleton silt loams	IaB	3-8	Yes	0-1.5	2	Slight	>60

TABLE 7.3-1

POTENTIAL LIMITATIONS OF SOIL TYPES CROSSED BY THE 08/09 EXPANSION PROJECT LOOP SEGMENTS

Soil Name	Map Unit	Slope (%)	Severe Compaction a/	Depth to Ground water (ft)	Revegetation Potential[a]	Severe Erosion Potential	Depth to Bedrock (ft)
Lansing channery silt loam	LhB LhC	2-10 10-20	-- --	>6 >6	1 2	Moderate Severe	>60 >60
Newtown, CT Loop Segment							
Ridgebury, Leicester, and Whitman soils	3	0-5	Yes	0-1	3	No	>5
Catden and Freetown soils	18	0-2	Yes	0-1	4	Yes	>5
Canton and Charlton soils, very stony	61B	3-8	No	>5	2	No	>5
Canton and Charlton soils, extremely stony	62C	3-15	No	>5	2	Yes	>5
Charlton – Chatfield complex, very rocky	73C	3-15	No	>5	2	Moderate	1.5-3.5
Hollis – Chatfield – Rock outcrop complex	75C 75E	3-15 15-45	No No	>5 >5	2 2	Moderate Yes	0-3.5 0-3.5

N/A = Not available. Varies based on site-specific conditions.
a = 1: well suited; 2: suited; 3: poorly suited; 4: unsuited

7.3.1.6 Agricultural and Residential Land

The majority of Iroquois' existing mainline ROW in the Boonville area is located within idle woodland and open land. There is a small section that crosses a residential area. Due to the siting of the new loop section within the existing ROW, it is unlikely that there will be any interference with agricultural drain tiles or irrigation systems.

Drain tiles may be installed to improve drainage in soils with high groundwater or poor internal drainage. Drain tiles are used to remove excess water from the top three to four feet of soil, discharge it from the area being drained, and improve the potential for the growth of crop plants. Construction activities, particularly trenching and heavy equipment traffic, could sever, crush or displace existing drain tiles.

Damage to existing drain tiles may result in lower crop yields and hinder timely cultivation. If not buried deep enough, the pipeline may interfere with the installation of tile drains in the future.

During environmental field surveys and correspondence with landowners, Iroquois did not identify any drain tiles or irrigation systems along the proposed pipeline route. However, if previously unidentified drain tiles or irrigation systems are encountered during construction, Iroquois will repair or replace drain tiles at the request of the landowner in accordance with the NYSDAM Agricultural Mitigation handbook for Pipeline Right-of-Way Construction Projects (1997). No filter-covered drain tiles will be used unless the local soil conservation authorities and the landowner agree. Iroquois will follow the depth of cover and the drain tile repair and monitoring mitigation measures specified in the FERC Plan and Procedures and the NYSDAM Agricultural Mitigation handbook for Pipeline Right-of-Way Construction Projects. Table 7.3-4 identifies areas where the Boonville Loop segment is located within residential areas and cropland and also any known locations of drain tiles or other irrigation systems.

TABLE 7.3-4

BOONVILLE LOOP SEGMENT CROPLAND AND RESIDENTIAL AREA LOCATIONS

Mile Post	Land Use Type	Crossing Length	Drainage Tiles or Irrigation Systems
1.85	Residential	300	None

Table 7.3-5 identifies all agricultural and residential areas along the proposed Wright Loop pipeline route. The majority of the existing ROW along this section of Iroquois' mainline is currently in active agricultural production for hay. Iroquois will follow the construction practices outlined in the FERC Plan and Procedures for agricultural and croplands during pipeline installation in this area. One residence is located within close proximity to the proposed construction area along this section of Iroquois' ROW.

The proposed Newtown Loop segment will also be located within Iroquois' existing mainline ROW. This existing ROW is located in idle woodlands, with the majority of the land being wholly owned in fee by Iroquois. The existing mainline ROW does abut residential neighborhoods, though a substantial buffer of mature woodland exists between the residential homes and the pipeline location. As a result, it is unlikely that Iroquois will experience any interference with drain tiles or residential irrigation systems during construction of the loop segment. Should construction contractors intercept any underground drainage structures on land other than that owned by Iroquois, all procedures specified in the FERC Plan and Procedures for mitigating impacts to drainage tiles will be implemented.

TABLE 7.3-5

WRIGHT LOOP SEGMENT CROPLAND AND RESIDENTIAL AREA LOCATIONS

Mile Post	Land Use Type	Crossing Length	Drainage Tiles or Irrigation Systems
0.18 to 0.82	Cropland	3400	None
0.82 to 0.88	Cropland	300	None
0.93 to 0.98	Cropland	300	None

7.3.2 Aboveground Facilities

7.3.2.1 Milford Compressor Station

The proposed project is expected to have minimal impacts on soil resources. The project site is relatively flat, devoid of wetlands, and does not possess soil types mapped as prime farmland soils. The site is owned by Iroquois and is not in residential or agricultural use.

The potential for erosion problems at the site should be low. The off-site movement of sediments is unlikely given the site's nearly level topography, the raised railroad bed and berm that surround part of the project area on the Iroquois property. To prevent the possibility of erosion on the project site, Iroquois will require all construction contractors to implement the FERC (2003) Plan and Procedures and Iroquois' SWPPP and SPCC Plans. It is unlikely that excavators will encounter bedrock during construction of the project; however, should exposure of bedrock become an issue during construction of the compressor station, Iroquois will utilize mechanical means (i.e. hydraulic rock hammer) to the extent practicable for removal of bedrock. Should blasting be required in order to properly prepare the site for construction, all applicable State and local regulations will be followed.

Following completion of construction, the site will be stabilized by re-establishment of vegetative cover to prevent erosion and sedimentation on the project site. The re-vegetation of the construction workspace will be done in accordance with Part D of the 2003 FERC Plan. Additionally, consultation with the local field office of the NRCS has been initiated to obtain recommended seed mixes, application rates, and planting dates, though no response has been received to date. As the landowner of the property, Iroquois may opt to use variations of these seed mixes to re-establish ground cover.

7.3.2.1.1 Cropland and Residential Impacts

The Milford Compressor Station Project will not impact cropland or residential areas. The project is proposed for a parcel of land owned in fee by Iroquois that is currently occupied by the Milford Sales Meter Station. Additionally, the soil type mapped for the project site (Udorthents) is not classified as a prime farmland by the NRCS.

7.3.2.2 Brookfield Compressor Station

The proposed project is expected to have minimal impacts on soil resources. The project site is relatively flat, devoid of wetlands, and does not possess soil types mapped as prime farmland soils. The site is owned by Iroquois and is not in residential or agricultural use.

To prevent the possibility of erosion on the project site, Iroquois will require all construction contractors to implement the FERC (2003) Plan and Procedures and Iroquois' SWPPP and SPCC Plans. Due to the previous land use of the project site as a sand and gravel pit, it is unlikely that excavators will encounter bedrock during construction of the project. Should exposure of bedrock become an issue during construction of the compressor station, Iroquois will utilize mechanical means (i.e. hydraulic rock hammer) to the extent practicable for removal of bedrock. Should blasting be required in order to properly prepare the site for construction, all applicable State and local regulations will be followed.

Following completion of construction, the site will be stabilized with re-establishment of vegetative cover to prevent erosion and sedimentation on the project site. The re-vegetation of the construction workspace will be done in accordance with Part D. of the 2003 FERC Plan. Additionally, consultation with the local field office of the NRCS has been initiated to obtain recommended seed mixes, application rates, and planting dates, though no response has been received to date. As the landowner of the property, Iroquois may opt to use variations of these seed mixes to re-establish ground cover.

7.4 MITIGATION

7.4.1 Pipeline Facilities

Iroquois will construct the project in accordance with the FERC 2003 Plan and Procedures. Iroquois has also consulted with the NRCS of New York (Salon 2007) and NYSDAM (Brower 2007) to determine the optimal seed mixture for stabilizing and re-vegetating the construction workspace after the facilities have been installed. Copies of all project correspondence and seed mix recommendations by the NRCS in New York and NYSDAM are available in Volume II – Appendix B. Consultation with the local field office of the NRCS has been initiated to obtain recommended seed mixes, application rates, and planting dates, though no response has been received to date.

Iroquois has reviewed the 2003 FERC Plan and Procedures with the applicable state and local erosion and sediment control guidelines and regulations to identify potential differences. The applicable guidelines for the Boonville and Wright Loop segments in New York include the NYSDEC Standards and Specifications for Erosion and Sediment Control (2005) and the NYSDAM Agricultural Mitigation handbook for Pipeline Right-of-Way Construction Projects (1997). Table 7.4-1 provides a summary of the three guidance documents as well as the rationale regarding any potential deviation from the NYSDEC Standards or NYSDAM handbook. The majority of the proposed deviations are based upon the linear nature of pipeline construction and where the FERC Plan and Procedures are more specific or more restrictive than the NYSDEC/NYSDAM standards.

TABLE 7.4-1

COMPARISON OF FERC PLAN AND PROCEDURES WITH NEW YORK STATE GUIDANCE DOCUMENTS BOONVILLE & WRIGHT LOOP SEGMENTS

Topic	FERC Guidelines	NYS Guidelines	Rationale for Variance from NYS Guidelines
Environmental Inspection	One per construction spread (Section I)	No Requirements	Not Applicable
Agricultural and Soil Conservation Inspection	No Requirement	One for all phases of construction (Section 2.1)	Not Applicable
Topsoil Segregation	Within wetlands, agricultural fields, residential areas (Section IV. B.)	- Within all work areas in agricultural lands (Section 3.2) - Conserve topsoil where possible through stockpiling (Page 3.27)	Topsoil segregation will follow FERC Plan as it is more stringent than NYS Guidelines
Temporary Slope Breakers	Spacing 5-15% slope 300 feet >15 to 30% 200 feet >30% 100 feet (Section IV. F. 1.)	Spacing <5% slope 125 feet 5 to 10% 100 feet 10 to 20% 75 feet 20 to 35% 50 feet >35% 25 feet (Page 5A.9)	Not Applicable; More stringent NYS spacing required
Mulch Application	- Apply on all slopes except within wetlands at rate of two tons per acre using straw or wood chips - Use of hydromulch not allowed within 100 feet of wetlands or waterbodies (Section IV. F. 3.)	- Application rate of two tons per acre for straw - Many other materials acceptable for use as mulch - No restrictions on hydromulch within proximity to wetlands or waterbodies (Page 3.3)	FERC guidelines are consistent with NYS guidelines
Trench Breakers	- Same spacing and upslope of permanent slope breakers - Install at base of slopes greater than 5% within 50 feet of a wetland (Section V.B.1.)	Spacing <5% slope 150 feet 5 to 10% 100 feet 10 to 15% 80 feet 15 to 20% 70 feet 20 to 30% 50 feet 30 to 40% 40 feet 40 to 100% 25 feet (Page Sample A-12)	Not Applicable; More stringent NYS spacing required

TABLE 7.4-1

COMPARISON OF FERC PLAN AND PROCEDURES WITH NEW YORK STATE GUIDANCE DOCUMENTS BOONVILLE & WRIGHT LOOP SEGMENTS

Topic	FERC Guidelines	NYS Guidelines	Rationale for Variance from NYS Guidelines
Soil Decompaction	- Plow areas of severe compaction with a paraplow or similar deep-tillage device (Section 5.C)	For Agricultural Areas: - Deep shattering of soil profile with deep, angled-leg subsoiler tool (Section 4.2.1) All Other Areas: - Chiseling or disking to a minimum depth of 12" (Page 3.5)	FERC guidelines are consistent with NY guidelines
Revegetation	Prepare a seedbed to depth of 3 to 4 inches (Section 5.D.3.a.)	- Scarify if compacted - Remove debris and obstacles such as rocks and stumps (Page 3.3)	Seedbed preparation will follow FERC Plan as it is more specific than NY Guidelines
Revegetation	Seed disturbed areas in accordance with written recommendations from local soil conservation authority (Section 5.D.3.b)	- Recommended seed mixes vary based upon site specific conditions - General erosion control mix consists of Creeping Red Fescue, Tall Fescue, Perennial Ryegrass, and Birdsfoot Trefoil (Page 3.7)	NRCS consultation recommends seed mix similar to that of the NY Guidelines – includes Indiangrass rather than Coastal Panicgrass and Sand Lovegrass
Lime / Fertilizer	In accordance with NRCS recommendations (Section 5.D.2.)	- Surface material limed to pH of 6.0 in top 3 inches of soil - Fertilizer applied per soil test to achieve moderate levels of phosphorous and potassium - 30 pounds per acre of nitrogen application required. (Page 3.37) - 600 pounds per acre of 5-10-10 or equivalent commercial fertilizer (Page 3.5)	- Iroquois shall follow NRCS recommendations as they are more site specific than the general NYS Guidelines - Recommend lime to pH range of 6.2 to 6.5 - Apply minimum of 20 lbs/acre of nitrogen and 40 lbs/acre of potassium and phosphorous

TABLE 7.4-1

COMPARISON OF FERC PLAN AND PROCEDURES WITH NEW YORK STATE GUIDANCE DOCUMENTS BOONVILLE & WRIGHT LOOP SEGMENTS

Topic	FERC Guidelines	NYS Guidelines	Rationale for Variance from NYS Guidelines
Revegetation, Monitoring and Maintenance			
Soil Exposure Restrictions	None	- Staged clearing and grading is necessary to keep areas of disturbance to less than 5 acres (Page 2.1)	Due to the linear and sequential nature of pipeline construction, compliance with this guideline is not feasible.
Vegetative Protection	None	Where protection of trees and/or other vegetation is required, the location of the site to be protected should be shown on the erosion control plan. (Page 3.37)	Iroquois typically works directly with individual landowners relative to specific vegetation protection and provides details in the field or on the site-specific plans if necessary.
Drainage Control	None	Accumulated sediment should be removed when 50% of the storage capacity of the sediment retention structure is filled with sediment. (Page 5A.53)	Typically stormwater drainage will be maintained on-site. Existing drainage structures will be protected, and no untreated stormwater will be discharged directly to a wetland or waterbody.
Timing	Complete final grading, topsoil replacement, and placement of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). (Plan Section V.A.1)	All sites should be seeded and stabilized with erosion control materials as soon as possible after final grading. Exposure of bare soils should not exceed 14 days before temporary or permanent seeding/stabilization (Page 2.3)	Due to linear nature of construction activity and need for equipment movement along the alignment, Iroquois shall adhere to the FERC Guideline.
Timing	Remove temporary sediment barriers when replaced by permanent erosion control measures or when revegetation is successful. (Plan Section V. A. 7.)	Temporary sediment trapping devices shall not be removed until permanent stabilization is established in all contributory drainage areas (Page 2.3)	Due to linear nature of construction activity and need for equipment movement along the alignment, Iroquois shall adhere to the FERC Guideline.

Applicable erosion control regulations and guidelines governing the Newtown Loop segment in Connecticut include The Erosion and Sediment Control Act (Section 22a-325 through 22a-329 Connecticut General Statutes) Public Act 83-388 and the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. These guidelines were reviewed and compared to the FERC Plan and Procedures in order to identify potential differences. Table 7.4-2 provides a summary of the two guidance documents as well as the rationale regarding any potential deviation from the Connecticut guidelines.

TABLE 7.4-2

COMPARISON OF FERC PLAN AND PROCEDURES WITH 2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL NEWTOWN LOOP SEGMENT

Topic	FERC Guidelines	CT Guidelines	Rationale for Variance from CT Guidelines
Environmental Inspection	One per construction spread (Section I)	At least one per project	FERC guidelines are consistent with CT guidelines
Topsoil Segregation	Within wetlands, agricultural fields, residential areas (Section IV. B.)	Within the immediate construction area of sufficient volume to re-topsoil disturbed area to ≥4 inches	Not Applicable; More stringent CT guidelines will be observed
Temporary Slope Breakers	Spacing 5-15% slope 300 feet >15 to 30% 200 feet >30% 100 feet (Section IV. F. 1.)	None	More stringent FERC Guidelines will be observed

TABLE 7.4-2

COMPARISON OF FERC PLAN AND PROCEDURES WITH 2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL NEWTOWN LOOP SEGMENT

Topic	FERC Guidelines	CT Guidelines	Rationale for Variance from CT Guidelines
Mulch Application	- Apply on all slopes except within wetlands at rate of two tons per acre using straw or wood chips - Use of hydromulch not allowed within 100 feet of wetlands or waterbodies (Section IV. F. 3.)	- Application rate of two tons per acre for hay or straw to achieve 80%-95% coverage during recommended seeding dates (95%-100% coverage outside seeding dates) - Wood chips not recommended - Many other materials acceptable for use as mulch (cellulose fiber, corn stalks, tackifiers, nettings, temp. erosion control blanket) - No restrictions on hydromulch within proximity to wetlands or waterbodies (Page 5-4-3 to 5-4-7)	FERC guidelines are consistent with CT guidelines; Woodchips not recommended
Trench Breakers	- Same spacing and upslope of permanent slope breakers - Install at base of slopes greater than 5% within 50 feet of a wetland (Section V.B.1.)	None	More stringent FERC Guidelines will be observed
Soil Decompaction	- Plow areas of severe compaction with a paraplow or similar deep-tillage device (Section 5.C)	None	More stringent FERC Guidelines will be observed
Revegetation	Prepare a seedbed to depth of 3 to 4 inches (Section 5.D.3.a.)	Prepare a seedbed to depth of 3 to 4 inches (Page 5-3-2)	FERC guidelines are consistent with CT guidelines

TABLE 7.4-2

COMPARISON OF FERC PLAN AND PROCEDURES WITH 2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL NEWTOWN LOOP SEGMENT

Topic	FERC Guidelines	CT Guidelines	Rationale for Variance from CT Guidelines
Revegetation	Seed disturbed areas in accordance with written recommendations from local soil conservation authority (Section 5.D.3.b)	Follow NRCS recommendations or use general seed mixtures for permanent seeding included in CT Guidelines for Sediment and Erosion Control handbook (Page 5-3-6)	NRCS consultation recommends seed mix similar to that of the CT Guidelines – includes Indiangrass rather than Coastal Panicgrass and Sand Lovegrass
Lime / Fertilizer	In accordance with NRCS recommendations (Section 5.D.2.)	- Apply ground limestone and fertilizer according to soil tests conducted by reliable soil testing lab (Optimal pH of 6.2-7.0) - 300 lbs/Acre 10-10-10 fertilizer or equivalent - 8,000 lbs/Acre lime to achieve $6.2 \leq pH \leq 7.0$ (Page 5-3-6)	- Iroquois shall follow NRCS recommendations as they are more site specific than the general CT Guidelines
Revegetation, Monitoring and Maintenance			
Soil Exposure Restrictions	None	Project phasing and sequencing should be implemented so as to limit the amount of disturbed land area (Page 3-7)	Due to the linear and sequential nature of pipeline construction, compliance with this guideline is not feasible.
Vegetative Protection	None	Where protection of trees and/or other vegetation is required, the location of the site to be protected should be shown on the erosion control plan. (Page 5-1-4.)	Iroquois typically works directly with individual landowners relative to specific vegetation protection and provides details in the field or on the site-specific plans if necessary.

TABLE 7.4-2

COMPARISON OF FERC PLAN AND PROCEDURES WITH 2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL NEWTOWN LOOP SEGMENT

Topic	FERC Guidelines	CT Guidelines	Rationale for Variance from CT Guidelines
Drainage Control	None	Accumulated sediment should be removed when sediment interferes with the needed detention capacity or operation of the outlet control structure (Page 5-9-13)	Typically stormwater drainage will be maintained on-site. Existing drainage structures will be protected, and no untreated stormwater will be discharged directly to a wetland or waterbody.
Timing	Complete final grading, topsoil replacement, and placement of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). (Plan Section V.A.1)	All sites should be seeded and stabilized with erosion control materials within 7 days of final grading. (Page 5-3-6)	Due to linear nature of construction activity and need for equipment movement along the alignment, Iroquois shall adhere to the FERC Guideline.
Timing	Remove temporary sediment barriers when replaced by permanent erosion control measures or when revegetation is successful. (Plan Section V. A. 7.)	Remove temporary sediment trapping devices following establishment of permanent stabilization in all contributory drainage areas. (Section 5-11)	FERC guidelines are consistent with CT guidelines

7.4.2 Aboveground Facilities

7.4.2.1 Milford Compressor Station

To minimize off-site movement of sediments during construction, Iroquois will adhere to erosion control, dewatering, site stabilization, and re-vegetation standards set forth in the FERC 2003 Plan and Procedures and the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. Requirements of the FERC Plan that pertain specifically to residential and agricultural lands, such as soil compaction and drainage tiles, are not applicable to this project.

Iroquois plans to strip suitable topsoil from the proposed building areas and stockpile it separately from other spoil within the construction workspace areas for use in the final grading of lawn areas within the stations' fencing. The contractor will be required to install erosion control barriers, as appropriate, to prevent stockpiled material from migrating out of the construction workspace and into off-site wetland areas. If the amount of suitable topsoil on-site is insufficient for post-construction restoration needs of the project site, topsoil may need to be brought in from off-site sources in order to supplement original stockpiles. The re-vegetation of the construction workspace will be done in accordance with Part D of the 2003 FERC Plan.

Iroquois anticipates that a portion of the site will be seeded in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control using a seed mixture that includes cool-season, warm-season and perennial grass seeds. The cool-season grasses are Kentucky bluegrass (*Poa pratensis*), creeping red fescue (*Festuca rubra*), and perennial ryegrass (*Lolium perenne*). Clover (*Trifolium spp*.) is the suggested warm-season grass. The perennial warm-season grasses are indiangrass (*Sorghastrum nutans*), little bluestem (*Andropogon scoparium*), and switchgrass (*Panicum virgatum*). The warm-season grasses produce well when compared to cool-season grasses during the hot and dry weather of July and August, and successfully tolerate well-drained soil conditions. Consultation with the local field office of the NRCS has been initiated to obtain recommended seed mixes, application rates, and planting dates, though no response has been received to date. As the landowner of the property, Iroquois may opt to use variations of these seed mixes to re-establish ground cover.

7.4.2.2 Brookfield Compressor Station

To minimize off-site movement of sediments during construction, Iroquois will adhere to erosion control, dewatering, site stabilization, and revegetation standards set forth in the FERC 2003 Plan and Procedures and the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. Requirements of the FERC Plan that pertain specifically to residential and agricultural lands, such as soil compaction and drainage tiles, are not applicable to this project.

Iroquois plans to strip suitable topsoil from the proposed building areas and stockpile it separately from other spoil within the construction workspace areas for use in the final grading of lawn areas within the stations' fencing. The contractor will be required to install erosion control barriers, as appropriate, to prevent stockpiled material from migrating out of the construction workspace and into off-site wetland areas. The amount of suitable topsoil may be limited due to the site's previous use for sand and gravel, and may need to be supplemented with topsoil brought in from off-site sources.

The re-vegetation of the construction workspace will be done in accordance with Part D of the 2003 FERC Plan. Consultation with the local field office of the NRCS has been initiated to obtain recommended seed mixes, application rates, and planting dates, though no response has been received to date. As the landowner of the property, Iroquois may opt to use variations of these seed mixes to reestablish ground cover.

7.5 REFERENCES

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