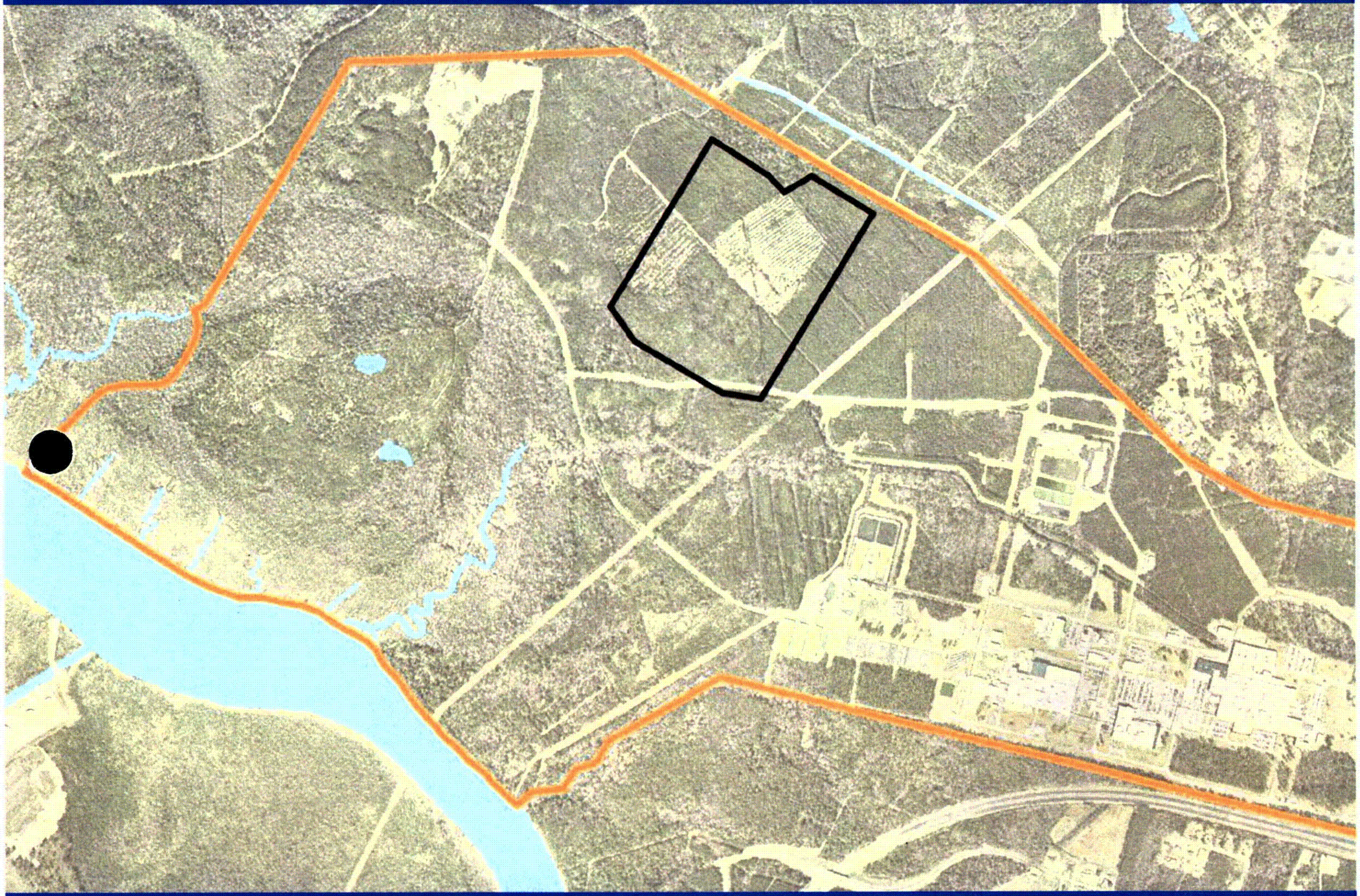
Environmental Report for the GLE Commercial Facility

Volume II: Appendices

Revision 0



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PREPARED FOR:

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Volume II – Appendices

Figure Number	Name of Map Data Layer	Reference
Executive Summary		
ES-1	Cities	ESRI, 2006b.
ES-1	Airport	FAA, 2007a.
ES-1	Railroads	USGS, 1998.
ES-1	Interstate	Tele Atlas North America and Geographic Data Technology, 2006c.
ES-1	Highway	Tele Atlas North America and Geographic Data Technology, 2006a.
ES-1	Major Road	Tele Atlas North America and Geographic Data Technology, 2006a.
ES-1	Local Road	Tele Atlas North America and Geographic Data Technology, 2006a.
ES-1	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
ES-1	Surface Water	ESRI, 2005b.
Chapter 1		
1-1	Wilmington International Airport	FAA, 2007c.
1-1	City or Town	ESRI, 2006a.
1-1	Surface Water	National Atlas of the United States, 2006c.
1-1	Interstate	Tele Atlas North America, 2006c.
1-1	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
1-1	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
1-2	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
1-2	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
1-3	Major road or highway	New Hanover County Department of Information Technology, 2005b.
1-3	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
1-3	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
1-3	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
1-4	Castle Hayne Quadrangle	USGS, 2007a.
1-5	N/A	Neff, 2006b.
1-6	N/A	Schwartz and Meade, 2006.
1-9	N/A	Lohrey, 2006.
1-12	N/A	Mikerin, 2006.

Figure Number	Name of Map Data Layer	Reference
1-13	N/A	Cornell, 2006.
1-14	N/A	Harding, 2007.
1-15	N/A	EIA, 2007.
Chapter 2		
2.1-1	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
2.1-1	Major Road or Highway	New Hanover County Department of Information Technology, 2005b.
2.1-1	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
2.2-2	State Boundaries	Tele Atlas North America, 2007d.
2.2-3	Peak Acceleration	USGS, 2005d.
2.2-4	Quaternary Faults	USGS, 2005c.
2.2-4	Fault Areas	USGS, 2005c.
Chapter 3		
3.1-1	Airport	FAA, 2007a.
3.1-1	City or Town	National Atlas of the United States, 2004.
3.1-1	Military Terminal	NC CGIA, 2003.
3.1-1	Universities - Public	NCDOA, 2003.
3.1-1	State Park	NCDOA, 2007.
3.1-1	Seaport	New Hanover County Department of Information Technology, 2005c.
3.1-1	Interstate	Tele Atlas North America, 2006d.
3.1-1	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.1-2	N/A	U.S. Census Bureau, 2000e; NC OSBM, 2006a.
3.1-3	N/A	U.S. Census Bureau, 2000e; NC OSBM, 2006a.
3.1-4	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.1-4	CDPs (Population > 5,000)	U.S. Census Bureau, 2000c.
3.1-5	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.1-5	CDPs (Population > 1,000)	U.S. Census Bureau, 2000b.
3.1-6	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.1-6	CDPs (Population > 5,000)	U.S. Census Bureau, 2000c.
3.1-7	N/A	City of Wilmington and New Hanover County, 2006.
3.1-8	N/A	City of Wilmington, 2004.
3.1-9	N/A	Brunswick County, 2006.

Figure Number	Name of Map Data Layer	Reference
3.1-10	N/A	Pender County, 2006.
3.1-11	Historic Site	NC DOA, 2007.
3.1-11	Paddling Trail	NCDENR, 2001.
3.1-11	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.1-11	Historic Site	National Register of Historic Places, 2008b.
3.1-11	Conservation and Recreation Areas	Conservation Biology Institute, 2005.
3.1-12	Historic Site	National Register of Historic Places, 2008a.
3.1-12	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.1-12	Military/Federal Reservation	NC CGIA, 2006.
3.1-12	Historic Site	National Register of Historic Places, 2008c.
3.1-12	Conservation and Recreation Areas	Conservation Biology Institute, 2005.
3.1-13	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.1-13	Military/Federal Reservation	NC CGIA, 2006.
3.1-13	Historic Site	National Register of Historic Places, 2008c.
3.1-13	Conservation and Recreation Areas	Conservation Biology Institute, 2005.
3.1-14	Active Mines and Mineral Processing Plants	USGS, 2005a.
3.1-14	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.1-15	Landfills	EPA Landfill Methane Outreach Program, 2004.
3.1-15	Point of Interest	New Hanover Correctional Center, 2007.
3.1-15	Park	New Hanover County Department of Information Technology, 2005c.
3.1-15	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.1-15	Swamp/Marsh	USGS, 2004a.
3.1-15	Water	USGS, 2004c.
3.1-15	School	USGS, 2007g.
3.1-16	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.1-16	Population 2000	U.S. Census Bureau, 2000d.
3.2-1	Water	ESRI, 2005b.
3.2-1	Airport	FAA, 2007a.
3.2-1	Seaport	New Hanover County Department of Information Technology, 2005c.
3.2-1	Primary Road	New Hanover County Department of Information Technology, 2005d.

Figure Number	Name of Map Data Layer	Reference
3.2-1	Interstate	New Hanover County Department of Information Technology, 2005b.
3.2-1	Railroads	USGS, 1998.
3.2-1	City or Town	USGS, 2007d.
3.2-1	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.2-1	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.2-2	Highway	Tele Atlas North America and Geographic Data Technology, 2006a.
3.2-2	Interstate	Tele Atlas North America and Geographic Data Technology, 2006c.
3.2-2	Local Road	Tele Atlas North America and Geographic Data Technology, 2006d.
3.2-2	Major Road	Tele Atlas North America and Geographic Data Technology, 2006e.
3.2-3	Water	ESRI, 2005b.
3.2-3	Airport	FAA, 2007a.
3.2-3	Seaport	New Hanover County Department of Information Technology, 2005c.
3.2-3	Primary Road	New Hanover County Department of Information Technology, 2005d.
3.2-3	Railroads	USGS, 1998.
3.2-3	City or Town	USGS, 2007d.
3.2-3	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.2-3	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.2-4	Water	ESRI, 2005b.
3.2-4	Airport	FAA, 2007a.
3.2-4	Primary Road	New Hanover County Department of Information Technology, 2005d.
3.2-4	Railroads	USGS, 1998.
3.2-4	Interstate	Tele Atlas North America and Geographic Data Technology, 2006c.
3.2-4	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.2-4	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.2-4	City or Town	USGS, 2007d.
3.2-5	Military Terminal	NC CGIA, 2003.

Figure Number	Name of Map Data Layer	Reference
3.2-5	Seaport	New Hanover County Department of Information Technology, 2005c.
3.2-5	Interstate	New Hanover County Department of Information Technology, 2005b.
3.2-5	Railroads	USGS, 1998.
3.2-5	City or Town	USGS, 2007d.
3.2-5	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.2-5	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.2-6	Airport/Heliport	FAA, 2007b.
3.2-6	Wilmington International Airport	FAA, 2007c.
3.2-6	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.2-6	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.2-6	Interstate	New Hanover County Department of Information Technology, 2005b.
3.2-6	City or Town	USGS, 2007d.
3.2-7	Traffic Count Locations	NC DOT, 2006.
3.2-7	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.2-7	Road	New Hanover County Department of Information Technology, 2005d.
3.2-7	Interstate	New Hanover County Department of Information Technology, 2005b.
3.2-7	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.2-9	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.2-9	Roads	New Hanover County Department of Information Technology, 2005d.
3.2-9	Interstate	New Hanover County Department of Information Technology, 2005b.
3.2-9	Proposed Route	New Hanover County Department of Information Technology, 2005a.
3.2-9	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.2-9	Surface Water	USGS, 2005e.
3.2-9	Swamp/Marsh	USGS, 2005e.
3.3-1	Elevation	NOAA, 2006.
3.3-1	Surface Water	New Hanover County Department of Information Technology, 2002.

Figure Number	Name of Map Data Layer	Reference
3.3-1	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-1	Road	New Hanover County Department of Information Technology, 2005d.
3.3-1	Building or Structure	New Hanover County Department of Information Technology, 2007.
3.3-2	Physiographic Provinces	Fenneman and Johnson, 1946.
3.3-2	Mid-Atlantic Coastal Plain	USGS, 2005b
3.3-2	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-3	NC Physiography	NCGS, 2008.
3.3-3	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-4	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-4	Fall Zone	Rogers, 1990.
3.3-5	Major Rivers	NC CGIA, 2006.
3.3-5	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-5	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005a.
3.3-5	Wetlands	U.S. FWS, 1999.
3.3-6	N/A	Beyer, 1991
3.3-7	N/A	Ator et al., 2005.
3.3-8	N/A	Richards, 1950.
3.3-9	Geologic Formations	NCGS, 1998.
3.3-9	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-10	Mid-Atlantic Coastal Plain	USGS, 2005b.
3.3-10	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-10	Structural Arches and Embayments	Ator et al., 2005
3.3-10	Chesapeake Impact Crater	Ator et al., 2005
3.3-11	N/A	Baldwin et al., 2004.
3.3-12	Carbonate-Bearing Rock Formations	NCGS, 1998
3.3-12	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-13	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-13	Status of Facility	USGS, 2005a.
3.3-13	County Boundary	Tele Atlas North America, 2007c.

Figure Number	Name of Map Data Layer	Reference
3.3-14	Radon Zones	U.S. EPA, 2007a.
3.3-15	Lakes	National Atlas of the United States, 2006a.
3.3-15	Rivers	National Atlas of the United States, 2006b.
3.3-15	Cape Fear River Basin Boundary	NRCS, 1998a.
3.3-15	Counties	Tele Atlas North America and Geographic Data Technology, 2005b.
3.3-15	City or Town	ESRI, 2006a.
3.3-16	N/A	Fine and Cunningham, 2001.
3.3-17	N/A	Ator et al., 2005
3.3-18	Major Rivers	NC CGIA, 2006.
3.3-18	Mid-Atlantic Coastal Plain	USGS, 2005b
3.3-18	Structural Arches and Embayments	Ator et al., 2005
3.3-18	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-19	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-19	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.3-20	Surface Water	New Hanover County Department of Information Technology, 2002.
3.3-20	Cross-section Line	Alexander and Wallace, 1980.
3.3-21	Surface Water	New Hanover County Department of Information Technology, 2002.
3.3-21	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-21	Road	New Hanover County Department of Information Technology, 2005d.
3.3-21	Building or Structure	New Hanover County Department of Information Technology, 2007.
3.3-21	Surface Water	New Hanover County Department of Information Technology, 2002.
3.3-22	Surface Water	New Hanover County Department of Information Technology, 2002.
3.3-22	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-22	Road	New Hanover County Department of Information Technology, 2005d.
3.3-22	Building or Structure	New Hanover County Department of Information Technology, 2007.
3.3-23	Streams	New Hanover County Department of Information Technology, 2002.

Figure Number	Name of Map Data Layer	Reference
3.3-23	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
3.3-23	Surface Water	New Hanover County Department of Information Technology, 2002.
3.3-23	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-23	Soil Associations	NRCS, 2006b.
3.3-23	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.3-24	Surface Water	New Hanover County Department of Information Technology, 2002.
3.3-24	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-24	Soil Types	NRCS, 2006a.
3.3-25	Wilmington Site Boundary	New Hanover County Department of Information Technology, 2005c.
3.3-25	Castle Hayne Quadrangle	USGS, 2007a.
3.3-30	Earthquake Epicenter	SEUSSN, 2008.
3.3-30	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-30	Elevation	NOAA, 2001.
3.3-30	Faults	North Carolina: Lawrence and Hoffman, 1993. NCGS, 1998. Virginia: Bailey, 2000. South Carolina: Maybin et al., 1998.
3.3-30	State Boundary	Tele Atlas North America and Geographic Data Technology, 2005e.
3.3-31	N/A	SEUSSN, 2008.
3.3-32	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-32	Approximate Earthquake Epicenter and Year	SEUSSN, 2008.

Figure Number	Name of Map Data Layer	Reference
3.3-32	Faults	North Carolina: Lawrence and Hoffman, 1993. NCGS, 1998. Virginia faults: Bailey, 2000. South Carolina: Maybin et al., 1998.
3.3-32	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.3-35	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.3-35	Earthquake Epicenter	SEUSSN, 2008.
3.3-35	Faults	North Carolina: Lawrence and Hoffman, 1993. NCGS, 1998. Virginia faults: Bailey, 2000. South Carolina: Maybin et al., 1998.
3.3-35	State Boundary	Tele Atlas North America and Geographic Data Technology, 2005e.
3.3-35	Rock Seismic Amplitude	USGS, 2007f.
3.4-1	N/A	Lautier, 1998.
3.4-2	Castle Hayne Aquifer Extent	NCDENR, 2007b.
3.4-2	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-2	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.4-3	Peedee Aquifer Extent	NCDENR, 2007e.
3.4-3	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-3	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.4-4	Black Creek Aquifer Extent	NCDENR, 2007a.
3.4-4	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-4	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.4-5	Upper Cape Fear Aquifer Extent	NCDENR, 2007f.
3.4-5	Wilmington Site	New Hanover County Department of Information Technology, 2005c.

Figure Number	Name of Map Data Layer	Reference
3.4-5	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.4-6	Lower Cape Fear Aquifer Extent	NCDENR, 2007c.
3.4-6	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-6	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.4-7	Surface Water	New Hanover County Department of Information Technology, 2002.
3.4-7	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-7	Building or Structure	New Hanover County Department of Information Technology, 2007.
3.4-7	Road	New Hanover County Department of Information Technology, 2005d.
3.4-7	Swampy Area	USGS, 2001.
3.4-9	N/A	Bain, 1970.
3.4-10	Western Extent of Semiconfing Unit	Bain, 1970.
3.4-10	Surface Water	New Hanover County Department of Information Technology, 2002.
3.4-10	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-10	Building	New Hanover County Department of Information Technology, 2007.
3.4-10	Swampy Area	USGS, 2001.
3.4-10	Roads	New Hanover County Department of Information Technology, 2005d.
3.4-12	Surface Water	New Hanover County Department of Information Technology, 2002.
3.4-12	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-12	Roads	New Hanover County Department of Information Technology, 2005d.
3.4-12	Building or Structure	New Hanover County Department of Information Technology, 2007.
3.4-13	Surface Water	New Hanover County Department of Information Technology, 2002.
3.4-13	Public Water Supply Water Sources	NC DENR, 2006.
3.4-13	Roads	New Hanover County Department of Information Technology, 2005d.
3.4-13	Wilmington Site	New Hanover County Department of Information Technology, 2005c.

Figure Number	Name of Map Data Layer	Reference
3.4-13	Building or Structure	New Hanover County Department of Information Technology, 2007.
3.4-13	Simulated Principal Aquifer Levels	RTI, 2002.
3.4-13	Swampy Area	USGS, 2001.
3.4-14	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.4-14	Surface Water	New Hanover County Department of Information Technology, 2002.
3.4-14	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-14	Swampy Area	USGS, 2001.
3.4-15	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.4-15	Surface Water	New Hanover County Department of Information Technology, 2002.
3.4-15	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-15	Swampy Area	USGS, 2001.
3.4-16	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.4-16	Surface Water	New Hanover County Department of Information Technology, 2002.
3.4-16	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-16	Swampy Area	USGS, 2001.
3.4-17	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.4-17	Surface Water	New Hanover County Department of Information Technology, 2002.
3.4-17	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-17	Swampy Area	USGS, 2001.
3.4-18	Rivers and Streams	ESRI, 2005a.
3.4-18	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-18	Northeast Cape Fear River Sub-basin	NRCS, 1998b.
3.4-18	Cape Fear River Basin	NRCS, 1998b.
3.4-18	Cape Fear River Sub-basin	NRCS, 1998b.
3.4-18	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.4-18	USGS Stream Gage	USGS, 2004b.

Figure Number	Name of Map Data Layer	Reference
3.4-19	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.4-19	Streams	New Hanover County Department of Information Technology, 2002.
3.4-19	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-20	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-20	Northeast Cape Fear River Sub-basin	NRCS, 1998b.
3.4-20	Cape Fear River Basin	NRCS, 1998b.
3.4-20	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.4-20	Highway	Tele Atlas North America, 2006b.
3.4-20	Interstate	Tele Atlas North America, 2006c.
3.4-20	Major Road	Tele Atlas North America, 2006e.
3.4-20	Rivers and Streams	ESRI, 2005a.
3.4-20	NCDENR DWQ Monitoring Stations	U.S. EPA, 2007b.
3.4-21	Major (>1 MGD) NPDES-permitted Discharges	NCDENR, 2006a.
3.4-21	Minor (<1 MGD) NPDES-permitted Discharges	NCDENR, 2006a.
3.4-21	Rivers of Interest	ESRI, 2005a.
3.4-21	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-21	Cape Fear River Basin	NRCS, 1998b.
3.4-21	Cape Fear River Sub-basin	NRCS, 1998b.
3.4-21	Northeast Cape Fear River Sub-basin	NRCS, 1998b.
3.4-21	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.4-21	Highway	Tele Atlas North America, 2006b.
3.4-21	Interstate	Tele Atlas North America, 2006d.
3.4-22	Surface Water	New Hanover County Department of Information Technology, 2002.
3.4-22	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-22	Road	New Hanover County Department of Information Technology, 2005d.
3.4-22	Building or Structure	New Hanover County Department of Information Technology, 2007.
3.4-24	Streams and Channels	NCDENR, 2006b.
3.4-24	Wilmington Site	New Hanover County Department of Information Technology, 2005c.

Figure Number	Name of Map Data Layer	Reference
3.4-25	100-year Floodplain	NC Floodplain Mapping Program, 2007a.
3.4-25	500-year Floodplain	NC Floodplain Mapping Program, 2007b.
3.4-25	Surface Water	New Hanover County Department of Information Technology, 2002.
3.4-25	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-25	Elevation Ranges	USGS, 2001.
3.4-26	Wetlands	U.S. FWS, 1999.
3.4-26	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.4-26	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-27	Peedee Aquifer Boundary	NCDENR, 2007e.
3.4-27	Peedee Fresh/Salt Transition Zone	NCDENR, 2007e.
3.4-27	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-27	Well Measurements	Wilson, 2007.
3.4-27	March 2007 Piezometric Surface	Wilson, 2007.
3.4-28	Peedee Aquifer Boundary	NCDENR, 2007e.
3.4-28	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-28	Well Measurements	Wilson, 2007.
3.4-28	Feb 2007 Piezometric Surface	Wilson, 2007.
3.4-29	Peedee Aquifer Boundary	NCDENR, 2007e.
3.4-29	Peedee Fresh/Salt Transition Zone	NCDENR, 2007e.
3.4-29	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.4-29	Elev. Decrease Rate (ft/yr)	Wilson, 2007.
3.5-1	Rivers or Streams	
3.5-1	Wilmington Site	Bailey, C.M. 2000. Major faults & high-strain zones in Virginia. In Teaching Resources: The Geology of Virginia. College of William and Mary, Department of Geology, Williamsburg, VA. Available at http://www.wm.edu/geology/virginia/provinces/pdf/va_faults.pdf.
3.5-1	Highway	Tele Atlas North America, 2006a.
3.5-1	Interstate	Tele Atlas North America, 2006d.
3.5-2	Primary Nursery Areas	NC Division of Marine Fisheries, 2007.
3.5-2	100-year Floodplain	NC Floodplain Mapping Program, 2007a.
3.5-2	500-year Floodplain	NC Floodplain Mapping Program, 2007b.

Figure Number	Name of Map Data Layer	Reference
3.5-2	Rare Natural Community	NCDENR, 2007d.
3.5-2	Rare Vascular Plant	NCDENR, 2007d.
3.5-2	Rare Vertebrate Animal	NCDENR, 2007d.
3.5-2	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.5-2	Unstable Soils (Site Only)	NRCS, 2006a.
3.5-2	Drained NWI Wetlands	U.S. FWS, 1999.
3.5-2	NWI Wetlands	U.S. FWS, 1999.
3.5-2	Steep Slopes (>10%)	USGS, 2001.
3.5-3	Rivers or Streams	National Atlas of the United States, 2005b.
3.5-3	Rare Nonvascular Plant	NCDENR, 2007d.
3.5-3	Rare Vascular Plant	NCDENR, 2007d.
3.5-3	Rare Vertebrate Animal	NCDENR, 2007d.
3.5-3	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.5-3	Highway	Tele Atlas North America, 2006a.
3.5-3	Interstate	Tele Atlas North America, 2006d.
3.6-1	Average Temperature (Celsius)	NOAA, 1996.
3.6-2	Maximum Temperature (Celsius)	NOAA, 1996.
3.6-2	Minimum Temperature (Celsius)	NOAA, 1996.
3.6-3	N/A	NOAA, 2004a.
3.6-4	Precipitation (mm)	NOAA, 1996.
3.6-5	N/A	NOAA, 2004a.
3.6-6	N/A	NOAA, 2005b.
3.6-7	N/A	NOAA, 2005b.
3.6-8	N/A	NOAA, 2005b.
3.6-9	N/A	NOAA, 2005b.
3.6-10	N/A	NOAA, 2005b.
3.6-11	N/A	NOAA, 2005b.
3.6-12	N/A	NOAA, 2005b.
3.6-13	N/A	NOAA, 2005b.
3.6-14	N/A	NOAA, 2005b.
3.6-15	N/A	NOAA, 2005b.
3.6-16	N/A	NOAA, 2005b.
3.6-17	N/A	NOAA, 2005b.
3.6-18	N/A	NOAA, 2005b.
3.6-19	N/A	NOAA, 2005b.
3.6-20	N/A	NOAA, 2005b.

Figure Number	Name of Map Data Layer	Reference
3.6-21	N/A	NOAA, 2005b.
3.6-22	N/A	Holzworth, 1972.
3.6-23	N/A	Holzworth, 1972.
3.6-24	N/A	Holzworth, 1972.
3.6-25	N/A	Holzworth, 1972.
3.6-26	N/A	Holzworth, 1972.
3.6-27	N/A	Holzworth, 1972.
3.6-28	N/A	Holzworth, 1972.
3.6-29	N/A	Holzworth, 1972.
3.6-30	N/A	Holzworth, 1972.
3.6-31	N/A	Holzworth, 1972.
3.6-32	N/A	NOAA, 2000.
3.6-33	Tornadoes	NOAA, 2005.
3.6-33	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.6-33	Counties	Tele Atlas North America, 2007b.
3.6-34	Hurricane Categories	National Atlas of the United States, 2005a.
3.6-35	Storm Surge	NOAA, 1999.
3.6-35	County Boundary	Tele Atlas North America, 2007c.
3.6-36	Water	ESRI, 2005b.
3.6-36	NCDAQ Station	NC DAQ, 2007b.
3.6-36	NCDAQ Station	NC DAQ, 2007a.
3.6-36	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.6-37	State Boundary	Tele Atlas North America and Geographic Data Technology, 2005e.
3.6-37	County Boundary	Tele Atlas North America, 2007c.
3.6-37	Ozone Non-Attainment Areas	U.S. EPA, 2007c.
3.6-37	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.6-38	State Boundary	Tele Atlas North America and Geographic Data Technology, 2005e.
3.6-38	County Boundary	Tele Atlas North America, 2007c.
3.6-38	$PM_{2.5}$ Non-Attainment Areas	U.S. EPA, 2007c.
3.6-38	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.6-39	State Boundary	Tele Atlas North America and Geographic Data Technology, 2005e.
3.6-39	County Boundary	Tele Atlas North America, 2007c.
3.6-39	CO Maintenance Areas	U.S. EPA, 2007c.

Figure Number	Name of Map Data Layer	Reference
3.6-39	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.7-1	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.7-1	Streams	New Hanover County Department of Information Technology, 2002.
3.7-1	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.7-15	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.7-15	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.8-1	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.8-1	Castle Hayne Quadrangle	USGS, 2007a.
3.9-1	Visible Areas	NC DOT, 2007.
3.9-1	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.9-1	Roads	New Hanover County Department of Information Technology, 2007.
3.9-1	County Boundary	Tele Atlas North America, 2007c.
3.9-1	Incorporated City or Town	U.S. Census Bureau, 2000a.
3.9-1	Surface Water	USGS, 2005a.
3.9-1	Swamp/Marsh	USGS, 2005e.
3.9-9	Interstate	New Hanover County Department of Information Technology, 2005b.
3.9-9	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.9-9	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.9-9	Railroad	Tele Atlas North America and Geographic Data Technology, 2005d.
3.9-9	Secondary Road	Tele Atlas North America and Geographic Data Technology, 2006f.
3.9-9	Highway	Tele Atlas North America, 2006b.
3.9-9	Major Road	Tele Atlas North America, 2006e.
3.9-9	L.V. Sutton Electric Plant	U.S. EPA, 2008.
3.9-9	Surface Water	USGS, 2005e.
3.9-10	Natural Heritage Element	NCDENR, 2007d.
3.9-10	Significant Natural Heritage Areas	NCDENR, 2007d.
3.9-10	Swamp/Marsh	USGS, 2005e.

Figure Number	Name of Map Data Layer	Reference
3.9-10	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.9-10	County Boundary	Tele Atlas North America, 2007c.
3.9-10	Incorporated City or Town	U.S. Census Bureau, 2000a.
3.9-10	Surface Water	USGS, 2005a.
3.10-1	Population Centers	National Atlas of the United States, 2007.
3.10-2	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.10-2	Interstate	Tele Atlas North America, 2006d.
3.10-2	Highway	Tele Atlas North America, 2006a.
3.10-2	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.10-2	Percentage of Minorities	U.S. Census Bureau, 2007b.
3.10-3	Uninhabited Place	USGS, 2007h.
3.10-3	Populated Place	USGS, 2007e.
3.10-3	Schools	USGS, 2007g.
3.10-3	Church	USGS, 2007c.
3.10-3	Cemetery	USGS, 2007b.
3.10-3	Roads	Tele Atlas North America, 2006f.
3.10-4	Populated Place	USGS, 2007e.
3.10-4	Schools	USGS, 2007g.
3.10-4	Church	USGS, 2007c.
3.10-4	Cemetery	USGS, 2007b.
3.10-4	Roads	Tele Atlas North America, 2006f.
3.10-5	Populated Place	USGS, 2007e.
3.10-5	Church	USGS, 2007c.
3.10-5	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.10-5	Railroads	Tele Atlas North America and Geographic Data Technology, 2005d.
3.10-5	Interstate	Tele Atlas North America and Geographic Data Technology, 2006b.
3.10-5	Highway	Tele Atlas North America, 2006a.
3.10-5	Major Road	Tele Atlas North America, 2006a.
3.10-5	Secondary Road	Tele Atlas North America and Geographic Data Technology, 2006f.
3.10-5	Census Tract 011500, Census Block Group 1	Tele Atlas North America and Geographic Data Technology, 2007a.
3.10-5	Wilmington Site	New Hanover County Department of Information Technology, 2005c.

Figure Number	Name of Map Data Layer	Reference
3.10-6	Interstate	Tele Atlas North America, 2006d.
3.10-6	Highway	Tele Atlas North America, 2006a.
3.10-6	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.10-6	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.10-6	Percentage Living Below Poverty	U.S. Census Bureau, 2007a.
3.10-7	Population per Square Mile	Tele Atlas North America and Geographic Data Technology, 2005c.
3.10-7	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
3.10-7	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.10-7	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.10-8	Nursing Homes	Centers for Medicare and Medicaid Services, 2004.
3.10-8	Schools	ESRI, 2006c.
3.10-8	Fire Departments	ESRI Business Analyst, 2006a.
3.10-8	Hospitals	ESRI Business Analyst, 2006b.
3.10-8	Police Departments	ESRI Business Analyst, 2006c.
3.10-8	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.10-8	Urban Areas	U.S. Census Bureau, 2006.
3.11-1	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.11-1	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.11-2	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.11-2	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.11-3	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.11-3	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
3.12-1	NPDES Outfalls	NCDENR, 2006a.
3.12-1	Streams	New Hanover County Department of Information Technology, 2002.
3.12-1	Wilmington Site	New Hanover County Department of Information Technology, 2005c.
3.12-1	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.

Figure Number	Name of Map Data Layer	Reference
Chapter 4, Appendix R, Appendix S		
4.4-1	Streams	New Hanover County Department of Information Technology, 2002.
4.4-1	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.4-1	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
4.4-2	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.4-2	Streams	New Hanover County Department of Information Technology, 2002.
4.4-2	Castle Hayne Quadrangle	USGS, 2007a.
4.4-3	Streams	New Hanover County Department of Information Technology, 2002.
4.4-3	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.4-3	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
4.4-4	Streams	New Hanover County Department of Information Technology, 2002.
4.4-4	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.4-4	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006
4.4-5	Streams	New Hanover County Department of Information Technology, 2002.
4.4-5	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.4-5	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
4.4-6	Streams	New Hanover County Department of Information Technology, 2002.
4.4-6	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.4-6	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
4.4-7	Streams	New Hanover County Department of Information Technology, 2002.
4.4-7	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.4-7	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
4.4-8	Streams	New Hanover County Department of Information Technology, 2002.

Figure Number	Name of Map Data Layer	Reference
4.4-8	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.4-8	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
4.4-9	Simulated groundwater elevation (ft, msl)	Bain, 1970.
4.4-9	Western extent of semiconfining unit	Bain, 1970.
4.4-9	Roads	New Hanover County Department of Information Technology, 2005b.
4.4-9	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.4-9	Surface Water	New Hanover County Department of Information Technology, 2002.
4.4-9	Building or Structure	New Hanover County Department of Information Technology, 2007.
4.4-9	Swampy Area <6ft MSL	USGS, 2001.
4.4-10	Roads	New Hanover County Department of Information Technology, 2005b.
4.4-10	Western Extent of Semiconfining Unit	Bain, 1970.
4.4-10	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.4-10	Surface Water	New Hanover County Department of Information Technology, 2002.
4.4-10	Building or Structure	New Hanover County Department of Information Technology, 2007.
4.4-10	Swampy Area <6ft MSL	USGS, 2001.
4.4-11	Simulated Groundwater Elevation (ft, msl)	Bain, 1970.
4.4-11	Western Extent of Semiconfining Unit	Bain, 1970.
4.4-11	Roads	New Hanover County Department of Information Technology, 2005b.
4.4-11	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.4-11	Surface Water	New Hanover County Department of Information Technology, 2002.
4.4-11	Building or Structure	New Hanover County Department of Information Technology, 2007.
4.4-11	Swampy Area <6ft MSL	USGS, 2001.
4.4-12	Roads	New Hanover County Department of Information Technology, 2005b.
4.4-12	Western Extent of Semiconfining Unit	Bain, 1970.
4.4-12	Wilmington Site	New Hanover County Department of Information Technology, 2005a.

Figure Number	Name of Map Data Layer	Reference
4.4-12	Surface Water	New Hanover County Department of Information Technology, 2002.
4.4-12	Building or Structure	New Hanover County Department of Information Technology, 2007.
4.4-12	Swampy Area <6ft MSL	USGS, 2001.
4.5-1	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.5-1	Rivers or Streams	National Atlas of the United States, 2005b.
4.5-1	Interstate	Tele Atlas North America, 2006d.
4.5-1	Highway	Tele Atlas North America, 2006a.
4.5-2	Vascular Plant	NCDENR, 2007d.
4.5-2	Vertebrate Animal	NCDENR, 2007d.
4.5-2	Interstate	Tele Atlas North America, 2006d.
4.5-2	Highway	Tele Atlas North America, 2006a.
4.5-2	Rivers or Streams	National Atlas of the United States, 2005b.
4.5-2	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.7-1	Roads	New Hanover County Department of Information Technology, 2005b.
4.7-1	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.7-2	Roads	New Hanover County Department of Information Technology, 2005b.
4.7-2	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.7-3	Roads	New Hanover County Department of Information Technology, 2005b.
4.7-3	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.7-4	Roads	New Hanover County Department of Information Technology, 2005b.
4.7-4	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.7-5	Roads	New Hanover County Department of Information Technology, 2005b.
4.7-5	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.7-6	Roads	New Hanover County Department of Information Technology, 2005b.
4.7-6	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.7-7	Roads	New Hanover County Department of Information Technology, 2005b.

Figure Number	Name of Map Data Layer	Reference
4.7-7	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.8-1	Castle Hayne Quadrangle	USGS, 2007a.
4.8-1	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.11-1	Interstate	Tele Atlas North America, 2006d.
4.11-1	Highway	Tele Atlas North America, 2006a.
4.11-1	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
4.11-1	Percentage of Minorities	U.S. Census Bureau, 2007b.
4.11-1	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.11-2	County Boundary	Tele Atlas North America and Geographic Data Technology, 2005b.
4.11-2	Percentage Living Below Poverty	U.S. Census Bureau, 2007a.
4.11-2	Interstate	Tele Atlas North America, 2006d.
4.11-2	Highway	Tele Atlas North America, 2006a.
4.11-2	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.12-1	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.12-1	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
4.12-2	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
4.12-2	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
R-2	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
R-3	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
R-4	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
R-5	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
R-6	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
S-3	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
S-2	Schools	USGS, 2007g.
S-2	Wilmington Site	New Hanover County Department of Information Technology, 2005a.

Figure Number	Name of Map Data Layer	Reference
S-1	Wilmington Site	New Hanover County Department of Information Technology, 2006.
S-1	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
Chapter 6		
6-1	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.
6-2	Roads	New Hanover County Department of Information Technology, 2005b.
6-2	Western Extent of Semiconfining Unit	Bain, 1970.
6-2	Surface Water	New Hanover County Department of Information Technology, 2002.
6-2	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
6-2	Building or Structure	New Hanover County Department of Information Technology, 2007.
6-2	Swampy Area	USGS, 2001.
6-3	Wilmington Site	New Hanover County Department of Information Technology, 2005a.
6-3	New Hanover County Aerial Photography	New Hanover County Department of Information Technology, 2006.

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RTI INTERNATIONAL

3040 Cornwallis Road ▪ PO Box 12194 ▪ Research Triangle Park, NC 27709-2194 ▪ USA
Telephone 919 541-6000 ▪ Fax 919 541-5985 ▪ www.rti.org

September 28, 2007

Ms. Jennifer Frye
U.S. Army Corps of Engineers – Wilmington District
Post Office Box 1890
Wilmington, NC 28401-1890

Subject: Jurisdictional Determination Request
General Electric-Hitachi Nuclear Energy Americas, LLC, Wilmington, NC
RTI Project No. 0210753

Dear Ms. Frye:

On behalf of General Electric-Hitachi Nuclear Energy Americas, LLC (GE-H), RTI International (RTI) is requesting a jurisdictional determination within the study area depicted in Figures 1 and 2 (attached). The mailing address of the property owner and physical address of the property are as follows.

Property Owner: General Electric-Hitachi Nuclear Energy Americas, LLC

Mailing Address:	**Physical Address:**
Post Office Box 780	3901 Castle Hayne Road
Wilmington, NC 28402	Wilmington, NC 28401

The project is located in New Hanover County, North Carolina and the Parcel ID number is R01700-001-001-000. The total area of the parcel is 1,621 acres, with approximately 320 acres previously developed for industrial use. The GE-H property is bordered by NC 133 (previously US-117) on the east, the recently constructed I-140 bypass on the south, and the Northeast Cape Fear River on the west (Figure 1). The study area currently being evaluated for new industrial development is 265 acres, which includes two potential on-site access-road corridors. The Northeast Cape Fear River is the nearest named body of water to the study area and is located within HUC 03030007. The access-road corridor portions of the study area cross an unnamed tributary to the Northeast Cape Fear River and an unnamed tributary to Prince George Creek (see Figures 1 and 2).

As depicted on Figure 3, the study area has been generally divided into four regions (A-D) to facilitate discussion of the results of field investigations and delineation of surface waters. The jurisdictional surface waters (and associated non-jurisdictional features) within these four regions are depicted in Figures 4A through 4K (see also the attached Figure 4 index map). The following table summarizes the jurisdictional and non-jurisdictional surface waters within the study area, and discussions of the study area regions are presented after the table.

Surface Water	Area (acres)	Type	Study Area Region	Delineation Maps
Wetland A	0.07	Isolated, non-jurisdictional	C	4L
Wetland B	0.11	Isolated, non-jurisdictional	C	4M
Wetland C	0.23	Headwater wetland adjacent to a non-RPW	C	4M
Wetland D	0.20	Riparian wetland adjacent to a RPW	D	4N
Wetland E	0.44	Riparian/swamp forest wetland abutting a RPW	A	4A, 4B
Stream WDS	0.05 (175 linear feet)	RPW	D	4N
Stream WES	0.29 (217 liner feet)	RPW	A	4A

RPW = relatively permanent water

- **Region A (see delineation maps 4A and 4B):** This 200-ft wide portion of study area is centered on an existing 2-lane gravel road that crosses an unnamed tributary to the Northeast Cape Fear River (delineated as points WES) and its abutting riparian wetland and swamp forest wetland (delineated as points WE).

- **Region B (see delineation maps 4C through 4K):** This portion of the study area is approximately 200 acres and is the location of the proposed industrial development. GE-H estimates that about 50 acres will be developed for the industrial project within Region B, but the exact location and layout of the facilities are still being evaluated. No jurisdictional wetlands or streams are located within this region of the study area. The majority of Region B is planted as loblolly or longleaf pine and contains drainage ditches. These ditches are non-RPWs that indirectly flow to a traditional navigable water. It is requested that the USCOE makes the determination of significant nexus for these features. Table 1 lists the size and field observed characteristics of these features. Those features potentially exhibited ordinary high water marks (OHWMs) are shown with and an asterisk (*). The new *Approved Jurisdictional Determination Form* for Region B is attached.

Ditch ID	BH	W(tob)	W(bot)	OHWM	Field Observations (9/4/07 - 9/7/07)	Delineation Map
DA	2-4	2-4	4-7		no active signs of water flow; old signs of shelving, wracking, and undercutting	4I, 4J
DB	4	6-8	4-5	*	shelving, undercutting, sphagnum moss present	4G, 4I, 4J, 4K
DC	3	4-5	2-3	*	sphagnum moss present; shelving	4H

Ditch ID	BH	W(tob)	W(bot)	OHWM	Field Observations (9/4/07 - 9/7/07)	Delineation Map
DD	3-4	6-8	5		no signs of recent flow; no vegetation in channel; abundant pine needles; old signs of shelving, wracking and undercutting	4D, 4E, 4H, 4I
DF	3-5	3	1	*	sorting of bed material, wracking, shelving, evidence of flow (plugged at DF3)	4E, 4F
DG	3-4	4-5	2	*	sphagnum, scripus; standing water at DG3 ends at gravel road	4E, 4F
DH	2-4	3-6	1-2		vegetation thick throughout; no signs of flowing water; sparse; old signs of shelving, wracking, undercutting, and sphagnum	4F, 4G, 4I, 4J
DI	4-5	3-4	2-3	*	moderate evidence of water; shelving, undercutting; green sphagnum;	4C, 4D
DJ	2	3-4	1-1.5		no evidence of flow or water mark; shallow; grades to upland	4C, 4D
DK	3-3.5	3-4	2-3		heavy pine litter; no signs of flow	4C, 4D
DL	2	3-4	2-3		no active sign of flow or standing water	4C, 4D
DM	3-3.5	4	1.5-2	*	damp at bottom of ditch; no signs of flow; shelving, changes in the soil; sediment sorting	4M

BH = bank height, feet; W(tob)= width at top of bank, feet; W(bot) = width at bottom of channel, feet; OHWM = ordinary high water mark; * = indicated possible signs of OHWM

- **Region C (see delineation maps 4L and 4M):** This 200-ft wide portion of the study area generally follows an existing, 2-lane gravel road with a small portion of new alignment. This region contains 2 isolated wetlands (depicted by points WA and WB) and headwater wetland (depicted by points WC) hydrologically connected by a non-RPW (ditch DM) to the unnamed tributary to Prince George Creek (a RPW depicted by points WDS).

- **Region D (see delineation maps 4N and 4O):** This portion of the study area is a potential stream crossing of a segment of a 200-ft wide corridor under consideration for a new access road to the property. This region contains the unnamed tributary to Prince George Creek (depicted as WD) and riparian wetlands (depicted by points WDS) that are adjacent to the tributary.

Attached to this letter is a list of coordinates for the wetlands delineation points depicted in Figures 4A through 4O. Data collections points for the attached *USCOE Routine Wetland Delineation Forms* are circled on these figures. Also enclosed are three *Approved Jurisdictional Determination Forms* for surface waters draining to the unnamed tributary of Northeast Cape Fear River (Region A), for the potential non-RPWs of Region B, and for the surface waters draining to the unnamed tributary to Prince George Creek (combined for Regions C and D).

Upon receipt and review of the enclosed information, we request a meeting for a determination of the jurisdictional surface waters within the 265-acre study area depicted in Figures 1 and 2. We are available to meet on-site at your earliest convenience. If you have additional questions, please contact me at 919-316-3366.

Sincerely,

Kimberly Y. Matthews

Kimberly Y. Matthews
Environmental Scientist

Driving directions to the site from downtown Wilmington: Go north on US-17/Market Street. Turn right onto North 23rd street and travel for 2.5 miles. Turn right onto Castle Hayne Road/NC-133. At approximately 3.4 miles, Castle Hayne Road/NC-133 intersects I-140. Continue under the I-140 overpass and make the next left into the south gate of GE property. You will have to park before going through the gate, register as a visitor with the facility security staff, and be escorted onto the site.

Attachments:

- Figure 1 – Vicinity Map
- Figure 2 – Site Map
- Figure 3 – Regions of the Study Area
- Figure 4 – Jurisdictional Determination of Surface Waters, Index Map
- Figure 4A through 4O – Jurisdictional Determination of Surface Waters, Delineation Maps
- Figure 5 – Soil Survey
- A. Written Authorization for Site Access
- B. USCOE Routine Wetland Determination Forms (1987 Manual) (5 sets)
- C. Coordinates of the Delineation Points
- D. NCDWQ Wetland Rating Forms (5)
- E. USCOE Stream Quality Assessment Forms (2)
- F. NCDWQ Stream Identification Forms (2)
- G. USCOE Approved Jurisdictional Determination Forms (2007) (3)

Copies transmitted to:
Al Kennedy (GE-H)
Chris Monetta (GE-H)
Troy Beasley (Withers and Ravenel)
Joe Alexander (RTI)
Andrew Stahl (RTI)

WITHERS & RAVENEL
ENGINEERS | PLANNERS | SURVEYORS

December 20, 2007

Ms. Jennifer Frye
US Army Corps of Engineers
Wilmington Regulatory Field Office
69 Darlington Avenue
Wilmington, NC 28403

Re: General Electric–Hitachi Nuclear Energy Americas, LLC

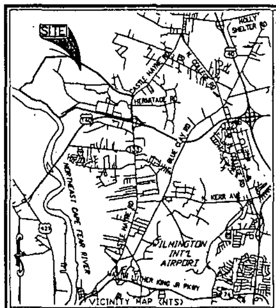
Ms. Frye:
Attached to this letter are five copies of the wetland survey of the onsite jurisdictional areas as approved based on the information submitted by RTI International and the field visit on October 16, 2007. Upon approval/signature of the enclosed surveys, please return all extra copies to Withers and Ravenel to my attention.

Please feel free to call me if you have any questions.

Sincerely,

Troy Beasley
Environmental Scientist

7040 Wrightsville Avenue, Suite 101 Wilmington, North Carolina 28403 tel: 910-256-9277 fax: 910-256-2584
www.withersravenel.com



GENERAL NOTES

1.) THIS IS A SURVEY OF AN EXISTING PARCEL(S) OF LAND.

THIS IS A CLEAN WATER ACT, SECTION 404 JURISDICTIONAL WETLAND MAP. THIS IS NOT A BOUNDARY SURVEY. PROPERTY BOUNDARY SHOWN HEREON PER NEW HANOVER COUNTY TAX MAP.

2.) HORIZONTAL DATUMS FOR THIS SURVEY ARE BASED ON NC GRID, NAD 83/01 / GE PLANT GRID.
3.) ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES.
4.) AREA BY COORDINATE GEOMETRY.
5.) NO GRID MONUMENTS FOUND WITHIN 2000' OF SITE.
6.) THIS SURVEY PERFORMED AND MAP PREPARED WITHOUT BENEFIT OF A TITLE REPORT. THIS SURVEY SUBJECT TO ANY FACTS AND EASEMENTS WHICH MAY BE DISCLOSED BY A FULL AND ACCURATE TITLE SEARCH.
7.) WETLANDS DELINEATED ON 9/7/07 BY RTI INTERNATIONAL: 3040 CORNWALLIS RD; RTP, NC 27709. WETLANDS FIELD SURVEYED ON 11/28/07 BY WITHERS & RAVENEL USING TOTAL STATION INSTRUMENTS CAPABLE OF 0'00'07" ACCURACY.

8.) OWNERSHIP REFERENCE: GENERAL ELECTRIC COOB 806/458 & DB 806/463
9.) NEW HANOVER COUNTY PARCEL NO.: R01700-001-001-000 / 321100.53.2448.000
10.) ZONING DISTRICT: IND-INDUSTRIAL
11.) APPROXIMATE TOTAL TAX PARCEL AREA: 1620.91± AC.
TOTAL WETLAND DELINEATION SITE AREA: 268.18± AC.

404 WETLAND AREAS:

404 WETLAND AREA C:	0.22± AC.
404 WETLAND AREA D:	0.20± AC.
404 WETLAND AREA E1:	0.08± AC.
404 WETLAND AREA E2:	0.09± AC.
404 WETLAND AREA E3:	0.22± AC.
TOTAL 404 WETLAND AREA:	0.81± AC.

ISOLATED WETLAND AREAS:

ISOLATED WETLAND AREA A:	0.06± AC.
ISOLATED WETLAND AREA B:	0.13± AC.
TOTAL ISOLATED WETLAND AREA:	0.19± AC.

CERTIFICATE OF ACCURACY & MAPPING

I, THE UNDERSIGNED, CERTIFY THAT THIS SURVEY WAS DRAWN UNDER MY SUPERVISION FROM A BOUNDARY SURVEY MADE BY WITHERS & RAVENEL; THAT THIS SURVEY HAS BEEN PREPARED IN ACCORDANCE WITH THE STANDARDS OF WETLAND PLATTING AS ESTABLISHED BY THE U.S. ARMY CORPS OF ENGINEERS. WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER AND SEAL THIS 19 DAY OF JAN 20 08

MILES D. MCCALL III - PROFESSIONAL LAND SURVEYOR (L-3518)

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR L-3518 SEAL

1-19-08

404 WETLANDS DELINEATION CERTIFICATE

THIS CERTIFIES THAT THIS COPY OF THIS PLAT ACCURATELY DEPICTS THE BOUNDARY OF THE JURISDICTION OF SECTION 404 OF THE CLEAN WATER ACT WITHIN THE DESIGNATED SITE LIMITS AS DETERMINED BY THE UNDERSIGNED ON THIS DATE. OTHER AREAS OF JURISDICTION MAY BE PRESENT ON THE SITE BUT HAVE NOT BEEN DELINEATED. UNLESS THERE IS A CHANGE IN THE LAW OR OUR PUBLISHED REGULATIONS, THIS DETERMINATION MAY BE RELIED UPON FOR A PERIOD NOT TO EXCEED FIVE YEARS FROM THIS DATE. THIS DETERMINATION WAS MADE UTILIZING THE 1987 CORPS OF ENGINEERS WETLAND DELINEATION MANUAL. ANY ISOLATED WETLANDS OR WATERS THAT ARE OUT OF CORPS JURISDICTION HAVE BEEN LABELED ON THE SURVEY.

SIGNATURE, U.S. ARMY CORPS OF ENGINEERS OFFICIAL ____________ DATE

TITLE: ____________

EXPIRATION DATE OF DELINEATION: ____________

USACE ACTION ID: ____________

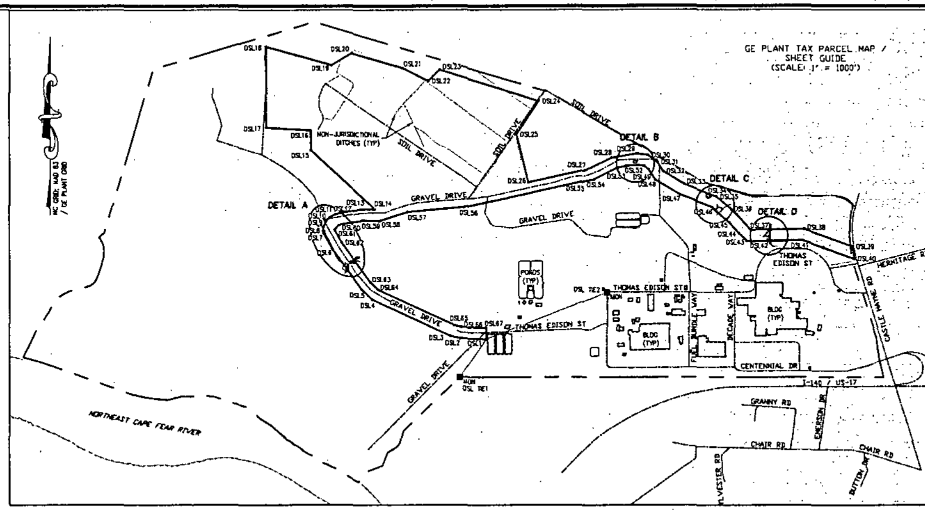
LEGEND

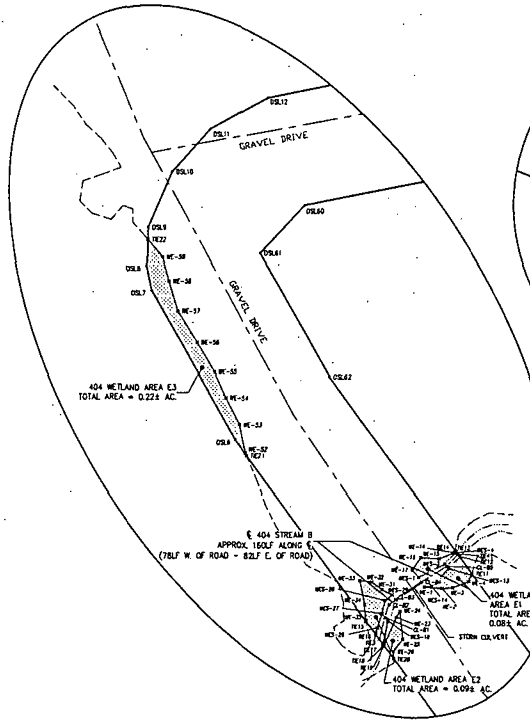
- WETLAND DELINEATION SITE LIMITS (DSL)
- GENERAL ELECTRIC TAX PARCEL BOUNDARY
- 404 JURISDICTIONAL STREAM TOP OF BANK
- ℄ ROAD
- ℄ 404 JURISDICTIONAL WETLAND STREAM
- NON-JURISDICTIONAL DITCH TOP OF BANK
- OFF-DELINEATION SITE WETLAND LIMITS
- NCM EXISTING CONCRETE MONUMENT
- WM-1 WETLAND FLAG
- 404 JURISDICTIONAL WETLAND AREA

WETLAND/STREAM CENTER LINE COORDINATE TABLE				
	NC GRID, NAD 83/01		GE PLANT GRID	
DESC	NORTHING	EASTING	NORTHING	EASTING
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

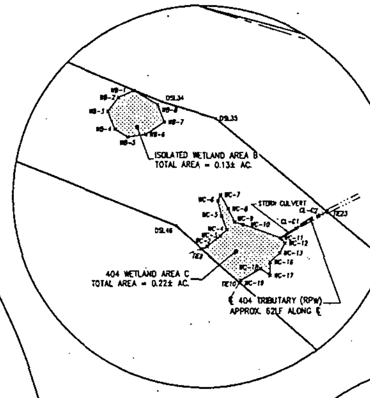
WETLAND AREA COORDINATE TABLE				
	NC GRID, NAD 83/01		GE PLANT GRID	
DESC	NORTHING	EASTING	NORTHING	EASTING
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

WETLAND DELINEATION SITE LIMITS COORDINATE TABLE				
	NC GRID, NAD83/01		GE PLANT GRID	
DESC	NORTHING	EASTING	NORTHING	EASTING
DSL1	[illegible]	[illegible]	[illegible]	[illegible]
DSL2	[illegible]	[illegible]	[illegible]	[illegible]
DSL3	[illegible]	[illegible]	[illegible]	[illegible]
DSL4	[illegible]	[illegible]	4372.10	[illegible]
DSL5	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

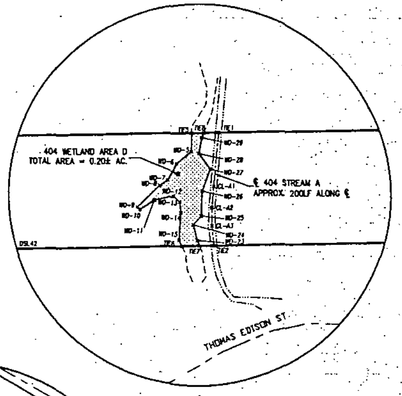




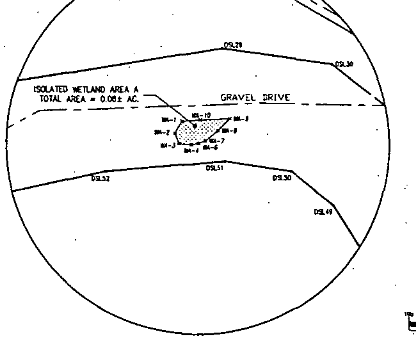
DETAIL A



DETAIL C



DETAIL D



DETAIL B

DETAIL GRAPHIC SCALE

1 inch = 100 ft.

No.	Revision	Date	By
1	ADDED 404 TRIBUTARY (DETAIL C)	1/16/08	MT

Designer N/A · Scale VARIES · Drawn By MAT · Date 11/28/07 · Checked By MDMcIII · Job No.

GENERAL ELECTRIC - HITACHI NUCLEAR ENERGY AMERICAS, LLC

WETLAND MAP

PREPARED FOR: ANDREW CONSULTING ENGINEERS, P.C. 3811 PEACHTREE AVE SUITE 300 WILMINGTON, NC 28403 910-202-5555

WITHERS & RAVENEL ENGINEERS | PLANNERS | SURVEYORS

Sheet No. 1

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. SAW-2008-00188 County: New Hanover U.S.G.S. Quad: Castle Hayne

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner/Agent: General Electric-Hitachi Nuclear Energy Americas, LLC
Address: Post Office Box 780
Wilmington, NC 28402

Telephone No.: ____

Property description:
Size (acres) 265 Nearest Town Wilmington
Nearest Waterway Northeast Cape Fear River River Basin Northeast Cape Fear River
USGS HUC 03030007 Coordinates N 34.3275 W 77.9294
Location description The project area is located within the larger 1,621 acre parcel (PIN: R01700-001-001-000), at 3901 Castle Hayne Road, northwest of the I-140/NC Highway 133 Interchange, in adjacent wetlands and unnamed tributaries to Prince George Creek and the Northeast Cape Fear River, north of Wilmington, NC.

Indicate Which of the Following Apply:

A. Preliminary Determination

_ Based on preliminary information, there may be wetlands on the above described property. We strongly suggest you have this property inspected to determine the extent of Department of the Army (DA) jurisdiction. To be considered final, a jurisdictional determination must be verified by the Corps. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331).

B. Approved Determination

_ There are Navigable Waters of the United States within the above described property subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

X There are waters of the U.S. including wetlands on the above described project area subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We strongly suggest you have the wetlands on your property delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

_ The wetland on your property have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

X The waters of the U.S. including wetlands have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on 1/22/2008. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described property which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

Action ID: 2008-00188

X The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in Wilmington, NC, at (910) 796-7215 to determine their requirements.

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact Jennifer Frye at 910-251-4923.

C. Basis For Determination

This site exhibits wetland criteria as described in the 1987 Corps Wetland Delineation Manual and is adjacent to unnamed tributaries to Prince Georges Creek and the Northeast Cape Fear River, Navigable Waters of the U.S. This project area also contains waterbodies that exhibit an Ordinary High Water Mark and are tributaries to Prince George Creek and NE Cape Fear River. This determination is based on information submitted by RTI International and a site visit by Jennifer Frye on 10/16/2007.

D. Remarks

Please be aware that this property also contains non-jurisdictional, isolated wetlands. Please contact the North Carolina Division of Water Quality at (919) 733-1786 to discuss the State's regulations and requirements for these waters. It was determined that these wetlands are not bordering, neighboring or contiguous with any Section 404 jurisdictional waterbody.

E. Appeals Information (This information applies only to approved jurisdictional determinations as indicated in B. above)

This correspondence constitutes an approved jurisdictional determination for the above described site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

District Engineer, Wilmington Regulatory Division
Attn:Jennifer Frye, Project Manager,
Wilmington Regulatory Field Office
PO Box 1890
Wilmington, North Carolina 28402

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the District Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by 3/22/2008.

It is not necessary to submit an RFA form to the District Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: Jennifer A. Frye

Date 01/22/2008 Expiration Date 01/22/2013

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete the Customer Satisfaction Survey located at our website at http://regulatory.usacesurvey.com/ to complete the survey online.

Copy furnished:
Chad Coburn, DENR-DWQ, Wilmington Regional Office, 127 Cardinal Drive Ext., Wilmington, NC 28405
RTI International, PO Box 12194, Research Triangle Park, NC 27709-2194
Withers & Ravenel, 7040 Wrightsville Ave., Suite 101, Wilmington, NC 28403

RTI INTERNATIONAL

3040 Cornwallis Road ▪ PO Box 12194 ▪ Research Triangle Park, NC 27709-2194 ▪ USA
Telephone 919 541-6000 ▪ Fax 919 541-5985 ▪ www.rti.org

October 8, 2007

Mr. John Hammond, Biologist
U.S. Fish and Wildlife Service
Raleigh Field Office
P.O. Box 33726
Raleigh, NC 27636 - 3726

SUBJECT: Request for information regarding endangered species and critical habitat for a potential facility expansion at GE-H in Wilmington, North Carolina

Dear Mr. Hammond,

General Electric-Hitachi Nuclear Energy Americas, LLC (GE-H) is considering a business expansion that would include construction, start-up, and operation of a new manufacturing facility at its property located near Wilmington, NC. The potential project is located in New Hanover County, North Carolina and the Parcel ID number is R01700-001-001-000. The total area of the parcel is 1,621 acres with approximately 320 acres currently developed for industrial use. The GE-H property is bordered by NC 133 (previously US-117) on the east, the recently constructed I-140 bypass on the south, and the Northeast Cape Fear River on the west (Figure 1). The action area currently being evaluated for new industrial development is 265 acres, which includes two potential on-site access-road corridors (Figure 2). The coordinates for the center of the study area are 34.333923 °N and -77.945009 °W.

Please provide information that you have regarding the presence of endangered or threatened species or critical habitat in the action area. After assessing the information provided by you, we will determine what additional actions are necessary to comply with the Section 7 consultation process.

If you have any questions, please contact me at 919-316-3366.

Sincerely,

Kimberly Y. Matthews
Environmental Scientist
RTI, International

Attachments:
Figure 1: Vicinity Map (Topography)
Figure 2: Site Map (Aerial Photo)

Copies transmitted to:
Al Kennedy (GE-H)
Joe Alexander (RTI)
Andrew Stahl (RTI)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

January 16, 2008

Ms. Kimberly Y. Matthews
RTI International
Post Office Box 12194
Research Triangle Park, North Carolina 27709-2194

Dear Ms. Matthews,

This follows U.S. Fish and Wildlife Service (Service) review of your November 19, 2007, letter regarding a facilities expansion proposed by General Electric-Hitachi Nuclear Energy Americas, LLC (GE-H) on its property in Wilmington in New Hanover County, North Carolina and your *request* for information pertaining to federally protected species known to occur in New Hanover County. The proposed expansion would take place on Parcel ID number R01700-001-000. The total area of the parcel is 1,621 acres, 320 of which are currently developed for industrial use. The GE-H property is bordered by NC 133 on the east, I-140 bypass on the south, and the Northeast Cape Fear River on the west. The proposed project location covers about 265 acres, which includes two potential on-site access roads. The center of the project is recorded as 34.333923° N and -77.945009° W. Our comments are provided in accordance with the Endangered Species Act of 1973, as amended (16 USC 1531 et seq.).

We have enclosed a list of endangered, threatened, and federal species of concern for New Hanover County, North Carolina to assist you in the planning of any actions that may affect listed species. The Service further advises that should any species occurring in the proposed project area become federally-listed or proposed, the federal action agency for the work would also be required to reevaluate its responsibilities under the Act. Since threatened and endangered species data are continually updated, the Service suggests the lead federal agency annual request an updated federal list of the species in the project area. A current list of federally protected species can be found on line at http://nc-es.fws.gov/es/countyfr.html.

If the project will not involve the removal of any suitable foraging and/or nesting habitat for the RCW, complete surveys of the project site may not be needed. However, surveys should "...be undertaken prior to the initiation of any project within the southeastern United States that calls for removal of pine trees 30 years or older; ..." For additional guidance for conducting RCW surveys please refer to Appendix 4 of the Service's "Recovery plan for the red-cockaded woodpecker (*Picoides borealis*), second revision" (Service 2003). The Recovery Plan can be found electronically at the following web link:
http://www.fws.gov/rcwrecovery/recovery_plan.html

If you have any questions regarding this matter, please contact Mr. John Hammond at 919-856-4520 (Ext. 28). Thank you for your continued cooperation with our agency.

Sincerely,

John D. Hammond

for Pete Benjamin
Field Supervisor

Literature Cited:

U.S. Fish and Wildlife Service. 2003. Recovery plan for the red-cockaded woodpecker (*Picoides borealis*): second revision. U.S. Fish and Wildlife Service, Atlanta, GA. 296 pp.

Endangered Species, Threatened Species, Federal Species of Concern, and Candidate Species,

New Hanover County, North Carolina

Updated: 12-20-2007

Critical Habitat Designations:

Piping plover - *Charadrius melodus* - See the Federal Register for a description of the primary constituent elements essential for the conservation of wintering piping plovers within the designated units. This document also contains a map and a description of each designated unit. **Federal Register Reference:** July10, 2001, Federal Register, 66:36038?36136.

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
American eel	*Anguilla rostrata*	FSC	Current
Carolina crawfish frog	*Rana capito capito*	FSC	Current
Eastern painted bunting	*Passerina ciris ciris*	FSC	Current
Green sea turtle	*Chelonia mydas*	T	Current
Loggerhead sea turtle	*Caretta caretta*	T	Current
Mimic glass lizard	*Ophisaurus mimicus*	FSC	Historic
Northern pine snake	*Pituophis melanoleucus melanoleucus*	FSC	Current
Piping plover	*Charadrius melodus*	T	Current
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	FSC	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Shortnose sturgeon	*Acipenser brevirostrum*	E	Current
Southeastern myotis	*Myotis austroriparius*	FSC	Current
Southern hognose snake	*Heterodon simus*	FSC	Current
West Indian manatee	*Trichechus manatus*	E	Current
Invertebrate:			
Buchholz's dart moth	*Agrotis buchholzi*	FSC	Current
Cape Fear threetooth	*Triodopsis soelneri*	FSC	Current
Eastern beard grass skipper	*Atrytone arogos arogos*	FSC	Obscure

Common Name	Scientific name	Federal Status	Record Status
Greenfield rams-horn	*Helisoma eucosmium*	FSC	Historic
Loammi skipper	*Atrytonopsis loammi*	FSC	Obscure
Magnificent rams-horn	*Planorbella magnifica*	FSC	Historic
Rare skipper	*Problema bulenta*	FSC	Current
Vascular Plant:			
Bog St. John's-wort	*Hypericum adpressum*	FSC	Historic
Carolina bishopweed	*Ptilimnium ahlesii*	FSC	Current
Carolina lead-plant	*Amorpha georgiana* var. *confusa*	FSC	Historic
Coastal beaksedge	*Rhynchospora pleiantha*	FSC	Current
Coastal goldenrod	*Solidago villosicarpa*	FSC	Historic
Dune blue curls	*Trichostema* sp. *1*	FSC	Current
False coco	*Pteroglossaspis ecristata*	FSC	Historic
Grassleaf arrowhead	*Sagittaria weatherbiana*	FSC	Current
Pickering's dawnflower	*Stylisma pickeringii* var. *pickeringii*	FSC	Current
Pondspice	*Litsea aestivalis*	FSC	Current
Raven's boxseed	*Ludwigia ravenii*	FSC	Historic
<u>Rough-leaved loosestrife</u>	*Lysimachia asperulaefolia*	E	Current
Sandhills milk-vetch	*Astragalus michauxii*	FSC	Historic
<u>Seabeach amaranth</u>	*Amaranthus pumilus*	T	Current
Small-leaved meadow-rue	*Thalictrum macrostylum*	FSC	Current
Spring-flowering goldenrod	*Solidago verna*	FSC	Current
Tough bumelia	*Sideroxylon tenax*	FSC	Historic
Venus' fly-trap	*Dionaea muscipula*	FSC	Current
Nonvascular plant:			
Lichen:			

Definitions of Federal Status Codes:
E = endangered. A taxon "in danger of extinction throughout all or a significant portion of its range."
T = threatened. A taxon "likely to become endangered within the foreseeable future throughout all or a significant portion of its range."
C = candidate. A taxon under consideration for official listing for which there is sufficient information to support listing. (Formerly "C1" candidate species.)

Definitions of Federal Status Codes (continued):

BGPA =Bald and Golden Eagle Protection Act. See below.
FSC = federal species of concern. A species under consideration for listing, for which there is insufficient information to support listing at this time. These species may or may not be listed in the future, and many of these species were formerly recognized as "C2" candidate species.
T(S/A) = threatened due to similarity of appearance. A taxon that is threatened due to similarity of appearance with another listed species and is listed for its protection. Taxa listed as T(S/A) are not biologically endangered or threatened and are not subject to Section 7 consultation. See below.
EXP = experimental population. A taxon listed as experimental (either essential or nonessential). Experimental, nonessential populations of endangered species (e.g., red wolf) are treated as threatened species on public land, for consultation purposes, and as species proposed for listing on private land.
P = proposed. Taxa proposed for official listing as endangered or threatened will be noted as "PE" or "PT", respectively.

Bald and Golden Eagle Protection Act (BGPA):

In the July 9, 2007 Federal Register(72:37346-37372), the bald eagle was declared recovered, and removed (de-listed) from the Federal List of Threatened and Endangered wildlife. This delisting took effect August 8,2007. After delisting, the Bald and Golden Eagle Protection Act (Eagle Act) (16 U.S.C. 668-668d) becomes the primary law protecting bald eagles. The Eagle Act prohibits take of bald and golden eagles and provides a statutory definition of "take" that includes "disturb". The USFWS has developed National Bald Eagle Management Guidelines to provide guidance to land managers, landowners, and others as to how to avoid disturbing bald eagles. For more information, visit http://www.fws.gov/migratorybirds/baldeagle.htm

Threatened due to similarity of appearance(T(S/A)):

In the November 4, 1997 Federal Register (55822-55825), the northern population of the bog turtle (from New York south to Maryland) was listed as T (threatened), and the southern population (from Virginia south to Georgia) was listed as T(S/A) (threatened due to similarity of appearance). The T(S/A) designation bans the collection and interstate and international commercial trade of bog turtles from the southern population. The T(S/A) designation has no effect on land management activities by private landowners in North Carolina, part of the southern population of the species. In addition to its official status as T(S/A), the U.S. Fish and Wildlife Service considers the southern population of the bog turtle as a Federal species of concern due to habitat loss.

Definitions of Record Status:
Current - the species has been observed in the county within the last 50 years.
Historic - the species was last observed in the county more than 50 years ago.
Obscure - the date and/or location of observation is uncertain.
Incidental/migrant - the species was observed outside of its normal range or habitat.

Definitions of Record Status (continued):

Probable/potential - the species is considered likely to occur in this county based on the proximity of known records (in adjacent counties), the presence of potentially suitable habitat, or both.

RTI INTERNATIONAL
3040 Cornwallis Road ▪ PO Box 12194 ▪ Research Triangle Park, NC 27709-2194 ▪ USA
Telephone 919 541-6000 ▪ Fax 919 541-5985 ▪ www.rti.org

November 19, 2007

Mr. Robb Mairs
North Carolina Division of Coastal Management
Wilmington Field Office
127 Cardinal Drive Ext.
Wilmington, NC 28405-3845

SUBJECT: Request determination for the need of a CAMA permit for a potential facility expansion at GE-H in Wilmington, North Carolina

Dear Mr. Mairs,

General Electric-Hitachi Nuclear Energy Americas, LLC (GE-H) is considering a business expansion that would include construction, start-up, and operation of a new manufacturing facility at its property located near Wilmington, NC. The potential project is located in New Hanover County, North Carolina and the Parcel ID number is R01700-001-001-000. The total area of the parcel is 1,621 acres with approximately 320 acres currently developed for industrial use. The GE-H property is bordered by NC 133 (previously US-117) on the east, the recently constructed I-140 bypass on the south, and the Northeast Cape Fear River on the west (Figure 1). The study area currently being evaluated for new industrial development is 265 acres, which includes two potential on-site access-road corridors (Figure 2). The coordinates for the center of the study area are 34.333923 °N and -77.945009 °W.

Please determine if construction activities within the study area would require a Coastal Area Management Act (CAMA) permit. Please let me know if you need a site visit or additional information to make this determination. It is likely that you will review this project through a federal consistency review. We request a written response that will be included a part of this review material.

If you have any questions, please contact me at 919-316-3366.

Sincerely,

Kimberly Y. Matthews
Environmental Scientist
RTI, International

Attachments:
Figure 1: Vicinity Map (Topography)
Figure 2: Site Map (Aerial Photo)

Copies transmitted to:
Al Kennedy (GE-H)
Joe Alexander (RTI)
Andrew Stahl (RTI)

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NCDENR
North Carolina Department of Environment and Natural Resources
Division of Coastal Management
Michael F. Easley, Governor | **James H. Gregson, Director** | William G. Ross Jr., Secretary

February 13, 2008

Kimberly Y. Matthews
RTI International
3040 Cornwallis Road
P.O. Box 12194
Research Triangle Park, N.C. 27709-2194

Dear Ms. Matthews:

This is in response to your letter dated December 21, 2007 and our last correspondence through email on January 14, 2008, which pertains to General Electric-Hitachi Nuclear Americas, LLC (GEH) consideration on expansion of their existing facility, adjacent to the Northeast Cape Fear River (NECFR) and its tributaries, in New Hanover County. Based on the information provided by you, it appears the work would be located outside the nearest Area of Environmental Concern (AEC). Our jurisdiction within this project area includes any development below mean high water (MHW) of the NECFR or its tributaries, and 75' from MHW landward of the NECFR, and 30' landward of MHW of its tributaries. However, if the work is outside the AEC, we may still review the proposal through a federal consistency review if the U.S. Corps of Engineers decides to pursue an Individual Permit (IP). Please let me know if you need any further assistance on this matter at 910-796-7215.

Sincerely,

Robb L. Mairs,
Field Representative

Cc: Doug Huggett, DCM
Dave Timpy, USACOE
Wilmington Files

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ENVIRONMENTAL SERVICES, INC.
524 S. NEW HOPE ROAD
RALEIGH, NORTH CAROLINA 27610
919-212-1760 • FAX 919-212-1707
www.environmentalservicesinc.com

1 October 2007

Peter Sandbeck
Deputy State Historic Preservation Officer
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617

Re: GE facility, New Hanover County, North Carolina

Dear Peter:

Environmental Services, Inc., (ESI) is assisting RTI International in the preparation of environmental documents for proposed improvements to the General Electric facility in New Hanover County, North Carolina. The study area covers 265 acres, including 63 acres of proposed road corridors and a main area of 202 acres (**Figure**). This project is subject to both Section 106 of the *National Historic Preservation Act* and the *National Environmental Policy Act*. ESI is requesting formal regulatory comment on the project from the North Carolina State Historic Preservation Office to assist in this study.

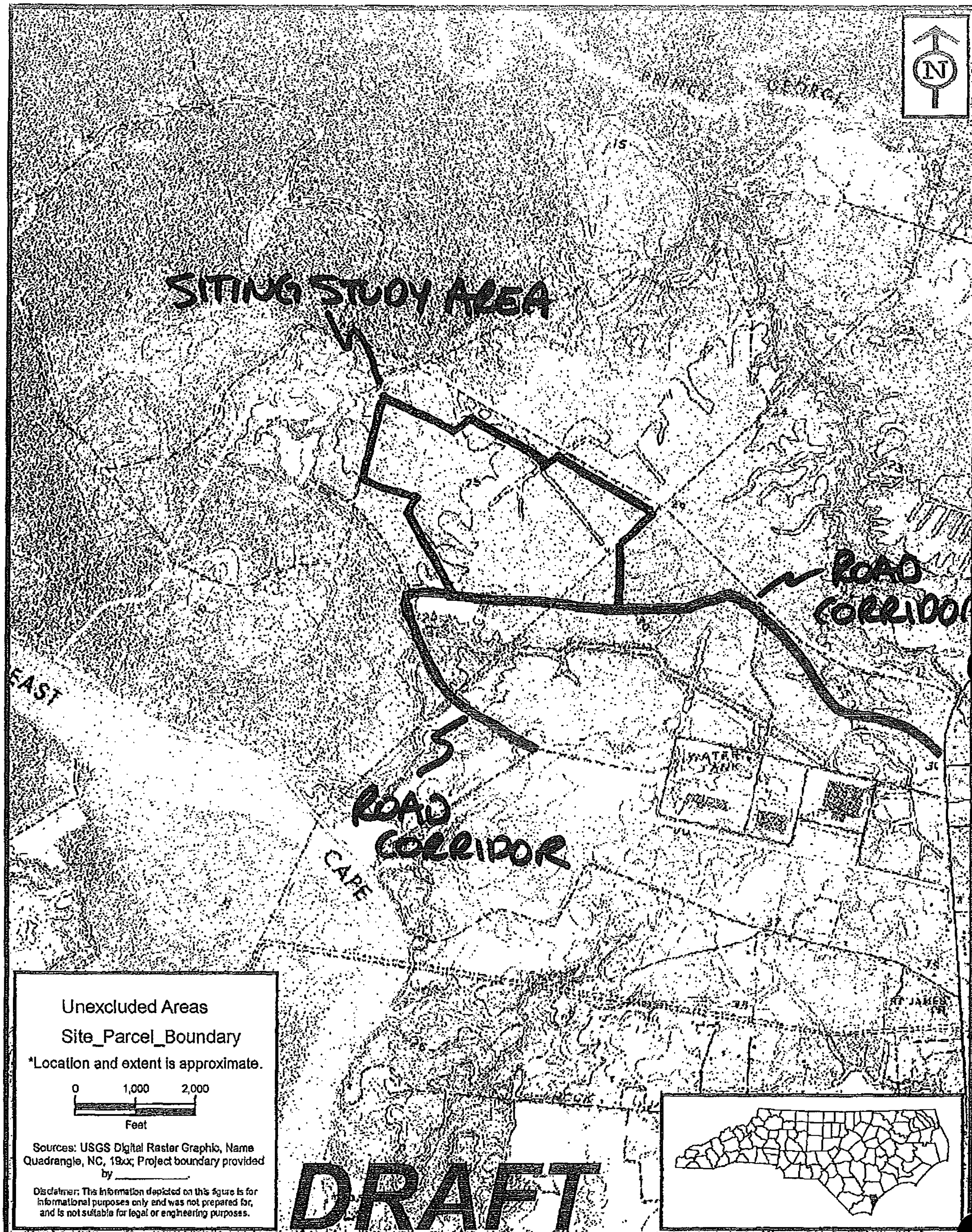
If you have any questions or comments, please feel free to call me at (919) 212-1760.

Sincerely,

ENVIRONMENTAL SERVICES, INC.

Scott Seibel, RPA
Assistant Vice President

Encl.



ENVIRONMENTAL SERVICES, INC.
524 S. New Hope Road
Raleigh, North Carolina 27610
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(919) 212-1707 FAX
www.environmentalservicesinc.com

Figure Title
Project Name
City, County, State

Project:	ER07155.00
Date:	Aug 07
Drwn/Chkd:	ESL/SS
Figure:	X

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North Carolina Department of Cultural Resources
State Historic Preservation Office
Peter B. Sandbeck, Administrator

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

November 19, 2007

Scott Seibel, RPA
Environmental Services , Inc.
524 New Hope Road
Raleigh, NC 27610

Re: Improvements to General Electric Facility, Castle Hayne, New Hanover County, ER 07-2157

Dear Mr. Seibel:

Thank you for your letter of October 1, 2007, concerning archaeological resources on a 265- acre study area located on property owned by the General Electric Castle Hayne Facility.

There are no recorded archaeological sites within the project study area. There are, however numerous recorded historic and prehistoric sites adjacent to the study area and the probability exists that potentially significant archaeological sites occur within the study area. We recommend that a comprehensive survey be conducted to identify and evaluate the significance of archaeological remains that may be damaged or destroyed by the proposed project. Potential effects on unknown resources should be assessed prior to the initiation of construction activities.

Two copies of the resulting archaeological survey report, as well as one copy of the appropriate site forms, should be forwarded to us for review and comment as soon as they are available and well in advance of any construction activities.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919/807-6579. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

Renee Gledhill-Earley
Peter Sandbeck

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ENVIRONMENTAL SERVICES, INC.
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RALEIGH, NORTH CAROLINA 27610
919-212-1760 • FAX 919-212-1707
www.environmentalservicesinc.com

11 March 2008

Peter Sandbeck
Deputy State Historic Preservation Officer
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617

Re: Potential GE Expansion, New Hanover County, North Carolina (ER 07-2157)
Archaeological Report

Dear Peter:

Enclosed are two copies of the archaeological survey report and two copies of the associated site forms for the archaeological investigation of the potential GE Expansion in New Hanover County, North Carolina, for your review. As a result of the investigation, two archaeological sites were recorded, one of which is recommended eligible for listing in the *National Register of Historic Places*.

If you have any questions or comments, please feel free to call me at (919) 212-1760.

Sincerely,

ENVIRONMENTAL SERVICES, INC.

Scott Seibel, RPA
Assistant Vice President

Encl.: Report (2)
Site Forms (4)

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RECEIVED
APR 1 5 2008

North Carolina Department of Cultural Resources

State Historic Preservation Office

Peter B. Sandbeck, Administrator

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

April 9, 2008

Scott Seibel, RPA
Environmental Services , Inc.
524 New Hope Road
Raleigh, NC 27610

Re: Report: *An Intensive Cultural Resource Investigation: Potential GE Expansion, New Hanover County, North Carolina,* ER 07-2157

Dear Mr. Seibel:

We have received the report referenced above. During the course of the investigation two new archaeological sites were recorded: 31NH800** and 31NH801.

Site 31NH800** was identified as a late 18th to early 20th century habitation site. It contained no identified structural remains. The artifact density was low and concentrated within the disturbed upper strata of the soil. The site was considered unlikely to produce significant new information. Environmental Services Inc. (ESI) recommended no further archaeological work on the site. We concur with this recommendation.

Site 31NH801 was identified as a prehistoric, short term habitation site. Ceramic analysis suggested a Middle Woodland period occupation. Subsurface testing indicated little subsequent soil disturbance and revealed the presence of intact cultural features. Based on this ESI recommended the site eligible for inclusion on the National Register of Historic Places under Criterion D. ESI recommended that site 31NH801 be avoided by all construction activities. We concur with this recommendation.

At present, plans do not call for construction that would impact site 31NH801. If plans change and impact to the site is unavoidable we recommend that additional data recovery be conducted as a condition for issuance of any federal or state permits pertaining to the project.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919/807-6579. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Peter Sandbeck

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W. Joseph Alexander, P.G.

Mr. Joseph Alexander is a Senior Geologist with RTI International (RTI), where he has worked for 23 years. He holds a professional B.S. degree in Geology and an M.S. in Geology with an engineering geology and hydrogeology emphasis. He is a registered geologist in several southeastern states and has over 30 years of applied experience that includes the siting of nuclear facilities. Mr. Alexander is RTI's Project Director for the GE-Hitachi Global Laser Enrichment LLC (GLE) project in Wilmington, NC, and served in the same position for the recent Global Nuclear Energy Partnership (GNEP) project at the Morris, IL, site.

Mr. Alexander started his professional geology career in the mid-1970s, conducting nuclear siting studies for private utility companies in the southeastern United States. This experience ranged from conducting field studies (i.e., geologic, hydrogeologic, and engineering geology) to providing lead technical authorship in key sections of Preliminary Safety Analysis Reports (PSARs). His PSAR writing assignments were typically for those sections pertaining to the regional and site geology and groundwater use conditions, aquifer delineations, well inventories, groundwater flow and quality, and transport of potential nuclear releases. As part of this experience, he also worked closely with a team of other geologists, seismologists, geotechnical engineers, environmental scientists, and ecologists responsible for other key elements of the siting studies. In this capacity, Mr. Alexander had the opportunity to gain an early appreciation for the multidisciplinary teams required to conduct broad environmental and geotechnical assessments, in addition to the opportunity to review and comment on other siting components of the PSARs.

Mr. Alexander further applied this experience to the nuclear industry, where he has provided continued technical consulting services for more than 25 years of his 34-year professional career. These activities have included a broad range of technical services, such as detailed site characterizations; hydrogeological, geochemical, geospatial, and geophysical assessments of radiological constituents in surface water, sediment, soil, and groundwater; remedial design and implementation to address low-level radiological organic releases; implementation of long-term monitoring programs; and stakeholder interactions with regulatory agencies and the public. Mr. Alexander has also led broad environmental assessments for other industries that have components similar to the GLE siting study. In addition, he is experienced leading site-characterization and research projects for the U.S. Department of Energy (DOE).

Robert A. Crate, Jr.

Mr. Robert Crate is the Fuel Growth Programs Manager for GLE. He began his professional nuclear career in 1976 as a supervisor and operator of naval nuclear submarine reactor plants. His naval career spanned 20 years and included assignment as a Nuclear Engineer at the Headquarters of the DOE's Naval Reactors Program. At Naval Reactors, Mr. Crate was the Program Manager for the radiation protection and health physics performance of eight land-based nuclear reactor plants, two nuclear-powered moored training ships, and one reactor-fuel examination and storage facility. He also led teams of experienced inspectors in conducting radiological controls assessments of reactor plant sites and nuclear-capable naval shipyards. In this capacity, Mr. Crate acted for the Naval Nuclear Propulsion Program Director, Admiral Bruce DeMars.

Mr. Crate has held Operations, Radiation Protection, and Quality Leadership positions at the Carolina Power & Light (CP&L) Brunswick Nuclear Plant. He received a Quality Achievement award (CP&L's highest employee award) for operational improvement initiatives, material condition upgrade projects, and radioactive tank- and sump-cleaning activities that resulted in the lowest liquid effluent releases in the history of the Brunswick Nuclear Plant.

For the past 9 years, Mr. Crate has held several leadership positions in the General Electric Company (GE)/Global Nuclear Fuel–Americas (GNF-A)/ GE-Hitachi Nuclear Energy (GEH) Nuclear Energy organization, which included responsibility for the safe and effective operation of a large uranium chemical process using a Dry Conversion Process (DCP) technology, Japan powder-packing operations, Ceramic Operations, and Bundle Fabrication. He also led a team of 24 exempt employees (engineers and supervisors) and 300 hourly manufacturing employees, with a $50M annual operating budget.

Stephen A. Johnston, Ph.D.

Dr. Stephen Johnston has a B.S in Nuclear Engineering and a Ph.D. in Economics with a Minor in Nuclear Engineering. He is an energy economist with experience in research, consulting, and teaching. Dr. Johnston is now retired from RTI after a 32-year career in research and consulting. He recently completed an appointment as Visiting Professor in the Energy and Environmental Studies graduate program at North Carolina A&T State University, where he taught energy and environmental economics. Dr. Johnston has also taught various economics courses at North Carolina State University (NCSU), the University of North Carolina at Chapel Hill, and Duke University.

Dr. Johnston currently teaches classes in energy and global warming in the Encore program at NCSU. He serves as Vice Chairman of the North Carolina Green Power Board of Directors and chairs the Board's Resource Committee, which evaluates bids from green power suppliers. Dr. Johnston also provides consulting services to RTI, advanced energy firms, and environmental firms specializing in the energy industries. He frequently provides technical expertise to clean energy coalitions and energy regulatory bodies.

Albert E. Kennedy

Mr. Albert Kennedy is the Facility Licensing Manager for GEH. He has a B.S. in Human Resources Management and has held several technical qualifications in the Naval Nuclear Propulsion Program, including serving as S7G Reactor Plant Engineer Officer.

Mr. Kennedy began his professional nuclear career in the mid-1970s as a supervisor and operator of Naval nuclear submarine reactor plants. His Naval career spanned 22 years, including 17 years within the DOE's Naval Reactors Program. As a Naval Reactors Technical Manager, Mr. Kennedy had a wide range of responsibilities, including nuclear facility operations, maintenance, radiation protection, and training. He was directly responsible for the training program development and start up of the first new naval nuclear program training facility in 30 years.

For the past 10 years, Mr. Kennedy has held several management positions at Progress Energy's Brunswick Nuclear Plant. The positions included Outage Management, Quality Assurance, Maintenance Projects, and Corporate Oversight.

Anthony B. Marimpietri

Mr. Tony Marimpietri has a B.S in Mechanical Engineering, an M.S. in Environmental Engineering, and a Masters in Regional Planning. He is an environmental consultant with over 30 years of experience in research and technical services. Mr. Marimpietri is a Senior Research Director with RTI, where he has led research organizations specializing in environmental analysis and modeling. His professional experience has concentrated on the environmental impacts of industrial facilities. This experience includes evaluating a wide range of industrial facilities for air and water impacts, environmental impacts analysis, and facility location and regulatory permitting reviews under the Clean Air Act, Clean Water Act, and the Resource Conservation and Recovery Act.

Prior to joining RTI, Mr. Marimpietri was involved in emergency response planning for nuclear power plants. This experience included evaluating public safety impacts, evacuation planning, monitoring, notification systems, and plans for coordination of community emergency response. Over his career, Mr. Marimpietri has been involved in model development, including development of decision-support systems. Most recently, Mr. Marimpietri has led the development of a multi-criteria evaluation tool to support decision making regarding surplus properties.

Louis M. Quintana

Mr. Louis Quintana is a Facility Licensing Program Manager for GEH and has a B.S.E. in Nuclear Engineering. He began his professional nuclear career in 1977 as a nuclear engineer and project manager for GE Nuclear Energy (GENE). His early career included reactor systems and core design activities, as well as 13 years in the project management of power reactor nuclear fuel design and manufacturing activities for several customer utilities. These duties included responsibility for commercial, contractual, engineering design, fabrication, and service aspects of contracted work.

For the following 5 years, Mr. Quintana held several manufacturing facility production and quality assurance leadership positions and was responsible for the safe operation of nuclear fuel bundle and component production lines and the quality of reactor vessel internal components. Mr. Quintana next served for several years as Quality Manager for the Services division of GENE and as Site Manager for GENE's Vallecitos Nuclear Center. As a Site Manager, Mr. Quintana had direct overall responsibility for nuclear facility operations, maintenance, license and environmental compliance, and commercial opportunities.

For the past 3 years, Mr. Quintana has held GENE and now GEH leadership positions in power reactor and fuel facility licensing.

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Cape Fear arch (Class C)

Structure Name Cape Fear arch (Class C)

Comments: Dall and Harris (1892 #3930) were perhaps the first to summarize the observations from which the existence of the Cape Fear arch could be deduced by later workers. They noted that in North Carolina "The Miocene strata ... are generally exposed on the south side of the large rivers and on the north slopes of the divides or swells between the rivers. This formation thickens, deepens toward the northern border of the State, the beds being much thicker on the Tar and Roanoke than on the rivers farther south" (p. 68). In addition, Dall and Harris (1892 #3930, p. 71) noted that, farther southwest in North Carolina along the upper part of the Cape Fear River, "Kerr represents, on the geological map accompanying his report for 1875, the Miocene formation as extending along the right flank of this river valley at least 20 miles above Elizabethtown". Nearly a century later, mapping by Markewich (1985 #3933), Soller (1988 #3937), and Owens (1989 #3935) showed that in the upper and lower parts of the Cape Fear River valley, in southwestern North Carolina, and in the Pee Dee River valley, in nearby South Carolina, both rivers flow along the southwestern sides of their valleys, eroding bluffs there. Successively older deposits and successively older and higher terraces appear successively farther to the northeast in both river valleys, demonstrating migration of both rivers to the southwest in response to southwestward tilting of the land surface (Markewich, 1985 #3933; Soller, 1988 #3937). Nowhere in their chapters on North and South Carolina did Dall and Harris (1892 #3930) deduce the presence of an arch or other tectonically uplifted area separating the northeasterly- and southwesterly-tilted river valleys. However, in subsequent decades the southeast-plunging arch was recognized and named for Cape Fear.

The crest of the arch approximately underlies the Cape Fear River (Soller, 1988 #3937; Owens, 1989 #3935), although the subcrop map of Owens (1989 #3935, shown in more detail as figure 4 of Soller, 1988 #3937) indicated that the crest has shifted tens of kilometers northeastward and southwestward since at least the middle of Late Cretaceous time (Soller, 1987 #3938). Isopach and structure contour maps of middle Cretaceous units indicated that the basins northeast and southwest of the arch subsided then, leaving the arch comparatively high (Harris and others, 1979 #3932). Isopach maps of early Paleocene, Oligocene, and Miocene strata indicated relative subsidence northeast of the arch (Harris, 1996 #3931), and the presence of Miocene rocks northeast and southwest of the arch but not on it led Owens (1970 #3934) to infer that it was a "physical barrier" (p. 24) then. Elevations of shorelines and river terraces indicated uplift of the crest of the arch relative to its southwestern limb during the Pliocene and Pleistocene (Winker and Howard, 1977 #3939; Blackwelder, 1981 #3927; Soller, 1988 #3937). Farther northeast on the other side of the arch, shoreline elevations indicated alternating relative uplifts of the crest and northeast limb during the Pleistocene (Zullo and Harris, 1979 #3940). Isopachs of early Pleistocene strata indicated relative subsidence on both flanks of the arch (Harris, 1996 #3931). Finally, three decades of leveling data suggested historical uplift of the arch, perhaps centered offshore (Brown and Oliver, 1976 #3929; Brown, 1978 #3928).

Reason for assignment to class C: Lack of evidence for Quaternary faulting. Harris and others (1979 #3932) and Zullo and others (1979 #3940) collected earlier suggestions for the existence of three faults longer than 100 km on the arch and its northeastern limb. However, Soller (1988 #3937, p. 49-50) suggested an alternative explanation of the evidence for one of the faults, and Prowell and Obermeier (1991 #3936) noted that much evidence favors regional warping but none requires faulting. Harris (1996 #3931) omitted two of the earlier faults and referred to the third as a hinge.

Date of compilation 02/18/00

Compiler and affiliation Russell L. Wheeler, U.S. Geological Survey

State North Carolina; South Carolina

County Bladen; Brunswick; Columbus; Duplin; New Hanover; Pender; Robeson; Sampson (North Carolina); Dillon; Horry; Marion (South Carolina)

1° x 2° sheet Florence; Beaufort; Georgetown

Physiographic province Coastal Plain

References

#3927 Blackwelder, B.W., 1981, Late Cenozoic marine deposition in the United States Atlantic coastal plain related to tectonism and global climate: Paleogeography, Paleoclimatology, Paleoecology, v. 34, p. 87-114.

#3928 Brown, L.D., 1978, Recent vertical crustal movement along the east coast of the United States: Tectonophysics, v. 44, p. 205-231.

#3929 Brown, L.D., and Oliver, J.E., 1976, Vertical crustal movements from leveling data and their relation to geologic structure in the Eastern United States: Reviews of Geophysics and Space Physics, v. 14, no. 1, p. 13-35.

#3930 Dall, W.H., 1892, Correlation papers—Neocene: U.S. Geological Survey Bulletin 84, 349 p.

#3931 Harris, W.B., 1996, An overview of the marine Tertiary and Quaternary deposits between Cape Fear and Cape Lookout, North Carolina, *in* Cleary, W.J., ed., Environmental coastal geology—Cape Lookout to Cape Fear, North Carolina: Carolina Geological Society Fieldtrip Guidebook, p. 1-10.

#3932 Harris, W.B., Zullo, V.A., and Baum, G.R., 1979, Tectonic effects on Cretaceous, Paleogene, and early Neogene sedimentation, North Carolina, *in* Baum, G.R., Harris, W.B., and Zullo, V.A., eds., Structural and stratigraphic framework for the coastal plain of North Carolina: Carolina Geological Society and Atlantic Coastal Plain Geological Association, p. 17-29.

#3933 Markewich, H.W., 1985, Geomorphic evidence for Pliocene-Pleistocene uplift in the area of the Cape Fear Arch, North Carolina, *in* Morisawa, M., and Hack, J.T., eds., Tectonic geomorphology: Boston, Allen & Unwin, p. 279-297.

#3934 Owens, J.P., 1970, Post-Triassic tectonic movements in the central and southern Appalachians as recorded by sediments of the Atlantic Coastal Plain, *in* Fisher, G.W., Pettijohn, F.J., Reed, J.C., Jr., and Weaver, K.N., eds., Studies of Appalachian geology—Central and southern: New York, John Wiley and Sons, p. 417-427.

#3935 Owens, J.P., 1989, Geologic map of the Cape Fear region, Florence 1° x 2° quadrangle and northern half of the Georgetown 1° x 2° quadrangle, North Carolina and South Carolina: U.S. Geological Survey Miscellaneous Investigations Map I-1948-A, 2 sheets, scale 1:250,000.

#3936 Prowell, D.C., and Obermeier, S.F., 1991, Evidence of Cenozoic tectonism, *in* Horton, J.W., Jr., and Zullo, V.A., eds., The geology of the Carolinas: Knoxville, Tennessee, University of Tennessee Press, p. 309-318.

#3938 Soller, D.R., 1987, Late Cenozoic tectonism of the Cape Fear Arch, central Atlantic coastal plain: Geological Society of America Abstracts with Programs, v. 19, no. 2, p. 130.

#3937 Soller, D.R., 1988, Geology and tectonic history of the lower Cape Fear River Valley, southeastern North Carolina: U.S. Geological Survey Professional Paper 1466-A, 60 p., 1 plate, scale 1:250,000.

#3939 Winker, C.D., and Howard, J.D., 1977, Correlation of tectonically deformed shorelines on the southern Atlantic coastal plain: Geology, v. 5, p. 123-127.

#3940 Zullo, V.A., and Harris, B.W., 1979, Plio-Pleistocene crustal warping in the outer coastal plain of North Carolina, *in* Baum, G.R., Harris, B.W., and Zullo, V.A., eds., Structural and stratigraphic framework for the coastal plain of North Carolina: Carolina Geological Society and Atlantic Coastal Plain Geological Assoication, Raleigh, North Carolina, October 19-21, 1979, Guidebook, p. 31-40.

Definition of Class C Hazard (Crone and Wheeler, 2000)

Geologic evidence (paleoseismological, stratigraphic, sedimentological, structural, and geomorphological) is **insufficient** to demonstrate:

(1) The existence of a tectonic fault, or

(2) Quaternary slip or deformation associated with the feature.

Table of Contents

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The following information was taken directly from the U.S. Department of Agriculture's National Resources Conservation Service Web site found at http://soils.usda.gov/technical/classification/osd/ index.html.

Official Soil Series Descriptions (OSD)

Introduction

"Official soil series description" is a term applied to the description approved by the Natural Resources Conservation Service that defines a specific soil series in the United States. These official soil series descriptions are descriptions of the taxa in the series category of the national system of classification. They mainly serve as specifications for identifying and classifying soils.

While doing survey work, field soil scientists should have all the existing official soil series descriptions that are applicable to their soil survey areas. Other official soil series descriptions that include soils in adjacent or similar survey areas are also commonly needed. Scientists in other disciplines, such as agronomists, horticulturists, engineers, planners, and extension specialists also use the descriptions to learn about the properties of soils in a particular area.

Additional information about the establishment and maintenance of official series descriptions can be found in the National Soil Survey Handbook, Part 614.06.

Fact Sheet

Data Product Keywords

Soils, soil taxonomy, typical pedon, geographically associated soils, competing series, distribution and extent, range in characteristics, type location, drainage and permeability, use and management

Summary

The Official Soil Series Descriptions (OSD) is a national collection of more than 20,000 detailed soil series descriptions, covering the United States, Territories, Commonwealths, and Island Nations served by USDA-NRCS. The descriptions, in a text format, serve as a national standard.

The soil series is the lowest category of the national soil classification system. The name of a soil series is the common reference term, used to name soil map units. Soil series are the most homogenous classes in the system of taxonomy. "Official Soil Series Descriptions" define specific soil series in the United States, Territories, Commonwealths, and Island Nations served by USDA-NRCS. They are descriptions of the taxa in the series category of the national system of soil classification. They serve mainly as specification for identifying and classifying soils. The descriptions contain soil properties that define the soil series, distinguish it from other soil series, serve as the basis for the placement of that soil series in the soil family, and provide a record of soil properties needed to prepare soil interpretations.

Extent of Program

National

Available Products Coverage

OSD are available for all soil series officially recognized in the United States, Territories, Commonwealths, and Island Nations served by USDA-NRCS.

Information Content

The OSD describe general and detailed information about each recognized soil in the United States, Territories, Commonwealths, and Island Nations served by USDA-NRCS, including location, author's initials, introductory paragraph, taxonomic classification, detailed soil profile description, location of the typical soil profile, range in characteristics, competing series, geographic setting, geographically associated soils, drainage and permeability, use and vegetation, distribution and extent, series established, remarks, and additional data.

Product Delivery Format

OSD are stored as unformatted ASCII text files and as html-formatted files.

Technical, Ordering, and Availability Information

The OSD are available through both the Web and through non-Web means. To obtain OSD through the Web, the URL for the NRCS soil survey data (through the USDA NRCS Soils Web site) is http://soils.usda.gov/Soils/technical/classification/osd/index.html. To obtain OSD through non-Web means, contact the USDA-NRCS State Office in your state.

BAYMEADE SERIES [1]

The Baymeade series consists of deep, well drained soils with moderately rapid permeability. They formed in loamy and sandy marine sediments of the lower Coastal Plain. Slopes range from 0 to 12 percent. Mean annual temperature is 63 degrees F., and mean annual precipitation is 54 inches.

Taxonomic Class

Loamy, siliceous, semiactive, thermic Arenic Hapludults

Typical Pedon

Baymeade sand – on a 3 percent slope under mixed hardwood and pine. (Colors are for moist soil unless otherwise stated.)

A – 0 to 3 inches; dark gray (10YR 4/1) fine sand; weak granular structure; loose; many fine and medium roots; many uncoated sand grains; moderately acid; abrupt smooth boundary. (2 to 10 inches thick)

E – 3 to 12 inches; light gray (10YR 7/2) fine sand; single grained; loose; many fine and medium roots; slightly acid; gradual wavy boundary. (0 to 15 inches thick)

E/Bh – 12 to 36 inches; very pale brown (10YR 7/4) fine sand; single grained; loose; common irregular bodies of friable organic coated sand that are dark brown (7.5YR 3/2) and brown (7.5YR 4/4) (Bh) make up about 12 percent of this horizon; many fine and medium roots; moderately acid; abrupt smooth boundary. (0 to 26 inches thick)

Bt – 36 to 49 inches; strong brown (7.5YR 5/6) fine sandy loam; weak coarse subangular blocky structure that parts into weak fine granular structure; very friable; many fine and medium roots; moderately acid; gradual wavy boundary. (5 to 40 inches thick)

BC – 49 to 58 inches; strong brown (7.5YR 5/6) loamy fine sand; weak fine granular structure; very friable; few fine roots; moderately acid; gradual wavy boundary. (0 to 17 inches thick)

[1] Reference: NRCS, 1999a.

C1 – 58 to 75 inches; mottled white (10YR 8/1) and very pale brown (10YR 7/4) fine sand; single grained; loose; moderately acid; gradual wavy boundary.

C2 – 75 to 78 inches; very pale brown (10YR 8/3) fine sand and loamy fine sand; single grained; loose; moderately acid.

Type Location

New Hanover County, North Carolina; Wilmington, 0.5 mile south of Dawson and Sixteenth Streets on west side of Sixteenth Street road bank.

Range in Characteristics

Solum thickness is 35 to more than 60 inches. Reaction ranges from very strongly acid to slightly acid, unless limed. Some pedons have extremely acid A and E horizons.

The A or Ap horizon has hue of 10YR to 2.5Y value of 4 to 6, and chroma of 1 or 2 or is neutral with value of 4 to 6 with common clean grains that are white or light gray. Texture of the A horizon is sand, fine sand, loamy sand, or loamy fine sand.

The E horizon has hue of 10YR or 2.5Y, value of 4 to 8, and chroma of 1 to 6 or is neutral with value of 6 to 8. Texture is sand, fine sand, loamy sand, or loamy fine sand. The Bh portion of E/Bh horizon or Bh horizon, where present, is granular to massive with hue of 5YR to 10YR, value of 3 to 7, and chroma of 2 to 8.

The E' horizon, where present has hues of 7.5YR to 2.5Y, values of 4 to 8, and chroma of 2 to 6 or it is neutral with values of 6 to 8. It is sand, fine sand, loamy sand or loamy fine sand.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 4 to 8. Mottles are in shades of yellow, brown, or gray at depths below 25 inches in some pedons. A gray matrix may be present in the lower Bt horizons of some pedons. Texture is commonly sandy loam or fine sandy loam but some pedons are sandy clay loam. The lower Bt horizon may occur as lamella of sandy loam.

The BC horizon has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 2 to 8. Mottles are in shades of yellow, brown, or gray in some pedons. Texture is loamy sand, loamy fine sand, sandy loam, fine sandy loam or in some pedons sandy clay loam.

The C horizon has hue of 7.5YR to 2.5Y, value of 5 to 8, and chroma of 1 to 8 or is mottled in shades of these colors. Texture is sand or fine sand or stratified sandy, loamy, or clayey material. Some pedons have thin discontinuous Bh bodies in the C horizon.

Competing Series

Ailey, Blaney, Chipola, Chisolm, Coosaw, Garcon, Gomery, Kenansville, Remlik, Tenaha, Tomahawk, Uchee, and Valhalla in the same family. Closely related soils are the Alaga, Eustis, Kureb, Onslow, Seagate, Wagram, and Wakulla series. All of these soils except Kureb lack irregular intermittent Bh bodies in the E/Bh horizon. Kureb soils lack argillic horizons. Onslow soils lack an arenic epipedon and contain gray mottles indicative of wetness in the Bt horizon. Seagate and Valhalla soils have continuous Bh horizons. Seagate soils have poorer drainage.

Geographic Setting

Baymeade soils occur on broad, gently sloping surfaces of the lower Coastal Plain, generally above 20 feet. Slopes range from 1 to 12 percent. They formed in (stratified) interbedded sandy and loamy Coastal Plain sediments. The mean annual precipitation ranges from 47 to 60 inches and mean annual temperature ranges from 53 to 74 degrees F.

Geographically Associated Soils

These are the competing Kureb and the Blanton, Foreston, Goldsboro, Lakeland, Leon, Norfolk and Rimini series. Blanton soils have a Grossarenic epipedon. Foreston, Goldsboro and Norfolk lack an arenic epipedon. Lakeland soils lack light gray E horizons and an argillic horizon. Leon and Rimini soils have continuous Bh horizons, and the Leon soils have poorer drainage.

Drainage and Permeability

Well drained; slow runoff; moderately rapid permeability. Measured watertable levels at two sites show that the water table is 45 to 60 inches below the surface in December to April and other wet periods.

Use and Vegetation

Most of these soils are in forest of mixed hardwood and pine. Native vegetation is turkey oak, long leaf pine, dwarfed huckleberry, small myrtle, wire grass, and astor. Large areas are in residential and urban uses in New Hanover County.

Distribution and Extent

Lower Coastal Plains of North Carolina and possibly South Carolina. The series is extensive.

MLRA Office Responsible

Raleigh, North Carolina

Series Established

New Hanover County, North Carolina; 1973.

Remarks

Diagnostic horizons and features recognized in this pedon are:

- Ochric epipedon – the zone from the surface to a depth of 36 inches (the Ap and E horizons)
- Arenic feature – the zone of sandy sediments from 0 to 36 inches (the A, E, E/Bh horizons)
- Argillic horizon – the zone from a depth of 36 to 58 inches (the Bt and BC horizons)

Additional Data

None.

Tabular Series Data

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
NC0083	BAYMEADE	0- 12	59- 63	190-250	46- 57	20- 70

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
NC0083	NONE		4.0-5.0	APPARENT	DEC-APR	60-60	

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
NC0083	0-36	FS S	0- 0	100-100	0- 8	1- 3
NC0083	0-36	LS LFS	0- 0	100-100	5-13	1- 4
NC0083	36-49	FSL SCL SL	0- 0	100-100	8-26	2- 6
NC0083	49-78	LFS S SL	0- 0	100-100	0-12	0- 3

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
NC0083	0-36	4.5- 6.5	.5-1.	0- 0	6.0- 20	LOW
NC0083	0-36	4.5- 6.5	.5-1.	0- 0	6.0- 20	LOW
NC0083	36-49	4.5- 6.5	0.-.5	0- 0	2.0- 6.0	LOW
NC0083	49-78	4.5- 6.5	0.-.5	0- 0	6.0- 20	LOW

DOROVAN SERIES[2]

The Dorovan series consists of very poorly drained, moderately permeable soils on densely forested flood plains, hardwood swamps, and depressions in the Atlantic Coast Flatwoods, Eastern Gulf Coast Flatwoods, and Southern Coastal Plain Major Land Resource Areas. They formed in highly decomposed acid-organic materials. Near the type location, the mean annual temperature is about 67 degrees F., and the annual precipitation is about 57 inches. Slopes are less than 1 percent.

Taxonomic Class

Dysic, thermic Typic Haplosaprists

Typical Pedon

Dorovan muck, undrained – forested. (Colors are for wet soil unless otherwise stated.)

Oe – 0 to 3 inches; very dark brown (10YR 2/2) mucky peat consisting of partially decomposed moss, leaves, roots, and twigs; 50 percent fiber after rubbing; slightly sticky; extremely acid; gradual wavy boundary. (0 to 4 inches thick)

Oa1 – 3 to 11 inches; black (10YR 2/1) muck that remains black (10YR 2/1) when rubbed and pressed; about 30 percent fiber unrubbed and less than 5 percent rubbed; fibers remaining after rubbing are partially decomposed wood 1 to 2 mm in size; massive; nonsticky; common roots and partially decomposed limbs; extremely acid; diffuse wavy boundary.

Oa2 – 11 to 74 inches; black (10YR 2/1) muck that remains black (10YR 2/1) when rubbed and pressed; about 30 percent fiber unrubbed and less than 5 percent rubbed; fibers remaining after rubbing are partially decomposed wood 1 to 2 mm in size; massive; nonsticky; few roots; decomposed limbs and

[2] Source: NRCS, 1998.

twigs; few logs; extremely acid; gradual wavy boundary. Combined thickness of the Oa horizon(s) is 51 to 80 inches)

Cg1 – 74 to 92 inches; very dark grayish brown (10YR 3/2) sand; single grained; nonsticky; few partially decayed small fragments of wood; very strongly acid; gradual wavy boundary.

Cg2 – 92 to 108 inches; dark grayish brown (10YR 4/2) sand; single grained; nonsticky; few partially decayed small fragments of wood; very strongly acid.

Type Location

George County, Mississippi. Approximately 2.5 miles south of junction of State Highways 26 and 63; 0.75 mile east of Highway 63; 150 feet west of old bridge site and 75 feet north of levee in Cedar Creek flood plain; NE1/4 sec. 16 T. 2 S., R. 6 W.

Range in Characteristics

The organic material ranges from 51 to more than 80 inches thick. It is extremely acid very strongly acid in the organic layers. It is strongly acid or very strongly acid in the 2C horizon.

The Oe layer is neutral with value of 2 to 4 or has a hue of 7.5YR or 10YR; value of 2 to 4, and chroma of 1 to 3. It contains 40 to 90 percent fiber unrubbed, and 20 to 60 percent rubbed. Some pedons lack this layer.

The remaining organic layers are neutral with value of 2 or 3 or have hue of 10YR, 7.5YR, 5YR, or 2.5Y; value of 2 or 3, and chroma of 0 to 3. They contain 10 to 40 percent fiber unrubbed, less than 1/6 of the volume when rubbed. Fibers remaining after rubbing are dominantly woody. A few logs and large fragments of wood are typically in the lower part of the organic layers.

The C horizon is neutral or has hue of 10YR, 2.5Y, or 5Y; value of 2 to 5, and chroma of 0, 1, or 2. Texture is sand, fine sand, loamy sand, sandy loam, fine sandy loam, clay, or their mucky analogues.

Competing Series

These are the Dare and Pungo series in the same family and the Belhaven, Croatan, Handsboro, Istokpoga, Johnston, Mattamuskeet, Maurepas, Pamlico, Ponzer, and Terra Ceia series. Belhaven, Dare and Mattamuskett soils have hue of 2.5YR or 5YR in some part. Pungo soils have parts of the control section that are less decomposed than Dorovan soils. Belhaven and Ponzer have loamy mineral layers at a depth of less than 51 inches. Croatan, Mattamuskeet, and Pamlico soils have mineral layers at a depth of less than 51 inches, and Handsboro soils have sulfitic materials within 40 inches of the surface. Istokpoga soils have less decomposed organic matter than Dorovan soils, and the mean annual soil temperature exceeds 72 degrees F. Johnston soils have loamy mineral surface layers that are high in organic matter over sandy material. Maurepas and Terra Ceia soils are medium acid or moderately alkaline, and Terra Ceia soils have annual temperature of more than 72 degrees F.

Geographic Setting

Dorovan soils are on the flood plains, hardwood swamps, and depressions in the Atlantic Coast Flatwoods, Eastern Gulf Coast Flatwoods, and Southern Coastal Plain Major Land Resource Areas. The soil is saturated to the surface most of the time. Runoff is very slow and water is ponded on the surface in depressions. Slopes are 0 to 2 percent. The underlying mineral sediments commonly are loamy or sandy and are very strongly acid or strongly acid. The mean annual temperature is about 67 degrees F., and the annual precipitation is about 57 inches.

Geographically Associated Soils

These are the competing Croatan, Johnston, Pamlico, and Ponzer series and the Atmore, Basin, Harleston, and Lenoir series. All but Croatan, Pamlico, and Ponzer are mineral soils.

Drainage and Permeability

Very poorly drained; moderate permeability. Water is at or near the surface most of the time.

Use and Vegetation

Nearly all of the soils are used for woodland and wildlife habitat. The native vegetation is blackgum, baldcypress, sweetbay, swamp tupelo, titi, greenbrier, red maple and scattered pine. The ground cover is ferns, mosses, and other hydrophytic plants.

Distribution and Extent

Alabama, Florida, Mississippi, North Carolina, and South Carolina. The series is of moderate extent.

MLRA Office Responsible

Auburn, Alabama.

Series Established

Escambia County, Alabama; 1969.

Remarks

Diagnostic horizons and features recognized in this pedon are:

- Histic epipedon – the zone from the surface to a depth of more than 8 inches (the Oa1, Oa2 horizons).

KENANSVILLE SERIES [3]

The Kenansville series consists of well drained, nearly level to gently sloping soils on Coastal Plain uplands and stream terraces. They have formed in marine and fluvial sediments. Slopes range from 0 to 10 percent.

Taxonomic Class

Loamy, siliceous, subactive, thermic Arenic Hapludults

TYPICAL PEDON: Kenansville loamy sand - in a cultivated field on a 2 percent slope. (Colors are for moist soil unless otherwise stated.)

Ap – 0 to 8 inches, grayish brown (10YR 5/2) loamy sand; weak medium granular structure; very friable; common fine roots; moderately acid; abrupt smooth boundary. (6 to 10 inches thick)

E – 8 to 24 inches, light yellowish brown (10YR 6/4) loamy sand; weak medium granular structure; very friable; few fine roots; moderately acid; gradual wavy boundary. (14 to 30 inches thick)

[3] Source: NRCS, 2002a.

Bt – 24 to 36 inches, yellowish brown (10YR 5/8) sandy loam; weak medium subangular blocky structure; very friable; common fine roots and pores; sand grains coated and bridged with clay; very strongly acid; gradual wavy boundary. (6 to 35 inches thick)

BC – 36 to 42 inches, yellowish brown (10YR 5/8) loamy sand; weak medium granular structure; very friable; few fine roots and pores; clay coatings on sand grains; few bridging of sand grains by clay; strongly acid; gradual wavy boundary. (4 to 22 inches thick)

C – 42 to 84 inches, very pale brown (10YR 7/3) sand; few fine distinct strong brown and common medium faint light gray (10YR 7/2) iron depletions; single grained; loose; strongly acid.

Type Location

Lenoir County, North Carolina; 11 miles northeast of Kinston and 1.2 miles northwest of Grifton; 100 feet northeast of intersection of North Carolina Highway 11 and State Road 1704; in a cultivated field.

Range in Characteristics

Solum thickness ranges from 40 to 60 inches. The soil ranges from very strongly through moderately acid in all horizons, unless limed.

The A or Ap horizon has hue of 7.5YR to 2.5Y, value of 3 to 6, and chroma of 1 to 4. The A horizon is less than 6 inches thick if its color value, moist, is less than 3.5. Texture is loamy sand, loamy fine sand, sand, or fine sand.

The E horizon has hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 3 to 8. Texture is similar to the A or Ap horizon.

The BE horizon, where present, has hue of 10YR or 2.5Y, value of 4 to 8, and chroma of 3 to 6. Texture is loamy sandy, loamy fine sand or sandy loam.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 4 to 8. Texture is sandy loam or fine sandy loam. Thin layers of sandy clay loam are present in some pedons.

The BC, or B/C horizon, where present, has similar matrix color as the Bt horizon. Texture is sand, loamy sand, sandy loam or fine sandy loam.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 to 8, and chroma of 1 to 8. Texture is sand or loamy sand.

Competing Series

(This section not checked this date; added activity class) The Baymeade, Blaney, Chipola, Chisolm, Coosaw, Garcon, Gomery, Remlik, Tenaha, Tomahawk, Uchee, and Valhalla series are in the same family. Alaga, Bassfield, Conetoe, Eustis, Galestown, Kamia, Latonia, Maxton, Molena, Pocalla, Rumford, Valhalla, Wagram, and Wakulla series are in closely related family. Baymead soils have A and B horizons with irregular intermittent Bh bodies. Blaney soils have a Bt horizon that is compact and brittle in part of the mass. Chipola and Chisolm soils have Bt horizons with redder hues. Coosaw and Garcon soils have low chroma mottles in the lower Bt horizon. Also, Garcon have less clayey Bt horizons. Gomery and Tenaha soils are underlain by soft bedrock. Remlik soils have common lamellae in the C horizon and are commonly on 6 to 45 percent slopes. Tomahawk soils have Bh horizon in lower part of solum. Also, they are somewhat poorly drained. Uchee soils have a clayey lower Bt horizon with moderately slow permeability. Valhalla soils have buried E and Bt horizons. Alaga, Eustis, Galestown, Molena, and Wakulla soils have coarser textures. In addition, Galestown soils are mesic and Molena soils have mixed mineralogy. Bassfield and Lotonia soils lack the arenic surface layer. Conetoe soils have mixed mineralogy. Kalmia and Maxton soils thinner A horizon and finer textures Bt horizon. Pocalla soils are bisequal. Rumford soils have thinner A horizons and redder Bt horizons. Wagram soils have thicker sola.

Geographic Setting

Kenansville soils are on nearly level to gently sloping Coastal Plain uplands and stream terraces. They formed in Coastal Plain and stream terrace sediments. Kenansville soils generally are on the smoother parts of the landscape between the higher, sandier ridges and the lower wet areas. Slope gradients are commonly 0 to 4 percent with a full range up to 10 percent. Average annual precipitation is about 48 inches and mean annual temperature is about 63 degrees F. near the type location.

Geographically Associated Soils

These are the competing Eustis, Kalmia, Wagram, and Wakulla series and the Cahaba, Eunola, Foreston, Johns and Lakeland series. Cahaba, Eunola, and Foreston soils lack thick sandy epipedons. Johns soils have low chroma mottles indicative of wetness in the Bt horizon. Lakeland soils are sandy and do not have Bt horizons.

Drainage and Permeability

Well drained; slow runoff; moderately rapid permeability. A seasonal water table is below 4.0 feet for the wet substratum phase.

Use and Vegetation

Most areas are cleared and used for crops. Tobacco, corn, cotton, peanuts, and soybeans are the principal crops. Forested areas are in mixed hardwoods and pine. Native trees include oaks, hickory, dogwoods, and longleaf and loblolly pine.

Distribution and Extent

Coastal Plain of North Carolina, Delaware, South Carolina, and Virginia. The series is of moderate extent.

MLRA Office Responsible

Raleigh, North Carolina

Series Established

Duplin County, North Carolina; 1955.

Remarks

Diagnostic horizons and features recognized in this pedon are:

- Ochric epipedon - the zone from the surface to a depth of 24 inches (the Ap and E horizons)
- Arenic feature - the zone with sandy textures from the surface to 24 inches (the Ap and E horizons)
- Argillic horizon - the zone from a depth of 24 to 42 inches (the Bt and BC horizons)

Additional Data

None.

Tabular Series Data

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SOI-5   Soil Name   Slope   Airtemp FrFr/Seas Precip   Elevation

SOI-5   FloodL FloodH Watertable Kind    Months   Bedrock Hardness

SOI-5   Depth   Texture                  3-Inch   No-10   Clay%   -CEC-

SOI-5   Depth     -pH-      O.M.   Salin   Permeab    Shnk-Swll
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LEON SERIES [4]

The Leon series consists of very deep, moderate to moderately slowly permeable, poorly and very poorly drained soils on upland flats, depressions, stream terraces, and tidal areas. They formed in sandy marine sediments of the Atlantic and Gulf Coastal Plain. Near the type location, the mean annual temperature is about 68 degrees F., and the mean annual precipitation is about 55 inches. Slopes range from 0 to 5 percent.

Taxonomic Class

Sandy, siliceous, thermic Aeric Alaquods

Typical Pedon

Leon sand - forested. (Colors are for moist soil)

A – 0 to 3 inches; very dark gray (10YR 3/1) sand, rubbed; weak fine crumb structure; very friable; many fine and medium roots; many clean sand grains give a salt-and-pepper appearance; very strongly acid; clear smooth boundary. (2 to 9 inches thick)

E1 – 3 to 9 inches; gray (10YR 6/1) sand; common medium faint grayish brown (10YR 5/2) streaks of sand along root channels; single grained; loose; many fine and medium roots; very strongly acid; gradual wavy boundary.

E2 – 9 to 15 inches; light gray (10YR 7/1) sand; few medium faint grayish brown (10YR 5/2) streaks of sand along root channels; single grained; loose; few fine and medium roots; common medium pores; very strongly acid; clear wavy boundary. (Combined thickness of the E horizons range from 4 to 25 inches.)

Bh1 – 15 to 18 inches; black (5YR 2/1) sand; weak medium subangular blocky structure that parts to weak fine granular; friable; many fine and medium roots and pores; more than 95 percent of sand grains have organic coatings; very strongly acid; abrupt wavy boundary.

Bh2 – 18 to 22 inches; dark reddish brown (5YR 2/2) sand; common medium faint black (10YR 2/1) masses with more organic matter than matrix; distinct brown (7.5YR 4/4) streaks having less organic carbon than matrix; weak fine subangular blocky structure that parts to weak fine granular; friable; few

[4] Source: NRCS, 2005a.

fine and medium roots; common fine pores; more than 95 percent of sand grains have organic coatings; very strongly acid; clear wavy boundary.

Bh3 – 22 to 30 inches; dark brown (7.5YR 3/2) sand; common medium distinct vertical streaks of dark reddish brown (5YR 2/2) sand along root channels; weak fine granular structure; friable; few fine and medium roots and pores; many coated sand grains; very strongly acid; gradual wavy boundary. (Combined thickness of the Bh horizons range from 6 to 35 inches.)

BE – 30 to 33 inches; brown (10YR 5/3) sand; few faint streaks of light brownish gray (10YR 6/2) areas with less organic carbon than matrix; single grained; loose; few medium and fine roots; few fine pores; many uncoated sand grains; very strongly acid; gradual irregular boundary. (2 to 30 inches thick)

E' – 33 to 66 inches; light brownish gray (10YR 6/2) sand; common medium faint dark grayish brown (10YR 4/2) masses with more organic carbon than matrix; single grained; loose; few fine and medium roots; many uncoated sand grains; very strongly acid; clear wavy boundary. (0 to 36 inches thick)

B'h – 66 to 80 inches; very dark brown (10YR 2/2) sand; single grained; loose; common medium distinct light brownish gray (10YR 6/2) streaks and pockets having less organic carbon than matrix; many uncoated sand grains; very strongly acid.

Type Location

Bay County, Florida. Approximately 0.75 mile north of Mine Testing Laboratory and U.S. Highway 98, about 3.0 miles south of West Bay along the west side of Woods Road; NW 1/4, SW 1/4, Sec. 19, T. 3 S., R. 15 W.

Range in Characteristics

The Bh horizon is within 30 inches of the soil surface. Reaction ranges from extremely acid to slightly acid throughout. In tidal areas, the soil reaction ranges from very strongly acid to moderately alkaline throughout.

The A or Ap horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 or 2; or is neutral with value of 2 to 4. When dry, this horizon has a salt-and-pepper appearance due to mixing of organic matter and white sand grains. Texture is sand, fine sand, mucky fine sand, mucky sand, or muck.

The E horizon has hue of 7.5YR to 2.5Y, value of 4 to 8, and chroma of 1 to 4; or is neutral with value of 5 to 8. Redoximorphic features and streaks in shades of black or gray range from none to common. Texture is sand or fine sand.

Where present, a transitional horizon between the lower E horizon and the Bh1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1. Thickness ranges from 0.5 to 2.0 inches. Texture is sand or fine sand.

The Bh horizon has hue of 5YR to 10YR, value of 2 or 4, and chroma of 1 to 4; or is neutral with value of 2 to 4. This horizon burns white on ignition. Vertical or horizontal streaks or pockets of sand or organic matter depletions in shades of gray or brown range from none to common. Texture is sand, fine sand, loamy sand or loamy fine sand.

The E' horizon, where present, has hue of 7.5YR to 2.5Y, value of 4 to 8, and chroma of 1 to 3. Streaks and masses of organic matter accumulation in shades of brown range from none to common. Texture is sand or fine sand

The B'h horizon, where present, is similar in colors and texture to the Bh horizon but occurs below the BE or E' horizons.

The C horizon, where present, has of 7.5YR to 2.5Y, value of 4 to 8, and chroma of 1 to 6. Texture is sand or fine sand.

Competing Series

The Witherbee series is the only known series in the same family. The somewhat poorly drained Witherbee soils have less developed spodic horizons.

Geographic Setting

Leon soils are on upland flats, depressions, stream terraces, and tidal areas of the lower Atlantic and Gulf Coastal Plain. They formed in thick beds of acid sandy marine sediments. The climate is humid semitropical. Slopes range from 0 to 5 percent. The average annual temperature ranges from 66 to 70 degrees F., and the average annual precipitation ranges from 50 to 60 inches.

Geographically Associated Soils

These include the Chipley, Foxworth, Hurricane, Kershaw, Lakeland, Lynn Haven, Mascotte, Olustee, Ortega, Osier, Plummer, Portsmouth, Pottsburg, Ridgeland, Scranton, and Wesconnett series. Chipley, Foxworth, Kershaw, Lakeland, and Ortega soils are on higher positions and lack spodic horizons. In addition, Chipley soils are somewhat poorly drained, Foxworth soils are moderately well drained to excessively drained, Kershaw and Lakeland soils are excessively drained, and Ortega soils are moderately well drained. Hurricane and Pottsburg soils have a spodic horizon at depths greater than 50 inches. In addition, Hurricane soils are somewhat poorly drained and on higher positions and Pottsburg soils are somewhat poorly to poorly drained and on similar to slightly higher positions. Lynn Haven soils are on similar positions but have an umbric epipedon. Mascotte and Olustee soils are on similar positions but are underlain by argillic horizons under the Bh horizon. Osier soils are on flood plains and lack spodic horizons. Plummer soils are on similar to lower positions and are grossarenic. The very poorly drained Portsmouth are on lower positions and lack spodic horizons. Ridgeland and Wesconnett soils and lack E horizons between the A and Bh horizons. In addition, Ridgeland soils are on slightly higher positions and are somewhat poorly drained while Wesconnett soils are in lower depressional areas and are very poorly drained. The poorly drained Scranton soils are on similar to slighter higher positions and lack spodic horizons.

Drainage and Permeability

Poorly drained and very poorly drained; moderate to moderately rapid permeability in the Bh horizons, moderate to moderately slow in the B'h horizons, and rapid in the other layers.

Use and Vegetation

Most areas of Leon soils are used for forestry, range, and pasture. Areas with adequate water control are used for cropland and vegetables. Natural vegetation consists of longleaf pine, slash pine, water oak, myrtle, with a thick undergrowth of sawpalmetto, running oak, fetterbush, inkberry (gallberry), chalky bluestem, creeping bluestem, and pineland threeawn (wiregrass). In depressions, the vegetation is dominated by brackenfern, smooth sumac and swamp cyrilla are common. Vegetation in the tidal areas includes bushy seaoxeye, marshhay cordgrass, seashore saltgrass, batis, and smooth cordgrass.

Distribution and Extent

The Atlantic and Gulf Coastal Plain from Florida, Maryland, South Carolina and Virginia. The series is of large extent.

MLRA Office Responsible

Auburn, Alabama.

Series Established

Leon County, Florida; 1905.

Remarks

The water table is at depths of 6 to 18 inches for 1 to 4 months during most years. In low flatwoods or sloughs it is at a depth of 0 to 6 for periods of more than 3 weeks during most years. It is between depths of 18 and 36 inches for 2 to 10 months during most years. It is below 60 inches during the dry periods of most years. Depressional areas are covered with standing water for periods of 6 months or more in most years.

Diagnostic horizons and features recognized in this pedon are:

- Ochric epipedon – the zone from the surface of the soil to a depth of approximately 15 inches (A, E1, and E2 horizons).
- Albic horizons – the zones from approximately 3 inches to 15 inches and 33 inches to 66 inches (E1, E2, and E' horizons) (not required for Leon series).
- Spodic horizon within 30 inches – the zone from 15 inches to 22 inches (Bh1, Bh2, and Bh3 horizons) and from approximately 66 inches to 80 inches or more (B'h horizons).
- Aquic conditions – endosaturation throughout.

IFAS Soil Characterization Data: S2-1-(1-9), S2-2-(1-8), S3-3-(1-5), S4-8-(1-9), S10-12-(1-7) S12-17-(1-7), S16-9-(1¬7), S19-6-(1-5), S33-24-(1-7), S37-28-(1-8), S45-27-(1-7), S46-2-(1-6), S57-46-(1-6), S66-24-(1-8); sample by IFAS, University of Florida, Gainesville, FL.

SOI-5 Soil Name Slope Airtemp FrFr/Seas Precip Elevation FL0051 LEON 0- 5 65- 70 230-310 50- 60 8- 135 FL0093 LEON 0-2 65-70 230-310 50-60 8-135 FL0406 LEON 0-2 65-70 230-310 50-60 8-135 FL0501 LEON 0-2 65-70 230-310 50- 60 8- 135 FL0508 LEON 0- 2 65- 70 230-310 50- 60 0- 2

SOI-5 FloodL FloodH Watertable Kind Months Bedrock Hardness FL0051 NONE 0.5-1.5 APPARENT MAR-SEP 60¬60 FL0093 NONE 0-0.5 APPARENT FEB-SEP 60-60 FL0406 RARE COMMON 0-1.0 APPARENT MAR-SEP 60-60 FL0501 NONE - APPARENT - 60-60 FL0508 FREQ 0-0.5 APPARENT JAN-DEC 60-60

SOI-5 Depth Texture 3-Inch No-10 Clay% -CEC- FL0051 0- 3 S FS 0- 0 100-100 1- 5 2- 12 FL0051 3-15 S FS 0- 0 100-100 0- 3 .3- 1 FL0051 15-30 S FS LS 0- 0 100-100 2- 8 8- 30 FL0051 30-66 S FS 0- 0 100-100 1- 4 .5- 3 FL0051 66-80 0- 0 100-100 2- 8 8- 30 FL0093 0- 4 MK-S MK-FS 0- 0 100-100 1- 6 12- 30 FL0093 0- 4 S FS 0- 0 100-100 1-5 2- 12 FL0093 4-16 S FS 0- 0 100-100 0- 3 .3- 1 FL0093 16-25 S FS LS 0- 0 100-100 2- 8 8- 30 FL0093 25-80 S FS 0¬0 100-100 1- 4 .5- 3 FL0406 0- 3 FS S 0- 0 100-100 1- 5 2- 12 FL0406 0- 3 MK-FS MK-S 0- 0 100-100 1- 6 12- 30 FL0406 3-15 FS S 0- 0 100-100 0- 3 .3- 1 FL0406 15-23 FS S LS 0- 0 100-100 2- 8 8- 30 FL0406 23-80 FS S 0- 0 100¬100 1- 4 .5- 3 FL0501 0- 3 MUCK – 0- 0 90-200 FL0501 3-17 S FS 0- 0 100-100 0- 3 .3- 2 FL0501 17-80 S FS LFS 0- 0 100-

100 2- 8 8- 30 FL0508 0-26 S FS 0- 0 100-100 1- 3 1- 12 FL0508 26-40 S FS 0- 0 100-100 2- 8 12- 30 FL0508 40-80 S FS 0- 0 100-100 2-10 .5- 3

SOI-5 Depth -pH- O.M. Salin Permeab Shnk-Swll FL0051 0- 3 3.6- 6.5 .5-4. 0- 2 6.0- 20 LOW FL0051 3-15 3.6- 6.5 0.-.5 0- 2 6.0- 20 LOW FL0051 15-30 3.6- 6.5 2.-4. 0- 2 0.6- 6.0 LOW FL0051 30-66 3.6- 6.5 0.-.5 0- 2 2.0- 20 LOW FL0051 66-80 3.6- 6.5 1.-3. 0- 2 0.2- 2.0 LOW FL0093 0- 4 3.6- 6.5 10-20 0- 2 6.0- 20 LOW FL0093 0- 4 3.6- 6.5 2.-5. 0- 2 6.0- 20 LOW FL0093 4-16 3.6- 6.5 0.-.5 0- 2 6.0- 20 LOW FL0093 16-25 3.6- 6.5 1.-4. 0- 2 0.6-6.0 LOW FL0093 25-80 3.6- 6.5 0.-.5 0- 2 2.0- 20 LOW FL0406 0- 3 3.6- 5.5 .5-4. 0- 2 6.0- 20 LOW FL0406 0- 3 3.6- 5.5 10-20 0- 2 6.0-20 LOW FL0406 3-15 3.6- 5.5 0.-.5 0- 2 6.0- 20 LOW FL0406 15-23 3.6- 5.5 1.-4. 0- 2 0.6- 6.0 LOW FL0406 23-80 3.6- 5.5 0.-.5 0- 2 0.6- 20 LOW FL0501 0- 3 3.6- 5.5 20-80 0- 2 6.0- 20 LOW FL0501 3-17 3.6- 5.5 0.-.5 0- 2 6.0- 20 LOW FL0501 17-80 3.6- 5.5 1.-4. 0- 2 0.6- 6.0 LOW FL0508 0-26 4.5- 8.4 1.-3. 8-16 2.0- 6.0 LOW FL0508 26-40 4.5-8.4 1.-4. 8-16 0.6- 6.0 LOW FL0508 40-80 4.5- 8.4 0.-.5 2- 8 0.6- 6.0 LOW

LYNCHBURG SERIES[5]

- MLRA(s): 133A-Southern Coastal Plain, 153A-Atlantic Coast Flatwoods, 153B-Tidewater Area
- MLRA Office Responsible: Raleigh, North Carolina
- Depth Class: Very deep
- Drainage Class (Agricultural): Somewhat poorly drained
- Internal Free Water Occurrence: Shallow, common
- Flooding Frequency and Duration: None
- Ponding Frequency and Duration: None
- Index Surface Runoff: Negligible
- Permeability: Moderate
- Landscape: Lower to upper coastal plain
- Landform: Marine terraces, flats Geomorphic
- Component: Talfs, dips
- Parent Material: Marine deposits, fluviomarine deposits
- Slope: 0 to 2 percent
- Elevation (type location): Unknown
- Mean Annual Air Temperature (type location): 62 degrees F.
- Mean Annual Precipitation (type location): 48 inches

Taxonomic Class

Fine-loamy, siliceous, semiactive, thermic Aeric Paleaquults

Typical Pedon

Lynchburg loamy fine sand – cultivated. (Colors are for moist soil.)

[5] Source: NRCS, 2005b.

Ap – 0 to 6 inches; very dark gray (10YR 3/1) loamy fine sand; weak medium granular structure; very friable; common fine roots, few medium roots; very strongly acid; clear smooth boundary. (3 to 11 inches thick)

E – 6 to 10 inches; light olive brown (2.5Y 5/4) loamy fine sand; weak medium subangular blocky structure; very friable; common fine roots; few fine pores; common medium distinct dark gray (10YR 4/1) iron depletions; very strongly acid; clear smooth boundary. (0 to 10 inches thick)

Bt – 10 to 17 inches; light olive brown (2.5Y 5/4) sandy clay loam; weak medium subangular blocky structure; friable; common fine roots; few fine pores; few faint clay films on faces of some peds; common medium distinct light brownish gray (2.5Y 6/2) iron depletions and many medium distinct yellowish brown (10YR 5/6), and few fine medium prominent red (2.5YR 4/8) masses of oxidized iron; very strongly acid; clear wavy boundary.

Btg1 – 17 to 30 inches; light brownish gray (2.5Y 6/2) sandy clay loam; weak medium subangular blocky structure; friable; few fine roots; few fine pores; common faint clay films on faces of some peds; many medium prominent yellowish brown (10YR 5/6) and common medium prominent red (2.5YR 4/6) masses of oxidized iron; very strongly acid; gradual smooth boundary.

Btg2 – 30 to 65 inches; gray (10YR 6/1) sandy clay loam; weak medium subangular blocky structure; friable; few fine roots; common faint clay films on faces of peds; many medium prominent yellowish brown and many medium prominent red (2.5YR 4/8) masses of oxidized iron; very strongly acid; gradual smooth boundary.

Btg3 – 65 to 80 inches; gray (10YR 5/1) clay; weak medium subangular structure; firm; few fine roots; few faint clay films on faces of peds; many medium prominent strong brown (7.5YR 5/8) and few fine prominent red (2.5YR) masses of oxidized iron and few medium faint greenish gray (5BG 6/1) iron depletions; very strongly acid. (Combined thickness of the Bt horizons are more than 40 inches.)

Type Location

Colleton County, South Carolina, 3,000 feet southwest of junction of U.S. Highway 21 and Seaboard Coastline Railroad in Ruffin; 4 southwest of junction of U.S. Highway 21 and South Carolina Secondary Road 272; 100 feet north of U.S. Highway 21.

Range in Characteristics

- Thickness of the surface and subsurface layers: 3 to 19 inches
- Depth to top of the Argillic horizon: 3 to 19 inches
- Depth to the base of the Argillic horizon: 60 to more than 80 inches
- Soil reaction: Extremely acid to strongly acid throughout, except where limed
- Depth to Bedrock: Greater than 80 inches
- Depth to Seasonal High Water Table: 6 to 18 inches, November to April
- Rock Fragment content: 0 to 10 percent, by volume
- Other features: The particle-size control section contains less than 30 percent silt.

Range of Individual Horizons

Ap horizon or A horizon (where present)

- Color – hue of 10YR or 2.5Y, value of 2 to 5, and chroma of 1 to 2, or is neutral with value of 2 to 5
- Texture – sand, fine sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, or loam

E horizon

- Color – hue of 10YR or 2.5Y, value of 4 to 7, chroma of 1 to 4
- Texture – sand, fine sand, loamy sand, loamy fine sand, sandy loam, fine sandy loam, or loam
- Redoximorphic features (where present) – masses of oxidized iron in shades of red, yellow, or brown and iron depletions in shades of brown, yellow, olive, or gray

Bt horizon

- Color – hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 to 8
- Texture – sandy clay loam, but ranges to sandy loam, fine sandy loam, loam or clay loam.
- The particle-size control section contains less than 30 percent silt
- Redoximorphic features (where present) – masses of oxidized iron in shades of red, yellow, or brown and iron depletions in shades of brown, yellow, olive, or gray

Btg horizon

- Color – hue of 10YR to 5Y, value of 4 to 7, chroma of 1 to 2, or is neutral with value of 4 to 7
- Texture – sandy loam, fine sandy loam, loam, sandy clay loam, or clay loam. Some pedons are sandy clay or clay at a depth of 40 inches or more
- Redoximorphic features (where present) – masses of oxidized iron in shades of red, yellow, or brown and iron depletions in shades of brown, yellow, olive, or gray

BCg horizon

- Color – hue of 10YR to 5Y, value of 4 to 7, chroma of 1 or 2, or is neutral with value of 4 to 7
- Texture – sandy loam, fine sandy loam, loam, sandy clay loam, clay loam, sandy clay, or clay
- Redoximorphic features (where present) – masses of oxidized iron in shades of red, yellow, or brown and iron depletions in shades of brown, yellow, olive, or gray

Competing Series

- Hazlehurst soils – have a firm, brittle Bx horizon with more than 5 percent plinthite
- Jedburg soils – contains more than 30 percent silt in the particle-size control section

Geographic Setting

- Landscape: Lower to upper coastal plain
- Landform: Marine terraces, flats
- Geomorphic Component: Talfs, dips

- Parent Material: Marine deposits, fluviomarine deposits
- Elevation: 40 to 450 feet
- Mean Annual Air Temperature: 57 to 70 degrees F.
- Mean Annual Precipitation: 38 to 52 inches Frost Free Period: 190 to 245 days

Geographically Associated Soils

- Clarendon soils – do not have redox depletions in the upper part of the argillic horizon
- Coxville soils – have a fine particle-size control section and have redox depletions with dominant chroma of 2 or less throughout
- Dunbar soils – have a fine particle-size control section
- Duplin soils – do not have redox depletions in the upper part of the argillic horizon and have a fine particle-size control section
- Eunola soils – are moderately well drained
- Foreston soils – do not have redox depletions in the upper part of the argillic horizon and have a coarse-loamy particle-size control section
- Goldsboro soils – are moderately well drained
- Grady soils – have a fine particle-size control section and have redox depletions with dominant chroma of 2 or less throughout Johns soils – have contrasting textures within a depth of 40 inches
- Ocilla soils – have sandy epipedon 20 to 40 inches thick
- Pelham soils – have redox depletions with dominant chroma of 2 or less throughout and sandy epipedon 20 to 40 inches thick
- Rains soils – are poorly drained
- Stallings soils – have a coarse-loamy particle-size control section
- Woodington soils – have a coarse-loamy particle-size control section

Drainage and Permeability

- Depth Class: Very deep
- Drainage Class (Agricultural): Somewhat poorly drained
- Internal Free Water Occurrence: Shallow, common
- Flooding Frequency and Duration: None
- Ponding Frequency and Duration: None
- Index Surface Runoff: Negligible
- Permeability: Moderate

Use and Vegetation

- Major Uses: About one-half of the soil is in cropland or pasture and the remainder is in forest
- Dominant Vegetation: Where cultivated – corn, soybeans, cotton, tobacco, truck crops, small grains, or improved pasture. Where wooded – oak, sweetgum, blackgum, longleaf pine, slash pine, loblolly pine, and an understory of gallberry and pineland threeawn.

Distribution and Extent

- Distribution: Georgia, Alabama, Florida, North Carolina, South Carolina, and Virginia
- Extent: Large

MLRA Office Responsible

Raleigh, North Carolina

Series Established

Tift County, Georgia; 1947.

Remarks

Diagnostic horizons and features recognized in this pedon are:

- Ochric epipedon – the zone from the surface of the soil to a depth of 10 inches (Ap and E horizons).
- Argillic horizon – the zone from 10 to 62 inches (Bt and Btg horizons).

Additional Data

None.

Tabular Series Data

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
SC0037	LYNCHBURG	0-2	57-70	190-245	38-52	40-450

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
SC0037	NONE		0.5-1.5	APPARENT	NOV-APR	>80	-

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
SC0037	0-10	LS LFS S FS	0-0	90-100	2-10	1-4
SC0037	0-10	SL FSL L	0-0	90-100	5-20	2-6
SC0037	10-65	SCL SL CL	0-0	90-100	18-35	2-7
SC0037	65-80	SCL SC C	0-0	92-100	20-50	2-7

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
SC0037	0-10	3.6-6.0	0.05-5.0	0-0	6.0-20	LOW
SC0037	0-10	3.6-5.5	0.05-5.0	0-0	2.0-6.0	LOW
SC0037	10-65	3.6-5.5	0.0-0.5	0-0	0.6-2.0	LOW
SC0037	65-80	3.6-5.5	0.0-0.5	-	0.6-2.0	LOW

MURVILLE SERIES [6]

The Murville series consists of very poorly drained soils that have rapid permeability in the A horizon and moderately rapid permeability in the Bh horizon. The soils formed from wet sandy marine and fluvial sediments. They are in flats or in slight depressions on broad interstream areas of uplands and stream terraces in the Coastal Plain. Slopes are less than 2 percent. At the type location, the mean annual temperature is about 63 degrees F., and the mean annual precipitation is about 50 inches.

Taxonomic Class

Sandy, siliceous, thermic Umbric Endoaquods

Typical Pedon

Murville fine sand – on a nearly level slope under pond pine with understory of gallberry, smilax, and canes. (Colors are for moist soil unless otherwise stated.)

Oe – 2 to 0 inches; partially decayed leaves, moss, and twigs.

A – 0 to 8 inches; black (N 2/) fine sand; weak fine granular structure; very friable; many roots; many clean quartz grains; loamy feel and appearance from organic matter; very strongly acid; clear wavy boundary. (6 to 11 inches thick)

Bh – 8 to 45 inches; black (10YR 2/1) fine sand; massive; very friable; few roots in upper portion; sand grains mostly have dark films or coatings; few clean quartz grains; loamy feel and appearance from organic matter; very strongly acid; gradual wavy boundary. (24 to 45 inches thick)

C – 45 to 70 inches; pale brown (10YR 6/3) fine sand with thin strata of sandy loam and sandy clay loam; single grained; loose; streaks of light gray (10YR 7/1); few old root channels; very strongly acid.

Type Location

New Hanover County, North Carolina; about 0.5 mile north of junction of U.S. Highway 421 and N. C. Highway 132, along N. C. 132 and east 1600 feet along canal in wooded area.

Range in Characteristics

Solum thickness ranges from 30 to 60 inches. Humus in the A and Bh horizons gives the sandy material a loamy feel and appearance. The soil is strongly acid to extremely acid.

A thin Oa or Oe horizon can be present in some pedons.

The A or Ap horizons have hue of 10YR to 5YR, or they are neutral, value of 2 or 3, and chroma of 0 to 2. There are few to common clean sand grains. Texture is sand, fine sand, loamy sand, loamy fine sand, or mucky analogues of these textures. Intermittent Eg horizons from 1/4 to 2 inches thick occur in fewer than 50 percent of the pedons.

The Bh horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. It is sand, fine sand, loamy fine sand, or loamy sand. Few to common uncoated sand grains may be present and some pedons may have very thin discontinuous lamellae of clean sand. The sand grains in the lower horizons may have thin humus coatings with hue of 10YR to 5YR, value of 4 to 5, and chroma of 1 to 4.

[6] Source: NRCS, 1999b.

Some pedons have a BEg or Eg horizon below the Bh horizon. Where present, the BEg horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The Eg horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 1 or 2. Texture of the BEg and Eg horizons is sand, fine sand, loamy fine sand, or loamy sand. Thickness of the BE or Eg horizons ranges from 0 to 20 inches. Pedons that have either of these horizons also have a B'h horizon below them that has similar properties to the Bh horizon.

The C horizon, and Cg horizon where present, is dominantly fine sand, sand, loamy sand, or loamy fine sand, but may have lenses or strata of loamy material at depths of 50 to 80 inches below the surface. The C horizon has hue of 10YR to 5Y, value of 5 to 8, and chroma of 3. The Cg horizon has the same hue and value range, but has chroma of 1 or 2. Some pedons may have thin layers of darker-colored material.

Competing Series

These are Boulogne, Lynn Haven and Wesconnett series. Boulogne soils have sola thicker than 80 inches, are fine sand or loamy fine sand only, and have firm or very firm Bh horizons. Lynn Haven soils have continuous E horizons. Wesconnett soils have a B'h horizon, and in addition are sand or fine sand to depths of 80 inches or more.

Geographic Setting

Murville soils are nearly level and are on flat or slight depressional areas on Coastal Plain uplands and stream terraces. They formed in wet sandy marine or fluvial sediments. Slopes are less than 2 percent. Near the type location, mean annual temperature is about 63 degrees F., and mean annual precipitation is about 50 inches.

Geographically Associated Soils

These include the Baymeade, Kureb, Leon, Lynn Haven, Rutlege, and Torhunta soils. Baymeade, Kureb, and Leon soils are better drained and are on higher landscape positions than Murville soils. In addition, Baymeade and Kureb soils do not have a spodic horizon. Lynn Haven, Rutlege, and Torhunta soils are in the same landscape positions as Murville. Lynn Haven soils have continuous E horizons, Rutlege and Torhunta soils do not have a spodic horizon.

Drainage and Permeability

Murville soils are very poorly drained. Permeability is rapid in the A horizon, and moderately rapid in the Bh horizon. The water table is at or near the surface most of the time except during summer months or where artificially drained. Depth to the seasonal high water table ranges from 0 to 1 foot from November to May.

Use and Vegetation

Chiefly in cutover forests of pond pine, with a few scattered loblolly, longleaf pine, and red maple. Slash pine grow in the southern part of the range. Understory vegetation includes sweetbay, redbay, swamp cyrilla (red titi), zenobia, inkberry (bitter gallberry), large gallberry, greenbrier, switchcane, fetterbush lyonia, blueberry, loblollybay gordonia, southern bayberry (waxmyrtle), and a ground cover of sphagnum and club mosses, chainfern, broom sedge, and switchcane and maidencane in open areas. Where frequent burning has taken place only the understory species are present.

Distribution and Extent

Lower Coastal Plain of North Carolina and Florida. The series is of moderate extent.

MLRA Office Responsible

Raleigh, North Carolina

Series Established

New Hanover County, North Carolina; 1973.

Remarks

The Murville soils were formerly included in the Ridgeland series. However, Ridgeland soils are in a mixed mineralogy family. The April 1993 revision of this series changed the subgroup classification from Typic Haplaquods to Umbric Endoaquods.

Diagnostic horizons and soil properties recognized in the typical pedon are: Umbric epipedon - the zone from the surface of the soil to a depth of 45 inches (A and Bh horizons) Spodic horizon - the zone from 8 to 45 inches (Bh horizon) MLRA(S): 153A, 153B SIR: NC0085

Tabular Series Data

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SOI-5  Soil Name   Slope  Airtemp FrFr/Seas Precip  Elevation
NC0085 MURVILLE    0- 2    59- 70  190-290  45- 60    10-  90

SOI-5  FloodL FloodH Watertable Kind   Months  Bedrock Hardness
NC0085 NONE   RARE       -     APPARENT    -     60-60

SOI-5  Depth  Texture                3-Inch  No-10  Clay%   -CEC-
NC0085  0- 8  FS S LFS                0-  0 100-100  2- 8   2- 11
NC0085  0- 8  MK-S MK-LS MK-LFS       0-  0 100-100  2- 8   9- 22
NC0085  8-45  FS S LFS                0-  0 100-100  2- 8   2- 10
NC0085 45-56  FS S                    0-  0 100-100  2- 8   0-  4
NC0085 56-70  VAR                      -       -       -      -

SOI-5  Depth   -pH-     O.M.  Salin  Permeab   Shnk-Swll
NC0085  0- 8  3.5- 5.5  2.-9.  0- 0  6.0-  20  LOW
NC0085  0- 8  3.5- 5.5  9.-15  0- 0  6.0-  20  LOW
NC0085  8-45  3.5- 5.5  2.-8.  0- 0  2.0- 6.0  LOW
NC0085 45-56  3.5- 5.5  0.-2.  0- 0  6.0-  20  LOW
NC0085 56-70    -        -      -       -
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ONSLOW SERIES[7]

The Onslow series consists of moderately well drained and somewhat poorly drained soils that formed from moderately fine-textured Coastal Plain sediments. These soils are on nearly level to slightly convex divides of uplands. Slopes range from 0 to 3 percent.

Taxonomic Class

Fine-loamy, siliceous, semiactive, thermic Spodic Paleudults

[7] Source: NRCS, 2002b.

Typical Pedon

Onslow loamy fine sand, on a nearly level convex divide in woods. (Colors are for moist soil unless otherwise stated.)

A – 0 to 4 inches; very dark gray (10YR 3/1) loamy fine sand; weak medium granular structure; very friable; many fine roots; very strongly acid; clear wavy boundary. (3 to 6 inches thick)

E – 4 to 8 inches; gray (10YR 6/1) loamy fine sand; weak medium granular structure; very friable; common fine roots; very strongly acid; clear wavy boundary. (0 to 7 inches thick)

E/Bh – 8 to 14 inches; very pale brown (10YR 7/3), light yellowish brown (10YR 6/4), and reddish brown (5YR 5/4) loamy fine sand; massive; very friable to firm; about 1/3 of the horizon is weakly cemented Bh and 1/3 is strongly cemented Bh concretions ranging from 1/4 to 3/4 inch in size; few fine roots; very strongly acid; clear wavy boundary. (3 to 8 inches thick)

E' – 14 to 17 inches; very pale brown (10YR 7/3) loamy fine sand; weak medium granular structure; very friable; few fine roots; very strongly acid; clear wavy boundary. (0 to 10 inches thick)

BE – 17 to 20 inches; brownish yellow (10YR 6/6) fine sandy loam; few coarse distinct very pale brown (10YR 7/3) mottles; weak fine subangular blocky structure; very friable; few fine roots; very strongly acid; clear wavy boundary. (0 to 4 inches thick)

Bt1 – 20 to 30 inches; brownish yellow (10YR 6/6) sandy clay loam; few medium distinct strong brown (7.5YR 5/8), and light gray (10YR 7/1) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few medium roots; few thin clay films on faces of peds; very strongly acid; gradual wavy boundary. (6 to 15 inches thick)

Bt2 – 30 to 41 inches; mottled light yellowish brown (10YR 6/4), strong brown (7.5YR 5/8), and light gray (10YR 7/2) sandy clay loam; weak medium subangular blocky structure; friable; slightly sticky, slightly plastic; few thin clay films on faces of peds; very strongly acid; gradual wavy boundary. (8 to 15 inches thick)

Btg – 41 to 53 inches; light gray (10YR 7/2) sandy clay loam; common medium distinct brownish yellow (10YR 6/8), and few fine prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few thin clay films on faces of peds; very strongly acid; gradual wavy boundary. (5 to 14 inches thick)

BCg – 53 to 68 inches; light gray (10YR 7/1, 6/1) sandy clay loam with lenses of sandy loam; common medium distinct yellowish red (5YR 5/8) mottles; weak subangular blocky structure; friable; slightly sticky; few small bodies of clean sand; very strongly acid; gradual wavy boundary. (7 to 20 inches thick)

Cg – 68 to 80 inches; white (10YR 8/1) sandy loam with common lenses of loamy sand; few medium distinct light yellowish brown (10YR 6/4) and brownish yellow (10YR 6/8) mottles; massive; friable; very strongly acid.

Type Location

Onslow County, North Carolina; 0.6 mile southwest of Swansboro, 0.3 mile north of intersection of SR 1444 and SR 1447, 100 feet east of SR 1444.

Range in Characteristics

The loamy textured horizons extend to 60 inches or more below the soil surface. The reaction ranges from strongly acid to extremely acid in all horizons except where the surface has been limed.

The A or Ap horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 1 to 3.

The E horizon, where present, has hue of 10YR to 5Y, value of 5 to 7, and chroma of 1 to 4.

The E portion of the E and Bh horizon has hue of 10YR or 2.5Y, value of 4 to 8, and chroma of 3 to 6. The Bh portion has hue of 10YR, 7.5YR or 5YR, value of 2 to 5, and chroma of 2 to 4. It is discontinuous and ranges from 15 to 75 percent of the E/Bh horizon. Weakly to strongly cemented Bh concretions range from 15 to 35 percent of the Bh portion of this horizon. In some pedons the Bh horizon is destroyed by tillage but the Bh concretions remain in the plow layer as evidence of this horizon.

The E' horizon, where present, has hue of 10YR to 5Y, value of 5 to 8, and chroma of 2 to 4. The A, E, and E/Bh horizons are loamy fine sand, fine sandy loam, loamy sand, and sandy loam.

The BE horizon where present, has hue of 10YR to 5Y, value of 5 to 7, and chroma of 3 to 8. It is fine sandy loam, sandy loam, or sandy clay loam.

The Bt horizon has hue of 10YR to 5Y or rarely 7.5YR, value of 5 to 8, and chroma of 3 to 8 or is mottled in shades of these colors. Mottles in shades of gray, brown, and red are in most pedons with a dominant matrix color.

The Btg and BCg horizons have hue of 10YR to 5Y, value of 5 to 8, and chroma of 1 to 2. Mottles in shades of yellow, brown, and red are in most pedons. The Bt, Btg, and BCg horizons are sandy clay loam, clay loam, fine sandy loam, and sandy loam.

The Cg horizon has hue of 10YR to 5Y, value of 5 to 8, and chroma of 1 to 3. Mottles in shades of yellow and brown are in some pedons. It is sandy clay loam, clay loam, sandy loam, loamy sand, and sand or is stratified with these textures. Some pedons have clayey or silty IIC horizons.

Competing Series

There are no other series in this family. Those closely related families are the Baymeade, Craven, Foreston, Goldsboro, Leon, Mandarin, Mascotte, and Seagate series. Baymeade and Seagate soils have arenic surface layers. Craven, Foreston, and Goldsboro soils do not have spodic horizons. Leon, Mandarin, and Mascotte soils have a continuous spodic horizon and in addition, Leon and Mandarin soils lack an argillic horizon.

Geographic Setting

Onslow soils are on slightly convex interstream divides in the lower Coastal Plain. Slopes range from 0 to 3 percent. They formed in loamy Coastal Plain sediments at elevations of about 20 to 65 feet above sea level. Average annual precipitation is about 50 inches and mean annual temperature is 63 degrees F. near the type location.

Geographically Associated Soils

In addition to the competing series, these are the Autryville, Echaw, Lenoir, Lynchburg, Pactolus, Rains, Stallings, and Wrightsboro series. Except for the Echaw, none of the soils have a spodic horizon. Echaw soils are sandy and have a continuous spodic horizon at a depth of 30 to 50 inches.

Drainage and Permeability

Moderately well drained and somewhat poorly drained; slow runoff; moderate permeability. The seasonal high water table is about 18 inches below the surface for 2 to 4 months in most years.

Use and Vegetation

About 2/3 of the acreage is cleared and used for crops, pasture, or urban. Main crops grown are corn, soybeans, and tobacco. Native woodland species include loblolly pine, longleaf pine, red oak, white oak, water oak, hickory, sweetgum, red maple, holly, dogwood, and sweetbay.

Distribution and Extent

Lower Coastal Plains of North Carolina, South Carolina, Virginia, and possibly Georgia and Florida. The series is inextensive.

MLRA Office Responsible

Raleigh, North Carolina

Series Established

Onslow County, North Carolina, 1921.

Remarks

Diagnostic horizons and features recognized in this pedon are:

- Ochric epipedon – the zone from the surface to a depth of 8 inches (the A and E horizons).
- Albic horizon – the zone from a depth of 4 to 8 inches (the E horizon - not required).
- Argillic horizon – the zone from a depth of 20 to 68 inches.

Tabular Series Data

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
NC0049	ONSLOW	0- 3	59- 64	190-250	46- 57	25- 65

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
NC0049	NONE		1.5-3.0	APPARENT	DEC-APR	60-60	

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
NC0049	0-17	LFS LS	0- 0	95-100	2- 8	1- 3
NC0049	0-17	FSL SL	0- 0	95-100	5-15	1- 4
NC0049	17-53	SCL SL CL	0- 0	95-100	15-35	2- 4
NC0049	53-80	VAR	-	-	-	-

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
NC0049	0-17	3.5- 5.5	.5-2.	0- 0	6.0- 20	LOW
NC0049	0-17	3.5- 5.5	.5-2.	0- 0	2.0- 6.0	LOW
NC0049	17-53	3.5- 5.5	0.-.5	0- 0	0.6- 2.0	LOW
NC0049	53-80	-	-	-	-	

PANTEGO SERIES [8]

The Pantego series consists of very deep, very poorly drained, moderately permeable soils that formed in thick loamy sediments on the Southern Coastal Plain and Atlantic Coast Flatwoods. Slopes are less than 2 percent. Near the type location mean annual temperature is 62 degrees F., and mean annual precipitation is 48 inches.

Taxonomic Class

Fine-loamy, siliceous, semiactive, thermic Umbric Paleaquults

Typical Pedon

Pantego loam – cultivated field. (Colors are for moist soil unless otherwise stated.)

Ap – 0 to 10 inches; black (10YR 2/1) loam; weak fine granular structure; very friable; many fine roots; very strongly acid; gradual wavy boundary. (0 to 12 inches thick)

A – 10 to 18 inches; very dark gray (10YR 3/1) loam; weak fine granular structure; friable; very strongly acid; clear smooth boundary. (4 to 14 inches thick)

Bt – 18 to 27 inches; very dark gray (10YR 3/1) sandy clay loam; weak fine subangular blocky structure; friable; few faint clay films on faces of peds and in pores; very strongly acid; gradual wavy boundary. (0 to 18 inches thick)

Btg1 – 27 to 42 inches; gray (10YR 5/1) sandy clay loam; few fine and medium distinct mottles of brownish yellow (10YR 6/6); weak fine and medium subangular blocky structure; friable; slightly sticky; few faint clay films on faces of peds; very strongly acid; gradual smooth boundary.

Btg2 – 42 to 55 inches; gray (10YR 6/1) sandy clay loam; few medium and coarse distinct mottles of yellowish brown (10YR 5/6); weak fine subangular blocky structure; friable, slightly sticky; few faint clay films on faces of peds; very strongly acid; gradual wavy boundary.

Btg3 – 55 to 65 inches; gray (10YR 6/1) sandy clay loam; weak coarse subangular blocky structure; friable; few faint clay films on faces of peds; very strongly acid. (Combined thickness of the Btg horizons is 30 to more than 60 inches.)

Type Location

Pitt County, North Carolina; 1/2 mile south of Winterville, North Carolina, on Highway 11, 100 feet west from road.

Range in Characteristics

Solum thickness is greater than 60 inches. The soil is strongly acid, very strongly acid, or extremely acid except where the surface has been limed.

Some pedons have an Oa horizon that has hue of 10YR, value of 2 or 3, and chroma of 1; or it is neutral and has value of 2. It is less than 8 inches thick.

[8] Source: NRCS, 1999c.

The A or Ap horizon has hue of 10YR or 2.5Y or is neutral, value of 2 or 3, and chroma of 0 to 2. It is loamy fine sand, loamy sand, fine sandy loam, sandy loam, loam, or mucky analogues of these textures.

Some pedons have an Eg horizon that has hue of 10YR or 2.5Y or is neutral, value of 4 to 6, and chroma of 0 to 2. It is loamy sand, loamy fine sand, sandy loam, fine sandy loam, or loam.

Some pedons have a BEg horizon that has hue of 10YR or 2.5Y, value of 4 or 6, and chroma of 1 or 2. It is loam, sandy loam, fine sandy loam, or sandy clay loam.

The Bt horizon, where present, has hue of 10YR or 2.5Y, value of 3, and chroma of 1 or 2. It has the same textures as the Btg horizon.

The Btg horizon has hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 or 2 with few to common mottles of higher chroma. The Btg horizon is sandy clay loam, sandy loam, sandy clay, or clay loam, fine sandy loam, or sandy loam.

Some pedons have a BCg horizon that has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 or 2. It is sandy clay loam, clay loam, sandy clay, sandy loam, or fine sandy loam.

The Cg horizon, where present, has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2 with higher chroma mottles. It is sandy clay loam, clay loam, sandy loam, fine sandy loam, loamy fine sand, fine sand, loamy sand, or sand.

Competing Series

There are no other series in the same family. Bayboro, Byars, Cape Fear, Ellabelle, Hyde, Johnston, Lumbee, Paxville, Pocomoke, Portsmouth, Rains, Surrency, Torhunta, and Weeksville series are in closely related families. Bayboro, Byars, and Cape Fear soils have Btg horizons containing more than 35 percent clay. Ellabelle and Surrency soils have arenic umbric epipedons. Hyde soils have mixed mineralogy. Johnston, Torhunta, and Weeksville soils lack Btg horizons. Lumbee and Rains soils have ochric epipedons and, in addition, Lumbee soils have thinner sola. Pocomoke soils have sandy BCg horizons at depths of 40 to 60 inches. Portsmouth soils have mixed mineralogy and a decrease in clay of 20 percent or more within 60 inches of the surface.

Geographic Setting

Pantego soils are in nearly level and slightly depressional areas of the Southern Coastal Plain and Alantic Coast Flatwoods. Slope gradients are less than 2 percent. The soil formed in medium-textured Coastal Plain deposits. Mean annual temperature is 62 degrees F. near the type location, and mean annual rainfall is about 48 inches.

Geographically Associated Soils

In addition to the competing Byars, Rains, and Torhunta series, these include Coxville, Dothan, Dunbar, Duplin, Goldsboro, Lynchburg, Marlboro, Norfolk, and Rutlege series. Except for Rutlege, these soils lack umbric epipedons and are better drained than Pantego soils. Rutlege soils are sandy throughout.

Drainage and Permeability

Very poorly drained; ponded to very slow runoff; moderate permeability. The water table is at or near the surface during wet seasons.

Use and Vegetation

Most of the areas are in forests and the native vegetation consists of water tupelo, water, oaks, willow oak, sweetgum, blackgum, red maple, bald cypress, and pond, loblolly and slash pines. The understory includes inkberry, gallberry, sweetbay, greenbrier, southern bayberry, swamp cyrilla, switch cane and ferns. Cleared areas are used primarily for corn, soybeans, small grain, truck crops, hay, and pasture.

Distribution and Extent

Coastal Plain of Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Virginia. The series is of moderate extent. MLRA OFFICE RESPONSIBLE: Raleigh, North Carolina

Series Established

Pitt County, North Carolina; 1969. REMARKS: Diagnostic horizons and features recognized in this pedon are: Umbric epipedon - the zone from the surface to a depth of 27 inches (the Ap, A and Bt horizons) Argillic horizon - the zone from a depth of 18 to 65 inches (the Bt, Btg1, Btg2, and Btg3 horizons) MLRA: 133A, 153A SIR: NC0051, NC0218 (Flooded), NC0217 (Ponded)

Tabular Series Data

SOI-5	Soil Name	Slope	Airtemp	FrFr/Seas	Precip	Elevation
NC0051	PANTEGO	0- 2	59- 70	190-310	38- 60	25- 450
NC0217	PANTEGO	0- 1	59- 70	190-310	50- 60	25- 300
NC0218	PANTEGO	0- 2	59- 70	190-310	38- 60	25- 300

SOI-5	FloodL	FloodH	Watertable	Kind	Months	Bedrock	Hardness
NC0051	NONE	RARE	0-1.0	APPARENT	NOV-MAY	60-60	
NC0217	NONE		-	APPARENT	-	60-60	
NC0218	COMMON		0-1.0	APPARENT	JAN-DEC	60-60	

SOI-5	Depth	Texture	3-Inch	No-10	Clay%	-CEC-
NC0051	0-18	MK-L MK-FSL	0- 0	95-100	5-15	11- 18
NC0051	0-18	L FSL SL	0- 0	95-100	5-15	5- 13
NC0051	0-18	LFS LS	0- 0	95-100	4-10	4- 12
NC0051	18-42	SCL SL CL	0- 0	95-100	18-35	4- 8
NC0051	42-65	CL SC SCL	0- 0	95-100	20-40	4- 9
NC0217	0- 5	MK-LS LS LFS	0- 0	95-100	4-10	11- 18
NC0217	0- 5	L FSL SL	0- 0	95-100	5-15	5- 13
NC0217	0- 5	MUCK	0- 0	-	0- 0	4- 12
NC0217	5-32	SL SCL CL	0- 0	95-100	18-35	4- 8
NC0217	32-64	SC SCL CL	0- 0	95-100	20-40	4- 9
NC0218	0-18	MK-L MK-FSL MK-SL	0- 0	95-100	5-15	11- 18
NC0218	0-18	L FSL SL	0- 0	95-100	5-15	5- 13
NC0218	0-18	MK-LS MK-FSL	0- 0	95-100	4-10	4- 12
NC0218	18-42	SCL SL CL	0- 0	95-100	18-35	4- 8
NC0218	42-65	CL SC SCL	0- 0	95-100	20-40	4- 9

SOI-5	Depth	-pH-	O.M.	Salin	Permeab	Shnk-Swll
NC0051	0-18	3.5- 5.5	10-15	0- 0	0.6- 2.0	LOW
NC0051	0-18	3.5- 5.5	4.-10	0- 0	2.0- 6.0	LOW
NC0051	0-18	3.5- 5.5	3.-10	0- 0	2.0- 6.0	LOW
NC0051	18-42	3.5- 5.5	.5-2.	0- 0	0.6- 2.0	LOW
NC0051	42-65	3.5- 5.5	0.-.5	0- 0	0.6- 2.0	LOW
NC0217	0- 5	3.5- 5.5	6.-15	0- 2	2.0- 6.0	LOW
NC0217	0- 5	3.5- 5.5	4.-10	0- 2	2.0- 6.0	LOW
NC0217	0- 5	3.5- 5.5	25-99	0- 2	6.0- 20	LOW
NC0217	5-32	3.5- 5.5	.5-2.	0- 2	0.6- 2.0	LOW

NC0217	32-64	3.5- 5.5	.5-1.	0- 2	0.2- 0.6	LOW
NC0218	0-18	3.5- 5.5	10-15	0- 0	0.6- 2.0	LOW
NC0218	0-18	3.5- 5.5	4.-10	0- 0	2.0- 6.0	LOW
NC0218	0-18	3.5- 5.5	10-15	0- 0	2.0- 6.0	LOW
NC0218	18-42	3.5- 5.5	.5-2.	0- 0	0.6- 2.0	LOW
NC0218	42-65	3.5- 5.5	0.-.5	0- 0	0.6- 2.0	LOW

WOODINGTON SERIES [9]

The Woodington series consists of poorly drained soils on broad, smooth interstream divides on the Coastal Plain. They are formed in loamy textures in Coastal Plain sediments. Slopes range from 0 to 2 percent.

Taxonomic Class

Coarse-loamy, siliceous, semiactive, thermic Typic Paleaquults

Typical Pedon

Woodington loamy sand – forested. (Colors are for moist soil unless otherwise stated.)

A1 – 0 to 4 inches; very dark gray (10YR 3/1) loamy sand; weak medium granular structure; very friable; many fine roots; very strongly acid; gradual wavy boundary. (3 to 5 inches thick.)

E – 4 to 12 inches; grayish brown (10YR 5/2) loamy sand; weak medium granular structure; very friable; many fine roots; few medium pores filled with dark gray soil; very strongly acid; clear wavy boundary. (5 to 15 inches thick.)

Btg1 – 12 to 16 inches; light brownish gray (10YR 6/2) sandy loam; few medium distinct light yellowish brown (10YR 6/4) mottles; weak fine subangular blocky structure; very friable, slightly sticky; sand coated and bridged with clay; few medium pores filled with dark gray material; very strongly acid; gradual wavy boundary. (3 to 10 inches thick.)

Btg2 – 16 to 32 inches; gray (10YR 6/1) sandy loam; few medium distinct light yellowish brown (10YR 6/4) and strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable; slightly sticky; sand coated and bridged with clay; very strongly acid; gradual wavy boundary. (10 to 20 inches thick.)

Btg3 – 32 to 47 inches; gray (10YR 6/1) sandy loam; common pockets of sand that are light gray (10YR 7/1) and yellowish brown (10YR 5/4); weak fine subangular blocky structure; very friable; very strongly acid; gradual wavy boundary. (12 to 20 inches thick.)

Cg – 47 to 85 inches; light gray (10YR 7/1) loamy sand; few medium distinct brownish yellow (10YR 6/6) mottles; weak fine granular structure; loose; common small pockets (skeletans) of clean sand; very strongly acid.

Type Location

Lenoir County, North Carolina; 5 miles south of Kinston; 1/2 mile north of intersection of State Road 1161 and 1149; 10 feet north of State Road 1149 in wooded area.

[9] Source: NRCS, 1999d.

Range in Characteristics

Thickness of the solum is more than 60 inches. The soil reaction ranges from extremely acid through strongly acid throughout the solum unless limed. Some pedons contain a few fine flakes of mica.

The A1 or Ap horizon has hue of 10YR to 5Y, or it is neutral, value of 2 to 5, and chroma of 0 to 2. Texture is loamy sand, loamy fine sand, sandy loam, or fine sandy loam.

The E horizon has hue of 10YR to 5Y or it is neutral, value of 4 to 7, and chroma of 0 to 2. Some pedons have mottles in shades of brown or yellow. Textures range the same as the surface horizon.

The Btg horizon has hue of 10YR to 5Y or it is neutral, value of 5 to 7, and chroma of 0 to 2. Mottles in shades of brown, yellow, and red are in most pedons. Texture is sandy loam or fine sandy loam. Silt content ranges from 5 to 30 percent.

The Cg horizon is in shades of gray, brown, and yellow or is mottled in these colors. The texture is loamy sand, loamy fine sand, sand, or fine sand. Thin strata of these textures are in some pedons.

Competing Series

The competing series are Bayou and Smithton in the same family. Similar soils in related families include Atmore, Fallsington, Pactolus, Plummer, Rains, Stallings, Torhunta, and Weston series. Bayou soils contain more than 18 percent clay in lower Btg, and are more compacted. Smithton soils contain more than 30 percent silt. Atmore soils have more than 5 percent plinthite within 60 inches of the surface and, contain more silt. Fallsington and Rains soils have more than 18 percent clay in the control section and Fallsington soils are mesic. Pactolus soils are sandy, lack argillic horizons, and have better drainage. Plummer soils have grossarenic epipedons and loamy Bt horizons. Stallings soils have colors of chroma 3 or more in the upper Bt horizon. Torhunta soils have umbric epipedons. Weston soils have solum thickness less than 60 inches.

Geographic Setting

Woodington soils are on nearly level smooth interstream divides in the Coastal Plain. Slopes are 2 percent or less. The soil formed in coarse textured Coastal Plain sediments. Average annual precipitation is 48 inches and mean annual temperature is 63 degrees F. near the type location.

Geographically Associated Soils

These are the Pactolus, Plummer, Rains, Stallings, and Torhunta soils of the competing series, and associated soils of better drainage on higher parts of the landscape are Goldsboro, Lynchburg, Norfolk, and Pocalla soils.

Drainage and Permeability

Poorly drained; slow runoff; moderately rapid permeability. A seasonal high water table is within 10 inches of the surface in periods of high rainfall.

Use and Vegetation

Most of the area is in forest of mixed hardwood and pine with loblolly and pond the principal pine species. Cleared areas are used for corn, soybeans, small grains, and pasture.

Distribution and Extent

Coastal Plains of North Carolina, Florida, Georgia, South Carolina, and Virginia. The series is of moderate extent.

MLRA Office Responsible

Raleigh, North Carolina

Series Established

Lenoir County, North Carolina; 1973.

Remarks

These soils were formerly included in the Weston series.

Tabular Series Data

Additional Data

North Carolina State University Soil Department laboratory data at site location.

WRIGHTSBORO SERIES [10]

The Wrightsboro series consists of very deep, moderately well drained soils on broad interstream divides in the lower Coastal Plain. These soils formed in loamy and clayey marine sediments. Slopes range from 0 to 4 percent and are dominantly less than 2 percent. Mean annual precipitation is about 53 inches and mean annual temperature is about 63 degrees F., near the type location.

Taxonomic Class

Fine-loamy, siliceous, semiactive, thermic Aquic Paleudults

Typical Pedon

Wrightsboro fine sandy loam – cultivated; elevation of 30 feet. (Colors are for moist soil unless otherwise stated.)

Ap – 0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam; weak medium granular structure; very friable; few fine roots; moderately acid; clear smooth boundary. (6 to 10 inches thick)

E – 6 to 9 inches; very pale brown (10YR 7/4) fine sandy loam; weak fine granular structure; very friable; few fine roots; strongly acid; clear smooth boundary. (2 to 10 inches thick)

Bt1 – 9 to 24 inches; brownish yellow (10YR 6/6) sandy clay loam; weak medium subangular blocky structure; friable; few distinct clay films on faces of peds and in pores; strongly acid; gradual wavy boundary.

Bt2 – 24 to 36 inches; brownish yellow (10YR 6/6) sandy clay loam; common medium distinct light gray (10YR 7/2) and very pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable;

[10] Source: NRCS, 2002c.

slightly sticky, slightly plastic; few distinct clay films on faces of peds and in pores; very strongly acid; gradual wavy boundary.

Bt3 – 36 to 48 inches; brownish yellow (10YR 6/6) sandy clay loam medium; many medium distinct light gray (10YR 7/1) and common medium distinct yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; common prominent clay films on faces of peds; very strongly acid; clear smooth boundary (combined thickness of the Bt horizon is 32 to 72 inches).

2Bg – 48 to 65 inches; light gray (10YR 7/2) clay with few strata of very fine sand and silt; many coarse distinct yellow (10YR 7/8) and common prominent reddish yellow (5YR 6/6) mottles; common reddish yellow (7.5YR 7/6) mottles surround old root channels; weak fine angular blocky structure; very firm, very sticky, very plastic; few fine flakes of mica; strongly acid.

Type Location

New Hanover County, North Carolina; 3.5 miles north of Wilmington on U.S. Highway 117, 110 feet west of U.S. Highway 117, 50 feet north of Secondary Road 1329.

Range in Characteristics

Solum thickness is more than 60 inches. Depth to bedrock is more than 60 inches and is commonly more than several hundred feet. The clayey 2B horizon is at a depth of 40 to 80 inches. Soil reaction ranges from very strongly acid to moderately acid, except where surface layers have been limed. Limed soils typically have slightly acid or neutral surface layers. Flakes of mica range from none to common in the B and C horizons.

The A or Ap horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2, or is neutral with value of 4 to 6. It is fine sandy loam, sandy loam, loamy fine sand, or loamy sand.

The E horizon has hue of 10YR to 2.5Y, value of 6 or 7, and chroma of 3 to 8. It is fine sandy loam, sandy loam, loamy fine sand, or loamy sand.

The BE or BA horizon, where present, has 10YR to 2.5Y, value of 5 or 7, and chroma of 3 to 8. It is fine sandy loam, sandy loam, or loam.

The Bt horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 3 to 8. Mottles are in shades of red, brown, yellow, or gray. Texture is sandy clay loam, clay loam, or loam. Clay content averages 24 to 35 percent and silt content is less than 30 percent.

The Btg horizon, where present, has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2, or is neutral with value of 4 to 7. Mottles are in shades of red, brown, yellow, or gray. Texture is sandy clay loam, clay loam, or loam. Clay content averages 24 to 35 percent and silt content is less than 30 percent.

The 2Bg horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2, or is neutral with value of 4 to 7. Mottles are in shades of red, brown, yellow, or gray. Texture is clay or sandy clay. Most pedons have lenses or fine strata of sandy or silty material.

The 2BCg or 2Cg horizon, where present, has hue of 10YR to 5Y, value of 5 to 7, and chroma of 1 or 2, or is neutral with value of 4 to 7. Mottles are in shades of red, brown, yellow, or gray. Texture is clay or sandy clay. Most pedons have lenses or fine strata of sandy or silty material.

Competing Series

These are the Goldston, Izagora, Kullit, Quitman, and Whitwell soils in the same family, and the Altavista, Tetotum, Craven, Duplin, Foreston, Stallings, Johns, Kempsville, and Ogeechee soils in similar families. Goldston and Whitwell soils do not have a lithologic discontinuity within 40 to 80 inches. Altavista and Tetotum soils have mixed mineralogy. Craven and Duplin soils have a clayey particle-size control section. Foreston and Stallings soils have a coarse-loamy particle-size control section. Kullit soils have hue of 5YR in part of the Bt horizon. Johns soils have solum thickness less than 40 inches and have a fine-loamy over sandy or sandy-skeletal particle-size control section. Kempsville soils do not have low chroma mottles in the upper subsoil. Ogeechee soils have mottles with chroma of 2 or less throughout the upper subsoil. Quitman soils have a Btx horizon, and in addition do not have a lithologic discontinuity and a clayey 2B horizon.

Geographic Setting

Wrightsboro soils are on broad interstream divides in the lower Coastal Plain. Slopes range from 0 to 4 percent, but are dominantly less than 2 percent. The soils formed in fluvial and marine sediments that have mixed mineralogy. The average annual rainfall ranges from about 38 to 55 inches, the frost free season ranges from about 220 to 256 days, and the mean annual air temperature ranges from 59 to 71 degrees F.

Geographically Associated Soils

These are the competing Craven, Foreston, Kempsville, Ogeechee, and Stallings series and the Pactolus, Paxville, Torhunta, and Woodington soils. Pactolus soils are sandy throughout. Paxville and Torhunta soils have an umbric epipedon and Torhunta and Woodington soils have a coarse-loamy particle-size control section.

Drainage and Permeability

Moderately well drained; slow runoff; and moderate permeability in the upper subsoil (Bt) and slow permeability in the lower subsoil (2Bg).

Use and Vegetation

Most area are cleared and used for cultivated crops and pasture. Many areas are used for residential and industrial development. Forested areas are in mixed hardwood and pines with understory of myrtle, gallberry, dogwood, and holly.

Distribution and Extent

The lower Coastal Plain of North Carolina and possibly South Carolina and Virginia. The series is of small extent.

MLRA Office Responsible

Raleigh, North Carolina

Series Established

New Hanover County, North Carolina; 1974.

Remarks

This series was formerly mapped with Goldsboro and Johns soils. Diagnostic horizons and features recognized in this pedon are:

- Ochric epipedon – the zone from the surface to a depth of 9 inches (A and E horizons)
- Argillic horizon – the zone from a depth of 9 to a depth of 48 inches (Bt1, Bt2, and Bt3 horizons)

Tabular Series Data

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SOI-5  Soil Name   Slope  Airtemp FrFr/Seas Precip  Elevation
NC0011 WRIGHTSBOR  0-  4   59- 70  220-256  38- 55    25-  95

SOI-5  FloodL FloodH Watertable Kind     Months  Bedrock Hardness
NC0011 NONE          2.0-3.0  APPARENT DEC-FEB  60-60

SOI-5  Depth  Texture                  3-Inch  No-10  Clay%   -CEC-
NC0011  0- 9  LS LFS                    0-  0  95-100  4-12   1-  5
NC0011  0- 9  SL FSL                    0-  0  95-100  5-18   1-  6
NC0011  9-48  SCL CL L                  0-  0  95-100 18-35   3-  8
NC0011 48-65  C SC                      0-  0  95-100 35-60   7- 13

SOI-5  Depth    -pH-     O.M.   Salin  Permeab    Shnk-Swll
NC0011  0- 9  4.5- 6.0  .5-2.   0- 0   6.0-  20   LOW
NC0011  0- 9  4.5- 6.0  .5-2.   0- 0   2.0- 6.0   LOW
NC0011  9-48  4.5- 6.0  0.-.5   0- 0   0.6- 2.0   LOW
NC0011 48-65  4.5- 6.0  0.-.5   0- 0  0.06- 0.2   MODERATE
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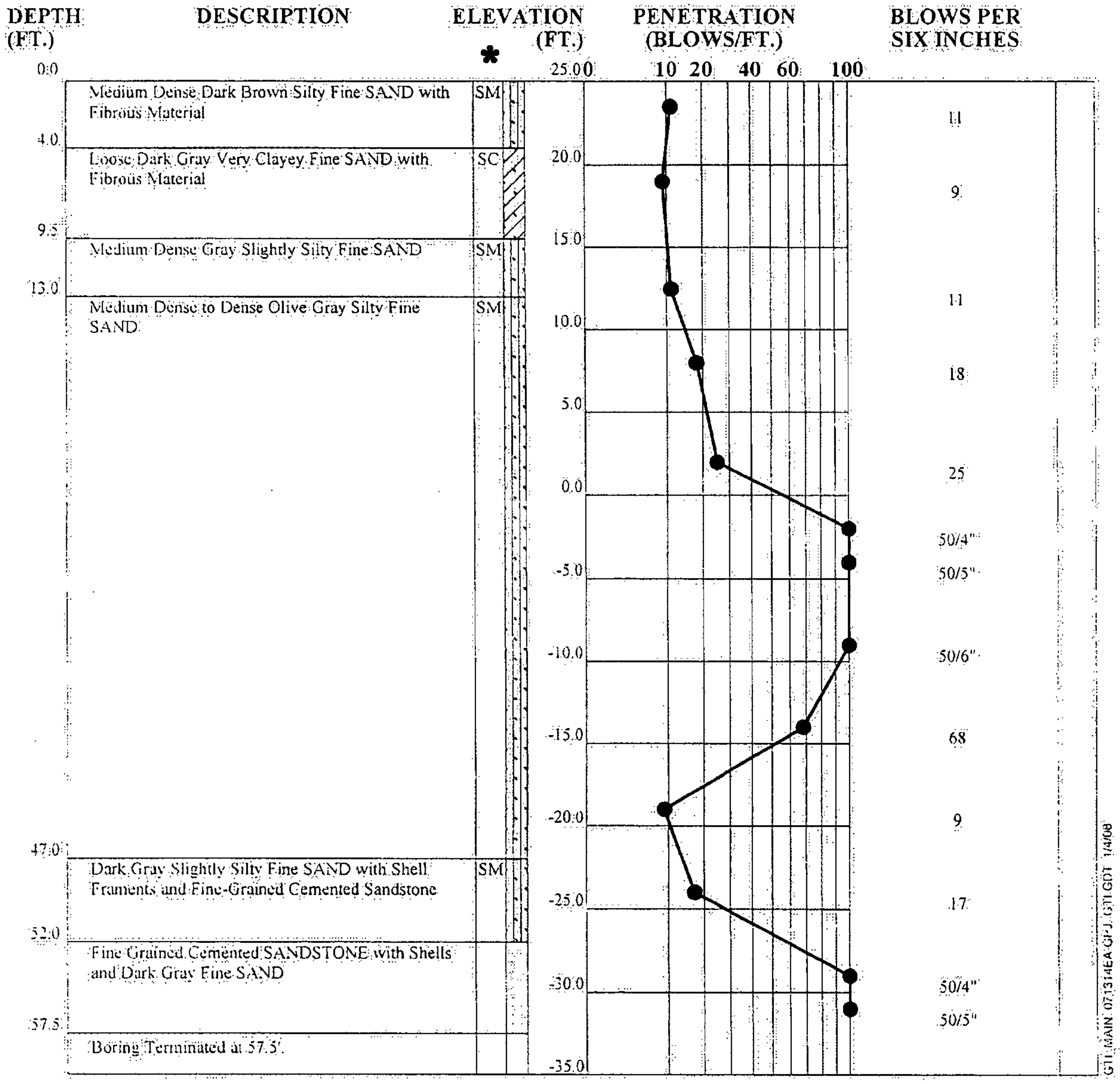
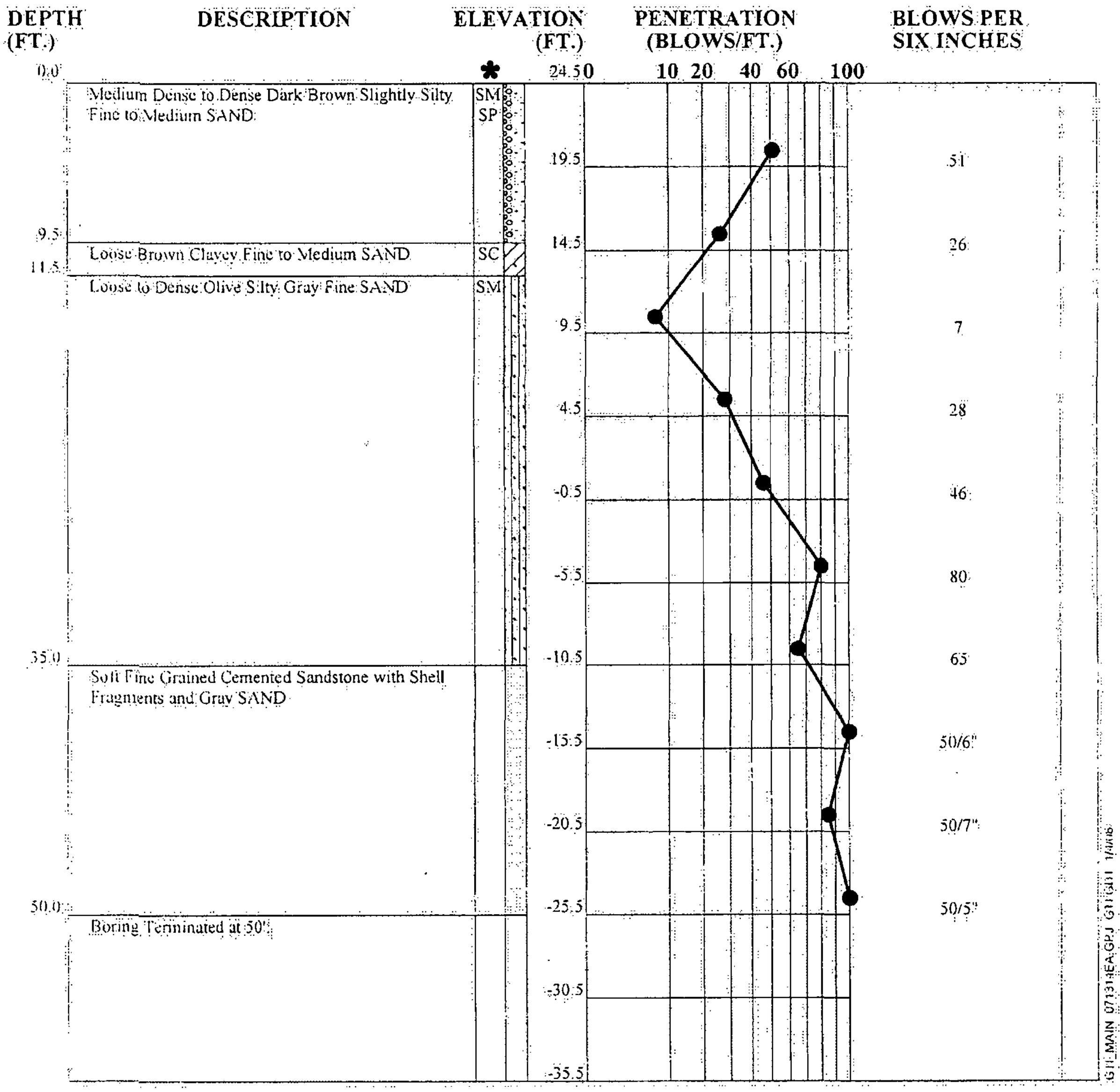
TEST BORING RECORD



* USCS – Unified Soil Classification System (see Appendix H).

JOB NUMBER 1-07-1314-EA
BORING NUMBER LF-1
DATE 7-24-80

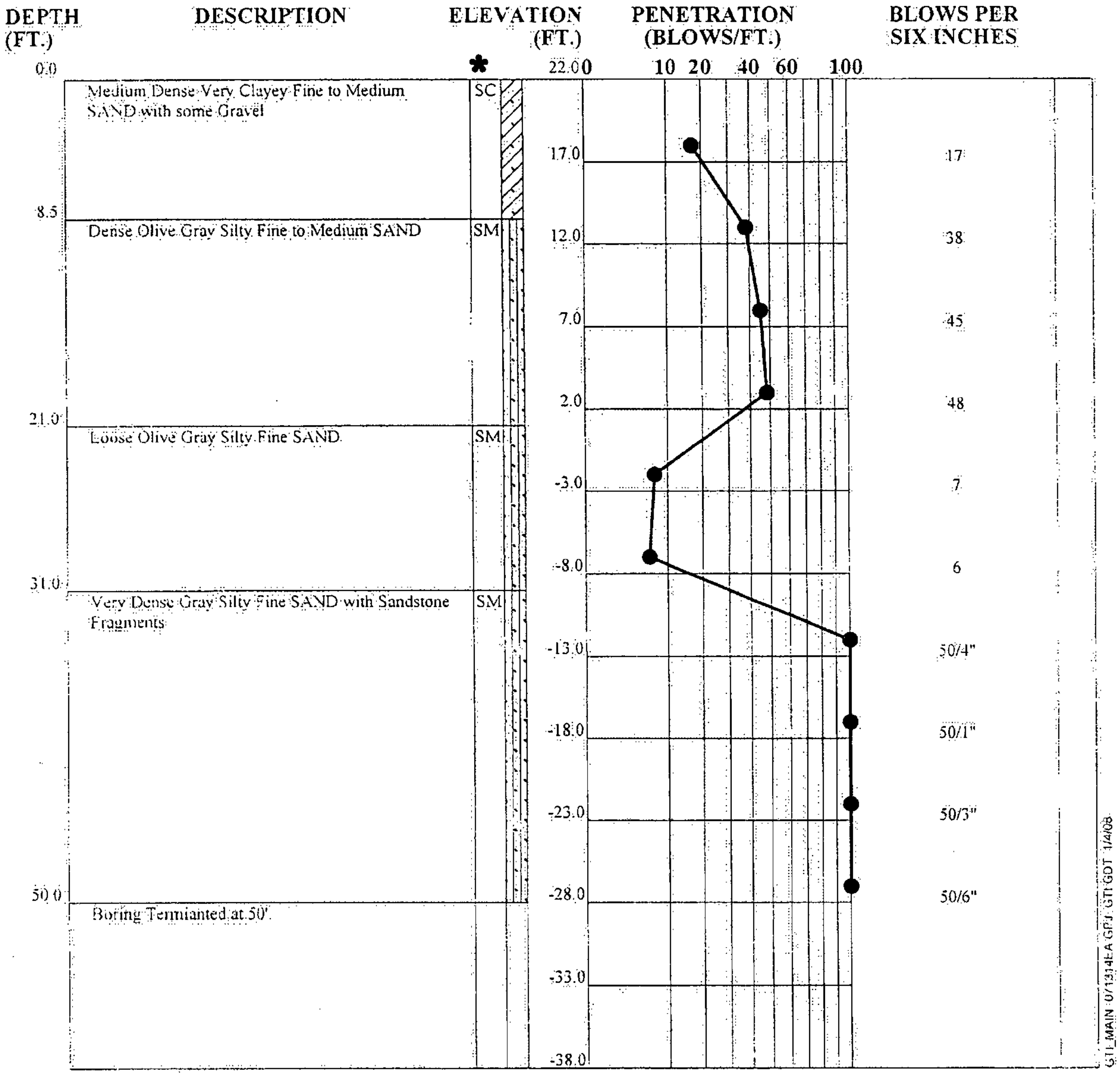
TEST BORING RECORD



* USCS – Unified Soil Classification System (see Appendix H).

JOB NUMBER 1-07-1314-EA
BORING NUMBER LF-2
DATE 7-25-80

TEST BORING RECORD



* USCS – Unified Soil Classification System (see Appendix H).

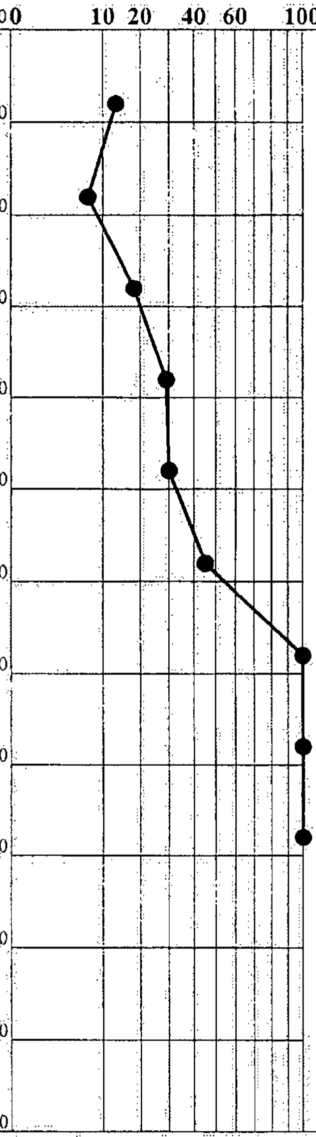
JOB NUMBER 1-07-1314-EA
BORING NUMBER LF-3
DATE 7-26-80

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	*
0.0	Medium Dense Tan Very Clayey Fine to Medium SAND	SC
7.0	Loose Gray and Orange Slightly Silty to Clayey Fine SAND	SM SC
12.0	Medium Dense Tan Silty Fine SAND	SM
22.0	Dense Olive Gray Silty Fine SAND	SM
29.0	Very Dense Olive Gray Silty Fine to Medium SAND with Sandstone and Shell Fragments	SM
45.0	Alternating 1 foot thick Sandstone and 5 feet thick Olive Gray Fine SAND	

ELEVATION (FT.)	BLOWS PER SIX INCHES
24.0	
19.0	13
14.0	7
9.0	18
4.0	29
-1.0	30
-6.0	45
-11.0	50/6"
-16.0	50/5"
-21.0	50/5"
-26.0	
-31.0	
-36.0	

PENETRATION (BLOWS/FT.)



GTI_MAIN 071314EA.GPJ GTI.GDT 1/4/08

* USCS – Unified Soil Classification System (see Appendix H).

JOB NUMBER 1-07-1314-EA
BORING NUMBER LF-4
DATE 7-29-80

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 40 60 100	BLOWS PER SIX INCHES
		-41.0		
		-46.0		
		-51.0		
80.0	Boring Terminated at 80'.	-56.0		
		-61.0		
		-66.0		
		-71.0		
		-76.0		
		-81.0		
		-86.0		
		-91.0		
		-96.0		

GTI_MAIN 07131-4EA.GPJ GTI.GDT 1/4/08

JOB NUMBER 1-07-1314-EA
BORING NUMBER LF-4
DATE 7-29-80

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	*
0.0 – 0.5	Topsoil	
0.5 – 3.0	Stiff Tan Fine to Medium Sandy SILT	ML
3.0 – 7.5	Stiff Gray Fine to Medium Sandy CLAY	CL
7.5 – 9.0	Medium Dense Tan Very Clayey Fine SAND	SC
9.0 – 17.5	Loose to Medium Dense Greenish Gray Silty Fine SAND	SM
17.5 – 29.0	Loose Greenish Gray Silty Fine SAND	SM
29.0 – 29.5	Dense Greenish Gray Silty Fine SAND	SM
29.5 – 35.5	Dense to Very Dense Gray Silty Fine to Coarse Sandy GRAVEL with Cemented Lenses and Shells	GM
35.5	Boring Terminated at 35.5'.	

ELEVATION (FT.)

PENETRATION (BLOWS/FT.): 0, 10, 20, 40, 60, 100

BLOWS PER SIX INCHES
5-7-8
5-5-5
2-5-5
2-3-10
7-7-12
2-4-2
2-2-2
26-50/1"
19-26-20

GTI_MAIN 071314EA.GPJ GTI.GDT 1/4/08

Groundwater encountered at 11' and caved at 12' 24 hours after boring.

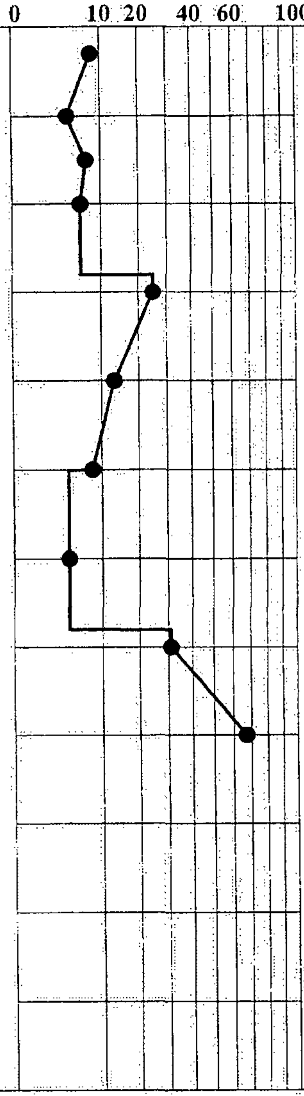
* USCS – Unified Soil Classification System (see Appendix H).

JOB NUMBER 1-07-1314-EA
BORING NUMBER G-1
DATE 12-8-07

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.) *
0.0 – 3.5	Loose Dark Brown Silty Fine to Medium SAND with Top 1.5' Organically Stained	SM ML
3.5 – 6.0	Loose Brown Silty Fine SAND with Fine Sandy CLAY Lenses	SM CL
6.0 – 10.0	Loose Brown and Gray Silty Fine to Medium SAND	SM
10.0 – 14.0	Loose Greenish Gray Silty Fine SAND	SM
14.0 – 25.0	Medium Dense Greenish Gray Silty Fine SAND	SM
25.0 – 34.0	Very Loose Greenish Gray Silty Fine SAND with Clayey Silty Layers between 25 and 29 feet	SM
34.0 – 36.5	Dense Gray Silty Fine to Medium SAND with Cemented Sandstone Fragments	SM
36.5 – 40.5	Dense to Very Dense Gray Silty Fine to Coarse Sandy GRAVEL with Cemented Lenses and Shells	GM
40.5	Boring Terminated at 40.5'	

PENETRATION (BLOWS/FT.)



BLOWS PER SIX INCHES
4-4-4
2-1-3
2-3-4
4-3-3
9-14-11
5-9-4
9-6-2
3-2-2
5-21-10
17-27-40

GTI_MAIN 07131 4EA GPJ GTI GDT 1/4/08

Groundwater encountered at 10.8' and caved at 11.2' 24 hours after boring.

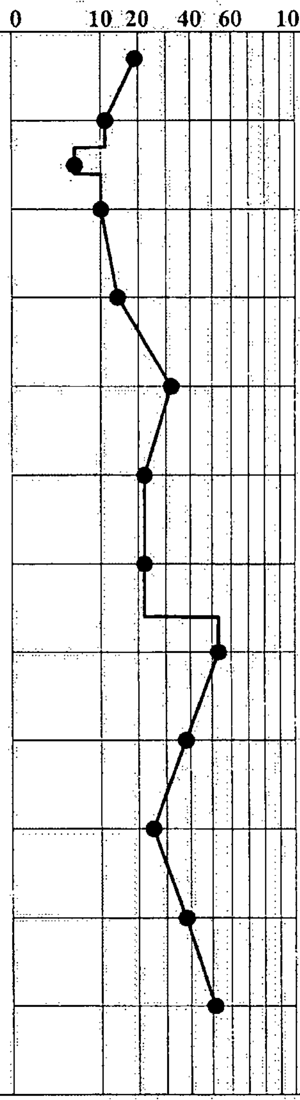
* USCS – Unified Soil Classification System (see Appendix H).

JOB NUMBER 1-07-1314-EA
BORING NUMBER G-2
DATE 12-18-07

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	*	BLOWS PER SIX INCHES
0.0				
0.2	Topsoil		SM	
3.0	Medium Dense Tan and Light Gray Silty Fine SAND			7-7-12
	Medium Dense Yellow Slightly Silty Fine to Medium SAND		SM SP	8-7-4
6.5				
7.5	Loose Tan Silty Fine to Coarse SAND		SM	2-2-3
8.0	Firm Gray Fine to Medium Sandy CLAY		CL	
	Medium Dense Reddish Brown Silty Fine to Medium SAND		SM	2-5-5
				3-7-7
17.5	Medium Dense to Dense Gray Silty Fine SAND		SM	
				10-15-17
				6-10-12
				8-11-11
33.0	Dense Gray Silty Fine SAND		SM	
				15-23-30
36.5	Very Dense Gray Silty Fine SAND with PWR Lenses		SM	
39.5	Dense Gray Silty Fine SAND		SM	37-21-17
41.0	Stiff Gray Very Fine Sandy SILT		SM ML	
45.0	Medium Dense Gray Silty Fine SAND with PWR Lenses		SM	6-9-16
				22-17-21
52.0	Very Dense Gray Silty Fine to Coarse Sandy GRAVEL with Cemented Lenses and Shells		GM	39-28-23
56.5	Boring Terminated at 56.5' with water losses in drilling.			

PENETRATION (BLOWS/FT.)



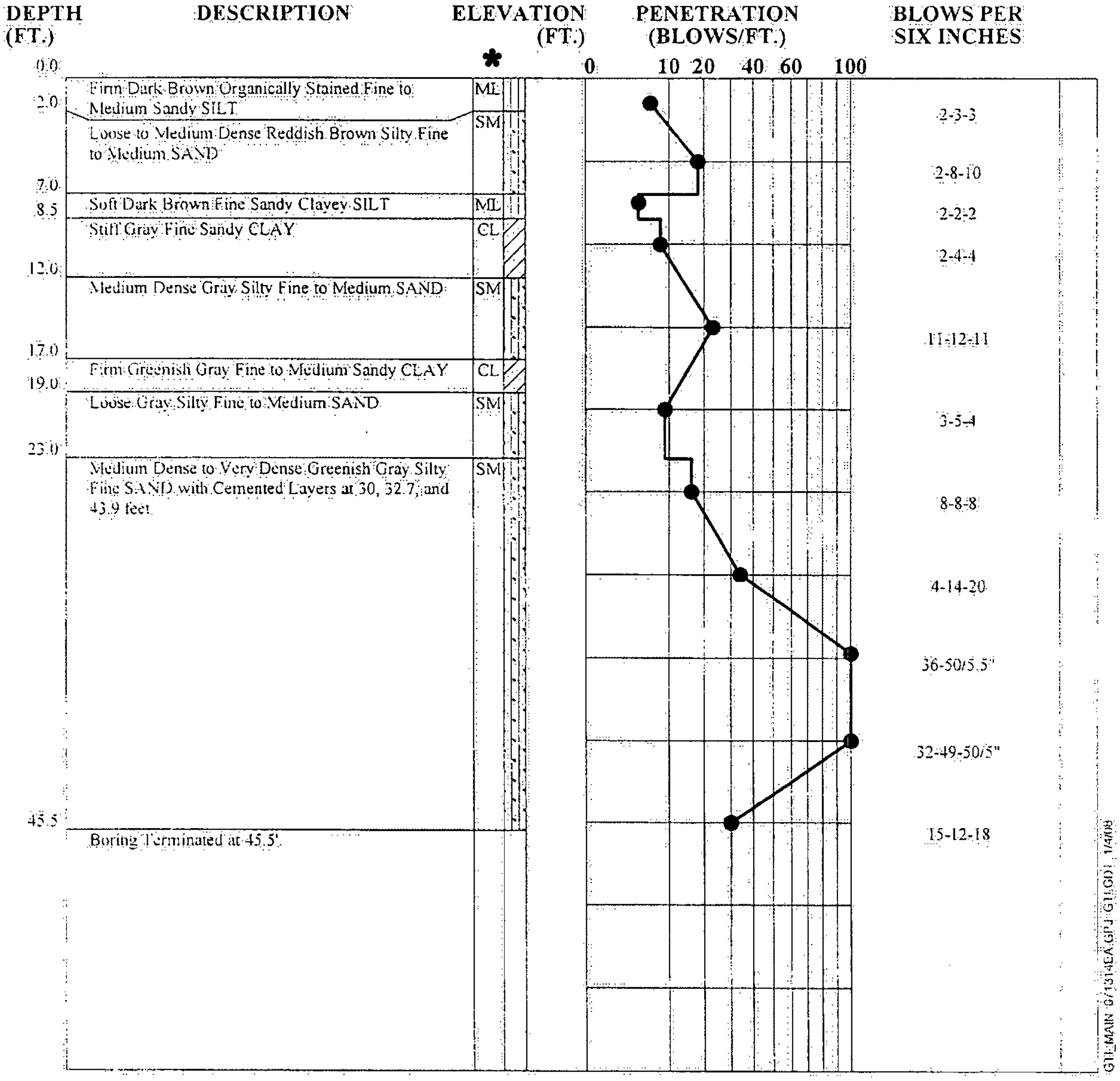
Caved at 13' 12 hours after boring and groundwater not encountered.

GTI_MAIN 07131-4EA.GPJ GTI.GDT 1/4/08

* USCS – Unified Soil Classification System (see Appendix H).

JOB NUMBER 1-07-1314-EA
BORING NUMBER G-3
DATE 12-17-07

TEST BORING RECORD



* USCS – Unified Soil Classification System (see Appendix H).

JOB NUMBER 1-07-1314-EA
BORING NUMBER G-4
DATE 12-19-07

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.) *
0.0	Topsoil	
3.0	Medium Dense Reddish Brown Silty Fine to Medium SAND	SM
8.5		
9.5	Firm Gray CLAY	CL
	Medium Dense Gray Very Silty Fine SAND	SM
12.5	Loose Light Gray Fine Sandy SILT	ML
18.0	Loose Light Gray Silty Fine SAND with SILT Lenses	SM ML
23.5	Dense to Very Dense Greenish Gray Silty Fine SAND	SM
33.5	Medium Dense Greenish Gray Silty Fine SAND with Thin Clay Lenses	SM
42.0	Medium Dense Greenish Gray Silty Fine SAND	SM SC
45.5	Boring Terminated at 45.5'	

PENETRATION (BLOWS/FT.): 0, 10, 20, 40, 60, 100

BLOWS PER SIX INCHES
5-5-7
5-11-12
7-10-10
3-12-11
2-4-4
2-2-2
18-28-28
11-20-28
6-6-16
5-6-9
8-10-12

GTI_MAIN 07131 4EA.GPJ GTI.GDT 1/4/08

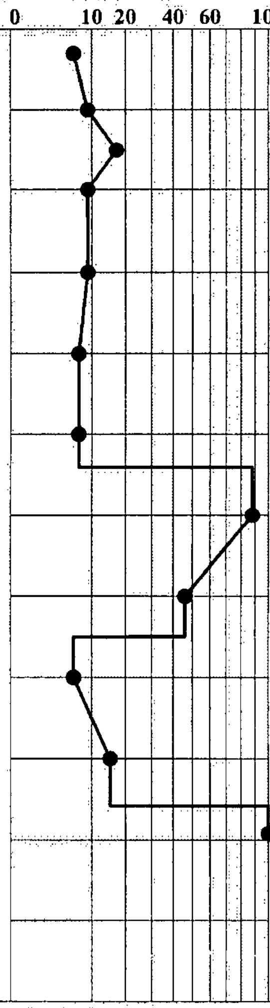
* USCS – Unified Soil Classification System (see Appendix H).

JOB NUMBER 1-07-1314-EA
BORING NUMBER G-5
DATE 12-19-07

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION * (FT.)
0.0	Topsoil	
2.0	Loose Dark Brown Organically Stained Very Silty Fine SAND	SM ML
4.0	Loose Brown Silty Fine to Medium SAND	SM
6.0	Medium Light Brown Fine to Medium SAND	SP
9.0	Soft Brown Fine to Medium Sandy CLAY	CL
9.5	Loose Brown Clayey Fine to Medium SAND	SC
12.5	Stiff Greenish Gray Fine to Medium Sandy CLAY	CL
16.5	Loose Greenish Gray Silty Fine SAND with some pebbles and Clay nodules	SM
27.0	Very Dense Greenish Gray Silty Fine SAND with PWR Lenses	SM
37.5	Loose Greenish Gray Silty Fine SAND with Shells and Cemented Layers	SM
47.9	Dense to Very Dense Gray Silty Fine to Coarse Sandy GRAVEL with Cemented Lenses and Shells	GM
49.7	Boring Terminated at 49.7'	

PENETRATION (BLOWS/FT.)



BLOWS PER SIX INCHES
2-3-3
1-2-7
5-8-9
2-4-5
3-4-5
2-3-4
4-5-2
12-43-45
22-25-21
6-3-3
6-1-14
16-50/2.5"

Groundwater encountered at 9.6' and caved at 40' 24 hours after boring.

GTI_MAIN 071314EA.GPJ GTI.GDT 1/4/08

* USCS – Unified Soil Classification System (see Appendix H).

JOB NUMBER 1-07-1314-EA
BORING NUMBER G-6
DATE 12-18-07

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Table of Contents

List of Tables

List of Figures

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Appendix G

Results of the 2007 Preliminary Subsurface Investigation

The following geotechnical considerations, along with the associated exhibits attached to this Appendix, are provided based on the preliminary subsurface investigation conducted in 2007 and are for general planning purposes only. A more detailed subsurface investigation and geotechnical evaluation would be necessary once the design of the Proposed GLE Facility is complete.

G.1 Grading Considerations

Some of the topsoil consists of organically stained soils with less than 5% organic content and would not require removal during clearing of vegetation. Tests would be needed during stripping to segregate topsoil from organically stained soils with less than 5% organic content, which could probably be used for structural fill.

The shallow soils in the Main portion of the GLE Study Area (209 acres [85 hectares (ha)] that were part of the preliminary 2007 subsurface investigation), excluding topsoil, would probably be suitable for re-use as structural fill, provided compaction moisture can be maintained near optimum during placement. If borrow is required, either from existing on-site borrow pits or from off-site sources, a low-plasticity clay or silt or a silty or clayey sand with Unified Soil Classification of CL, ML, SM, or SC would likely be specified for use as structural fill. Compaction requirements for structural fill would be specified as not less than 95% of the standard Proctor maximum dry density (MDD), except in the final foot beneath pavements and floor slabs, where this requirement would likely be increased to 98% of the MDD.

G.2 Shallow Foundation Considerations

If shallow foundations are selected for construction, bearing conditions would be inspected by a geotechnical engineer to verify that adequate bearing and suitable materials have been encountered. Using the results of the preliminary 2007 subsurface investigation, the Federal Highway Administration (FHA) method, which correlates soil compressibility to soil type and N-value (a measure of standard penetration test penetration resistance), as shown in **Table G-1**, was used to estimate settlements for both the size and pressure resulting from equipment loads. The estimated settlements are summarized in **Table G-2** for typical wall and column footings. The estimated settlements are for equipment loads assuming a slab bearing 12 inches (30 centimeters [cm]) below final grade and assuming soil conditions like those encountered in borings LF-2 and in G-6. The estimated settlements for areas encountered by soils similar to those at boring LF-2 vary from less than 0.1 to 0.9 inches (0.25 to 2.3 cm) in what could be one of the most heavily loaded areas based on preliminary design layouts. Alternatively assuming the soil conditions encountered at boring G-6 results in almost double the estimated settlements.

The results of the soil test borings (**Table G-3**) and soil laboratory tests (**Table G-4**) are part of the preliminary subsurface investigation conducted in the GLE Study Area in 2007. Grain size distribution results for six soil test borings drilled in 2007 are provided in **Figures G-1 through G-3**. These data, along with the results of seismic refraction profiling (**Table G-5** and **Figures 3.3-28**, **3.3-29**, **and G-4 through G-7**), support the geotechnical considerations described in this Appendix.

Figure G-8 portrays estimated settlements for 2-foot (ft; 0.61-meter [m]) wide wall footings embedded 1.5 ft (0.45 m) for frost protection plotted versus wall load in kips per ft for both borings LF-2 and G-6. **Figure G-9** portrays the estimated settlements for column footings embedded 1.5 ft (0.45 m) and sized for a bearing pressure of 3,000 per square foot (psf; 14,650 kilograms per square meter [kg/m^2]). The maximum settlements are less than 1 inch (2.5 cm) for wall loads less than 6 kips per linear ft (87,500

Newtons per m) and for column loads less than 125 kips (556 x 10^3 Newtons). The differential settlements are generally one half of the maximum settlements. The FHA estimation method is generally considered to be conservative, and a more accurate estimation of settlement would likely be provided, specifically if shallow foundations are selected, by performing field dilatometer testing during detailed evaluation for formation support. Should foundations need to be extended to provide adequate bearing, over-excavated footings would likely be designed to be backfilled to design bearing elevation utilizing uniformly graded #57 or #67 washed stone.

G.3 Deep Foundation Considerations

If the estimated maximum settlements with shallow foundation support are considered excessive, then deep foundation support would likely be used. To assist with preliminary planning, **Figure G-10** was prepared to portray estimated ultimate and skin friction capacity for a 16-inch (41-cm) diameter auger cast pile based upon both borings LF-2 and G-6. A pile installed with tip depth between 25 and 35 ft (8 and 11 m) below ground surface (bgs) would have a design capacity greater than 50 tons (45 metric tons [mt]) with design friction capacity greater than 10 tons (9 mt).

Piles in groups would likely be spaced center to center at 2.5 times the pile diameter or greater. The overall compressive capacity of pile groups with piles spaced at 3 times the pile diameter or greater would equal the individual pile capacity times the number of piles in the group. Since the silty sands encountered in the borings in the GLE Study Area would respond as cohesionless soils, pile groups with piles spaced closer than 3 times the pile diameter would be greater than or equal to the sum of individual pile capacities. The settlements of the pile groups would likely be greater than the settlement of an individual pile.

G.4 Seismic Design Response Spectrum

Table G-6 was prepared based on seismic line field measurements (see **Section 3.3.5.3.1.1** of this Report, *Seismic Refraction Profiling*, and **Figure 3.3-25**) to determine the seismic site classification, assuming that the shear wave velocity (Vs) is equal to the compression wave velocity divided by 2. The average Vs across soil profiles for each of the four seismic lines, calculated by equation 16-44 in the 2006 North Carolina Building Code (NCBC; ICC et al., 2006), varies from approximately 2,000 fps (610 meters per second [m/s]) in Seismic Line 3 to 3,600 fps (1,100 m/s) in Seismic Line 1. According to the 2006 NCBC (ICC et al., 2006), since the average Vs is greater than 1,200 fps (366 m/s), the Site falls under Site Class C for calculation of earthquake loads. **Figure G-11** shows the design response spectrum with 5% structural damping for Site Class C with Sds = 0.231 g and Sd1 = 0.109 g, where Sds stands for short period design spectral response acceleration, Sd1 is the one-second design spectral response acceleration, and units are given as earth gravity (g). These values were determined from the 2002 U.S. Geological Service (USGS) maps with a 2% in 50 years risk level. The final Site engineering design would take these measurements and site classification into account.

G.5 Liquefaction Potential

A simplified analysis was performed to determine the factor of safety (FS) against initiation of liquefaction for the soil profiles encountered in borings G-6 and LF-2 (see **Figure 3.3-25**), which correspond to the profiles with the highest and lowest potential for liquefaction, respectively, encountered during the Site subsurface investigations. **Tables G-7 and G-8** portray the results of the analyses. The CSR represents the Cyclic Stress Ratio calculated from the peak horizontal ground acceleration of 0.139 g determined from the USGS maps included with the 2006 NCBC (ICC et al., 2006) and the depth bgs; the CRR represents the Cyclic Resistance Ratio calculated from the measured blow count and the measured percent of fines passing the #200 sieve. The FS against initiation of liquefaction equals the CRR divided by the CSR. **Table G-7** indicates that the sands at depths of 25 and 40 ft (8 and 12 m) bgs in boring G-6 have FS values equal to 1.2 and 1, whereas **Table G-8** indicates the lowest FS against initiation of liquefaction in LF-2 equals 1.5. Typically, a FS less than 1 indicates a higher liquefaction potential, and increasing FS values above 1 show decreasing liquefaction potential. Therefore, the profile at G-6 has a marginal risk of localized zones liquefying during the design earthquake, which has a return period of 2,500 years, whereas the profile at LF-2 should not experience any liquefaction. Generally favorable engineering conditions were encountered across the GLE Study Area with only one localized zone with liquefaction potential that could be mitigated, as discussed at the end of **Section G.6**.

This simplified liquefaction analysis provides a screen for sites requiring more detailed analyses once the design of the Proposed GLE Facility is finalized. Because the GLE Study Area is designated as a seismic Site Class C (a classification designating a lower liquefaction potential), and since the Site sands have an average percent fines of 30% (increasing the resistance to any liquefaction forces), they have a low overall potential for soil liquefaction (ICC et al., 2006). Potential impact on the Proposed Action from soil liquefaction is SMALL.

G.6 Additional Geotechnical Considerations

The following geotechnical considerations of impacts are made based upon an assessment of the currently available field and laboratory data, an understanding of the current general draft of the proposed construction activities, and past experience with similar projects and subsurface conditions. When plans regarding actual grading and structure locations and loads are finalized, the following preliminary considerations would need to be confirmed, extended, or modified, as necessary. Additionally, if subsurface conditions different than those indicated in this Report are encountered, a geotechnical engineer would need to assess the significance of those conditions from a geotechnical engineering perspective. The practices and measures used to control potential impacts during construction and operation include the following:

- If deep foundations are selected, then once the geometry and structural loads for planned pile groups are available, settlement estimates can be provided based upon the results of load tests performed on individual piles. The uplift capacity for pile groups would likely be reduced from the sum of individual pile uplift capacities, and the uplift capacities for planned pile groups could be estimated once the pile group geometries are available.
- The North Carolina Building Code (NCBC) (ICC et al., 2006) requires load tests to verify capacity for piles with design capacity greater than 40 tons (36 mt). Test piles could be installed in areas where it is anticipated that high-capacity piles would be installed. At least two piles would likely be selected for compression-load testing and two piles for tension-load testing. The compression-pile load tests would be performed in accordance with the American Society for Testing and Materials (ASTM) D-1143 (ASTM, 2007a) and the tension-load tests in accordance with ASTM D-3689 (ASTM, 2007b) using the quick-load test method for both test types.
- The test piles would be instrumented with either strain gauges or telltales so that the load distribution along the shaft could be assessed. Both the compression and tension test piles could be loaded to failure. A grout sample could be taken during installation of the test piles and tested for its 7-day compressive strength before the start of the load tests. The installation of the reaction and test piles should be observed and documented while obtaining samples of the grout. An engineer would likely assist the contractor in performing the load tests and provide a report interpreting test results.
- A more detailed evaluation would be needed during the final subsurface investigation to measure the shear wave velocity profile and to make more detailed measurements versus depth to more accurately estimate the CSR and CRR for the profile at the final structure location. Seismic cone penetration tests would likely be performed at the proposed structure locations and cross-hole

seismic testing to obtain these measurements and further design against the low risk and potential of liquefaction.

- Control of the low liquefaction potential may be completed through the use of deep foundations (discussed above) or through engineering methods such as earthquake drains. These structures are injected into the area of potential liquefaction in the subsurface and prevent the build up of pore-water pressure within the zone, which could cause liquefaction during an earthquake event. Other similar engineering methods may be investigated based on the final subsurface investigation and final Site design.

Tables

Table G-1. Correlations of Soil Compressibility to Soil Type and N-Value

Clays and Silts (Cohesive Soils)	
SPT N-Value, bpf	**Consistency**
0 - 2	Very Soft
2 - 4	Soft
4 - 8	Firm
8 - 16	Stiff
16 - 32	Very Stiff
32 - 50	Hard
> 50	Very Hard
Sands (Cohesionless or Granular Soils)	
SPT N-Value, bpf	**Relative Density**
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
>50	Very Dense

Reference: AASHTO, 1988.

Table G-2. Preliminary Equipment Structural Loads and Estimated Settlements

Area[a]	Preliminary Draft Footprint[a] Length (ft)	Preliminary Draft Footprint[a] Width (ft)	Diameter[a] (ft)	Weight[a] (tons)	Pressure[a] (ksf)	Estimated Settlement[b] LF-2 (inches)	Estimated Settlement[b] G-6 (inches)
B	500	200	-				
	85	15	-	50	0.078	0.08	0.13
G	120	15	-	500	0.333	0.29	0.49
	60	25	-	50	0.067	0.08	0.13
	100	45	-	50	0.022	0.03	0.06
	100	25	-	130	0.104	0.12	0.21
	100	7	-	30	0.086	0.06	0.09
	20	10	-	20	0.200	0.13	0.22
	40	20	-	100	0.250	0.23	0.39
L	20	4	-	3	0.100	0.03	0.05
	7	7	-	3	0.122	0.05	0.07
LS	20	20	-	3	0.015	0.01	0.02
S	-	-	7	150	4.060	0.73	1.22
	-	-	7	200	5.413	0.87	1.43

[a] Refers to preliminary equipment layout areas within the different areas of the approximately 600,000 ft^2 (56,000 m^2) building to be located within the Proposed GLE Facility. The table summarizes a range of settlements that could be expected in the vicinity of two different borings (LF-2 and G-6, see **Figure 3.3-25**) and is based on anticipated equipment loads. In addition to these equipment loads, there would be loads resulting from the building itself that are anticipated to be relatively light. The final foundation design would be based upon available subsurface information in the vicinity of the buildings once their locations are established, and this design would reflect the actual loads of buildings, equipment, and any associated structures.

[b] Assumes slab embedded 1 foot into soils encountered in indicated boring.

ksf = 1,000 pounds per square foot.

Table G-3. Summary of Borings (1980 and 2007)

Boring	Date	Elevation (ft, msl)	Depth (ft, bgs)	Clay Layer (ft, bgs)	Top Peedee - Visual (ft, bgs)	6,000 fps (ft, bgs)	First N>30 (ft, bgs)	GW @ 24 Hrs (ft, bgs)	Caved (ft, bgs)	Water Losses (ft, bgs)	Comments
LF-1	7/24/80	25.0	57.5	-	13.0	21.0	25.0				
LF-2	7/25/80	24.5	50.0	-	11.5	11.0	20.0				
LF-3	7/26/80	22.0	50.0	-	8.5	30.0	10.0				
LF-4	7/29/80	24.0	56.0	-	22.0	-	25.0				
G-1	12/18/07		35.5	3-7.5	9.0	37.0	29.0	11.0	12.0		
G-2	12/18/07		40.5	-	10.0	-	34.0	10.8	11.2		
G-3	12/17/07		56.5	7.5-8	17.5	-	17.5	-	13.0	56.5	Total Water Loss
G-4	12/19/07		45.5	8.5-12	12.0	30.0	30.0				
G-5	12/19/07		45.5	8.5-9.5	23.5	22.0	23.5				
G-6	12/18/07		49.7	9-9.5 12.5-16.5	12.5	11.0	27.0	9.6	40.0	37.5	

ft, msl = approximate elevation in feet referenced to mean sea level

ft, bgs = feet below ground surface

fps = feet per second

First N>30 = first penetration resistance (N-value) greater than 30 blows per foot (bpf)

GW @ 24 hrs = stabilized depth to groundwater level measured in open soil test boring after 24 hours

Caved = depth at which borehole was measured to have caved (ft, bgs)

Water Losses = observed loss of drilling fluid (depth in ft, bgs); often indicates a more permeable zone

Table G-4. Summary of Soil Laboratory Tests

Boring	Sample	USCS	Depth (ft, bgs)	LL	PI	Percent Fines	Percent Org.	w (percent)	Coarse	Medium	Fine
									(percent sand)		
G-1	1	ML	0.5-2	18	3	66		6.5	0	8	26
G-1	6	SM	19-20.5			38		32.8	0	0	61
G-1	7	SM	24-25.5			41		26.7	0	0	59
G-2	1	SM-ML	0.5-2			48	0.6	13.3	1	10	42
G-2	2	CL	4-5.5	34	13	53		28.9	0	3	44
G-2	7	SM	24-25.5			36		31.0	0	0	64
G-2	8	SM	29-30.5			36		33.8	0	0	64
G-3	4	SM	9-10.5			38		9.3	0	2	60
G-3	7	SM	24-25.5			33		25.4	0	0	67
G-4	1	ML	0.5-2			63	1.2	14.5	0	7	30
G-4	3	ML	6.5-8	19	1	59		17.6	0	8	32
G-5	1	ML	0.5-2			55	6.2	14.9	0	8	37
G-5	5	ML	14-15.5			53		17.7	1	8	37
G-5	6	SM-ML	19-20.5	17	1	51		25.9	0	1	49
G-6	1	SM-ML	0.5-2			48	8.9	17.4	0	17	35
G-6	5	CL	14-15.5	26	8	55		19.0	3	20	22
G-6	6	SM	19-20.5			32		27.5	0	1	67
G-6	10	SM	39-40.5			36		33.4	0	0	64

USCS = Unified Soil Classification System (see **Appendix H**)

LL = liquid limit

PI = plasticity index

Percent Fines = percentage of fine material passing the #200 (0.075 mm) sieve

Percent Org. = percentage of organic material measured in soil sample

w = water content

Table G-5. Depths of Velocity Contours from Seismic Refraction Profiling

Boring	Seismic Line	Distance (ft)	Offset (ft)	Figure Reference[a]				Figure Reference[b]	
				Velocity 2,500 (ft/sec) and ft, bls	Velocity 6,000 (ft/sec) and ft, bls	Velocity 8,000 (ft/sec) and ft, bls	Velocity 11,000 (ft/sec) and ft, bls	Velocity 2,500 (ft/sec) and ft, bls	Velocity 11,000 (ft/sec) and ft, bls
G-1	3	1,050	0	10	37	48	55	10	25
G-2	-	-	-	-	-	-	-	-	-
G-3	-	-	-	-	-	-	-	-	-
G-4	2	150	50	19	30	34	>70	23	58
G-5	4	750	50	13	22	28	35	12	33
G-6	1	550	0	5	11	14	17	11	17
LF-1	1	0	0	0	21	23	25	10	27
LF-2	1	1,150	0	6	11	13	16	11	17
LF-3	3	225	25	5	30	47	55	5	53
LF-4	-	-	-	-	-	-	-	-	-

[a] See **Figures G-4 through G-7**.

[b] See **Figures 3.3-28 and 3.3-29**.

Velocity = compressional wave seismic velocity

Table G-6. Seismic Site Classification

Vs/Vp = **2**

Line 1 (G-6)

Depth		Vp, fps		Vs, fps			d/vs
Top	Bottom	Min	Max	Min	Max	Average	
0	5	0	2,500	0	1,250	625	0.0080
5	11	2,500	6,000	1,250	3,000	2,125	0.0028
11	14	6,000	8,000	3,000	4,000	3,500	0.0009
14	17	8,000	11,000	4,000	5,500	4,750	0.0006
17	100	11,000	11,000	5,500	5,500	5,500	0.0151

$$\overline{V_s} = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}} = 3{,}649 \text{ fps}$$

Line 2 (G-4)

Depth		Vp, fps		Vs, fps			d/vs
Top	Bottom	Min	Max	Min	Max	Average	
0	19	0	2,500	0	1,250	625	0.0304
19	30	2,500	6,000	1,250	3,000	2,125	0.0052
30	34	6,000	8,000	3,000	4,000	3,500	0.0011
34	75	8,000	11,000	4,000	5,500	4,750	0.0086
75	100	11,000	11,000	5,500	5,500	5,500	0.0045

$$\overline{V_s} = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}} = 2{,}004 \text{ fps}$$

Line 3 (G-1)

Depth		Vp, fps		Vs, fps			d/vs
Top	Bottom	Min	Max	Min	Max	Average	
0	10	0	2,500	0	1,250	625	0.0160
10	37	2,500	6,000	1,250	3,000	2,125	0.0127
37	48	6,000	8,000	3,000	4,000	3,500	0.0031
48	55	8,000	11,000	4,000	5,500	4,750	0.0015
55	100	11,000	11,000	5,500	5,500	5,500	0.0082

$$\overline{V_s} = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}} = 2{,}409 \text{ fps}$$

Line 4 (G-5)

Depth		Vp, fps		Vs, fps			d/vs
Top	Bottom	Min	Max	Min	Max	Average	
0	13	0	2,500	0	1,250	625	0.0208
13	22	2,500	6,000	1,250	3,000	2,125	0.0042
22	28	6,000	8,000	3,000	4,000	3,500	0.0017
28	35	8,000	11,000	4,000	5,500	4,750	0.0015
35	100	11,000	11,000	5,500	5,500	5,500	0.0118

$$\overline{V_s} = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}} = 2{,}497 \text{ fps}$$

Assumes Vp/Vs = 2.

Table G-7. Simplified Liquefaction Analysis at Boring G-6

z[a]	N[b]	USCS[c]	fines[d]	s_{vo}[e]	s_{vo}'[f]	rd (3)[g]	CSR (1)[h]	$(N_1)_{60}$ (9)[i]	a (6)[j]	b (7)[j]	$(N_1)_{60cs}$ (5)[k]	$CRR_{7.5}$ (4)[l]	MSF (24)[m]	FS (23)[n]
1.5	6	SM	48	172.5	172.5	0.998	0.090	20.4	5.00	1.20	29.5	0.44	1.07	5.19
5	9	SM	40	575	575	0.990	0.089	16.8	5.00	1.20	25.1	0.29	1.07	3.53
7.5	17	SP	10	862.5	862.5	0.985	0.089	25.9	0.87	1.02	27.3	0.35	1.07	4.18
10	9	SC	30	1150	1150	0.979	0.088	11.9	4.71	1.15	18.4	0.20	1.07	2.38
15	9	CL	55	1725	1413	0.969	0.107	10.7	5.00	1.20	17.8	0.19	1.07	1.91
20	7	SM	32	2300	1676	0.957	0.119	7.6	4.83	1.17	13.8	0.15	1.07	1.34
25	7	SM	30	2875	1939	0.942	0.126	7.1	4.71	1.15	12.9	0.14	1.07	1.19
30	87	SM	30	3450	2202	0.921	0.130	82.9	4.71	1.15	100.4	No Liq	1.07	No Liq
35	46	SM	30	4025	2465	0.891	0.131	41.4	4.71	1.15	52.5	No Liq	1.07	No Liq
40	6	SM	36	4600	2728	0.851	0.130	5.1	5.00	1.20	11.2	0.12	1.07	1.02
45	15	SM	30	5175	2991	0.804	0.126	12.3	4.71	1.15	18.9	0.20	1.07	1.72

Boring # G-6
g, pcf = 115
WT, ft = 10
PHGA = 0.139
Mag = 7.3
No Liq = No liquefaction

g, pcf: Unit weight of soil in pounds per cubic foot (pcf).
WT, ft Depth to water table in feet.
PHGA: Peak horizontal ground acceleration in units of g (32.2 feet per square second).
Mag: Design earthquake magnitude.
No Liq: No liquefaction can occur at indicated depth.

[a]z: Depth to measured N-value.

[b]N: Measured N-value in blows per foot (bpf).

[c]USCS: Unified Soil Classification System symbol.

[d]Fines: Percent of sample passing #200 sieve (0.075 mm).

[e]s_{vo}: Total vertical stress at indicated depth.

[f]s_{vo}': Effective vertical stress at indicated depth.

[g]Rd: Factor used for calculating cyclic stress ratio (CSR) resulting from maximum acceleration at ground surface (PHGA).

[h]CSR: Applied cyclic stress ratio at specified depth resulting from design earthquake.

[i]$(N_1)_{60}$: N-value corrected for effective vertical stress and SPT hammer energy.

[j]a, b: Constants used to correct cyclic resistance ratio (CRR) for fines content.

[k]$(N_1)_{60cs}$: N-value adjusted for actual fines content.

[l]$CRR_{7.5}$: Cyclic resistance ratio for magnitude 7.5 earthquake.

[m]MSF: Magnitude scaling factor to convert CRR to design earthquake magnitude.

[n]FS: Factor of safety against initiation of liquefaction = CRR/CSR.

Table G-8. Simplified Liquefaction Analysis at Boring LF-2

z[a]	N[b]	USCS[c]	fines[d]	s_{vo}[e]	s_{vo}'[f]	rd (3)[g]	CSR (1)[h]	$(N_1)_{60}$ (9)[i]	a (6)[j]	b (7)[j]	$(N_1)_{60cs}$ (5)[k]	$CRR_{7.5}$ (4)[l]	MSF (24)[m]	FS (23)[n]
5	51	SM	30	575	575	0.990	0.089	95.1	4.71	1.15	114.5	No Liq	1.07	No Liq
10	26	SC	30	1150	1150	0.979	0.088	34.3	4.71	1.15	44.3	No Liq	1.07	No Liq
15	7	SM	30	1725	1413	0.969	0.107	8.3	4.71	1.15	14.3	0.15	1.07	1.54
20	28	SM	30	2300	1676	0.957	0.119	30.6	4.71	1.15	40.0	No Liq	1.07	No Liq
25	46	SM	30	2875	1939	0.942	0.126	46.7	4.71	1.15	58.6	No Liq	1.07	No Liq
30	80	SM	30	3450	2202	0.921	0.130	76.2	4.71	1.15	92.7	No Liq	1.07	No Liq
35	65	SM	30	4025	2465	0.891	0.131	58.5	4.71	1.15	72.3	No Liq	1.07	No Liq
40	100	SM	30	4600	2728	0.851	0.130	85.6	4.71	1.15	103.5	No Liq	1.07	No Liq
45	100	SM	30	5175	2991	0.804	0.126	81.8	4.71	1.15	99.1	No Liq	1.07	No Liq
50	100	SM	30	5750	3254	0.753	0.120	78.4	4.71	1.15	95.2	No Liq	1.07	No Liq

Boring #	LF-2		
g, pcf =	115	g, pcf:	Unit weight of soil in pounds per cubic foot (pcf).
WT, ft =	10	WT, ft	Depth to water table in feet.
PHGA =	0.139	PHGA:	Peak horizontal ground acceleration in units of g (32.2 feet per square second).
Mag =	7.3	Mag:	Design earthquake magnitude.
No Liq =	No liquefaction	No Liq:	No liquefaction can occur at indicated depth.

[a]z: Depth to measured N-value.

[b]N: Measured N-value in blows per foot (bpf).

[c]USCS: Unified Soil Classification System symbol.

[d]Fines: Percent of sample passing #200 sieve (0.075 mm).

[e]s_{vo}: Total vertical stress at indicated depth.

[f]s_{vo}': Effective vertical stress at indicated depth.

[g]Rd: Factor used for calculating cyclic stress ratio (CSR) resulting from maximum acceleration at ground surface (PHGA).

[h]CSR: Applied cyclic stress ratio at specified depth resulting from design earthquake.

[i]$(N_1)_{60}$: N-value corrected for effective vertical stress and SPT hammer energy.

[j]a, b: Constants used to correct cyclic resistance ratio (CRR) for fines content.

[k]$(N_1)_{60cs}$: N-value adjusted for actual fines content.

[l]$CRR_{7.5}$: Cyclic resistance ratio for magnitude 7.5 earthquake.

[m]MSF: Magnitude scaling factor to convert CRR to design earthquake magnitude.

[n]FS: Factor of safety against initiation of liquefaction = CRR/CSR.

Figures

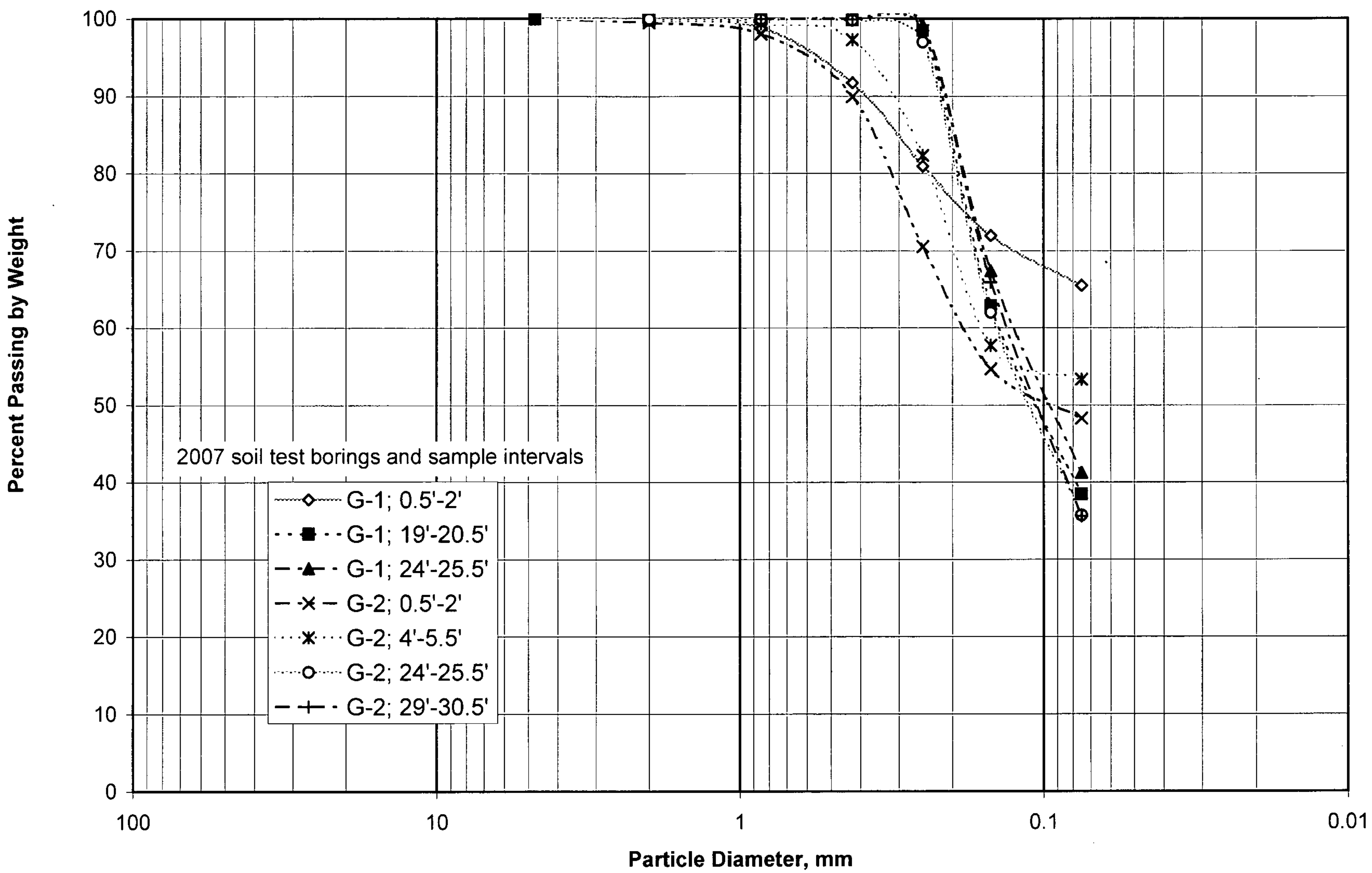


Figure G-1. Grain size distributions (Borings G-1 and G-2).

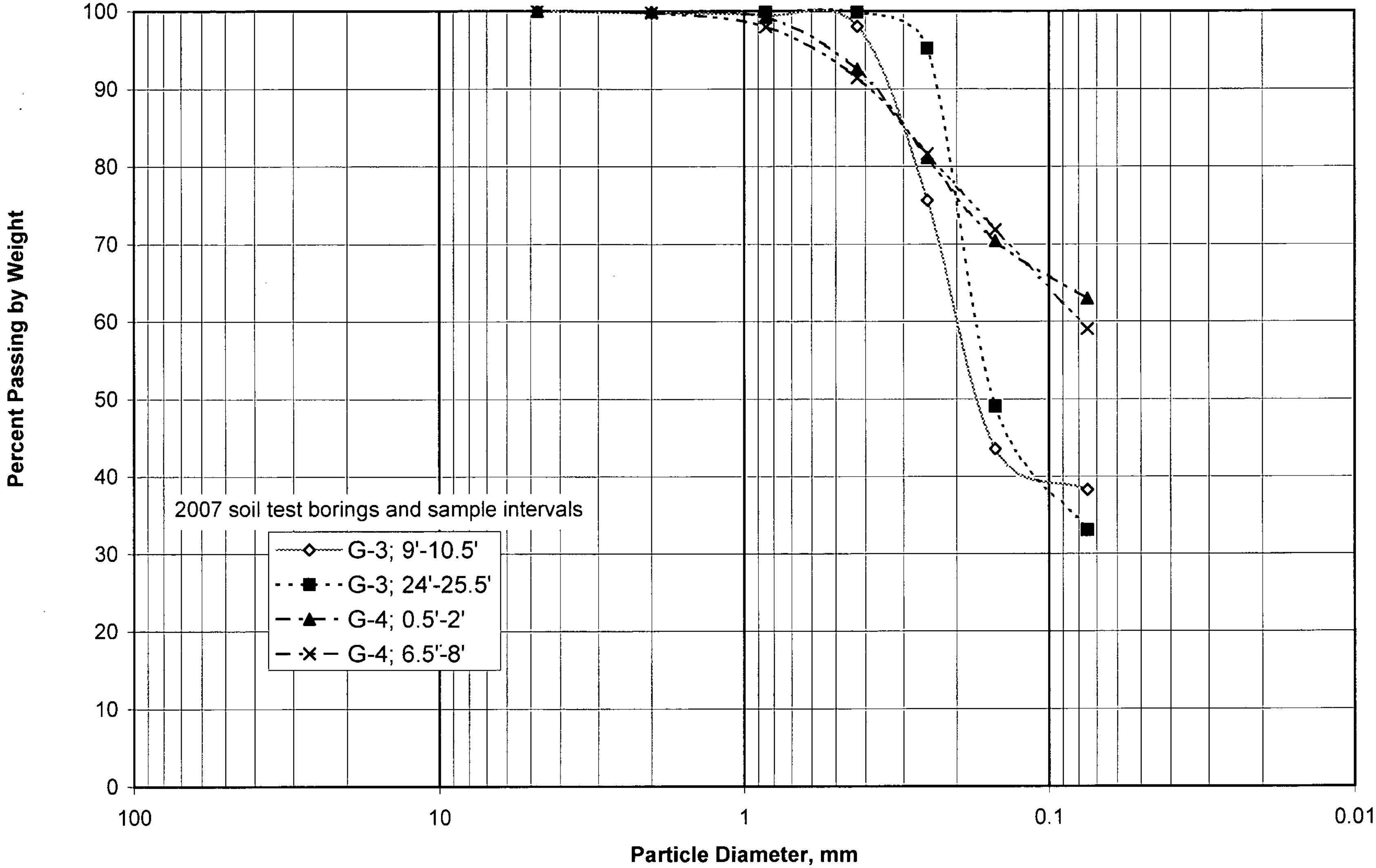


Figure G-2. Grain size distributions (Borings G-3 and G-4).

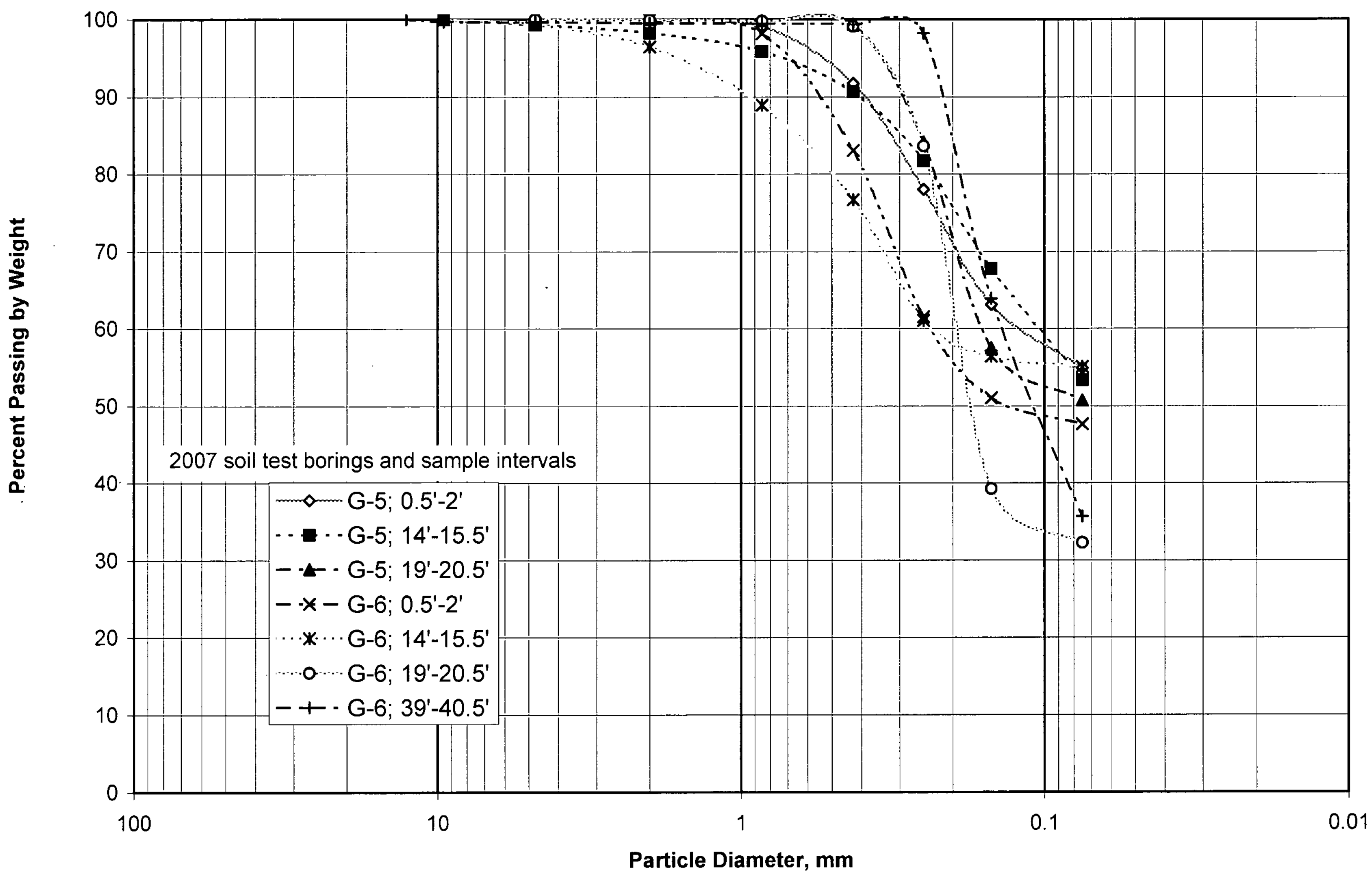


Figure G-3. Grain size distributions (Borings G-5 and G-6).

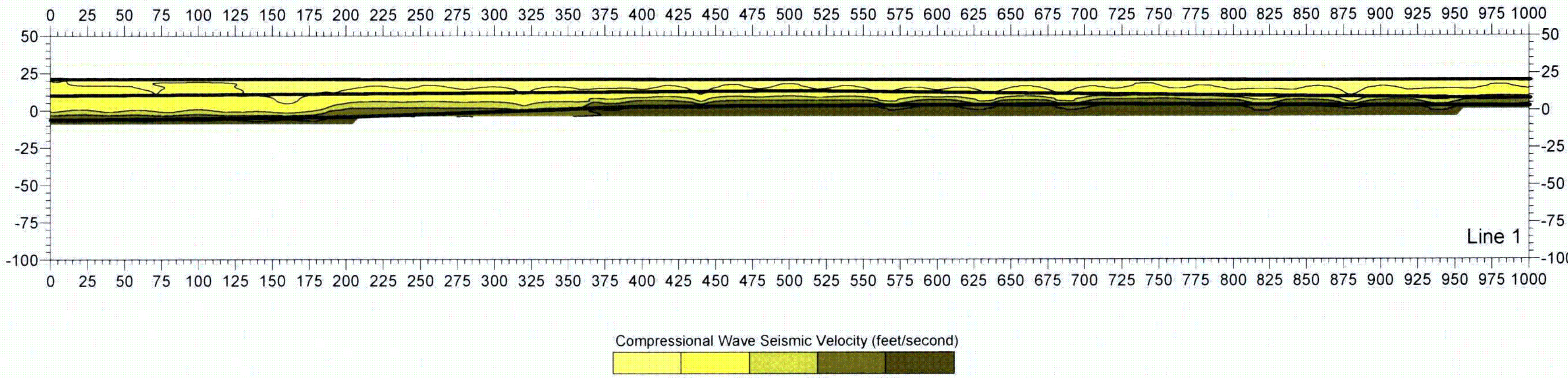


Figure G-4. Velocity modeling output (Seismic Line 1).

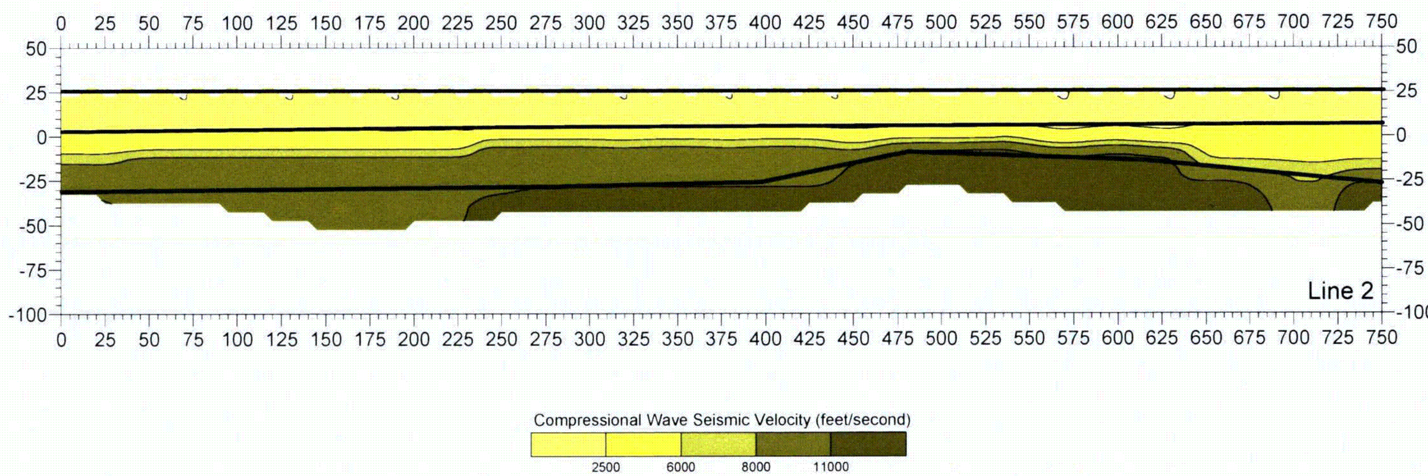


Figure G-5. Velocity modeling output (Seismic Line 2).

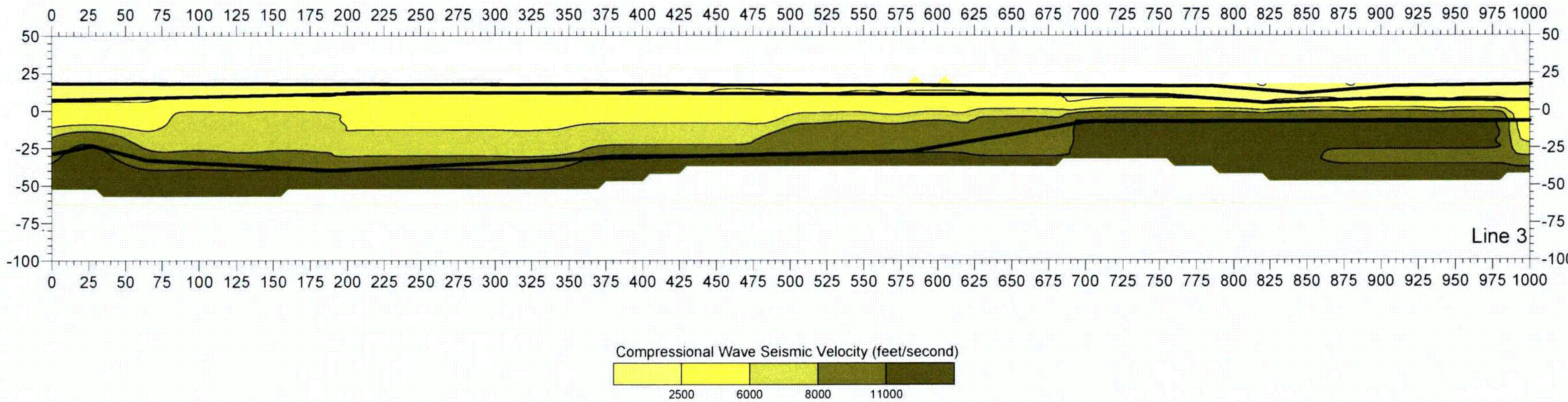


Figure G-6. Velocity modeling output (Seismic Line 3).

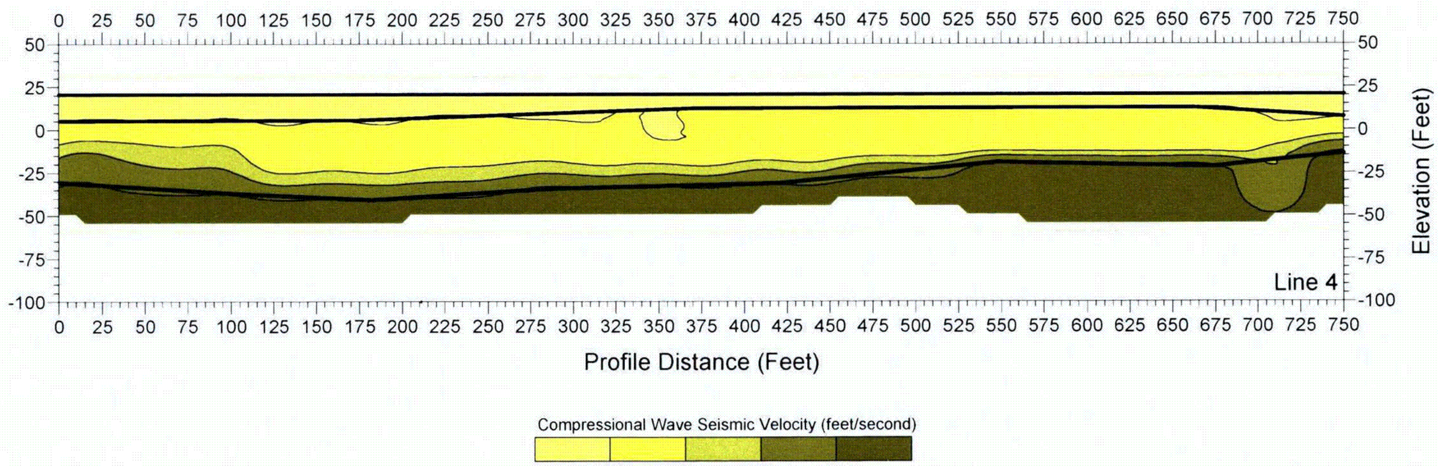
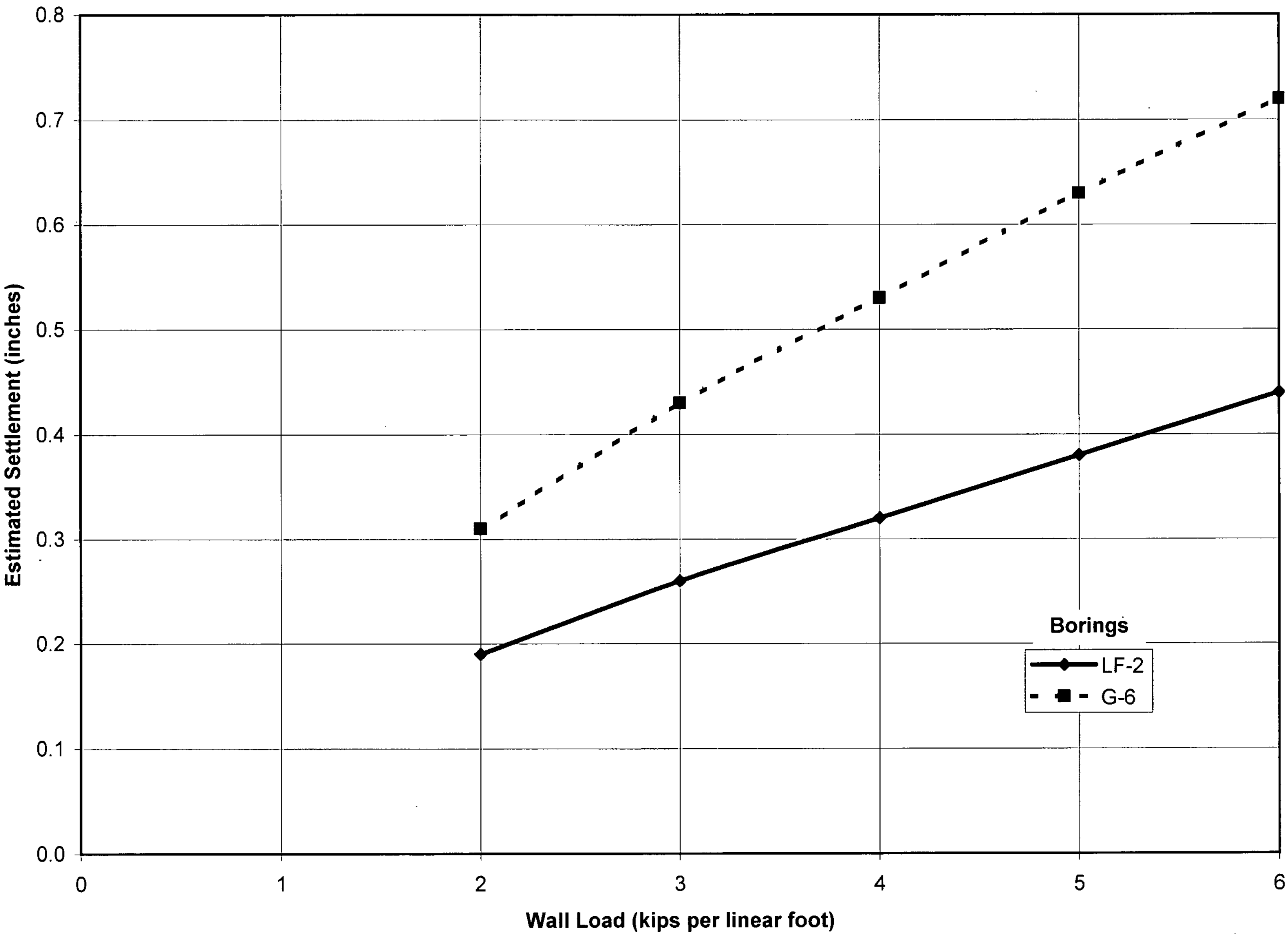
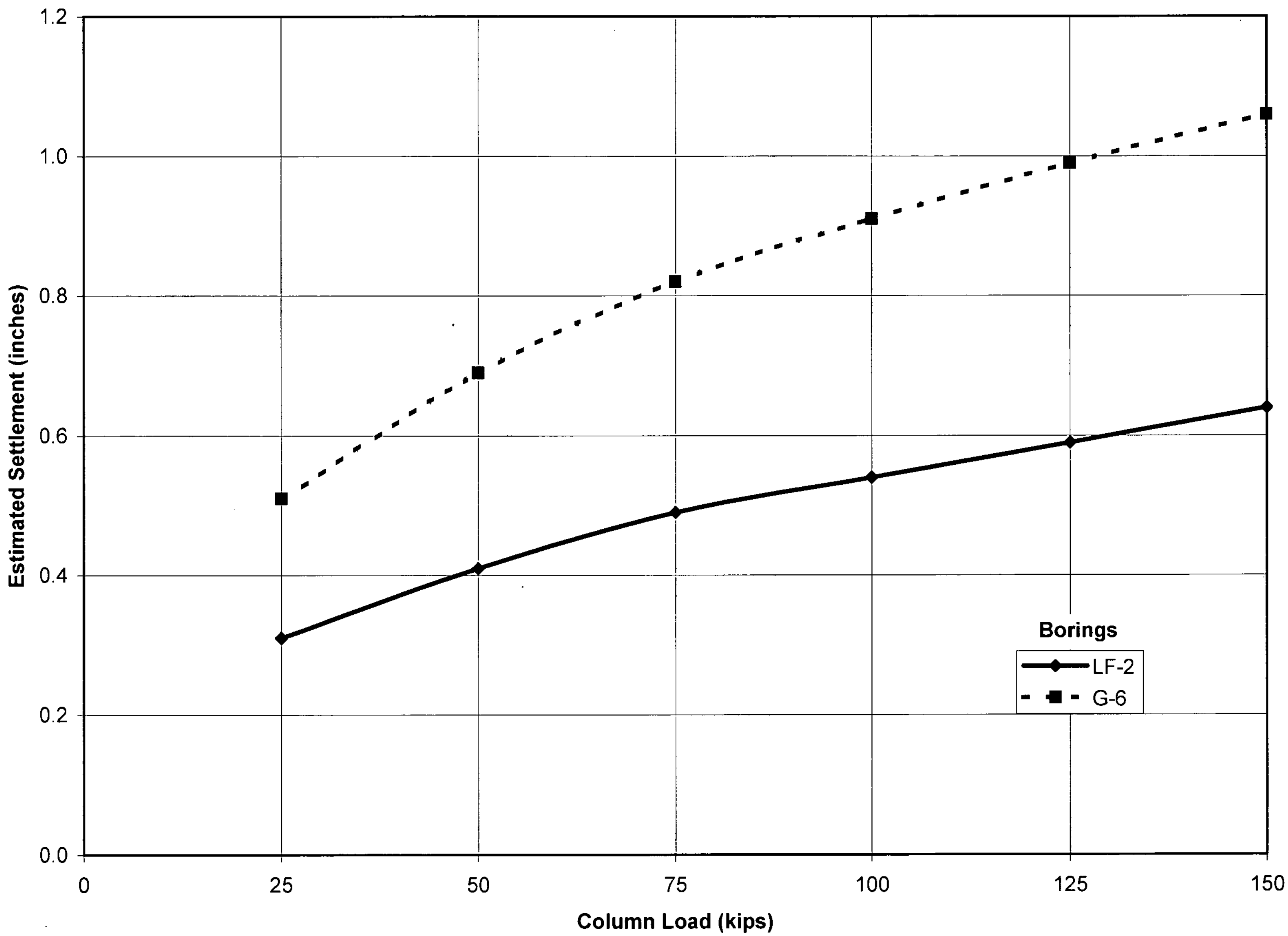


Figure G-7. Velocity modeling output (Seismic Line 4).



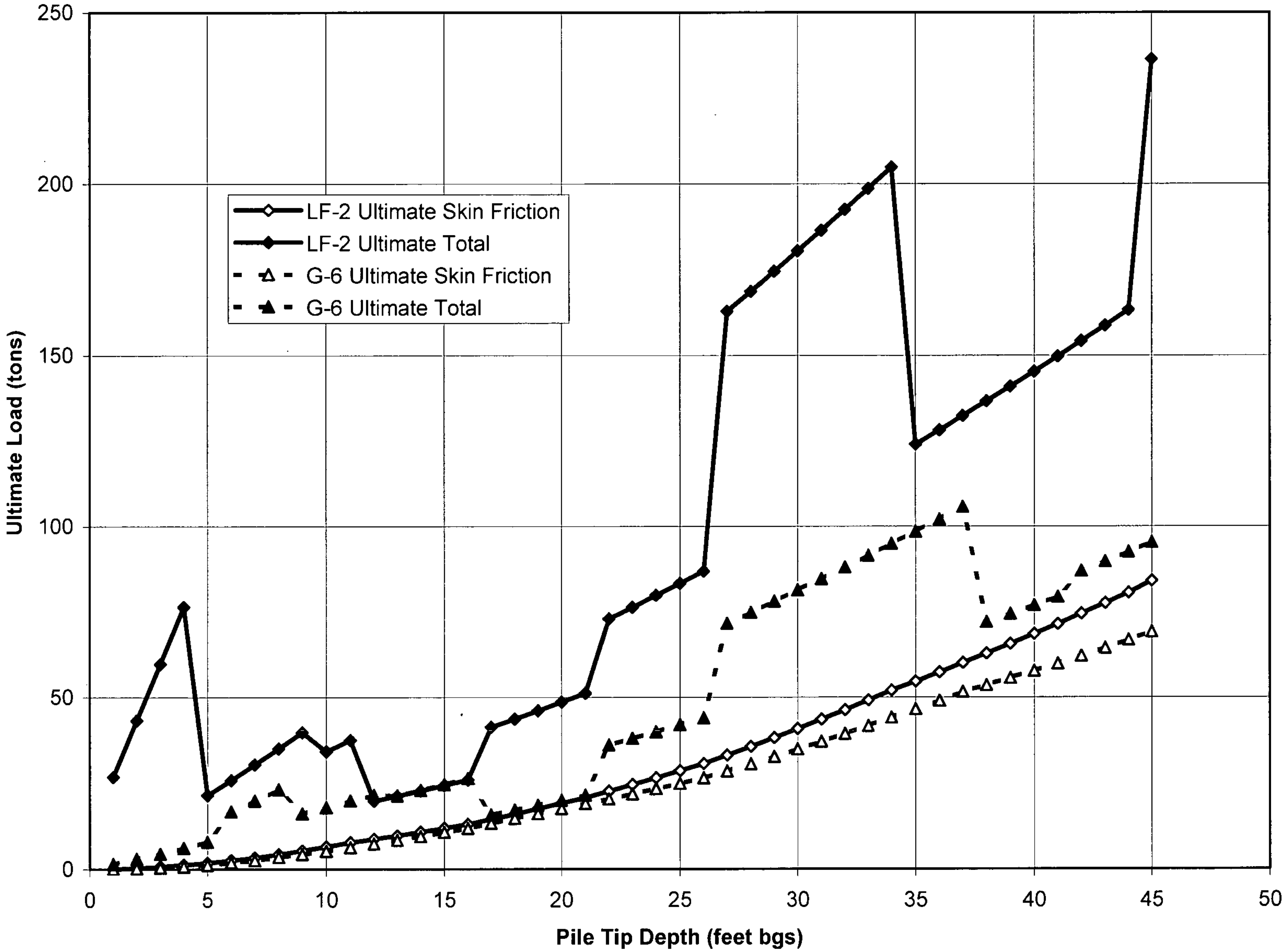
Assumes 2-foot wide footing embedded 1.5 feet into soils encountered in indicated boring.

Figure G-8. Estimated settlement of wall footings.



Assumes footing sized for bearing pressure of 3,000 psf and embedded 1.5 feet into soils encountered in indicated boring.

Figure G-9. Estimated settlement of column footings.



Divide ultimate capacity by factor of safety to determine design capacity.

Figure G-10. Estimated capacity of 16-inch diameter auger cast piles.

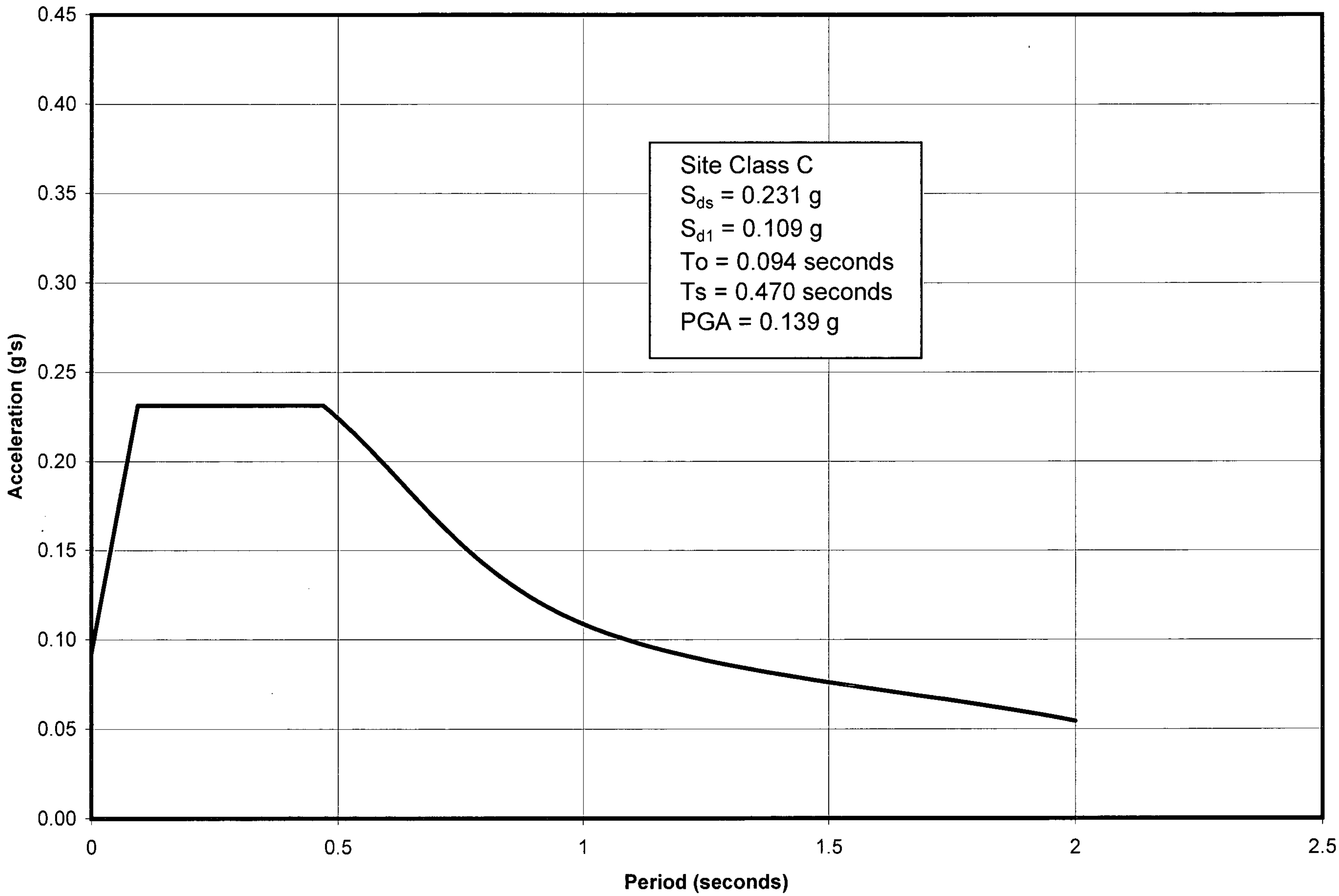


Figure G-11. Site Class C response spectrum.

Summary of Unified Soil Classification System[1]

The Unified Soil Classification System (USCS) is a soil-classification system used in engineering and geology disciplines to describe the texture and grain size of a soil. The classification system can be applied to most unconsolidated materials and is represented by a two-letter symbol. Each letter is described below.

First and/or Second Letters

Letter	Definition
G	gravel
S	sand
M	silt
C	clay
O	organic

Second Letter

Letter	Definition
P	poorly graded (uniform particle sizes)
W	well graded (diversified particle sizes)
H	high plasticity
L	low plasticity

Symbol Chart

Major Divisions			Group Symbol	Group Name
Coarse-grained soils more than 50% retained on No.200 (0.075 mm) sieve	gravel >50% of coarse fraction retained on No.4 (4.75 mm) sieve	clean gravel	GW	well graded gravel, fine to coarse gravel
			GP	poorly graded gravel
		gravel with >12% fines	GM	silty gravel
			GC	clayey gravel
	sand ≥50% of coarse fraction passes No.4 sieve	clean sand	SW	well graded sand, fine to coarse sand
			SP	poorly-graded sand
		sand with >12% fines	SM	silty sand
			SC	clayey sand
Fine-grained soils more than 50% passes No. 200 sieve	silt and clay liquid limit <50	inorganic	ML	silt
			CL	clay
		organic	OL	organic silt, organic clay
	silt and clay liquid limit ≥50	inorganic	MH	silt of high plasticity, elastic silt
			CH	clay of high plasticity, fat clay
		organic	OH	organic clay, organic silt
Highly organic soils			Pt	peat

[1] Reference: ASTM, 1985.

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Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1871	4	16	34.3	-78			3.5	I	5.68	3.53	M
1884	1	18	34.3	-78			3.5	I	5.68	3.53	M
1884	1	18	34.3	-78			3.5	I	5.68	3.53	M
1958	3	5	34.2	-77.8			3.5	I	19.97	12.41	M
1968	11	26	34.1	-77.8			3.3	I	29.06	18.06	M
1928	11	22	34	-78					36.98	22.98	
1927	11	23	33.9	-78			3.3	I	48.03	29.85	M
1974	12	9	34.2	-77.2			2.7	I	70.42	43.76	M
1850	3	30	35.4	-78			3.5	I	119.07	73.98	M
1882	10	23	35.1	-77			3.3	I	121.94	75.77	M
1882	1	8	34.6	-76.5			3.3	I	136.28	84.68	M
1994	8	6	35.101	-76.786	0	0.00	3.8	D	136.63	84.90	V
1755	11	0	33.4	-79.3			2.7	I	161.96	100.63	M
1820	9	3	33.4	-79.3			3.3	I	161.96	100.63	M
2004	10	12	34.342	-79.749	2	1.24	2.1	D	165.18	102.64	V
1735	3	8	35.5	-76.8					167.09	103.83	
2006	9	22	34.7	-79.75	5	3.11	3.5	L	169.97	105.62	G
1914	3	7	34.2	-79.8			3.3	I	170.62	106.02	M
1808	12	13	35.8	-78.6			2.7	I	173.83	108.01	M
1898	2	11	35.8	-78.6			2.7	I	173.83	108.01	M
1895	10	7	35.9	-77.5			3.5	I	179.31	111.42	M
2006	9	25	34.746	-79.876	5	3.11	3.7	B	182.38	113.32	G
1980	4	9	34.848	-79.941			2.8	D	191.14	118.77	V
1981	10	3	35.586	-79.431	37.3	23.18	1.1	D	194.21	120.68	V
1959	10	27	34.5	-80.2			4	C	207.26	128.78	M
1994	1	29	33.852	-80.149	2	1.24	2.9	D	209.35	130.08	V
1930	12	26	34.5	-80.3			3.3	I	216.39	134.46	M
1929	1	3	33.9	-80.3			3.3	I	221.56	137.67	M
1986	6	17	34.865	-80.323	0.2	0.12	2.2	D	225.20	139.93	V
1896	2	11	36.3	-78.6			3.3	I	226.85	140.96	M
1983	12	4	35.56	-79.996	20.8	12.92	1.6	D	231.25	143.69	V
1981	3	4	35.81	-79.737	1	0.62	3.3	I	231.36	143.76	M
1936	9	6	35.3	-80.2			2.7	I	231.99	144.15	M
1983	11	15	36.111	-79.341	14.6	9.07	1	D	234.91	145.96	V
1968	7	12	32.8	-79.7			3.3	I	235.01	146.03	M
2000	2	18	34.556	-80.5	0.1	0.06	2.4	D	235.18	146.13	V
1871	4	21	36.4	-78.6			2.7	I	237.60	147.64	M
1978	2	25	36.152	-79.318	21.1	13.11	3.3	I	237.65	147.67	M
1928	12	23	35.3	-80.3			3.3	I	240.11	149.20	M
1975	11	16	34.26	-80.57	7	4.35	2.8	N	240.80	149.63	G
2004	5	1	32.995	-80.003	10.7	6.65	2.7	D	241.11	149.82	V
1993	3	31	32.999	-80.04	5.2	3.23	1.2	D	243.54	151.33	V
1998	4	13	34.471	-80.603	6.6	4.10	4	D	243.90	151.55	V
1843	4	11	34.2	-80.6			2.7	I	243.95	151.58	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1989	5	3	33.108	-80.142	16.2	10.07	1.4	D	244.05	151.64	V
1992	11	21	32.95	-80.003	3.8	2.36	1.4	D	244.26	151.77	V
1960	3	12	33.072	-80.121	9	5.59	4	F	244.74	152.07	G
1997	3	22	33.093	-80.151	9.1	5.65	0.9	D	245.68	152.66	V
1998	9	11	33.094	-80.156	9.9	6.15	2.1	D	246.01	152.86	V
1989	5	3	33.068	-80.135	26.5	16.47	0.7	D	246.06	152.89	V
1959	8	3	33.054	-80.126	1	0.62	4.4	F	246.28	153.03	G
1999	3	29	33.064	-80.14	10.7	6.65	3	D	246.70	153.29	V
2002	7	7	33.043	-80.134	10.8	6.71	2.9	D	247.60	153.85	V
1698	3	5	32.9	-80			2.7	I	247.62	153.86	M
1754	5	19	32.9	-80			2.7	I	247.62	153.86	M
1757	2	7	32.9	-80			2.7	I	247.62	153.86	M
1799	4	4	32.9	-80			3.5	I	247.62	153.86	M
1799	4	11	32.9	-80			3.5	I	247.62	153.86	M
1799	4	11	32.9	-80			3.5	I	247.62	153.86	M
1816	12	30	32.9	-80					247.62	153.86	
1817	1	8	32.9	-80			4.8	C	247.62	153.86	M
1843	2	7	32.9	-80			2.7	I	247.62	153.86	M
1857	12	19	32.9	-80			3.5	I	247.62	153.86	M
1860	1	19	32.9	-80			3.5	I	247.62	153.86	M
1860	10	0	32.9	-80			2.7	I	247.62	153.86	M
1860	12	19	32.9	-80			2.7	I	247.62	153.86	M
1869			32.9	-80			3.3	I	247.62	153.86	M
1876	10	0	32.9	-80			2.7	I	247.62	153.86	M
1876	12	12	32.9	-80			3.3	I	247.62	153.86	M
1886	6	0	32.9	-80			2.7	I	247.62	153.86	M
1886	8	27	32.9	-80			2.7	I	247.62	153.86	M
1886	8	27	32.9	-80			3.5	I	247.62	153.86	M
1886	8	28	32.9	-80			2.7	I	247.62	153.86	M
1886	8	28	32.9	-80			3.8	I	247.62	153.86	M
1886	8	28	32.9	-80			3.3	I	247.62	153.86	M
1886	8	28	32.9	-80			2.4	I	247.62	153.86	M
1886	8	28	32.9	-80			3.3	I	247.62	153.86	M
1886	8	28	32.9	-80			2.7	I	247.62	153.86	M
1886	8	28	32.9	-80			2.4	I	247.62	153.86	M
1886	8	29	32.9	-80			2.4	I	247.62	153.86	M
1886	9	1	32.9	-80			6.9	F	247.62	153.86	G
1886	9	1	32.9	-80					247.62	153.86	
1886	9	1	32.9	-80					247.62	153.86	
1886	9	1	32.9	-80			2.7	I	247.62	153.86	M
1886	9	1	32.9	-80			2.7	I	247.62	153.86	M
1886	9	1	32.9	-80			2.7	I	247.62	153.86	M
1886	9	1	32.9	-80			3.5	I	247.62	153.86	M
1886	9	1	32.9	-80			2.7	I	247.62	153.86	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1886	9	1	32.9	-80			2.7	I	247.62	153.86	M
1886	9	1	32.9	-80			2.7	I	247.62	153.86	M
1886	9	1	32.9	-80			2.7	I	247.62	153.86	M
1886	9	1	32.9	-80			2.7	I	247.62	153.86	M
1886	9	1	32.9	-80			2.7	I	247.62	153.86	M
1886	9	1	32.9	-80			2.7	I	247.62	153.86	M
1886	9	1	32.9	-80			2.4	I	247.62	153.86	M
1886	9	2	32.9	-80			2.4	I	247.62	153.86	M
1886	9	2	32.9	-80			3.5	I	247.62	153.86	M
1886	9	3	32.9	-80			2.7	I	247.62	153.86	M
1886	9	4	32.9	-80			3.5	I	247.62	153.86	M
1886	9	5	32.9	-80					247.62	153.86	
1886	9	6	32.9	-80			3.5	I	247.62	153.86	M
1886	9	6	32.9	-80			2.7	I	247.62	153.86	M
1886	9	6	32.9	-80			2.7	I	247.62	153.86	M
1886	9	6	32.9	-80			3.3	I	247.62	153.86	M
1886	9	6	32.9	-80			2.4	I	247.62	153.86	M
1886	9	7	32.9	-80			2.7	I	247.62	153.86	M
1886	9	7	32.9	-80			2.4	I	247.62	153.86	M
1886	9	7	32.9	-80			2.4	I	247.62	153.86	M
1886	9	7	32.9	-80			2.4	I	247.62	153.86	M
1886	9	7	32.9	-80			2.4	I	247.62	153.86	M
1886	9	7	32.9	-80			2.4	I	247.62	153.86	M
1886	9	8	32.9	-80			2.7	I	247.62	153.86	M
1886	9	9	32.9	-80			2.7	I	247.62	153.86	M
1886	9	10	32.9	-80			2.4	I	247.62	153.86	M
1886	9	12	32.9	-80			2.4	I	247.62	153.86	M
1886	9	13	32.9	-80			2.7	I	247.62	153.86	M
1886	9	14	32.9	-80			2.7	I	247.62	153.86	M
1886	9	15	32.9	-80			2.4	I	247.62	153.86	M
1886	9	15	32.9	-80			2.4	I	247.62	153.86	M
1886	9	17	32.9	-80			3.8	I	247.62	153.86	M
1886	9	20	32.9	-80			2.7	I	247.62	153.86	M
1886	9	20	32.9	-80			2.7	I	247.62	153.86	M
1886	9	21	32.9	-80			2.7	I	247.62	153.86	M
1886	9	21	32.9	-80			3.8	I	247.62	153.86	M
1886	9	21	32.9	-80			3.5	I	247.62	153.86	M
1886	9	21	32.9	-80			2.7	I	247.62	153.86	M
1886	9	22	32.9	-80			2.4	I	247.62	153.86	M
1886	9	27	32.9	-80			3.8	I	247.62	153.86	M
1886	9	27	32.9	-80			3.5	I	247.62	153.86	M
1886	9	28	32.9	-80			2.7	I	247.62	153.86	M
1886	9	30	32.9	-80			2.7	I	247.62	153.86	M
1886	9	30	32.9	-80			2.7	I	247.62	153.86	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1886	10	9	32.9	-80			3.3	I	247.62	153.86	M
1886	10	9	32.9	-80			3.3	I	247.62	153.86	M
1886	10	9	32.9	-80			3.5	I	247.62	153.86	M
1886	10	9	32.9	-80			2.7	I	247.62	153.86	M
1886	10	15	32.9	-80			2.7	I	247.62	153.86	M
1886	10	15	32.9	-80			2.7	I	247.62	153.86	M
1886	10	22	32.9	-80			2.7	I	247.62	153.86	M
1886	10	22	32.9	-80			2.7	I	247.62	153.86	M
1886	10	22	32.9	-80			4.4	C	247.62	153.86	M
1886	10	22	32.9	-80			4.7	C	247.62	153.86	M
1886	10	23	32.9	-80			3.3	I	247.62	153.86	M
1886	10	23	32.9	-80			2.7	I	247.62	153.86	M
1886	10	30	32.9	-80			2.7	I	247.62	153.86	M
1886	10	31	32.9	-80			2.7	I	247.62	153.86	M
1886	10	31	32.9	-80			2.7	I	247.62	153.86	M
1886	11	5	32.9	-80			4.4	C	247.62	153.86	M
1886	11	7	32.9	-80			2.7	I	247.62	153.86	M
1886	11	17	32.9	-80			2.4	I	247.62	153.86	M
1886	11	28	32.9	-80			2.7	I	247.62	153.86	M
1886	11	28	32.9	-80			3.3	I	247.62	153.86	M
1886	12	1	32.9	-80			2.7	I	247.62	153.86	M
1886	12	2	32.9	-80			2.7	I	247.62	153.86	M
1886	12	2	32.9	-80			2.7	I	247.62	153.86	M
1886	12	6	32.9	-80			2.7	I	247.62	153.86	M
1887	1	3	32.9	-80			2.7	I	247.62	153.86	M
1887	1	4	32.9	-80			3.5	I	247.62	153.86	M
1887	1	4	32.9	-80			2.4	I	247.62	153.86	M
1887	1	5	32.9	-80			2.7	I	247.62	153.86	M
1887	1	11	32.9	-80			2.7	I	247.62	153.86	M
1887	2	26	32.9	-80			2.7	I	247.62	153.86	M
1887	3	4	32.9	-80			3.3	I	247.62	153.86	M
1887	3	17	32.9	-80			3.5	I	247.62	153.86	M
1887	3	18	32.9	-80			3.3	I	247.62	153.86	M
1887	3	19	32.9	-80			3.3	I	247.62	153.86	M
1887	3	20	32.9	-80			2.7	I	247.62	153.86	M
1887	3	22	32.9	-80			2.7	I	247.62	153.86	M
1887	3	24	32.9	-80			3.3	I	247.62	153.86	M
1887	3	24	32.9	-80			3.3	I	247.62	153.86	M
1887	3	24	32.9	-80			2.4	I	247.62	153.86	M
1887	3	27	32.9	-80			2.4	I	247.62	153.86	M
1887	3	28	32.9	-80			3.3	I	247.62	153.86	M
1887	3	28	32.9	-80			2.4	I	247.62	153.86	M
1887	3	30	32.9	-80			2.7	I	247.62	153.86	M
1887	3	31	32.9	-80			2.7	I	247.62	153.86	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1887	4	5	32.9	-80			2.7	I	247.62	153.86	M
1887	4	7	32.9	-80			3.3	I	247.62	153.86	M
1887	4	8	32.9	-80			3.3	I	247.62	153.86	M
1887	4	9	32.9	-80			2.7	I	247.62	153.86	M
1887	4	10	32.9	-80			3.3	I	247.62	153.86	M
1887	4	14	32.9	-80			3.3	I	247.62	153.86	M
1887	4	14	32.9	-80			2.7	I	247.62	153.86	M
1887	4	16	32.9	-80			2.7	I	247.62	153.86	M
1887	4	18	32.9	-80			2.7	I	247.62	153.86	M
1887	4	19	32.9	-80			2.4	I	247.62	153.86	M
1887	4	23	32.9	-80			2.7	I	247.62	153.86	M
1887	4	24	32.9	-80			2.7	I	247.62	153.86	M
1887	4	24	32.9	-80			2.4	I	247.62	153.86	M
1887	4	26	32.9	-80			2.4	I	247.62	153.86	M
1887	4	26	32.9	-80			2.7	I	247.62	153.86	M
1887	4	26	32.9	-80			3.3	I	247.62	153.86	M
1887	4	26	32.9	-80			2.4	I	247.62	153.86	M
1887	4	28	32.9	-80			3.5	I	247.62	153.86	M
1887	4	28	32.9	-80			2.7	I	247.62	153.86	M
1887	4	30	32.9	-80			2.7	I	247.62	153.86	M
1887	4	30	32.9	-80			2.7	I	247.62	153.86	M
1887	5	6	32.9	-80			3.3	I	247.62	153.86	M
1887	5	12	32.9	-80			2.7	I	247.62	153.86	M
1887	5	12	32.9	-80			2.7	I	247.62	153.86	M
1887	5	14	32.9	-80			2.7	I	247.62	153.86	M
1887	5	16	32.9	-80			2.7	I	247.62	153.86	M
1887	5	17	32.9	-80			2.4	I	247.62	153.86	M
1887	6	3	32.9	-80			3.3	I	247.62	153.86	M
1887	6	6	32.9	-80			2.7	I	247.62	153.86	M
1887	6	6	32.9	-80			2.4	I	247.62	153.86	M
1887	7	10	32.9	-80			3.3	I	247.62	153.86	M
1887	8	27	32.9	-80			3.5	I	247.62	153.86	M
1887	8	27	32.9	-80			3.3	I	247.62	153.86	M
1887	8	28	32.9	-80			2.7	I	247.62	153.86	M
1888	1	12	32.9	-80			2.7	I	247.62	153.86	M
1888	1	12	32.9	-80			3.8	I	247.62	153.86	M
1888	1	15	32.9	-80			2.7	I	247.62	153.86	M
1888	1	16	32.9	-80			3.3	I	247.62	153.86	M
1888	2	2	32.9	-80			2.4	I	247.62	153.86	M
1888	2	2	32.9	-80			2.7	I	247.62	153.86	M
1888	2	12	32.9	-80			2.7	I	247.62	153.86	M
1888	2	29	32.9	-80			3.5	I	247.62	153.86	M
1888	3	3	32.9	-80			3.3	I	247.62	153.86	M
1888	3	3	32.9	-80			3.3	I	247.62	153.86	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1888	3	4	32.9	-80			3.3	I	247.62	153.86	M
1888	3	14	32.9	-80			3.5	I	247.62	153.86	M
1888	3	20	32.9	-80			3.3	I	247.62	153.86	M
1888	3	25	32.9	-80			3.3	I	247.62	153.86	M
1888	4	16	32.9	-80			3.3	I	247.62	153.86	M
1888	4	16	32.9	-80			3.3	I	247.62	153.86	M
1888	4	16	32.9	-80			2.7	I	247.62	153.86	M
1888	4	20	32.9	-80			2.7	I	247.62	153.86	M
1888	4	20	32.9	-80			2.7	I	247.62	153.86	M
1888	5	2	32.9	-80			3.3	I	247.62	153.86	M
1889	2	10	32.9	-80			3.3	I	247.62	153.86	M
1889	7	12	32.9	-80			3.3	I	247.62	153.86	M
1889	8	29	32.9	-80			2.7	I	247.62	153.86	M
1890	1	15	32.9	-80			2.7	I	247.62	153.86	M
1891	6	24	32.9	-80			2.4	I	247.62	153.86	M
1891	10	13	32.9	-80			3.3	I	247.62	153.86	M
1891	12	5	32.9	-80			2.7	I	247.62	153.86	M
1892	11	3	32.9	-80			2.7	I	247.62	153.86	M
1892	11	4	32.9	-80			2.7	I	247.62	153.86	M
1892	11	4	32.9	-80			2.7	I	247.62	153.86	M
1892	11	4	32.9	-80			2.4	I	247.62	153.86	M
1892	11	6	32.9	-80			2.7	I	247.62	153.86	M
1892	11	8	32.9	-80			2.7	I	247.62	153.86	M
1892	11	8	32.9	-80			2.7	I	247.62	153.86	M
1892	11	9	32.9	-80			2.4	I	247.62	153.86	M
1892	11	10	32.9	-80			2.7	I	247.62	153.86	M
1892	11	10	32.9	-80			2.7	I	247.62	153.86	M
1892	11	10	32.9	-80			2.4	I	247.62	153.86	M
1892	11	11	32.9	-80			2.7	I	247.62	153.86	M
1892	11	11	32.9	-80			2.4	I	247.62	153.86	M
1892	11	11	32.9	-80			2.4	I	247.62	153.86	M
1892	11	12	32.9	-80			2.4	I	247.62	153.86	M
1892	11	23	32.9	-80			2.4	I	247.62	153.86	M
1892	12	22	32.9	-80			2.4	I	247.62	153.86	M
1892	12	22	32.9	-80			2.4	I	247.62	153.86	M
1893	2	14	32.9	-80			2.4	I	247.62	153.86	M
1893	2	14	32.9	-80			2.4	I	247.62	153.86	M
1893	3	2	32.9	-80			2.4	I	247.62	153.86	M
1893	3	2	32.9	-80			2.4	I	247.62	153.86	M
1893	3	3	32.9	-80			2.4	I	247.62	153.86	M
1893	3	3	32.9	-80			2.4	I	247.62	153.86	M
1893	3	8	32.9	-80			2.4	I	247.62	153.86	M
1893	6	21	32.9	-80			3.5	I	247.62	153.86	M
1893	6	21	32.9	-80			2.7	I	247.62	153.86	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1893	6	21	32.9	-80			2.7	I	247.62	153.86	M
1893	6	24	32.9	-80			2.7	I	247.62	153.86	M
1893	6	24	32.9	-80			2.4	I	247.62	153.86	M
1893	6	27	32.9	-80			2.4	I	247.62	153.86	M
1893	6	29	32.9	-80			2.4	I	247.62	153.86	M
1893	7	3	32.9	-80			2.4	I	247.62	153.86	M
1893	7	3	32.9	-80			2.4	I	247.62	153.86	M
1893	7	4	32.9	-80			2.4	I	247.62	153.86	M
1893	7	4	32.9	-80			2.4	I	247.62	153.86	M
1893	7	5	32.9	-80			2.4	I	247.62	153.86	M
1893	7	5	32.9	-80			3.3	I	247.62	153.86	M
1893	7	6	32.9	-80			2.4	I	247.62	153.86	M
1893	7	6	32.9	-80			2.4	I	247.62	153.86	M
1893	7	6	32.9	-80			3.3	I	247.62	153.86	M
1893	7	7	32.9	-80			2.4	I	247.62	153.86	M
1893	7	8	32.9	-80			2.4	I	247.62	153.86	M
1893	7	8	32.9	-80			3.3	I	247.62	153.86	M
1893	7	8	32.9	-80			3.3	I	247.62	153.86	M
1893	7	8	32.9	-80			2.4	I	247.62	153.86	M
1893	7	9	32.9	-80			2.4	I	247.62	153.86	M
1893	7	9	32.9	-80			2.4	I	247.62	153.86	M
1893	7	11	32.9	-80			2.4	I	247.62	153.86	M
1893	7	12	32.9	-80			2.4	I	247.62	153.86	M
1893	7	23	32.9	-80			2.4	I	247.62	153.86	M
1893	7	25	32.9	-80			2.4	I	247.62	153.86	M
1893	8	3	32.9	-80			2.4	I	247.62	153.86	M
1893	8	10	32.9	-80			2.4	I	247.62	153.86	M
1893	8	14	32.9	-80			2.4	I	247.62	153.86	M
1893	8	17	32.9	-80			2.4	I	247.62	153.86	M
1893	9	6	32.9	-80			2.4	I	247.62	153.86	M
1893	9	19	32.9	-80			2.4	I	247.62	153.86	M
1893	9	19	32.9	-80			3.3	I	247.62	153.86	M
1893	9	19	32.9	-80			3.3	I	247.62	153.86	M
1893	9	19	32.9	-80			3.3	I	247.62	153.86	M
1893	9	21	32.9	-80			2.7	I	247.62	153.86	M
1893	9	21	32.9	-80			2.7	I	247.62	153.86	M
1893	9	22	32.9	-80			2.4	I	247.62	153.86	M
1893	9	25	32.9	-80			2.4	I	247.62	153.86	M
1893	9	25	32.9	-80			2.4	I	247.62	153.86	M
1893	9	25	32.9	-80			2.4	I	247.62	153.86	M
1893	9	27	32.9	-80			2.4	I	247.62	153.86	M
1893	9	30	32.9	-80			2.4	I	247.62	153.86	M
1893	9	30	32.9	-80			2.7	I	247.62	153.86	M
1893	10	1	32.9	-80			2.7	I	247.62	153.86	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1893	10	2	32.9	-80			2.4	I	247.62	153.86	M
1893	10	2	32.9	-80			2.4	I	247.62	153.86	M
1893	10	2	32.9	-80			2.4	I	247.62	153.86	M
1893	10	8	32.9	-80			2.4	I	247.62	153.86	M
1893	10	10	32.9	-80			2.7	I	247.62	153.86	M
1893	10	17	32.9	-80			2.4	I	247.62	153.86	M
1893	10	24	32.9	-80			2.7	I	247.62	153.86	M
1893	10	25	32.9	-80			2.4	I	247.62	153.86	M
1893	11	8	32.9	-80			3.3	I	247.62	153.86	M
1893	11	8	32.9	-80			3.3	I	247.62	153.86	M
1893	12	3	32.9	-80			2.7	I	247.62	153.86	M
1893	12	27	32.9	-80			3.3	I	247.62	153.86	M
1893	12	27	32.9	-80			3.3	I	247.62	153.86	M
1893	12	27	32.9	-80			3.3	I	247.62	153.86	M
1893	12	27	32.9	-80			3.3	I	247.62	153.86	M
1893	12	28	32.9	-80			3.3	I	247.62	153.86	M
1893	12	29	32.9	-80			2.7	I	247.62	153.86	M
1893	12	30	32.9	-80			2.4	I	247.62	153.86	M
1893	12	31	32.9	-80			2.4	I	247.62	153.86	M
1894	1	10	32.9	-80			2.4	I	247.62	153.86	M
1894	1	10	32.9	-80			3.3	I	247.62	153.86	M
1894	1	10	32.9	-80			3.3	I	247.62	153.86	M
1894	1	10	32.9	-80			3.3	I	247.62	153.86	M
1894	1	18	32.9	-80			2.7	I	247.62	153.86	M
1894	1	30	32.9	-80			3.3	I	247.62	153.86	M
1894	2	1	32.9	-80			3.3	I	247.62	153.86	M
1894	2	14	32.9	-80			2.7	I	247.62	153.86	M
1894	3	5	32.9	-80			2.4	I	247.62	153.86	M
1894	3	14	32.9	-80			2.4	I	247.62	153.86	M
1894	3	16	32.9	-80			2.7	I	247.62	153.86	M
1894	4	15	32.9	-80			2.4	I	247.62	153.86	M
1894	5	26	32.9	-80			2.4	I	247.62	153.86	M
1894	6	6	32.9	-80			2.7	I	247.62	153.86	M
1894	6	9	32.9	-80			2.7	I	247.62	153.86	M
1894	6	16	32.9	-80			2.7	I	247.62	153.86	M
1894	6	16	32.9	-80			3.3	I	247.62	153.86	M
1894	8	11	32.9	-80			2.7	I	247.62	153.86	M
1894	8	11	32.9	-80			2.7	I	247.62	153.86	M
1894	8	14	32.9	-80			2.7	I	247.62	153.86	M
1894	8	16	32.9	-80			2.4	I	247.62	153.86	M
1894	8	19	32.9	-80			2.7	I	247.62	153.86	M
1894	8	19	32.9	-80			2.7	I	247.62	153.86	M
1894	8	20	32.9	-80			2.7	I	247.62	153.86	M
1894	9	7	32.9	-80			2.4	I	247.62	153.86	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1894	9	10	32.9	-80			2.4	I	247.62	153.86	M
1894	9	12	32.9	-80			2.4	I	247.62	153.86	M
1894	9	12	32.9	-80			2.4	I	247.62	153.86	M
1894	10	27	32.9	-80			2.7	I	247.62	153.86	M
1894	12	11	32.9	-80			3.3	I	247.62	153.86	M
1894	12	20	32.9	-80			2.7	I	247.62	153.86	M
1894	12	20	32.9	-80			2.7	I	247.62	153.86	M
1894	12	29	32.9	-80			2.7	I	247.62	153.86	M
1895	1	8	32.9	-80			3.3	I	247.62	153.86	M
1895	1	8	32.9	-80			3.3	I	247.62	153.86	M
1895	1	8	32.9	-80			3.3	I	247.62	153.86	M
1895	1	10	32.9	-80			2.7	I	247.62	153.86	M
1895	2	7	32.9	-80			2.7	I	247.62	153.86	M
1895	4	7	32.9	-80			2.7	I	247.62	153.86	M
1895	4	27	32.9	-80			3.3	I	247.62	153.86	M
1895	5	6	32.9	-80			2.7	I	247.62	153.86	M
1895	7	25	32.9	-80			3.3	I	247.62	153.86	M
1895	7	25	32.9	-80			2.4	I	247.62	153.86	M
1895	8	23	32.9	-80			2.7	I	247.62	153.86	M
1895	10	6	32.9	-80			3.3	I	247.62	153.86	M
1895	10	20	32.9	-80			3.3	I	247.62	153.86	M
1895	10	31	32.9	-80			2.7	I	247.62	153.86	M
1895	11	6	32.9	-80			2.7	I	247.62	153.86	M
1895	11	12	32.9	-80			3.3	I	247.62	153.86	M
1895	11	13	32.9	-80			2.7	I	247.62	153.86	M
1895	12	3	32.9	-80			2.7	I	247.62	153.86	M
1895	12	26	32.9	-80			2.7	I	247.62	153.86	M
1896	2	10	32.9	-80			2.4	I	247.62	153.86	M
1896	3	1	32.9	-80			2.7	I	247.62	153.86	M
1896	3	3	32.9	-80			2.4	I	247.62	153.86	M
1896	3	19	32.9	-80			3.3	I	247.62	153.86	M
1896	5	21	32.9	-80			2.4	I	247.62	153.86	M
1896	5	31	32.9	-80			2.7	I	247.62	153.86	M
1896	6	1	32.9	-80			2.4	I	247.62	153.86	M
1896	6	23	32.9	-80			2.4	I	247.62	153.86	M
1896	6	29	32.9	-80			2.7	I	247.62	153.86	M
1896	6	30	32.9	-80			2.7	I	247.62	153.86	M
1896	8	7	32.9	-80			2.4	I	247.62	153.86	M
1896	8	7	32.9	-80			2.4	I	247.62	153.86	M
1896	8	7	32.9	-80			2.4	I	247.62	153.86	M
1896	8	11	32.9	-80			3.3	I	247.62	153.86	M
1896	8	11	32.9	-80			3.3	I	247.62	153.86	M
1896	8	11	32.9	-80			3.3	I	247.62	153.86	M
1896	8	11	32.9	-80			3.3	I	247.62	153.86	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1896	8	12	32.9	-80			3.3	I	247.62	153.86	M
1896	8	13	32.9	-80			2.7	I	247.62	153.86	M
1896	8	14	32.9	-80			3.3	I	247.62	153.86	M
1896	8	15	32.9	-80			2.7	I	247.62	153.86	M
1896	8	16	32.9	-80			2.7	I	247.62	153.86	M
1896	8	17	32.9	-80			2.7	I	247.62	153.86	M
1896	8	30	32.9	-80			3.3	I	247.62	153.86	M
1896	9	8	32.9	-80			2.7	I	247.62	153.86	M
1896	9	8	32.9	-80			3.3	I	247.62	153.86	M
1896	9	11	32.9	-80			2.4	I	247.62	153.86	M
1896	9	11	32.9	-80			2.4	I	247.62	153.86	M
1896	9	13	32.9	-80			2.7	I	247.62	153.86	M
1896	11	14	32.9	-80			3.3	I	247.62	153.86	M
1897	2	1	32.9	-80			2.4	I	247.62	153.86	M
1897	3	17	32.9	-80			2.7	I	247.62	153.86	M
1897	3	30	32.9	-80			2.7	I	247.62	153.86	M
1897	6	1	32.9	-80			2.4	I	247.62	153.86	M
1897	7	10	32.9	-80			2.4	I	247.62	153.86	M
1898	8	3	32.9	-80			2.7	I	247.62	153.86	M
1898	9	23	32.9	-80			2.7	I	247.62	153.86	M
1899	3	10	32.9	-80			3.3	I	247.62	153.86	M
1899	3	16	32.9	-80			2.7	I	247.62	153.86	M
1899	5	5	32.9	-80			2.7	I	247.62	153.86	M
1899	5	18	32.9	-80			2.4	I	247.62	153.86	M
1899	12	4	32.9	-80			3.3	I	247.62	153.86	M
1900	1	14	32.9	-80			2.7	I	247.62	153.86	M
1900	5	10	32.9	-80			2.7	I	247.62	153.86	M
1900	8	11	32.9	-80			2.7	I	247.62	153.86	M
1900	9	4	32.9	-80			2.7	I	247.62	153.86	M
1900	9	24	32.9	-80			2.7	I	247.62	153.86	M
1901	1	0	32.9	-80			2.7	I	247.62	153.86	M
1901	9	5	32.9	-80			2.4	I	247.62	153.86	M
1901	9	14	32.9	-80			2.4	I	247.62	153.86	M
1901	9	16	32.9	-80			2.4	I	247.62	153.86	M
1901	9	17	32.9	-80			2.4	I	247.62	153.86	M
1901	9	29	32.9	-80			2.4	I	247.62	153.86	M
1901	12	2	32.9	-80			3.3	I	247.62	153.86	M
1902	1	22	32.9	-80			2.4	I	247.62	153.86	M
1902	2	5	32.9	-80			2.4	I	247.62	153.86	M
1902	3	18	32.9	-80			2.4	I	247.62	153.86	M
1902	3	26	32.9	-80			2.4	I	247.62	153.86	M
1902	5	16	32.9	-80			2.7	I	247.62	153.86	M
1902	5	24	32.9	-80			2.7	I	247.62	153.86	M
1902	9	28	32.9	-80			2.4	I	247.62	153.86	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1902	11	20	32.9	-80			2.4	I	247.62	153.86	M
1903	1	24	32.9	-80			3.3	I	247.62	153.86	M
1903	1	29	32.9	-80			2.7	I	247.62	153.86	M
1903	1	31	32.9	-80			3.3	I	247.62	153.86	M
1903	2	3	32.9	-80			3.3	I	247.62	153.86	M
1903	5	9	32.9	-80			2.7	I	247.62	153.86	M
1903	6	17	32.9	-80			2.4	I	247.62	153.86	M
1903	8	25	32.9	-80			2.7	I	247.62	153.86	M
1903	12	24	32.9	-80			2.4	I	247.62	153.86	M
1904	3	6	32.9	-80			2.4	I	247.62	153.86	M
1904	3	16	32.9	-80			2.4	I	247.62	153.86	M
1904	6	19	32.9	-80			2.4	I	247.62	153.86	M
1904	6	22	32.9	-80			2.4	I	247.62	153.86	M
1904	9	5	32.9	-80			2.7	I	247.62	153.86	M
1904	9	10	32.9	-80			2.4	I	247.62	153.86	M
1904	9	24	32.9	-80					247.62	153.86	
1904	10	1	32.9	-80			2.4	I	247.62	153.86	M
1904	11	15	32.9	-80			2.4	I	247.62	153.86	M
1904	12	6	32.9	-80			2.4	I	247.62	153.86	M
1905	3	5	32.9	-80			2.7	I	247.62	153.86	M
1905	6	4	32.9	-80			2.7	I	247.62	153.86	M
1905	7	23	32.9	-80			2.4	I	247.62	153.86	M
1905	7	23	32.9	-80			2.4	I	247.62	153.86	M
1905	10	11	32.9	-80			2.7	I	247.62	153.86	M
1905	10	16	32.9	-80			2.4	I	247.62	153.86	M
1905	12	28	32.9	-80			2.4	I	247.62	153.86	M
1906	8	5	32.9	-80			2.7	I	247.62	153.86	M
1907	4	19	32.9	-80			3.9	C	247.62	153.86	M
1908	1	15	32.9	-80			2.7	I	247.62	153.86	M
1908	1	15	32.9	-80			2.4	I	247.62	153.86	M
1908	3	3	32.9	-80			2.4	I	247.62	153.86	M
1908	3	7	32.9	-80			2.4	I	247.62	153.86	M
1908	10	26	32.9	-80			2.7	I	247.62	153.86	M
1908	12	28	32.9	-80			2.4	I	247.62	153.86	M
1909	2	26	32.9	-80			2.7	I	247.62	153.86	M
1909	8	21	32.9	-80			2.7	I	247.62	153.86	M
1909	12	14	32.9	-80			2.7	I	247.62	153.86	M
1910	5	2	32.9	-80			2.7	I	247.62	153.86	M
1910	9	2	32.9	-80			2.7	I	247.62	153.86	M
1910	9	12	32.9	-80			2.7	I	247.62	153.86	M
1911	11	24	32.9	-80			2.4	I	247.62	153.86	M
1912	3	31	32.9	-80			2.7	I	247.62	153.86	M
1912	6	12	32.9	-80			4.8	C	247.62	153.86	M
1912	6	29	32.9	-80			2.7	I	247.62	153.86	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1912	8	30	32.9	-80			2.4	I	247.62	153.86	M
1912	9	29	32.9	-80			3.3	I	247.62	153.86	M
1912	11	17	32.9	-80			3.3	I	247.62	153.86	M
1912	11	26	32.9	-80			2.4	I	247.62	153.86	M
1912	12	15	32.9	-80			2.4	I	247.62	153.86	M
1913	1	26	32.9	-80			2.4	I	247.62	153.86	M
1913	2	5	32.9	-80			2.4	I	247.62	153.86	M
1913	3	9	32.9	-80			2.7	I	247.62	153.86	M
1913	6	6	32.9	-80			2.4	I	247.62	153.86	M
1914	6	19	32.9	-80			2.7	I	247.62	153.86	M
1914	7	14	32.9	-80			3.3	I	247.62	153.86	M
1914	7	14	32.9	-80			2.4	I	247.62	153.86	M
1914	9	22	32.9	-80			4.2	C	247.62	153.86	M
1914	12	23	32.9	-80			2.4	I	247.62	153.86	M
1915	12	13	32.9	-80			2.7	I	247.62	153.86	M
1915	12	20	32.9	-80			2.7	I	247.62	153.86	M
1916	4	16	32.9	-80			2.4	I	247.62	153.86	M
1916	4	30	32.9	-80			2.7	I	247.62	153.86	M
1916	6	25	32.9	-80			2.7	I	247.62	153.86	M
1916	7	14	32.9	-80			2.4	I	247.62	153.86	M
1916	9	24	32.9	-80			2.4	I	247.62	153.86	M
1917	4	11	32.9	-80			2.4	I	247.62	153.86	M
1920	8	1	32.9	-80			2.4	I	247.62	153.86	M
1921	4	19	32.9	-80			2.7	I	247.62	153.86	M
1921	4	23	32.9	-80			2.7	I	247.62	153.86	M
1922	8	8	32.9	-80			2.4	I	247.62	153.86	M
1923	3	24	32.9	-80			2.7	I	247.62	153.86	M
1924	2	14	32.9	-80			2.7	I	247.62	153.86	M
1924	6	3	32.9	-80			2.7	I	247.62	153.86	M
1924	9	26	32.9	-80					247.62	153.86	
1928	12	19	32.9	-80			2.4	I	247.62	153.86	M
1930	9	3	32.9	-80			2.7	I	247.62	153.86	M
1932	1	6	32.9	-80			2.4	I	247.62	153.86	M
1932	1	13	32.9	-80			2.4	I	247.62	153.86	M
1933	7	26	32.9	-80			2.7	I	247.62	153.86	M
1933	12	19	32.9	-80			3.3	I	247.62	153.86	M
1933	12	23	32.9	-80			3.5	I	247.62	153.86	M
1933	12	23	32.9	-80			3.3	I	247.62	153.86	M
1934	12	9	32.9	-80			3.3	I	247.62	153.86	M
1935	2	6	32.9	-80			2.7	I	247.62	153.86	M
1935	10	20	32.9	-80			2.7	I	247.62	153.86	M
1936	12	30	32.9	-80			2.4	I	247.62	153.86	M
1937	10	25	32.9	-80			2.4	I	247.62	153.86	M
1938	8	5	32.9	-80			2.4	I	247.62	153.86	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1940	1	5	32.9	-80			2.7	I	247.62	153.86	M
1940	1	5	32.9	-80			2.7	I	247.62	153.86	M
1940	10	8	32.9	-80			2.4	I	247.62	153.86	M
1940	12	27	32.9	-80			2.4	I	247.62	153.86	M
1943	12	28	32.9	-80			3.3	I	247.62	153.86	M
1944	1	28	32.9	-80			3.3	I	247.62	153.86	M
1945	1	30	32.9	-80			3.3	I	247.62	153.86	M
1945	5	18	32.9	-80			2.7	I	247.62	153.86	M
1945	5	18	32.9	-80			2.7	I	247.62	153.86	M
1945	6	5	32.9	-80			2.4	I	247.62	153.86	M
1946	2	8	32.9	-80			2.7	I	247.62	153.86	M
1947	11	2	32.9	-80			3.3	I	247.62	153.86	M
1949	2	2	32.9	-80			3.3	I	247.62	153.86	M
1949	6	27	32.9	-80			3.3	I	247.62	153.86	M
1951	3	4	32.9	-80			3.3	I	247.62	153.86	M
1951	3	8	32.9	-80			2.4	I	247.62	153.86	M
1951	3	10	32.9	-80			2.4	I	247.62	153.86	M
1951	12	30	32.9	-80			3.3	I	247.62	153.86	M
1952	9	27	32.9	-80			2.7	I	247.62	153.86	M
1952	11	19	32.9	-80			3.5	I	247.62	153.86	M
1960	7	24	32.9	-80			3.5	I	247.62	153.86	M
1961	5	20	32.9	-80			2.7	I	247.62	153.86	M
1961	10	18	32.9	-80			2.7	I	247.62	153.86	M
1968	7	10	32.9	-80			2.4	I	247.62	153.86	M
1968	7	10	32.9	-80			2.4	I	247.62	153.86	M
1999	3	29	33.057	-80.147	7.9	4.91	2	D	247.68	153.90	V
1990	10	9	32.979	-80.086	11.6	7.21	1.2	D	248.29	154.28	V
2004	12	10	33.075	-80.172	10.3	6.40	2.4	D	248.43	154.37	V
1978	10	30	33.046	-80.151	7.3	4.54	1.9	D	248.69	154.53	V
1998	11	15	33.047	-80.154	9.1	5.65	2.1	D	248.86	154.63	V
1978	10	30	33.039	-80.15	3	1.86	2.4	D	249.07	154.77	V
1992	5	7	33.04	-80.151	2.5	1.55	1.5	D	249.08	154.77	V
1977	1	18	33.058	-80.173	1	0.62	3.8	I	249.59	155.09	M
2000	9	24	33.039	-80.16	7	4.35	2.3	D	249.83	155.24	V
1994	4	8	33.016	-80.141	3	1.86	1	D	249.90	155.28	V
1994	6	20	33.04	-80.162	2.1	1.30	2.7	I	249.92	155.29	M
1992	4	30	33.039	-80.164	5.9	3.67	1	D	250.13	155.42	V
1978	10	30	33.062	-80.187	17.5	10.87	1.3	D	250.41	155.59	V
1991	11	17	32.988	-80.123	3.8	2.36	2.4	I	250.42	155.60	M
1994	5	1	33.042	-80.171	3	1.86	0.7	D	250.47	155.63	V
2002	11	29	33.049	-80.177	9.1	5.65	2.5	D	250.47	155.64	V
2000	5	7	33.025	-80.157	7.7	4.78	1.3	D	250.51	155.66	V
1979	1	27	33.051	-80.182	6.2	3.85	2.8	D	250.73	155.79	V
1991	3	5	33.038	-80.172	0.9	0.56	2.4	I	250.80	155.84	M

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1979	7	4	33.017	-80.155	5	3.11	1.3	D	250.89	155.89	V
1988	4	30	33.006	-80.146	0.9	0.56	1.6	D	250.94	155.92	V
2002	1	28	33.018	-80.157	4.7	2.92	2.4	D	250.97	155.95	V
2002	12	16	33.049	-80.184	8.5	5.28	2.8	D	251.01	155.97	V
2000	9	22	33.01	-80.151	4.8	2.98	2.4	D	251.05	155.99	V
2003	5	5	33.055	-80.19	11.4	7.08	3.1	D	251.08	156.01	V
2002	7	26	33.06	-80.195	10	6.21	3	D	251.14	156.05	V
2004	11	25	33.053	-80.19	12.9	8.02	2.7	D	251.21	156.09	V
1980	6	22	33.015	-80.158	0.3	0.19	2.4	I	251.24	156.12	M
1985	5	19	33.01	-80.155	7.4	4.60	2.1	D	251.35	156.18	V
2002	2	2	33.014	-80.159	7.7	4.78	2.2	D	251.39	156.20	V
1980	6	22	33.012	-80.158	0.2	0.12	2.4	I	251.44	156.24	M
2004	8	18	33.023	-80.171	7.7	4.78	2.5	D	251.70	156.40	V
1998	10	31	33.05	-80.194	8.7	5.41	1.8	D	251.71	156.40	V
1992	2	29	33.016	-80.165	8.9	5.53	1.3	D	251.71	156.40	V
1997	3	29	32.989	-80.143	5.8	3.60	1.8	D	251.84	156.49	V
1992	5	7	33.009	-80.161	5.3	3.29	1	D	251.86	156.50	V
1996	7	1	33.091	-80.23	0.1	0.06	0.5	D	251.90	156.52	V
1995	7	29	33.001	-80.156	0.4	0.25	1.2	D	252.02	156.60	V
1979	12	7	33.008	-80.163	5	3.11	3.3	I	252.08	156.64	M
1978	9	7	33.063	-80.21	10	6.21	3.3	I	252.10	156.65	M
1991	3	27	33.019	-80.177	8.6	5.34	1.8	D	252.41	156.84	V
2000	8	10	33.016	-80.179	7.1	4.41	1.6	D	252.76	157.06	V
1992	2	19	32.916	-80.089	10.3	6.40	2.4	I	252.86	157.12	M
1994	4	17	32.918	-80.094	3	1.86	0.8	D	253.09	157.26	V
1986	5	8	33.007	-80.178	5.3	3.29	1.4	D	253.27	157.38	V
1992	8	21	32.987	-80.162	4.4	2.73	2.4	I	253.39	157.45	M
1995	4	17	32.997	-80.171	8.4	5.22	3.9	N	253.41	157.46	V
2000	5	27	32.95	-80.129	6.8	4.23	1.3	D	253.44	157.48	V
1998	8	28	32.984	-80.161	7.3	4.54	1.4	D	253.52	157.53	V
1995	9	16	32.979	-80.157	3.9	2.42	2.3	D	253.55	157.55	V
1992	8	21	32.985	-80.163	6.5	4.04	4.1	N	253.60	157.58	V
1998	12	5	32.994	-80.171	6.5	4.04	1.6	D	253.60	157.58	V
1992	8	21	32.988	-80.166	5.2	3.23	0.6	D	253.63	157.60	V
1995	5	16	32.962	-80.143	3	1.86	0.2	D	253.66	157.61	V
1995	7	21	32.985	-80.164	6.5	4.04	2.1	D	253.68	157.63	V
1977	12	20	33.064	-80.232	12	7.46	1.8	D	253.73	157.66	V
1995	9	16	32.972	-80.154	4.1	2.55	1.2	D	253.80	157.70	V
1994	1	29	32.982	-80.163	6.6	4.10	1	D	253.80	157.70	V
1994	4	21	32.937	-80.122	7	4.35	1.5	D	253.81	157.71	V
1992	9	6	32.945	-80.13	5.8	3.60	0.8	D	253.85	157.74	V
1992	8	9	33.013	-80.191	8.5	5.28	0.8	D	253.86	157.74	V
2003	10	22	32.983	-80.166	7.5	4.66	2.4	D	253.96	157.80	V
1990	11	13	32.947	-80.136	3.4	2.11	3.5	N	254.16	157.93	V

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1991	1	15	32.953	-80.146	2	1.24	2.4	I	254.49	158.13	M
1997	3	2	32.98	-80.172	7.5	4.66	1.6	D	254.61	158.21	V
1997	9	17	32.952	-80.148	6.2	3.85	2.2	D	254.70	158.27	V
1998	11	11	32.982	-80.176	7.3	4.54	1.3	D	254.77	158.31	V
1993	7	12	36.035	-79.823	5	3.11	3.3	I	254.78	158.31	M
1992	10	17	32.992	-80.185	4.4	2.73	1	D	254.79	158.32	V
1982	1	15	32.883	-80.084	0.5	0.31	1.7	D	254.83	158.35	V
2003	3	15	32.939	-80.138	5.3	3.29	2	D	254.85	158.36	V
1991	4	23	32.953	-80.151	6.4	3.98	1.4	D	254.86	158.36	V
1986	6	13	32.985	-80.18	7.1	4.41	1.1	D	254.87	158.37	V
1990	11	13	32.948	-80.147	5.4	3.36	0.6	D	254.90	158.39	V
2003	3	15	32.937	-80.137	5.4	3.36	2.3	D	254.92	158.40	V
2002	7	16	32.938	-80.138	6.7	4.16	2.8	D	254.92	158.40	V
2002	7	16	32.938	-80.138	7.2	4.47	2.3	D	254.92	158.40	V
2003	12	1	32.939	-80.139	8.4	5.22	2.1	D	254.93	158.40	V
1990	11	13	32.948	-80.149	5.9	3.67	0.8	D	255.05	158.48	V
1988	12	13	32.949	-80.15	5.4	3.36	2.4	D	255.06	158.48	V
1982	3	1	32.936	-80.138	6.7	4.16	3.3	I	255.06	158.48	M
1986	3	9	32.968	-80.169	5.8	3.60	2.7	I	255.18	158.56	M
1993	11	25	32.936	-80.14	7.5	4.66	1	D	255.20	158.58	V
1990	8	18	32.938	-80.142	4.2	2.61	1.7	D	255.21	158.58	V
1995	4	10	32.939	-80.143	5	3.11	1.2	D	255.22	158.59	V
1995	6	20	32.939	-80.143	6.4	3.98	0.8	D	255.22	158.59	V
1990	6	18	32.952	-80.155	5.1	3.17	1	D	255.22	158.59	V
1992	11	12	32.933	-80.138	5.7	3.54	1.2	D	255.26	158.61	V
1993	12	6	32.938	-80.143	5	3.11	1	D	255.29	158.63	V
1995	3	2	32.962	-80.165	4.6	2.86	0.7	D	255.29	158.63	V
1990	5	11	32.951	-80.155	6.1	3.79	2.7	I	255.29	158.63	M
1991	5	17	32.94	-80.145	1	0.62	1.4	D	255.30	158.64	V
1989	10	20	32.955	-80.16	4.8	2.98	0.9	D	255.39	158.69	V
2005	11	19	33	-80.2	5	3.11	2.6	L	255.39	158.69	G
1993	1	22	32.931	-80.138	8.5	5.28	1	D	255.40	158.70	V
1989	6	6	32.942	-80.149	2	1.24	0.9	D	255.46	158.73	V
1990	8	18	32.956	-80.162	6.7	4.16	0.5	D	255.47	158.74	V
1996	11	14	32.949	-80.156	5.6	3.48	0.4	D	255.50	158.76	V
1990	6	18	32.951	-80.158	4.9	3.04	2.7	I	255.51	158.77	M
1998	3	29	32.94	-80.149	9.4	5.84	1.7	D	255.59	158.82	V
2002	1	11	32.937	-80.147	6.1	3.79	2.7	D	255.65	158.85	V
1995	8	18	32.932	-80.143	3.6	2.24	0.2	D	255.70	158.88	V
1999	1	6	32.917	-80.129	8	4.97	1.3	D	255.71	158.89	V
2002	1	22	32.935	-80.146	6.7	4.16	1.1	D	255.71	158.89	V
2004	1	13	33.017	-80.219	7.5	4.66	2.2	D	255.73	158.90	V
2002	1	11	32.938	-80.149	6.7	4.16	2	D	255.73	158.90	V
1991	2	7	32.939	-80.15	6.2	3.85	1.3	D	255.74	158.91	V

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1980	9	1	32.978	-80.186	7	4.35	3.3	I	255.79	158.94	M
2003	7	19	32.924	-80.137	5.7	3.54	2.5	D	255.81	158.95	V
1983	6	26	32.931	-80.144	4.8	2.98	2	D	255.84	158.97	V
1993	6	15	32.977	-80.186	6.9	4.29	2.7	I	255.85	158.98	M
1995	8	19	32.979	-80.188	7.3	4.54	0	D	255.87	158.99	V
2000	11	15	32.95	-80.163	5.9	3.67	1	D	255.95	159.04	V
1990	6	2	32.935	-80.15	5.4	3.36	2.7	I	256.01	159.08	M
1990	2	18	32.961	-80.175	1.9	1.18	2.7	I	256.10	159.13	M
1997	5	10	32.94	-80.157	6.6	4.10	0.9	D	256.18	159.18	V
2002	1	7	32.932	-80.15	5.8	3.60	0.7	D	256.21	159.20	V
2002	4	28	32.935	-80.153	6.9	4.29	2.3	D	256.23	159.21	V
1992	10	30	32.963	-80.179	6.5	4.04	1	D	256.26	159.23	V
2004	8	20	32.933	-80.152	6.9	4.29	1.9	D	256.29	159.25	V
1991	2	18	32.962	-80.179	4.1	2.55	2.7	I	256.33	159.28	M
1999	5	30	32.918	-80.139	5.4	3.36	1.2	D	256.37	159.30	V
2003	12	2	32.928	-80.149	5.4	3.36	1.3	D	256.41	159.33	V
1998	11	5	32.934	-80.155	5.7	3.54	1.5	D	256.45	159.35	V
2003	2	26	32.936	-80.157	7.9	4.91	2.1	D	256.46	159.35	V
1995	6	5	32.941	-80.162	3	1.86	1	D	256.49	159.37	V
2000	5	23	32.929	-80.151	6.5	4.04	1	D	256.49	159.38	V
1998	9	11	32.943	-80.164	6.9	4.29	1.4	D	256.50	159.38	V
1988	1	23	32.935	-80.157	7.4	4.60	3.5	I	256.52	159.40	M
1989	1	2	32.936	-80.158	4.9	3.04	2.7	I	256.53	159.40	M
1983	11	6	32.937	-80.159	9.6	5.97	3.5	I	256.54	159.40	M
1996	5	6	33.028	-80.239	12.6	7.83	0.4	D	256.54	159.41	V
2003	2	1	32.931	-80.154	5.5	3.42	2.1	D	256.58	159.43	V
2000	12	3	32.948	-80.17	6.2	3.85	0.8	D	256.60	159.45	V
1997	12	5	32.96	-80.181	8.9	5.53	1.3	D	256.61	159.45	V
1977	12	15	32.944	-80.167	7.5	4.66	3.5	I	256.65	159.48	M
1987	10	6	32.944	-80.167	1.7	1.06	1.5	D	256.65	159.48	V
1995	4	10	32.944	-80.167	3.9	2.42	0.6	D	256.65	159.48	V
1992	3	8	32.958	-80.18	5.9	3.67	0.8	D	256.67	159.49	V
1977	8	23	32.939	-80.163	7.6	4.72	2.3	D	256.69	159.50	V
1963	5	4	32.972	-80.193	5	3.11	3.3	M	256.71	159.51	G
1993	10	3	32.992	-80.211	3.5	2.17	1	D	256.74	159.53	V
1983	11	6	32.929	-80.155	11.2	6.96	2.2	D	256.79	159.56	V
1997	11	26	32.931	-80.157	6.9	4.29	2.5	D	256.80	159.57	V
1989	3	15	32.962	-80.186	7.5	4.66	1.1	D	256.85	159.60	V
2003	2	28	32.932	-80.159	4.3	2.67	2.6	D	256.88	159.62	V
1975	4	28	33	-80.22	10	6.21	3.3	I	256.90	159.63	M
1986	9	17	32.931	-80.159	6.7	4.16	3.3	I	256.94	159.66	M
1991	8	24	32.939	-80.167	2.2	1.37	1.6	D	256.99	159.69	V
1988	1	23	32.931	-80.16	5.2	3.23	1.6	D	257.02	159.70	V
1994	6	19	32.933	-80.162	5	3.11	1	D	257.03	159.71	V

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1981	3	19	32.96	-80.188	5.9	3.67	2.7	I	257.14	159.78	M
1998	4	11	33.042	-80.259	9.7	6.03	1.6	D	257.19	159.81	V
1981	6	8	32.924	-80.156	3	1.86	1.2	D	257.20	159.82	V
1977	3	30	32.95	-80.18	8	4.97	3.5	I	257.21	159.82	M
1989	6	2	32.934	-80.166	5.8	3.60	3.3	I	257.26	159.85	M
2003	10	14	32.946	-80.177	7.2	4.47	2.5	D	257.26	159.85	V
2004	2	29	32.936	-80.168	7.7	4.78	2	D	257.27	159.86	V
2003	12	22	32.924	-80.157	5.6	3.48	3	D	257.28	159.86	V
2003	10	20	32.925	-80.158	7	4.35	1.4	D	257.28	159.87	V
1974	11	22	32.926	-80.159	6	3.73	4.7	P	257.29	159.87	G
2003	12	22	32.929	-80.162	10.2	6.34	1.8	D	257.30	159.88	V
1997	2	15	32.896	-80.131	6.9	4.29	1	D	257.31	159.89	V
2002	3	13	32.919	-80.153	7.6	4.72	2.2	D	257.33	159.89	V
1997	6	3	32.923	-80.157	5.9	3.67	1	D	257.34	159.91	V
2003	3	2	32.931	-80.165	6.5	4.04	2.9	D	257.39	159.93	V
1994	4	14	32.992	-80.221	9.5	5.90	2.4	I	257.50	160.00	M
1997	12	6	32.938	-80.174	6.5	4.04	1.2	D	257.58	160.05	V
1989	6	8	32.926	-80.163	6.1	3.79	1.6	D	257.58	160.05	V
1992	4	18	33.02	-80.246	3	1.86	1	D	257.59	160.06	V
1986	7	22	32.931	-80.168	5.8	3.60	1.3	D	257.61	160.07	V
1979	8	11	32.992	-80.223	10	6.21	2.7	I	257.65	160.10	M
1998	11	26	32.936	-80.174	6.4	3.98	1.5	D	257.71	160.13	V
1991	6	2	32.98	-80.214	5	3.11	3.5	I	257.76	160.16	M
1989	4	22	32.933	-80.172	6.8	4.23	0.7	D	257.77	160.17	V
1994	10	17	32.929	-80.169	5	3.11	1	D	257.82	160.20	V
2002	9	21	32.922	-80.163	8.2	5.10	2	D	257.85	160.22	V
1993	3	11	32.997	-80.23	9.1	5.65	2.4	I	257.85	160.22	M
2003	3	15	32.918	-80.16	5.8	3.60	0.9	D	257.91	160.26	V
1998	5	4	32.932	-80.173	10.5	6.52	2.2	D	257.91	160.26	V
1998	2	6	32.925	-80.167	5.6	3.48	0.9	D	257.94	160.28	V
1998	11	13	32.988	-80.224	12.5	7.77	2	D	257.99	160.31	V
2004	12	7	32.92	-80.163	7	4.35	2.2	D	257.99	160.31	V
2000	9	4	32.923	-80.166	6.3	3.91	1.3	D	258.01	160.32	V
2003	10	28	32.927	-80.17	7.4	4.60	1.7	D	258.03	160.33	V
1998	7	19	32.995	-80.231	11.7	7.27	1.8	D	258.06	160.35	V
1983	11	7	32.934	-80.177	9.1	5.65	1.6	D	258.07	160.36	V
1982	2	1	32.925	-80.169	0.5	0.31	2	D	258.09	160.37	V
1992	11	1	32.962	-80.203	3.7	2.30	1	D	258.12	160.39	V
2002	5	30	32.964	-80.205	10.1	6.28	2	D	258.14	160.40	V
2002	10	1	32.925	-80.17	5.7	3.54	1.1	D	258.16	160.42	V
2003	12	22	32.904	-80.151	6.7	4.16	1.5	D	258.21	160.45	V
1990	12	15	32.931	-80.177	5.4	3.36	0.7	D	258.27	160.48	V
1981	3	26	32.975	-80.217	9.8	6.09	1.4	D	258.31	160.51	V
2004	2	12	32.908	-80.157	9.1	5.65	2	D	258.38	160.55	V

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1974	11	22	32.89	-80.14	10	6.21	2.7	D	258.38	160.55	G
2003	9	24	32.898	-80.148	4.9	3.04	1	D	258.41	160.57	V
1996	10	11	32.916	-80.165	7.3	4.54	0.6	D	258.41	160.57	V
2000	8	6	32.912	-80.162	7.1	4.41	0.6	D	258.47	160.60	V
2003	6	12	32.982	-80.227	10.4	6.46	2.6	D	258.61	160.69	V
2000	12	18	32.95	-80.199	9.5	5.90	1	D	258.62	160.70	V
1983	3	22	32.932	-80.183	8.3	5.16	2	D	258.65	160.72	V
2004	5	8	32.923	-80.175	5.8	3.60	1.9	D	258.67	160.73	V
2003	4	30	32.909	-80.162	6.9	4.29	1.6	D	258.67	160.73	V
1883	9	21	36.1	-79.8			3.5	I	258.80	160.81	M
1990	6	2	32.907	-80.162	8.4	5.22	2.7	I	258.81	160.82	M
1990	2	7	32.908	-80.163	9.3	5.78	2.9	N	258.82	160.82	V
1990	1	7	32.968	-80.218	5.4	3.36	2.7	I	258.85	160.84	M
1991	4	24	32.933	-80.188	9.3	5.78	1.4	D	258.95	160.90	V
1996	10	20	32.901	-80.159	1	0.62	0.5	D	259.01	160.94	V
1997	1	10	32.944	-80.202	2.3	1.43	0.6	D	259.25	161.09	V
1988	11	30	32.964	-80.221	9.2	5.72	1.6	D	259.34	161.14	V
1994	11	1	32.899	-80.162	3	1.86	0.7	D	259.36	161.16	V
2000	10	19	32.969	-80.227	12.3	7.64	2	D	259.46	161.22	V
2000	1	11	32.862	-80.128	2.5	1.55	0.8	D	259.49	161.24	V
1979	10	21	32.92	-80.185	11	6.84	1.6	N	259.61	161.31	V
1998	9	12	32.95	-80.213	11	6.84	1.6	D	259.67	161.35	V
1986	8	17	32.908	-80.175	10.2	6.34	1.7	D	259.70	161.37	V
1984	9	2	32.94	-80.21	7	4.35	2	D	260.11	161.63	V
1981	5	3	32.976	-80.248	13	8.08	1	D	260.58	161.92	V
1998	9	27	32.929	-80.207	8	4.97	0.4	D	260.63	161.95	V
2003	11	18	32.888	-80.169	3.4	2.11	1.1	D	260.64	161.95	V
1994	9	19	32.915	-80.197	3	1.86	0.6	D	260.84	162.08	V
2004	7	20	32.972	-80.248	10.3	6.40	3.1	D	260.84	162.08	V
1997	9	27	32.888	-80.172	5	3.11	0.8	D	260.86	162.09	V
1993	1	7	32.909	-80.196	5.7	3.54	1.3	D	261.17	162.28	V
1996	10	21	33.087	-80.346	18.2	11.31	0.5	D	261.18	162.29	V
1997	10	15	32.947	-80.232	10.4	6.46	0	D	261.29	162.36	V
1989	11	2	32.905	-80.194	6	3.73	1	D	261.30	162.36	V
1972	2	7	33.46	-80.58			3.2	M	261.30	162.36	G
1972	2	7	33.46	-80.58			3.2	M	261.30	162.36	G
1998	9	27	32.919	-80.207	8.8	5.47	0.5	D	261.31	162.37	V
1977	12	15	32.983	-80.265	13.1	8.14	2.5	N	261.41	162.43	G
1977	5	31	32.94	-80.23	12	7.46	2.4	I	261.60	162.55	M
1996	2	25	32.763	-80.057	5	3.11	0.3	D	261.69	162.61	V
1996	9	17	32.82	-80.121	0.1	0.06	0.3	D	261.99	162.79	V
2004	8	13	32.982	-80.276	7	4.35	2.2	D	262.31	162.99	V
1988	5	30	32.918	-80.221	9.7	6.03	1.3	D	262.41	163.05	V
1973	12	19	32.974	-80.274	6	3.73	3	M	262.68	163.22	G

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1988	10	27	32.857	-80.172	7.6	4.72	1	D	263.02	163.43	V
1999	3	20	32.94	-80.252	15.5	9.63	1.5	D	263.25	163.58	V
1979	12	17	33.508	-80.627	1	0.62	1.1	D	263.37	163.65	V
1994	9	20	32.885	-80.207	8.5	5.28	0.6	D	263.63	163.81	V
1993	4	10	32.886	-80.216	5	3.11	1.2	D	264.22	164.18	V
1992	1	18	35.951	-80.081	4.8	2.98	2.1	D	264.63	164.43	V
1988	6	23	32.973	-80.3	6.2	3.85	2	D	264.72	164.49	V
1985	11	7	33.629	-80.7	0.8	0.50	1.9	D	265.27	164.83	V
1994	4	30	32.835	-80.187	3.4	2.11	0.6	D	265.65	165.07	V
1994	5	7	32.965	-80.31	2	1.24	1.8	D	265.99	165.28	V
1995	7	23	32.815	-80.203	9.4	5.84	0.4	D	268.22	166.66	V
1972	2	3	33.306	-80.582	2	1.24	4.5	P	268.48	166.82	G
1967	10	23	32.802	-80.221	19	11.81	3.8	P	270.43	168.04	G
1927	10	27	36.3	-76.2			3.3	I	270.54	168.10	M
1977	9	1	33.408	-80.663	6.2	3.85	1.8	D	270.64	168.17	V
1971	7	31	33.341	-80.631	4	2.49	3.8	N	270.93	168.35	G
1989	2	18	34.376	-80.911	25.1	15.60	1.3	D	271.86	168.92	V
1971	5	19	33.359	-80.655	1	0.62	3.7	N	272.14	169.10	G
1980	7	1	33.38	-80.673	2	1.24	1.6	D	272.72	169.46	V
1977	11	10	33.395	-80.685	0.3	0.19	0.8	D	273.08	169.69	V
1989	1	21	33.391	-80.688	4.3	2.67	1.6	D	273.52	169.95	V
1971	8	11	33.4	-80.7			3.5	N	274.15	170.35	G
1989	8	31	35.738	-80.427	1.7	1.06	1.1	D	274.53	170.58	V
1996	1	13	32.75	-80.229	9.8	6.09	0.5	D	274.72	170.70	V
1972	2	6	33.2	-80.6			2.4	I	275.29	171.06	M
1977	8	25	33.369	-80.698	3.4	2.11	3.3	I	275.34	171.09	M
1977	8	4	33.369	-80.699	9	5.59	3.1	N	275.42	171.14	G
1987	3	16	34.56	-80.948	3	1.86	3.1	D	276.09	171.55	V
1979	10	5	32.782	-80.281	13	8.08	2.1	D	276.18	171.61	V
1987	3	10	34.542	-80.952	0.9	0.56	2.1	D	276.31	171.69	V
2007	5	24	33.864	-80.904	10	6.21	2.4	L	276.88	172.05	G
1987	3	17	34.56	-80.962	2.5	1.55	1.2	D	277.37	172.35	V
1879	12	13	35.2	-80.8			2.7	I	277.72	172.56	M
1879	12	13	35.2	-80.8			3.3	I	277.72	172.56	M
1996	11	2	33.075	-80.547	5	3.11	0	D	277.81	172.63	V
1994	5	4	32.755	-80.285	2	1.24	2.4	I	278.38	172.97	M
2000	7	21	32.786	-80.317	6.7	4.16	1.7	D	278.52	173.06	V
1997	9	1	33.362	-80.732	1.5	0.93	2.3	D	278.54	173.08	V
1977	12	18	32.739	-80.292	6.6	4.10	1.8	D	280.02	173.99	V
1986	10	3	35.805	-80.456	0.2	0.12	2.5	D	280.90	174.55	V
1987	1	27	35.822	-80.446	5	3.11	2.1	D	281.26	174.76	V
1977	12	16	32.737	-80.317	8.1	5.03	2.1	D	281.96	175.20	V
2002	11	11	32.404	-79.936	2.4	1.49	4.4	L	282.62	175.61	G
1977	12	16	32.725	-80.318	7.1	4.41	2.3	D	282.88	175.77	V

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
2006	11	3	36.042	-80.258	2.1	1.30	2.5	L	283.24	175.99	G
1787	11	9	36.1	-80.2			2.7	I	283.74	176.31	M
1811	11	27	36.1	-80.2			3.3	I	283.74	176.31	M
1823	8	23	36.1	-80.2			2.7	I	283.74	176.31	M
1826	11	11	36.1	-80.2			2.7	I	283.74	176.31	M
1834	11	29	36.1	-80.2			2.7	I	283.74	176.31	M
2000	4	7	33.972	-81.006	1	0.62	1.2	D	284.01	176.47	V
1911	2	10	36.6	-79.4			3.3	I	284.52	176.79	M
2003	4	4	33.986	-81.032	0.5	0.31	1.4	D	286.14	177.80	V
2000	4	7	33.944	-81.03	1	0.62	1.8	D	286.69	178.14	V
2003	12	11	33.997	-81.046	1.1	0.68	1.5	D	287.24	178.48	V
2006	10	17	36.074	-80.29	2.4	1.49	2.9	L	287.75	178.80	G
2003	5	8	33.989	-81.053	0.9	0.56	1.5	D	288.01	178.96	V
1879	10	27	34.4	-81.1			2.7	I	289.22	179.71	M
1942	11	1	34.4	-81.1			2.4	I	289.22	179.71	M
2000	4	7	33.939	-81.057	0.8	0.50	1.4	D	289.24	179.72	V
2006	10	18	36.087	-80.308	5	3.11	1.3	C	289.92	180.15	G
2006	10	18	36.101	-80.303	2	1.24	2.8	L	290.62	180.58	G
1986	2	6	33.902	-81.065	0.6	0.37	1.7	D	290.67	180.62	V
2006	10	17	36.102	-80.308	1.2	0.75	1.5	C	291.03	180.84	G
1999	4	5	34.119	-81.109	0.1	0.06	1.5	D	291.37	181.05	V
1998	6	5	35.554	-80.785	9.4	5.84	3.4	D	292.04	181.47	V
2005	2	18	34.05	-81.11	5	3.11	3.1	L	292.30	181.63	G
1964	4	20	33.842	-81.096	3	1.86	3.5	M	294.74	183.15	G
2004	3	29	34.451	-81.164	1.8	1.12	1.6	D	295.21	183.43	V
2004	1	12	34.452	-81.164	2.5	1.55	1.4	D	295.21	183.44	V
1914	6	1	32.8	-80.6			2.7	I	298.70	185.60	M
1914	3	6	34.7	-81.2			2.7	I	300.59	186.78	M
1965	9	9	34.7	-81.2					300.59	186.78	
1965	9	9	34.7	-81.2			3.9	M	300.59	186.78	G
1965	9	10	34.7	-81.2			3	M	300.59	186.78	G
1965	9	12	34.7	-81.2			2.9	M	300.59	186.78	G
1853	5	20	34	-81.2			3.8	I	301.25	187.19	M
1978	1	25	34.295	-81.238	1	0.62	2.6	N	302.00	187.65	G
1855	2	2	37	-78.6			3.9	C	302.64	188.05	M
1994	4	18	34.491	-81.249	3.4	2.11	1.4	D	303.16	188.37	V
1986	10	18	34.954	-81.195	0.8	0.50	2.7	D	304.85	189.42	V
2003	6	27	34.027	-81.256	2.9	1.80	1.4	D	305.97	190.12	V
1981	2	21	33.604	-81.171	1	0.62	2.4	I	307.80	191.26	M
1992	9	20	32.898	-80.81	10.7	6.65	1.4	D	309.00	192.00	V
1906	4	18	34.1	-81.3					309.08	192.05	
2002	4	14	34.338	-81.321	2.1	1.30	2.3	L	309.51	192.32	G
1992	10	29	34.364	-81.34	0.6	0.37	1.8	D	311.23	193.39	V
1982	4	14	34.31	-81.34	2	1.24	2.6	L	311.32	193.44	G

(continued)

Appendix I. Historic Earthquakes Ranked by Distance from the Wilmington Site

Year	Month	Day	Latitude (N)	Longitude (W)	Depth (km)	Depth (mile)	Magnitude	Magnitude Type	Epicentral Distance (km)	Epicentral Distance (mile)	Source
1918	4	19	36.8	-76.3			3.1	C	312.57	194.22	M
1992	10	2	33.499	-81.202	3	1.86	2.4	D	313.97	195.09	V
1992	7	13	33.495	-81.214	0.1	0.06	1.9	D	315.17	195.84	V
2004	2	2	34.436	-81.396	2.8	1.74	0.3	D	316.43	196.62	V
1982	5	7	34.43	-81.4	0	0.00	2.7	I	316.79	196.84	M
1899	12	19	34.3	-81.4			2.7	I	316.86	196.88	M
1973	3	28	34.3	-81.4					316.86	196.88	
1973	3	29	34.3	-81.4					316.86	196.88	
1973	3	29	34.3	-81.4					316.86	196.88	
1973	3	29	34.3	-81.4					316.86	196.88	
1993	6	29	33.465	-81.245	4.3	2.67	2.2	D	318.94	198.18	V
1873	10	3	37.2	-78.2			3.6	C	319.93	198.79	M
1897	5	6	33.3	-81.2					321.33	199.67	
1897	5	24	33.3	-81.2					321.33	199.67	
1897	5	27	33.3	-81.2					321.33	199.67	

Notes:

Epicentral Distance: Epicentral distance (in km or mi) between the epicenter and a (recording) station

Magnitude Type Codes (SEUSSN, 2008):

C - mb from intensity and felt area

D - Md from duration or coda length

F - mb from felt area or attenuation data

I - mb from intensity data

L - ML

M - mb determined from modified instruments/formuli

N - mb from Lg wave data

P - mb from P wave data

References:

G - Stover et al., 1984

M - Sibol et al., 1987

V - SEUSSN, 2008

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The EDR Radius Atlas™

GLE Wilmington
3902 Castle Hayne Rd
Wilmington, NC 28429

Inquiry Number: 01977396.1r

July 12, 2007

EDR® Environmental Data Resources Inc

The Standard in Environmental Risk Information

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Milford, Connecticut 06461

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Internet: www.edrnet.com

TABLE OF CONTENTS

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-05) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

3902 CASTLE HAYNE RD
WILMINGTON, NC 28429

COORDINATES

Latitude (North):	34.334000 - 34˚ 20' 2.4"
Longitude (West):	77.946000 - 77˚ 56' 45.6"
Universal Tranverse Mercator:	Zone 18
UTM X (Meters):	228962.8
UTM Y (Meters):	3802926.8
Elevation:	24 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	34077-C8 CASTLE HAYNE, NC
Most Recent Revision:	2000

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

FEDERAL RECORDS

Delisted NPL................ National Priority List Deletions
NPL LIENS................... Federal Superfund Liens
CORRACTS................... Corrective Action Report
RCRA-TSDF................. Resource Conservation and Recovery Act Information
DOD............................ Department of Defense Sites
FUDS.......................... Formerly Used Defense Sites
US BROWNFIELDS......... A Listing of Brownfields Sites
CONSENT..................... Superfund (CERCLA) Consent Decrees
UMTRA........................ Uranium Mill Tailings Sites
ODI............................. Open Dump Inventory

TSCA	Toxic Substances Control Act
SSTS	Section 7 Tracking Systems
LUCIS	Land Use Control Information System
DOT OPS	Incident and Accident Data
US CDL	Clandestine Drug Labs
RADINFO	Radiation Information Database
LIENS 2	CERCLA Lien Information
PADS	PCB Activity Database System
MLTS	Material Licensing Tracking System
MINES	Mines Master Index File

STATE AND LOCAL RECORDS

OLI	Old Landfill Inventory
AST	AST Database
INST CONTROL	No Further Action Sites With Land Use Restrictions Monitoring
VCP	Responsible Party Voluntary Action Sites
DRYCLEANERS	Drycleaning Sites
BROWNFIELDS	Brownfields Projects Inventory

TRIBAL RECORDS

INDIAN RESERV	Indian Reservations
INDIAN LUST	Leaking Underground Storage Tanks on Indian Land
INDIAN UST	Underground Storage Tanks on Indian Land

EDR PROPRIETARY RECORDS

Manufactured Gas Plants	EDR Proprietary Manufactured Gas Plants

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

FEDERAL RECORDS

NPL: Also known as Superfund, the National Priority List database is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund program. The source of this database is the U.S. EPA.

A review of the NPL list, as provided by EDR, and dated 04/20/2007 has revealed that there is **1** NPL site within approximately 4 miles of the target property.

Lower Elevation	Address	Dist / Dir		Map ID	Page
REASOR CHEMICAL COMPANY	*NC 132*	*>2*	*ENE*	*109*	*178*

Proposed NPL: Proposed NPL sites . The source of this database is the U.S. EPA.

A review of the Proposed NPL list, as provided by EDR, and dated 04/20/2007 has revealed that there is 1 Proposed NPL site within approximately 4 miles of the target property.

Lower Elevation	Address	Dist / Dir		Map ID	Page
REASOR CHEMICAL COMPANY	*NC 132*	*>2*	*ENE*	*109*	*178*

CERCLIS: The Comprehensive Environmental Response, Compensation and Liability Information System contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

A review of the CERCLIS list, as provided by EDR, and dated 02/27/2007 has revealed that there are 5 CERCLIS sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
NORTHEAST CHEMICAL COMPANY SIT	2600 U.S. HIGHWAY 421 N	>2	SSW	AC154	266
V.C. CHEMICAL-ALMONT WORKS	*2400 U.S. HIGHWAY 421 N*	*>2*	*SSW*	*AG176*	*295*
PROGRESS ENERGY- L V SUTTON PL	*801 SUTTON STEAM PLANT*	*>2*	*SSW*	*AL195*	*327*

Lower Elevation	Address	Dist / Dir		Map ID	Page
INVISTA	*4600 4600 HWY 421 N*	*>2*	*WSW*	*E40*	*69*
REASOR CHEMICAL COMPANY	*NC 132*	*>2*	*ENE*	*109*	*178*

CERCLIS-NFRAP: Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

A review of the CERC-NFRAP list, as provided by EDR, and dated 03/21/2007 has revealed that there are 2 CERC-NFRAP sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
DIAMOND SHAMROCK MARTIN-MARIET	*OFF STATE RD 1002*	*1 - 2*	*ESE*	*B4*	*39*
CHEMICAL LEAMAN TANK LINES INC	*120 COWPEN LANDING RD*	*>2*	*SW*	*AB148*	*259*

EXECUTIVE SUMMARY

RCRAInfo: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System(RCRIS). The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month. Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month Large quantity generators generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month. Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

A review of the RCRA-LQG list, as provided by EDR, and dated 06/13/2006 has revealed that there are 3 RCRA-LQG sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
RAMPAGE SPORT FISHING YACHTS	*100 QUALITY DRIVE*	*>2*	*SE*	*57*	*93*

Lower Elevation	Address	Dist / Dir		Map ID	Page
INVISTA	*4600 4600 HWY 421 N*	*>2*	*WSW*	*E40*	*69*
DEL LABORATORIES INCORPORATED	*1830 CARVER DRIVE*	*>2*	*NNE*	*Z140*	*241*

RCRAInfo: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System(RCRIS). The database includes selective information on sites which generate, transport, store , treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month. Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month Large quantity generators generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month. Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

A review of the RCRA-SQG list, as provided by EDR, and dated 06/13/2006 has revealed that there are 18 RCRA-SQG sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
MARTIN MARIETTA CASTLE HAYNE Q	*COUNTY ROAD 1002 E*	*1 - 2*	*ESE*	*B3*	*38*
DIAMOND SHAMROCK MARTIN-MARIET	*OFF STATE RD 1002*	*1 - 2*	*ESE*	*B4*	*39*
CASTLE HAYNE CEMENT CORP	*110 CROWATAN DR*	*>2*	*E*	*F43*	*76*
BASF CORPORATION	*101 VITAMIN DRIVE*	*>2*	*W*	*AA145*	*250*
CHEMICAL LEAMAN TANK LINES INC	*120 COWPEN LANDING RD*	*>2*	*SW*	*AB148*	*259*
APPLIED ANALYTICAL INDUSTRIES	*3924 N KERR AVE*	*>2*	*SSE*	*152*	*265*
TRIPLE "T" PARTS & EQUIP	*2715 HWY 421 N*	*>2*	*SSW*	*AC153*	*265*
FAST FARE NC 733	*2540 CASTLE HAYNE RD*	*>2*	*SSE*	*AH167*	*280*
PROGRESS ENERGY- L V SUTTON PL	*801 SUTTON STEAM PLANT*	*>2*	*SSW*	*AL195*	*327*
HILCO TRANSPORT INC	*100 EXPORT LANE*	*>2*	*SE*	*AM198*	*337*

Lower Elevation	Address	Dist / Dir		Map ID	Page
SOUTHEAST RESPONSE AND REMEDIA	*4920 HIGHWAY 421 NORTH*	*>2*	*WSW*	*64*	*105*
WILMINGTON DIV APAC-CAROLINA	*4901 N COLLEGE RD*	*>2*	*ENE*	*K66*	*110*
TRIPLE T	*3401 HWY 421 N*	*>2*	*SW*	*Q82*	*129*
SOUTH ATLANTIC SERVICES INC	*US HWY 421 N*	*>2*	*SSW*	*V113*	*193*

EXECUTIVE SUMMARY

Lower Elevation	Address	Dist / Dir		Map ID	Page
CAROLINA SPECIALIZED TRANSPORT	*3301 HWY 421 N*	*>2*	*SSW*	*W127*	*222*
TIDEWATER TRANSIT CO INC	*3305 FREDRICKSON RD*	*>2*	*SSW*	*AF173*	*292*
FREDRICKSON MOTOR EXPRESS CORP	*234 SUTTON STEAM PLANT*	*>2*	*SSW*	*AR214*	*352*
NOBLE OIL SERVICES WILMINGTON	*208 SUTTON STEAM PLANT*	*>2*	*SSW*	*AR217*	*355*

ERNS: The Emergency Response Notification System records and stores information on reported releases of oil and hazardous substances. The source of this database is the U.S. EPA.

A review of the ERNS list, as provided by EDR, and dated 12/31/2006 has revealed that there are 33 ERNS sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
201 GOFF DR	201 GOFF DR	1 - 2	E	12	55
101 VIATAMIN DR	101 VIATAMIN DR	>2	W	AA146	258
101 TAKEDA DRIVE	101 TAKEDA DRIVE	>2	W	AA147	259
1 TAKEDA DR	1 TAKEDA DR	>2	W	151	265
SUTTON STEAM ELECTRIC PLANT 80	SUTTON STEAM ELECTRIC P	>2	SSW	AL190	318
801 SUTTON STEAM PLANT RD	801 SUTTON STEAM PLANT	>2	SSW	AL191	318
801 SUTTON STEAM PLANT RD	801 SUTTON STEAM PLANT	>2	SSW	AL192	318
2200 US HWY 421 NORTH	2200 US HWY 421 NORTH	>2	SSW	AQ213	352

Lower Elevation	Address	Dist / Dir		Map ID	Page
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E15	56
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E16	56
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E17	57
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E18	57
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E19	57
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E20	57
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E21	57
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E22	57
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E23	58
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E24	58
4600 HIGHWAY 421 NORTH	4600 HIGHWAY 421 NORTH	>2	WSW	E28	59
10472 ROAD OLD NORTHWEST	10472 ROAD OLD NORTHWES	>2	WSW	E29	59
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E30	60
4600 HWY 421 N	4600 HWY 421 N	>2	WSW	E31	60
4600 HWY 421 N	4600 HWY 421 N	>2	WSW	E32	60
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E33	60
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E36	69
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E37	69
4600 HWY 421 NORTH	4600 HWY 421 NORTH	>2	WSW	E38	69
4600 HIGHWAY 421 NORTH	4600 HIGHWAY 421 NORTH	>2	WSW	E39	69
4600 HWY 421 N	4600 HWY 421 N	>2	WSW	E41	76
109 CASTLE COVE LANE	109 CASTLE COVE LANE	>2	ENE	55	91
HIGHWAY 421 NORTH 5 MILES NORT	HIGHWAY 421 NORTH 5 MIL	>2	SW	90	146
3002 US HWY 421 NORTH	3002 US HWY 421 NORTH	>2	SSW	V115	195
1830 CARVER DR.	1830 CARVER DR.	>2	NNE	Z142	246

EXECUTIVE SUMMARY

HMIRS: The Hazardous Materials Incident Report System contains hazardous material spill incidents reported to the Department of Transportation. The source of this database is the U.S. EPA.

A review of the HMIRS list, as provided by EDR, and dated 03/05/2007 has revealed that there is 1 HMIRS site within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
Not reported	326 HERMITAGE RD	>2	ESE	48	84

ENG CONTROLS: A listing of sites with engineering controls in place.

A review of the US ENG CONTROLS list, as provided by EDR, and dated 04/20/2007 has revealed that there is 1 US ENG CONTROLS site within approximately 4 miles of the target property.

Lower Elevation	Address	Dist / Dir		Map ID	Page
REASOR CHEMICAL COMPANY	***NC 132***	***>2***	***ENE***	***109***	***178***

INST CONTROLS: A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

A review of the US INST CONTROL list, as provided by EDR, and dated 04/20/2007 has revealed that there is 1 US INST CONTROL site within approximately 4 miles of the target property.

Lower Elevation	Address	Dist / Dir		Map ID	Page
REASOR CHEMICAL COMPANY	***NC 132***	***>2***	***ENE***	***109***	***178***

RODS: Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid the cleanup.

A review of the ROD list, as provided by EDR, and dated 03/27/2007 has revealed that there is 1 ROD site within approximately 4 miles of the target property.

Lower Elevation	Address	Dist / Dir		Map ID	Page
REASOR CHEMICAL COMPANY	***NC 132***	***>2***	***ENE***	***109***	***178***

TRIS: The Toxic Chemical Release Inventory System identifies facilities that release toxic chemicals to the air, water, and land in reportable quantities under SARA Title III, Section 313. The source of this database is the U.S. EPA.

A review of the TRIS list, as provided by EDR, and dated 12/31/2005 has revealed that there are 4 TRIS sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
CAROLINA POWER & LIGHT CO LV S	801 SUTTON STEAM PLANT	>2	SSW	AL193	318

Lower Elevation	Address	Dist / Dir		Map ID	Page
FORTRON INDUSTRIES	4600 HWY 421 N	>2	WSW	E27	59
INVISTA	***4600 4600 HWY 421 N***	***>2***	***WSW***	***E40***	***69***

Lower Elevation	Address	Dist / Dir		Map ID	Page
DEL LABORATORIES INC	1830 CARVER DR	>2	NNE	Z141	246

FTTS: FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act) over the previous five years. To maintain currency, EDR contacts the Agency on a quarterly basis.

A review of the FTTS list, as provided by EDR, and dated 04/13/2007 has revealed that there is 1 FTTS site within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
SIGMA RECYCLING LLC	*2200 US HIGHWAY 421 NOR*	*>2*	*SSW*	*AQ211*	*350*

ICIS: The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

A review of the ICIS list, as provided by EDR, and dated 02/21/2007 has revealed that there are 4 ICIS sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
BASF CORPORATION	101 VITAMIN DRIVE	>2	W	AA144	246
CAROLINA POWER AND LIGHT L V S	801 SUTTON STEAM PLANT	>2	SSW	AL194	318
CREEKSIDE ESTATES MHP WATER SY	264 GOOSE NECK ROAD, W	>2	NE	201	339

Lower Elevation	Address	Dist / Dir		Map ID	Page
DEL LABORATORIES	1830 CARVER DRIVE	>2	NNE	AD158	269

HIST FTTS: A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

A review of the HIST FTTS list, as provided by EDR, and dated 10/19/2006 has revealed that there is 1 HIST FTTS site within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
SIGMA RECYCLING LLC	*2200 US HIGHWAY 421 NOR*	*>2*	*SSW*	*AQ211*	*350*

EXECUTIVE SUMMARY

FINDS: The Facility Index System contains both facility information and "pointers" to other sources of information that contain more detail. These include: RCRIS; Permit Compliance System (PCS); Aerometric Information Retrieval System (AIRS); FATES (FIFRA [Federal Insecticide Fungicide Rodenticide Act] and TSCA Enforcement System, FTTS [FIFRA/TSCA Tracking System]; CERCLIS; DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes); Federal Underground Injection Control (FURS); Federal Reporting Data System (FRDS); Surface Impoundments (SIA); TSCA Chemicals in Commerce Information System (CICS); PADS; RCRA-J (medical waste transporters/disposers); TRIS; and TSCA. The source of this database is the U.S. EPA/NTIS.

A review of the FINDS list, as provided by EDR, and dated 04/12/2007 has revealed that there are 83 FINDS sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
GE CO.	3901 CASTLE HAYNE RD. N	1 - 2	SE	A1	30
MARTIN MARIETTA CASTLE HAYNE Q	***COUNTY ROAD 1002 E***	***1 - 2***	***ESE***	***B3***	***38***
DIAMOND SHAMROCK MARTIN-MARIET	***OFF STATE RD 1002***	***1 - 2***	***ESE***	***B4***	***39***
HORTICULTURAL CROPS RESEARCH	3800 CASTLE HAYNE ROAD	1 - 2	ESE	C7	43
CROWN NC-733	3540 CASTLE HAYNE ROAD	1 - 2	SE	11	55
ST STANISLAUS CATHOLIC CHURCH	4849 CASTLE HAYNE ROAD	>2	E	42	76
CASTLE HAYNE CEMENT CORP	***110 CROWATAN DR***	***>2***	***E***	***F43***	***76***
OAKLEY MHP	2206 OAKLEY ROAD	>2	SSE	47	84
DOUBLE R INCORPORATED	310 CHESTERFIELD ROAD	>2	ESE	51	87
CASTLE HAYNE PARK	4700 OLD AVENUE	>2	E	52	87
THE PANTRY #444	3053 CASTLE HAYNE ROAD	>2	SSE	I53	87
RAMPAGE SPORT FISHING YACHTS	***100 QUALITY DRIVE***	***>2***	***SE***	***57***	***93***
NORTH COLLEGE PLAZA	5212 NORTH COLLEGE ROAD	>2	ENE	J63	104
J T RITTER MILL WORK	2913 CASTLE HAYNE ROAD	>2	SSE	L72	121
WRIGHTSBORO ELEMENTARY SCHOOL	2716 CASTLE HAYNE RD	>2	SSE	U111	191
NEW HANOVER REG JUVENILE CENTE	3830 JUVENILE CENTER RO	>2	ESE	117	196
CONOCO, INCORPORATED	2636 CASTLE HAYNE ROAD	>2	SSE	U125	221
SIMMONS HEIGHTS APARTMENTS	4100 PARMELE ROAD	>2	E	X129	225
PEARSALL S LANDING	479 BLOSSOM FERRY ROAD	>2	ENE	Y130	225
ASHCO CO INCORPORATED	4505 NORTH COLLEGE ROAD	>2	E	X138	240
BASF CORPORATION	***101 VITAMIN DRIVE***	***>2***	***W***	***AA145***	***250***
CHEMICAL LEAMAN TANK LINES INC	***120 COWPEN LANDING RD***	***>2***	***SW***	***AB148***	***259***
APPLIED ANALYTICAL INDUSTRIES	***3924 N KERR AVE***	***>2***	***SSE***	***152***	***265***
TRIPLE "T" PARTS & EQUIP	***2715 HWY 421 N***	***>2***	***SSW***	***AC153***	***265***
KOCH SULFUR PRODUCTS COMPANY	2600 US HIGHWAY 421 NOR	>2	SSW	AC155	268
KOCH SULFUR PRODUCTS, INCORPOR	2600 US HIGHWAY 421 NOR	>2	SSW	AC156	268
NORTH WILMINGTON COMMUNITY CHU	2907 BLUE CLAY ROAD	>2	SE	AE162	277
EAGLE ISLAND FRUIT AND SEAFOOD	2500 US HIGHWAY 421	>2	SSW	AG164	278
BURGER KING #7618	2549 CASTLE HAYNE ROAD	>2	SSE	AH165	279
FAST FARE NC 733	***2540 CASTLE HAYNE RD***	***>2***	***SSE***	***AH167***	***280***
MCDONALD S #13382	2541 CASTLE HAYNE ROAD	>2	SSE	AH170	291
CROWN CENTRAL PETROLEUM-NC/733	2540 CASTLE HAYNE RD	>2	SSE	AH171	291
WRIGHTSBORO CENTER	2535 CASTLE HAYNE ROAD	>2	SSE	AH172	292
INTERNATIONAL PAPER CO	4409 HOLLY SHELTER ROAD	>2	ENE	175	295
V.C. CHEMICAL-ALMONT WORKS	***2400 U.S. HIGHWAY 421 N***	***>2***	***SSW***	***AG176***	***295***
WRIGHTSBORO VOL. FIRE DEPARTME	3515 NORTH KERR AVENUE	>2	SE	AK183	308
PEARL S SEAFOOD RESTAURANT	3500 NORTH KERR AVENUE	>2	SE	AK186	314
SEEGARS FENCE CO. INC-WILMING	2705 BLUE CLAY ROAD	>2	SSE	AJ187	314
PROGRESS ENERGY- L V SUTTON PL	***801 SUTTON STEAM PLANT***	***>2***	***SSW***	***AL195***	***327***
HILCO TRANSPORT INC	***100 EXPORT LANE***	***>2***	***SE***	***AM198***	***337***
TIDEWATER FUELS INCORPORATED	100 EXPORT LANE P.O. BO	>2	SE	AM199	337
LGS LEONARD H LONG	2217 CASTLE HAYNE ROAD	>2	SSE	AO206	345
CASTLE HAYNE-DOT	5430 BARBADOS BOULEVARD	>2	ENE	AP207	345
WRIGHTSBORO UMC	3300 NORTH KERR AVENUE	>2	SE	210	350
PTC OF MOUNT AIRY INCORPORATED	2102 US HWY 421-N	>2	SSW	AQ215	353

EXECUTIVE SUMMARY

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
VISION SOFTWARE	5601 BARBADOS BOULEVARD	>2	ENE	218	355
CAPE FEAR OPTIMIST PARK	3222 NORTH KERR AVENUE	>2	SE	219	356

Lower Elevation	Address	Dist / Dir		Map ID	Page
HERMITAGE HOUSE REST HOME	4724 CASTLE HAYNE ROAD	>2	E	D13	55
INVISTA S.A.R.L.	4600 HIGHWAY 421 NORTH	>2	WSW	E25	58
ARTEVA SPECIALTIES, S.A.R.L.	4600 US HIGHWAY 421 NOR	>2	WSW	E26	58
INVISTA	***4600 4600 HWY 421 N***	***>2***	***WSW***	***E40***	***69***
LOBO S CORNER	5219 NORTH COLLEGE ROAD	>2	ENE	J60	101
SOUTHEAST RESPONSE AND REMEDIA	***4920 HIGHWAY 421 NORTH***	***>2***	***WSW***	***64***	***105***
WILMINGTON DIV APAC-CAROLINA	***4901 N COLLEGE RD***	***>2***	***ENE***	***K66***	***110***
APAC CAROLINA INCORPORATED CAS	4909 NORTH COLLEGE ROAD	>2	ENE	K67	111
JUNG S EGGROLL EXPRESS	5319 CASTLE HAYNE ROAD	>2	ENE	M70	114
MATERIAL SALVAGE AND RECYCLING	3612 HIGHWAY 421 NORTH	>2	SW	N73	122
WILMINGTON MATERIALS	3612 US HIGHWAY 421 NOR	>2	SW	N76	125
NEW HANOVER COUNTY	5210 US HIGHWAY 421 NOR	>2	WSW	O77	126
LANDFILL WWTP	5210 US HIGHWAY 421 NOR	>2	WSW	O78	126
READY MIXED CONCRETE COMPANY -	5125 HIGHWAY 421 NORTH	>2	WSW	80	129
CAROLINA OMELET HOUSE	5512 CASTLE HAYNE ROAD	>2	ENE	P81	129
TRIPLE T	***3401 HWY 421 N***	***>2***	***SW***	***Q82***	***129***
CASTLE HAYNE SHOPPING CENTER	5601 CASTLE HAYNE ROAD	>2	ENE	P84	134
HARDEE S #1329	5601 CASTLE HAYNE ROAD	>2	ENE	P85	135
GOGAS #7	5604 CASTLE HAYNE ROAD	>2	ENE	P87	141
ATLANTIC MACK SALES. INCORPORA	3401 US HIGHWAY 421 NOR	>2	SW	Q91	146
THE PANTRY #915	5717 CASTLE HAYNE ROAD	>2	ENE	R98	160
MCCLURE PRESBYTERIAN PRE-SCH	5908 CASTLE HAYNE ROAD	>2	ENE	105	173
SHADY HAVEN MHP	4307 PARMELE ROAD	>2	E	108	177
REASOR CHEMICAL COMPANY	***NC 132***	***>2***	***ENE***	***109***	***178***
SOUTH ATLANTIC SERVICES INC	***US HWY 421 N***	***>2***	***SSW***	***V113***	***193***
CAROLINA SPECIALIZED TRANSPORT	***3301 HWY 421 N***	***>2***	***SSW***	***W127***	***222***
EZZELL TRUCKING-N HANOVER	235 SUTTON LAKE ROAD	>2	SSW	133	228
ATLANTIC SCRAP AND PROCESSING	2830 US HWY 421 N	>2	SSW	W134	228
RIVER S EDGE LOUNGE	6303 CASTLE HAYNE ROAD	>2	NE	136	231
DEL LABORATORIES INCORPORATED	***1830 CARVER DRIVE***	***>2***	***NNE***	***Z140***	***241***
RIVERSIDE PARK	6710 OLD BRIDGE SITE RO	>2	NE	143	246
TIDEWATER TRANSIT CO INC	***3305 FREDRICKSON RD***	***>2***	***SSW***	***AF173***	***292***
SOUTHEASTERN PET CREMATION	203 BEVAL ROAD	>2	SSW	AI179	305
CREEKSIDE ESTATES MHP WATER SY	264 GOOSE NECK ROAD, W	>2	NE	180	306
FREDRICKSON MOTOR EXPRESS CORP	***234 SUTTON STEAM PLANT***	***>2***	***SSW***	***AR214***	***352***
NOBLE OIL SERVICES WILMINGTON	***208 SUTTON STEAM PLANT***	***>2***	***SSW***	***AR217***	***355***

RAATS: The RCRA Administration Action Tracking System contains records based on enforcement actions issued under RCRA and pertaining to major violators. It includes administrative and civil actions brought by the United States Environmental Protection Agency. The source of this database is the U.S. EPA.

A review of the RAATS list, as provided by EDR, and dated 04/17/1995 has revealed that there is 1 RAATS site within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
DIAMOND SHAMROCK MARTIN-MARIET	***OFF STATE RD 1002***	***1 - 2***	***ESE***	***B4***	***39***

STATE AND LOCAL RECORDS

SHWS: The State Hazardous Waste Sites records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. The data come from the Department of Environment & Natural Resources' Inactive Hazardous Sites Program.

A review of the SHWS list, as provided by EDR, and dated 04/20/2007 has revealed that there are 3 SHWS sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
CHEMICAL LEAMAN TANK LINES, IN	120 COWPEN LANDING	>2	WNW	178	305

Lower Elevation	Address	Dist / Dir		Map ID	Page
HERCOFINA/CAPE INDUSTRIES	HWY 421 N	>2	WSW	G46	83
CHEMICAL LEAMAN	***120 COWPEN LANDING***	***>2***	***SW***	***AB150***	***262***

IMD: Incident Management Database.

A review of the IMD list, as provided by EDR, and dated 07/21/2006 has revealed that there are 50 IMD sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
GENERAL ELECTRIC COMPANY	***US 117 NORTH CASTLE HAY***	***1 - 2***	***SE***	***A2***	***31***
SOUTH EAST FOREST PRODUCTS	2332 CHAIR ROAD	1 - 2	SE	6	42
ROBINSONS CAR CARE	4332 CASTLE HAYNE ROAD	1 - 2	E	9	49
R.W. MOORE EQUIPMENT CO., INC.	***113 CROATAN RD.***	***>2***	***E***	***F44***	***77***
DILLMAN PROPERTY	***2401 OAKLEY ROAD***	***>2***	***SSE***	***H49***	***84***
SPICER PROPERTY (MARVIN)	***2923 CASTLE HAYNE ROAD***	***>2***	***SSE***	***L69***	***112***
CROOM RESIDENCE	***103 WHITMAN AVE.***	***>2***	***SSE***	***89***	***142***
CHAMBLEE RESIDENCE	***128 WHITMAN AVE.***	***>2***	***SSE***	***94***	***149***
WINDSAIL WATER SUPPLY WELL(SEE	***2709 CASTLE HAYNE RD***	***>2***	***SSE***	***U112***	***191***
WRIGHTSBORO FOOD MART	***2636 CASTLE HAYNE RD.***	***>2***	***SSE***	***U124***	***213***
LP IV C/O MIDWEST FIRST FINANC	***140 LONG LEAF DRIVE***	***>2***	***SSE***	***135***	***228***
ANSCO & ASSOCIATES, INC.	***2929 BLUE CLAY RD.***	***>2***	***SE***	***AE159***	***271***
TOLEDO CAROLINA	***2915 BLUE CLAY ROAD***	***>2***	***SE***	***AE161***	***275***
COASTAL POWER AND ELECTRIC	208 TRANSCOM COURT	>2	SSW	AF163	277
FAST FARE NC 733	***2540 CASTLE HAYNE RD***	***>2***	***SSE***	***AH167***	***280***
PCS NITROGEN, FMRLY ARCADIAN	2830 HWY 421 NORTH	>2	SSW	177	297
WRIGHTSBORO VOL. FIRE DEPT	***3515 N KERR AVE.***	***>2***	***SE***	***AK184***	***308***
SEEGARS FENCE CO.	***2705 BLUE CLAY RD.***	***>2***	***SSE***	***AJ188***	***315***
TIDEWATER FUELS INC	***100 EXPORT LN PO BOX 44***	***>2***	***SE***	***AM197***	***335***
PANTRY #450	***3702 HWY 132 N.***	***>2***	***ESE***	***204***	***342***
CORBETT FARMING COMPANY	***2501 BLUE CLAY ROAD***	***>2***	***SSE***	***AN209***	***348***
WILMINGTON RESOURCES	2200 US HWY 421 N	>2	SSW	AQ212	351

Lower Elevation	Address	Dist / Dir		Map ID	Page
HOECHST CELANESE -SPRAY FIELD	4600 HWY 421 NORTH	>2	WSW	E34	60
HOECHST CELANESE - #6 SPILL (C	4600 HWY. 421 NORTH	>2	WSW	E35	68
INVISTA	***4600 4600 HWY 421 N***	***>2***	***WSW***	***E40***	***69***
BURTON PROPERTY UST	***102 RITTER DR.***	***>2***	***SSE***	***56***	***91***
KOSA	460 HWY 421 NORTH	>2	WSW	58	95

EXECUTIVE SUMMARY

Lower Elevation	Address	Dist / Dir		Map ID	Page
PRAXAIR, INC.	4832 HWY 421	>2	WSW	61	101
HANOVER CLOCKS	5316 HWY. 421 NORTH	>2	W	62	103
BEST BAIT & TACKLE	***5400 CASTLE HAYNE RD.***	***>2***	***ENE***	***M74***	***122***
TRIPLE T	***3401 HWY 421 N***	***>2***	***SW***	***Q82***	***129***
MARY BLANCHARD OIL SPILL	6104 SYCAMORE AVENUE	>2	ENE	R93	148
JANICKI'S TWIN STATE	***5712 CASTLE HAYNE ROAD***	***>2***	***ENE***	***S95***	***152***
TWIN STATE EXXON	***5712 CASTLE HAYNE RD***	***>2***	***ENE***	***S96***	***154***
THE PANTRY 915 DBA SPRINT	***5717 CASTLE HAYNE ROAD***	***>2***	***ENE***	***R97***	***156***
RAINBOW MOTEL	***5718 CASTLE HAYNE RD***	***>2***	***ENE***	***R99***	***160***
FUTURE PANTRY LOCATION	***5719 CASTLE HAYNE RD***	***>2***	***ENE***	***R100***	***163***
WILMINGTON AUTO SALVAGE	4614 NORTH COLEGE ROAD	>2	E	102	168
KENAN TRANSPORT CO.	***3201 US HWY 421 NORTH***	***>2***	***SSW***	***T103***	***169***
KENAN TRANSPORT DIESEL UST	***3201 US HWY 421 NORTH***	***>2***	***SSW***	***T104***	***171***
SOUTHERN BELL TELECOMMUNICATIO	***5915 ORANGE STREET***	***>2***	***ENE***	***106***	***173***
NEW HANOVER COUNTY WASTEC	3002 US HWY 421 NORTH	>2	SSW	V114	194
HORTON IRON & METAL COMPANY	***HWY 421 NORTH***	***>2***	***SSW***	***V119***	***197***
BRUCE'S DRIVE IN	***HIGHWAY 421 NORTH***	***>2***	***SSW***	***V122***	***208***
DEL LABORATORIES	1830 CARVER ROAD	>2	NNE	Z139	240
CHEMICAL LEAMAN	***120 COWPEN LANDING***	***>2***	***SW***	***AB150***	***262***
FREDRICKSON MOTOR EXPRESS	***3327 FREDRICKSON RD.***	***>2***	***SSW***	***AF160***	***273***
TIDEWATER TRANSIT	***3305 FREDRICKSON RD.***	***>2***	***SSW***	***AF174***	***293***
JOHN MILLER CONSTRUCTION SITE	3 SOUTHPOINT ROAD	>2	NNE	200	338
COOPER-KENWORTH WASTE OIL RELE	208 SUTTON STEAM PLANT	>2	SSW	AR216	354

HSDS: The Hazardous Substance Disposal Sites list contains locations of uncontrolled and unregulated hazardous waste sites. The file contains sites on the national priority list as well as the state priority list. The data source is the North Carolina Center for Geographic Information and Analysis.

A review of the NC HSDS list, as provided by EDR, and dated 04/06/2006 has revealed that there are 4 NC HSDS sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
GENL ELEC CO		1/2 - 1	SE	0	30
HERCOFINA		>2	WSW	0	30
REASOR CHEMICAL COMPANY		>2	E	0	30
CHEMICAL LEAMAN TANK LINES INC		>2	WNW	0	30

SWF/LF: The Solid Waste Facilities/Landfill Sites records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. The data come from the Department of Environment & Natural Resources' List of Solid Waste Facility Contacts in Alpha Order.

A review of the SWF/LF list, as provided by EDR, and dated 04/24/2007 has revealed that there are 5 SWF/LF sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
CHARLES BLYTHE EQUIPMENT	***3415 BLUE CLAY ROAD***	***>2***	***SE***	***110***	***190***
BLUE CLAY ROAD LANDFILL	***4129 BLUE CLAY ROAD***	***>2***	***ESE***	***149***	***262***

Lower Elevation	Address	Dist / Dir		Map ID	Page
NEW HANOVER COUNTY LANDFILL	***US 421 NORTH***	***>2***	***W***	***83***	***134***
NEW HANOVER WASTE-TO-ENERGY FA	***3002 US 421 NORTH***	***>2***	***SSW***	***V116***	***195***

EXECUTIVE SUMMARY

Lower Elevation	Address	Dist / Dir		Map ID	Page
HORTON IRON & METAL COMPANY	*HWY 421 NORTH*	*>2*	*SSW*	*V119*	*197*

HIST LF: A listing of solid waste facilities.

A review of the HIST LF list, as provided by EDR, and dated 11/06/2006 has revealed that there are 5 HIST LF sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
CHARLES BLYTHE EQUIPMENT	*3415 BLUE CLAY ROAD*	*>2*	*SE*	*110*	*190*
BLUE CLAY ROAD LANDFILL	*4129 BLUE CLAY ROAD*	*>2*	*ESE*	*149*	*262*

Lower Elevation	Address	Dist / Dir		Map ID	Page
NEW HANOVER COUNTY LANDFILL	*US 421 NORTH*	*>2*	*W*	*83*	*134*
NEW HANOVER WASTE-TO-ENERGY FA	*3002 US 421 NORTH*	*>2*	*SSW*	*V116*	*195*
HORTON IRON & METAL COMPANY	*HWY 421 NORTH*	*>2*	*SSW*	*V119*	*197*

LUST: The Leaking Underground Storage Tank Incidents Management Database contains an inventory of reported leaking underground storage tank incidents. The data come from the Department of Environment, & Natural Resources' Incidents by Address.

A review of the LUST list, as provided by EDR, and dated 06/01/2007 has revealed that there are 32 LUST sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
GENERAL ELECTRIC COMPANY	*US 117 NORTH CASTLE HAY*	*1 - 2*	*SE*	*A2*	*31*
R.W. MOORE EQUIPMENT CO., INC.	*113 CROATAN RD.*	*>2*	*E*	*F44*	*77*
DILLMAN PROPERTY	*2401 OAKLEY ROAD*	*>2*	*SSE*	*H49*	*84*
SPICER PROPERTY (MARVIN)	*2923 CASTLE HAYNE ROAD*	*>2*	*SSE*	*L69*	*112*
CROOM RESIDENCE	*103 WHITMAN AVE.*	*>2*	*SSE*	*89*	*142*
CHAMBLEE RESIDENCE	*128 WHITMAN AVE.*	*>2*	*SSE*	*94*	*149*
WINDSAIL WATER SUPPLY WELL(SEE	*2709 CASTLE HAYNE RD*	*>2*	*SSE*	*U112*	*191*
WRIGHTSBORO FOOD MART	*2636 CASTLE HAYNE RD.*	*>2*	*SSE*	*U124*	*213*
RIVERQUEST/PEARSALL LANDING	479 BLOSSOMS FERRY	>2	ENE	Y132	227
LP IV C/O MIDWEST FIRST FINANC	*140 LONG LEAF DRIVE*	*>2*	*SSE*	*135*	*228*
ANSCO & ASSOCIATES, INC.	*2929 BLUE CLAY RD.*	*>2*	*SE*	*AE159*	*271*
TOLEDO CAROLINA	*2915 BLUE CLAY ROAD*	*>2*	*SE*	*AE161*	*275*
FAST FARE NC 733	*2540 CASTLE HAYNE RD*	*>2*	*SSE*	*AH167*	*280*
WRIGHTSBORO VOL. FIRE DEPT	*3515 N KERR AVE.*	*>2*	*SE*	*AK184*	*308*
SEEGARS FENCE CO.	*2705 BLUE CLAY RD.*	*>2*	*SSE*	*AJ188*	*315*
PANTRY #450	*3702 HWY 132 N.*	*>2*	*ESE*	*204*	*342*
CORBETT FARMING COMPANY	*2501 BLUE CLAY ROAD*	*>2*	*SSE*	*AN209*	*348*

Lower Elevation	Address	Dist / Dir		Map ID	Page
BURTON PROPERTY UST	*102 RITTER DR.*	*>2*	*SSE*	*56*	*91*
BEST BAIT & TACKLE	*5400 CASTLE HAYNE RD.*	*>2*	*ENE*	*M74*	*122*
TRIPLE T	*3401 HWY 421 N*	*>2*	*SW*	*Q82*	*129*
JANICKI'S TWIN STATE	*5712 CASTLE HAYNE ROAD*	*>2*	*ENE*	*S95*	*152*
TWIN STATE EXXON	*5712 CASTLE HAYNE RD*	*>2*	*ENE*	*S96*	*154*
THE PANTRY 915 DBA SPRINT	*5717 CASTLE HAYNE ROAD*	*>2*	*ENE*	*R97*	*156*
RAINBOW MOTEL	*5718 CASTLE HAYNE RD*	*>2*	*ENE*	*R99*	*160*

EXECUTIVE SUMMARY

Lower Elevation	Address	Dist / Dir		Map ID	Page
FUTURE PANTRY LOCATION	***5719 CASTLE HAYNE RD***	***>2***	***ENE***	***R100***	***163***
KENAN TRANSPORT CO.	***3201 US HWY 421 NORTH***	***>2***	***SSW***	***T103***	***169***
KENAN TRANSPORT DIESEL UST	***3201 US HWY 421 NORTH***	***>2***	***SSW***	***T104***	***171***
SOUTHERN BELL TELECOMMUNICATIO	***5915 ORANGE STREET***	***>2***	***ENE***	***106***	***173***
BRUCE'S DRIVE IN	***HIGHWAY 421 NORTH***	***>2***	***SSW***	***V122***	***208***
CHEMICAL LEAMAN	***120 COWPEN LANDING***	***>2***	***SW***	***AB150***	***262***
FREDRICKSON MOTOR EXPRESS	***3327 FREDRICKSON RD.***	***>2***	***SSW***	***AF160***	***273***
TIDEWATER TRANSIT	***3305 FREDRICKSON RD.***	***>2***	***SSW***	***AF174***	***293***

LUST TRUST: This database contains information about claims against the State Trust Funds for reimbursements for expenses incurred while remediating Leaking USTs.

A review of the LUST TRUST list, as provided by EDR, and dated 05/04/2007 has revealed that there are 9 LUST TRUST sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
DILLMAN PROPERTY	2401 OAKLEY RD	>2	SSE	H50	86
SPICER PROPERTY	2923 CASTLE HAYNE ROAD	>2	SSE	L68	111
CROOM RESIDENCE	***103 WHITMAN AVE.***	***>2***	***SSE***	***89***	***142***
CHAMBLEE RESIDENCE	***128 WHITMAN AVE.***	***>2***	***SSE***	***94***	***149***
CONOCO STORE #33051	2636 CASTLE HAYNE RD	>2	SSE	U126	222
LP IV C/O MIDWEST FIRST FINANC	***140 LONG LEAF DRIVE***	***>2***	***SSE***	***135***	***228***
CROWN NC #733	2540 CASTLE HAYNE RD	>2	SSE	AH169	291
WRIGHTSBORO VOL FIRE DEPT	3525 N. KERR AVENUE	>2	SE	AK182	307
PANTRY #450	***3702 HWY 132 N.***	***>2***	***ESE***	***204***	***342***

UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the Department of Environment & Natural Resources' Petroleum Underground Storage Tank Database.

A review of the UST list, as provided by EDR, and dated 05/25/2007 has revealed that there are 36 UST sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
GENERAL ELECTRIC COMPANY	***US 117 NORTH CASTLE HAY***	***1 - 2***	***SE***	***A2***	***31***
INTERNATIONAL PAPER COMPANY	ROUTE 3, BOX 1884	1 - 2	ESE	B5	41
HORTICULTURAL CROPS RESEARCH	3800 CASTLE HAYNE RD.	1 - 2	ESE	C8	43
R.W. MOORE EQUIPMENT CO.	NORTHSIDE INDUSTRIAL PA	1 - 2	ESE	10	51
THE PANTRY 444	3052 CASTLE HAYNE RD.	>2	SSE	I54	88
CHEMICAL LEAMAN TANK LINES.IN	65 HWY 421 & 120 COWPEN	>2	SW	107	175
WRIGHTSBORO FOOD MART	***2636 CASTLE HAYNE RD.***	***>2***	***SSE***	***U124***	***213***
PEARSALL'S LANDING	479 BLOSSOM FERRY RD.	>2	ENE	Y131	225
ASHWORTH	4505 NORTH COLLEGE ROAD	>2	E	X137	231
FAST FARE NC 733	***2540 CASTLE HAYNE RD***	***>2***	***SSE***	***AH167***	***280***
ANSCO & ASSOCIATES. INC.	BLUECLAY ROAD	>2	SE	168	288
THE RAPAIR CENTER	RT 6 BOX 72 A, N. KERR	>2	SSE	AJ181	306
WRIGHTSBORO VOL. FIRE DEPT	***3515 N KERR AVE.***	***>2***	***SE***	***AK184***	***308***
SEEGARS FENCE CO. INC-WILMING	2705 BLUE CLAY ROAD	>2	SSE	AJ189	317
TIDEWATER FUELS INC	***100 EXPORT LN PO BOX 44***	***>2***	***SE***	***AM197***	***335***
TOLEDO CAROLINA INC	PO BOX 1763	>2	SSE	AN202	339
LGS LEONARD H LONG	2217 CASTLE HAYNE RD	>2	SSE	AO205	344
NC DOT - CASTLE HAYNE	5430 BARBADOS BLVD	>2	ENE	AP208	346

EXECUTIVE SUMMARY

Lower Elevation	Address	Dist / Dir		Map ID	Page
CAPE INDUSTRIES	P.O. BOX 327 HWY 421 N.	>2	WSW	G45	80
MINUTE SHOP	5219 NORTH COLLEGE ROAD	>2	ENE	J59	96
ROY'S BAIT AND TACKLE SHOP	3821-A HWY 421N	>2	SW	65	105
BEST BAIT & TACKLE	HWY 117 AND ASH ST	>2	ENE	M71	114
AMERICAN PROPERY INVESTORES V	HIGHWAY 421 NORTH	>2	WSW	75	124
NEW HANOVER CO. SECURE LANDFI	5210 HWY 421 NORTH	>2	WSW	O79	127
GOGAS 7	5604 CASTLE HAYNE ROAD	>2	ENE	P86	135
WASTE INDUSTRIES. INC.	3618 HIGHWAY 421 NORTH	>2	SW	N88	141
ATLANTIC MACK SALES. INC.	3401 U.S. HIGHWAY 421 N	>2	SW	Q92	146
THE PANTRY 915 DBA SPRINT	***5717 CASTLE HAYNE ROAD***	***>2***	***ENE***	***R97***	***156***
PANTRY 484	5800 CASTLE HAYNE RD	>2	ENE	R101	165
CUMMINS ATLANTIC INC	HWY 421 N	>2	SSW	V118	196
ARCADIAN CORP.	P.O. BOX 630	>2	SSW	V120	200
W.R. GRACE & CO.. AG. CHEMICA	P.O. BOX 1586 / HWY. 42	>2	SSW	V121	204
BRUCE'S DRIVE IN	***HIGHWAY 421 NORTH***	***>2***	***SSW***	***V122***	***208***
TRIPLE T PARTS & EQUIP. CO.IN	HWY 421 NORTH	>2	SSW	V128	223
FREDERICKSON MOTOR EXPRESS CO	FREDERICKSON ROAD	>2	SSW	AI185	313
L.V. SUTTON PLANT	ROUTE 6, BOX 46 / HIGHW	>2	SSW	AL203	340

NPDES: General information regarding NPDES(National Pollutant Discharge Elimination System) permits.

A review of the NPDES list, as provided by EDR, and dated 06/19/2007 has revealed that there are 5 NPDES sites within approximately 4 miles of the target property.

Equal/Higher Elevation	Address	Dist / Dir		Map ID	Page
FORMER CONOCO STORE 33051	2636 CASTLE HAYNE RD	>2	SSE	U123	213
FORMER FAST FARE NC-733	2540 CASTLE HAYNE RD	>2	SSE	AH166	279
SUTTON STEAM ELECTRIC PLANT	801 SUTTON STEAM PLANT	>2	SSW	AL196	334

Lower Elevation	Address	Dist / Dir		Map ID	Page
HERMITAGE HOUSE REST HOME WWTP	4724 CASTLE HAYNE RD	>2	E	D14	56
DEL LABORATORIES, INC.	1830 CARVER DR	>2	NNE	AD157	269

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped:

Site Name	Database(s)
KBK FLY ASH TRANSFER STATION	SWF/LF, HIST LF
BRUNSWICK CO TRANSFER/LELAND	SWF/LF, HIST LF
NORTH CAROLINA RESOURCE CONSERVATION, LL	SWF/LF, HIST LF
RUNNING DEER LCID LANDFILL	SWF/LF, HIST LF
CLYDE WISECARVER	SWF/LF, HIST LF
CONGLETON DEMO/CYPREE LANDFILL	SWF/LF, HIST LF
WILMINGTON MATERIALS	SWF/LF, HIST LF
GENERAL ELECTRIC COMPANY, WILMINGTON,	FINDS, RCRA-LQG, TRIS, RCRA-TSDF, CERC-NFRAP
IDEAL BASIC INDS/PLANT MARL QUARRY	SHWS
CAROLINA CREOSOTING CORPORATION	SHWS
HOLDING POND FOR WASTE/USS	SHWS
WILMINGTON BRANCH/BORDEN/SMITH DOUGL	SHWS
D&G PROPERTIES-SLAUGHTERHOUSE PARCEL	SHWS
SHACKLEFORD BANKS DRUMS	SHWS
VC CHEMICAL-ALMONT WORKS	SHWS
CAROLINA P&L CO. SUTTON STEAM	SHWS, VCP
SHEPARD CHEMICAL WORKS	SHWS
FLEMINGTON LDFL	SHWS, CERC-NFRAP, OLI
SOUTHERN WOOD PIEDMONT LANDFAR	SHWS, VCP, IMD
POTTER'S SEPTIC TANK SERVICE	SHWS
WILMINGTON GUN CLUB (FORMER)	SHWS
CAPE FEAR RIVER DRUMS	CERCLIS
SOUTHERN METALS RECYCLING	CERCLIS, FINDS
IDEAL BASIC INDS/PLANT MARL QUARRY	LUST, CERC-NFRAP, IMD
BRUNSWICK CO LDFL	CERC-NFRAP
SCOTCHMAN # 115	LUST, IMD
MARTIN MARIETTA	LUST
MOORE'S CREEK UST # 2	LUST, IMD
JOHNSON'S GROCERY	LUST, IMD
MOORE'S CREEK BATTLEFIELD QUAR	LUST, IMD
JENNIFER SUBDIVISION	LUST, IMD
CONNIE'S MOBILE HOME PARK	LUST, IMD
INDUSTRIAL ELECTRIC SALES & SE	LUST, IMD
BRYANTS TEXACO (FORMER)	LUST, IMD
ARVIDA DEVELOPMENT CENTER	LUST, IMD
PENDER ACADEMY	LUST, UST, LUST TRUST, IMD
ROCKY POINT QUARRY	LUST, UST, LUST TRUST, IMD
ALFORDS SEAFOOD	LUST, IMD
COASTAL FOOD SERVICE	LUST, IMD
AIRPORT INDUSTRIAL CENTER	LUST, IMD
AIR WILMINGTON	LUST, IMD
JORDAN PROPERTY	LUST, IMD
CP&L, EASTERN DIVISION GARAGE	LUST, IMD
COUNTRY STORE	LUST TRUST
KRAFT PROPERTY	LUST TRUST
KENAN TRANSPORT COMPANY	LUST TRUST
WILMINGTON MAINT. GARAGE	LUST TRUST
FREDERICK JORDAN PROPERTY	LUST TRUST
AIR WILMINGTON	LUST TRUST

EXECUTIVE SUMMARY

NEW HANOVER RENT A CAR	LUST TRUST
WATSON'S SERVICE STATION	UST
ARNOLD WESLEY PORTER	UST
DICKERSON CAROLINA INC.	UST
CASTLE HAYNE QUARRY	UST
HOLNAM. INC.	UST
SOUTHERN BELL-GLC 21806	UST
MCO TRANSPORT. INC.	UST
LUDEKE FARMS WHOLESALE FLORIS	UST
JOHNSONS GROCERY	UST
E & H EXXON	UST
OLD DOMINION FREIGHT LINE	UST
HENRY'S SERVICE CENTER	UST
MACO'S UNION 76 TRUCK STOP	UST
LELAND GROCERY	UST
H.C. WILLIAMS. JR. TRUCKING C	UST
BELVILLE MINI MART	UST
F.W. GROVES TRUCKING CO.	UST
NORTH CAROLINA EQUIPMENT COMP	UST
LELAND CITGO	UST
TWISDALE MFG CO INC	UST
ESTES EXPRESS LINES 13	UST
GULF ATLANTIC DISTRIBUTION SE	UST
RD'S TRUCK STOP	UST
FOX'S HOLSUM BAKERY INC	UST
ROUTE 3	UST
ROOKS FARM SERVICE INC.	UST
DAVIS FOODS INC	UST
LONG CREEK GRADY ELEM SCHOOL	UST
COUNTRY STORE	UST
BETTY'S GROCERY	UST
SCOTCHMAN 308	UST
WILCO 396	UST
SCOTCHMAN 265	UST
WILMINGTON AIRPORT	UST
PHOENIX COUNTRY STORE	UST
NEW HANOVER COUNTY GARAGE	UST
SOUTHERN BELL - WLMGNCHW	UST
WORSLEY TRANSPORT	UST
UNION CARBIDE INDUSTRIAL GASE	UST
NEW HANOVER COUNTY AIRPORT	UST
SOUTHERN BELL-GLC 21216	UST
PLOOF TRUCK LINES. INC.	UST
SOUTHERN IMPORT COMPANY. INC.	UST
COSTCO GASOLINE (LOC NO TDB)	UST
WILM TOWB	UST
PUMP STATION 34	UST
ALMONT SHIPPING - NEW	BROWNFIELDS
PPD HEADQUARTERS	BROWNFIELDS
FLEMINGTON LANDFILL	BROWNFIELDS
NEW HANOVER CO AIRPORT (PIEDMONT AIRLINES)	AST
INDUSTRIAL TECHNOLOGY GROUP	RCRA-SQG, FINDS
SEA MARK BOATS	RCRA-SQG
CINCINNATI THERMAL SPRAY	RCRA-SQG, FINDS
LOUISIANA PACIFIC CORPORATION	RCRA-SQG, FINDS

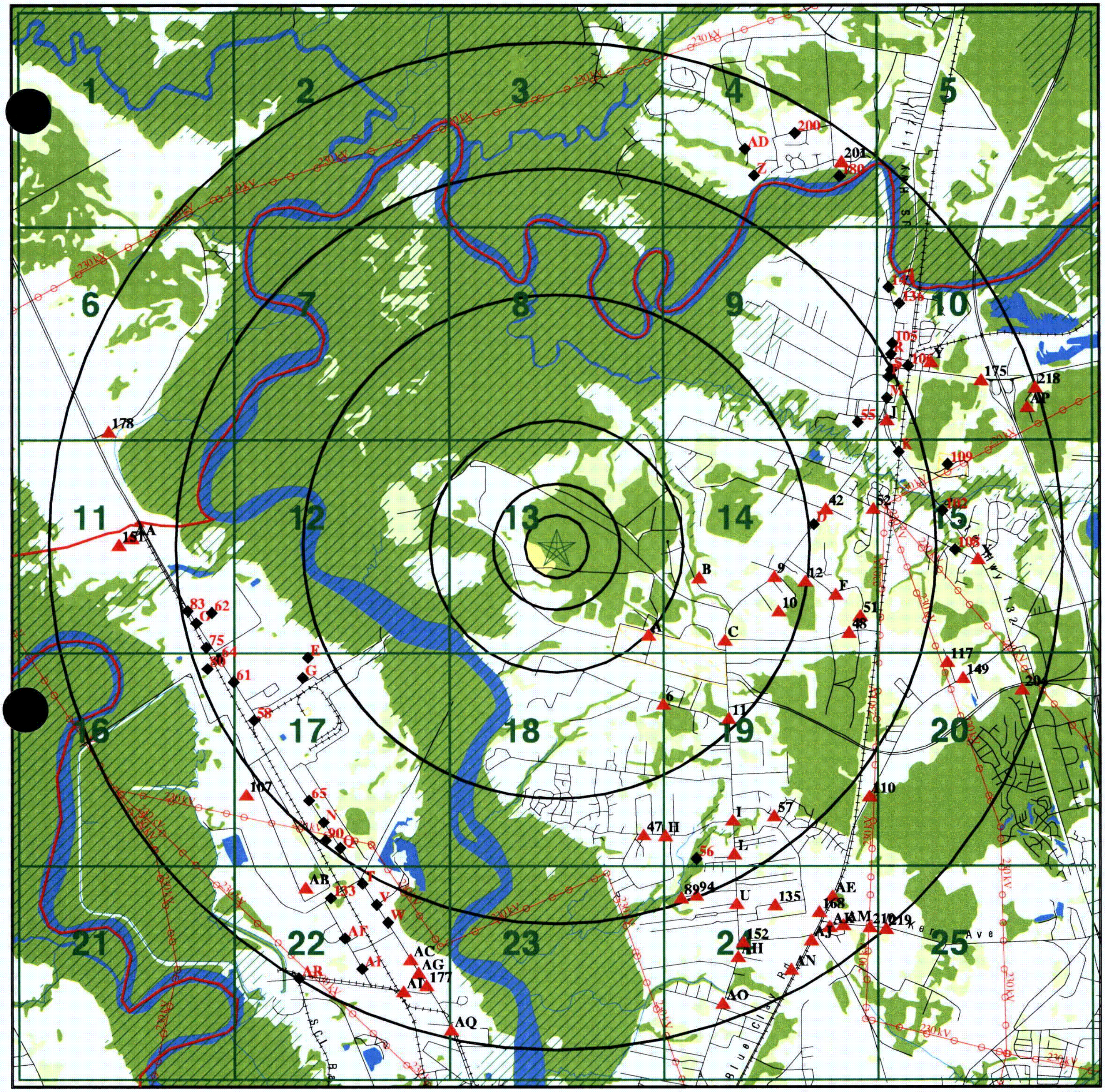
EXECUTIVE SUMMARY

NC EQUIPMENT CO	RCRA-SQG, FINDS
SHIPSIDE PACKING CO	RCRA-SQG, FINDS
PRECISION METAL PRODUCTS INC	RCRA-SQG, FINDS
DEL LABORATORIES, INC	FINDS, RCRA-LQG
HIGHWAY 421 NORTH 5 MILES NORTH OF WILMINGTON	ERNS
HIGHWAY 421N, 4 MILES NORTH OF WILMINGTON	ERNS
CAPE FEAR RIVER AT THE OLD WILMINGTON SHIPYARD	ERNS
CHEM SERVE TERMINAL WILMINGTON	ERNS
E/R FM WILMINGTON TO SAVANNAH	ERNS
RIVER ROAD/8MI FM WILMINGTON SOUTHBOUND	ERNS
WILMINGTON STATE PORT AUTHORITY DOCK 6	ERNS
WILMINGTON MARINE CENTER RIVER RD	ERNS
WILMINGTON STATE DOCKS BERTH A	ERNS
WILMINGTON STATE PORT BERTH 9	ERNS
WILMINGTON STATE DOCKS BERTH 9	ERNS
WILMINGTON ST PORT AUTH BERTH 2,3	ERNS
WILMINGTON DOCK WATER ST.	ERNS
WILMINGTON AUTO SALVAGE & SALE	FINDS
WILMINGTON BRANCH	FINDS
HY - YIELD BROMINE INC	FINDS, SSTS
WILMINGTON GRADING	FINDS
CARVER BOAT CORPORATION	FINDS, IMD
WILMINGTON AIRPORT	FINDS
READY MIXED CONCRETE COMPANY - WILMINGTON	FINDS
WILMINGTON AUTO TRUCK STOP	FINDS
PHILLYSHIP OF WILMINGTON	FINDS
PCS NITROGEN FERTILIZER L P WILMINGTON PLANT	FINDS
WILMINGTON WATER TREATMENT PLANT	FINDS
WILMINGTON HOUSING AUTHORITY	FINDS
WILMINGTON SHIPPING COMPANY	FINDS
NEXT STEP PROPERTIES OF WILMINGTON LIMITED LIABILITY COMPANY	FINDS
ALMONT-OLD WILMINGTON HARBOUR	FINDS
METAL TESTING SOUTH WILMINGTON	FINDS
WILMINGTON EXPORT PACKING INCORPORATED	FINDS
WILMINGTON FACILITY	FINDS
WILMINGTON FERTILIZER,117 SITE	FINDS
WILMINGTON POP	FINDS
SIDBURY PLAZA	IMD
REASOR CHEMICAL	IMD
OXYCHEM LAGOONS	IMD
BROOKDALE GREENHOUSES, INC.	IMD
CASTLE HAYNE CVS SITE	IMD
PETROLEUM EQUIP. & INST. CO.	IMD
MARTIN MARIETTA	IMD
EXXON PIPELINE 109 +45	IMD
LEERAY, INCORPORATED	IMD
LEERAY TRUCK SALES	IMD
CONOCO-ATLANTIC GULF (DIESEL S	IMD
T-N-T AUTO SALES	IMD
CHEMICAL CARTAGE	IMD
INDUSTRIAL ELECTRICAL SALES &	IMD
NATIONAL STARCH(C.T. SPECIALTI	IMD
POLE PROPERTY	IMD
INFINGER TRANSPORT	IMD
C.H. CLARK AND SON, INC.	IMD

EXECUTIVE SUMMARY

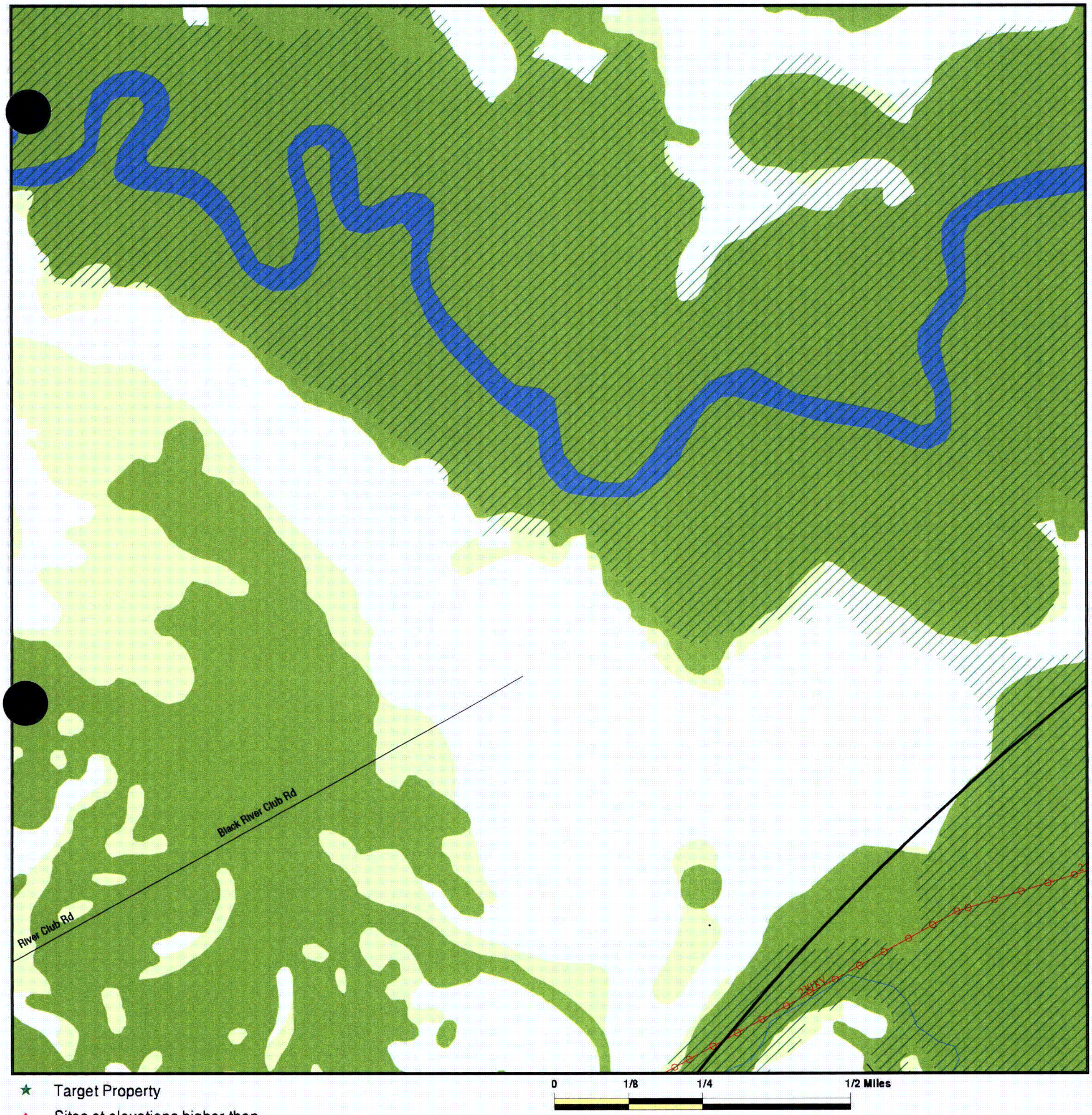
JBS MECHANICL SERVICES, INC.	IMD
CARVER BOAT CO.	IMD
ADAMS TRUCKING	IMD
EAGLE ISLAND ENGINEER YARD	IMD
CP&L SUTTON PLANT	IMD
FLORIDA ROCK AND TANK TRUCK SP	IMD
SOUTH ATLANTIC SERVICES, INC.	IMD
CP&L TRANSFORMER SITE	IMD
FLEMINGTON LANDFILL	IMD
CENTRAL TRANSPORT, INC	IMD
AMERICAN CONTRACT COATING	IMD
GENERAL ELECTRIC-CENTRAL TCE P	IMD
GENERAL ELECTRIC	IMD
GENERAL ELECTRIC-URANYL NITRAT	IMD
10TH ST LANDFILL	IMD
OLD NEUWIRTH PROPERTY	IMD
IDEAL BASIC CEMENT LANDFILL	IMD
NCDOT HIGHWAY 17 BYPASS	IMD
NATIONAL CAR SALES (ALEX TRASK	IMD
MILITARY CUTOFF FIRING RANGE	IMD
EAGLE ISLAND,CSX PROPERTY	IMD
SUNOCO BULK TERMINAL (FORMER)	IMD
INTERNATIONAL PAPER/CP&L TANK	IMD
AERONAUTICS/AIR WILMINGTON	IMD
CASTLE HAYNE SERVICE DUMP	OLI
CASTLE HAYNE TRASH SERVICE	OLI
DUPONT DUMP	OLI
WILMINGTON LDFL (KIDDER ST)	OLI
TALLMAN CLAY PIT	OLI
MILITARY CUTOFF LANDFILL	OLI
BURNT MILL CREEK LF	OLI
WILMINGTON LANDFILL	OLI
MARTIN MARIETTA AGG PEE DEE QUARRY	ICIS
TRUMPETER CREEK FARMS #1 & #2	ICIS
HITCHING POST TRAILER PARK WATER SYS	ICIS
OIL SPILL (FLORIDA ROCK & TANK LINES, INC.)	ICIS
INVISTA S.A.R.L.	ICIS
SOUTHERN STATES CHEMICAL	ICIS
OIL SPILL (CENTRAL TRANSPORT TERMINAL)	ICIS
SIGMA RECYCLING	ICIS
SPRUNT LAURENCE	ICIS
TOWN & COUNTRY MHP #1 WATER SYS	ICIS
OCCIDENTAL CHEMICAL CORP.	SSTS
HY-YIELD BROMINE	SSTS
SOUTH ATLANTIC SERVICES INC	SSTS
SHEPARD CHEMICAL WORKS, INC	SSTS
NEW HANOVER FACILITY	NPDES
WILMINGTON TERMINAL	NPDES
INVISTA, S.A.R.L.	NPDES
COUNTY LANDFILL WWTP	NPDES
WASTEC WWTP	NPDES
WILMINGTON ACID PLANT	NPDES
WILMINGTON FACILITY WWTP	NPDES

OVERVIEW MAP - 01977396.1r



- ★ Target Property
- ▲ Sites at elevations higher than or equal to the target property
- ◆ Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
- Power transmission lines
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Hazardous Substance Disposal Sites

SITE NAME:	GLE Wilmington	CLIENT:	Research Triangle Institute
ADDRESS:	3902 Castle Hayne Rd Wilmington NC 28429	CONTACT:	Michael Lowry
		INQUIRY #:	01977396.1r
LAT/LONG:	34.3340 / 77.9460	DATE:	July 12, 2007 1:06 pm



- Target Property
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- Indian Reservations BIA
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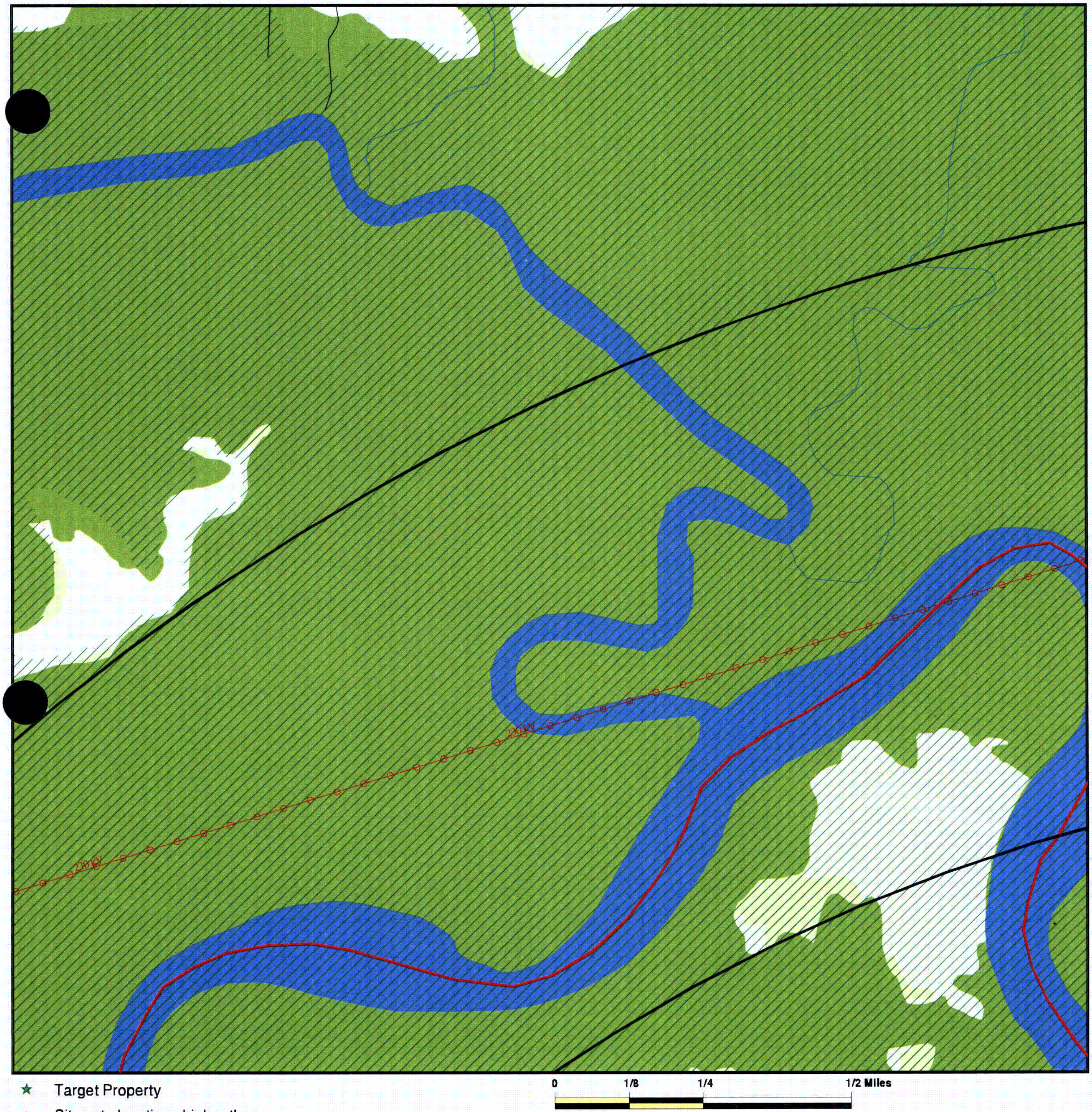
DETAIL MAP 2 of 25 - 01977396.1r



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- Indian Reservations BIA
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- 500-year flood zone
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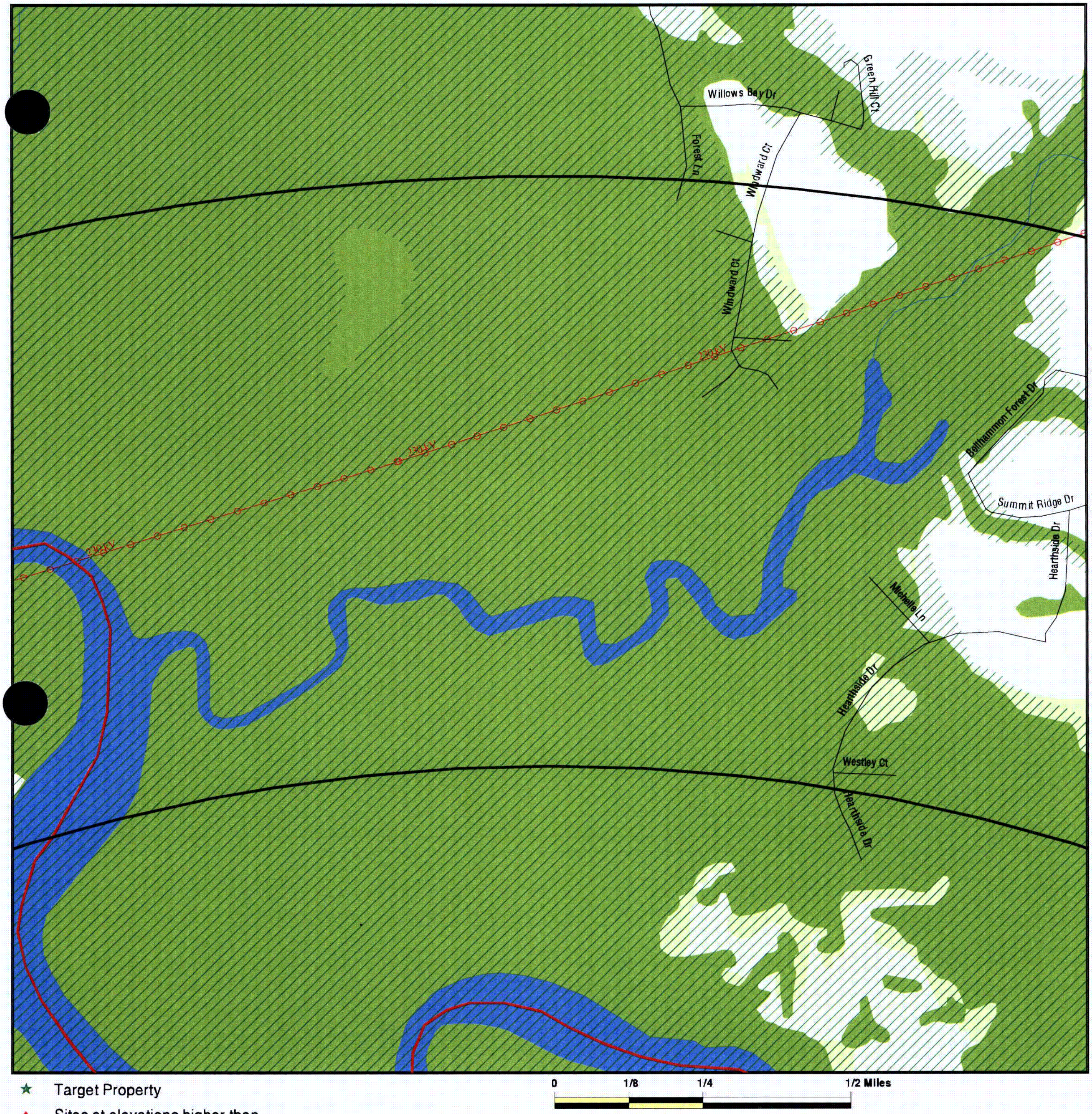
- State Wetlands
- Hazardous Substance Disposal Sites

SITE NAME: GLE Wilmington ADDRESS: 3902 Castle Hayne Rd Wilmington NC 28429 LAT/LONG: 34.3340 / 77.9460	CLIENT: Research Triangle Institute CONTACT: Michael Lowry INQUIRY #: 01977396.1r DATE: July 12, 2007 1:06 pm

DETAIL MAP 3 of 25 - 01977396.1r



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- Dept. Defense Sites
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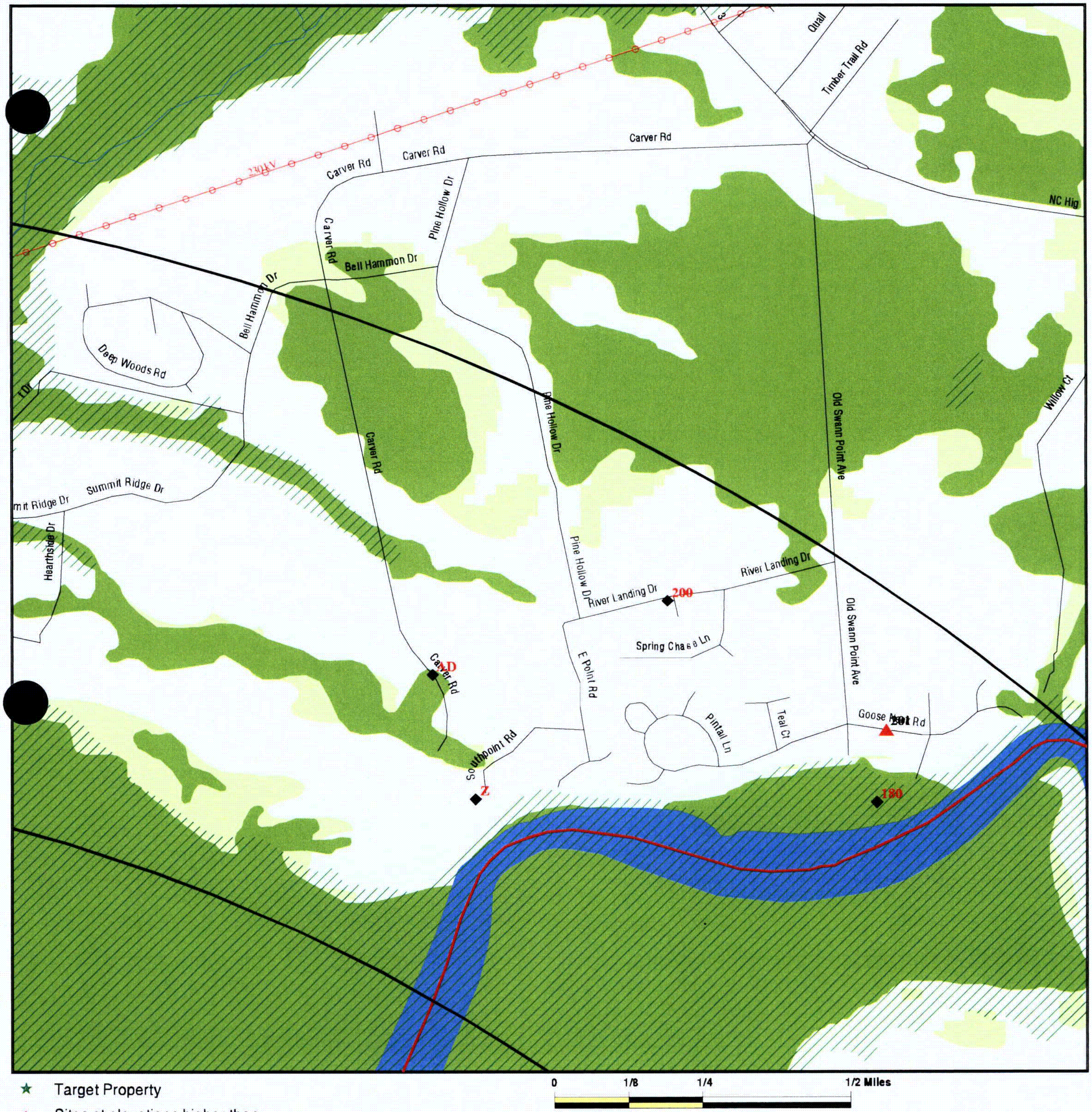
LAT/LONG:	34.3340 / 77.9460	DATE:	July 12, 2007 1:06 pm

DETAIL MAP 4 of 25 - 01977396.1r



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
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- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
- Power transmission lines
- Oil & Gas pipelines
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- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Hazardous Substance Disposal Sites

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		INQUIRY #:	01977396.1r
LAT/LONG:	34.3340 / 77.9460	DATE:	July 12, 2007 1:06 pm

DETAIL MAP 5 of 25 - 01977396.1r

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Hazardous Substance Disposal Sites

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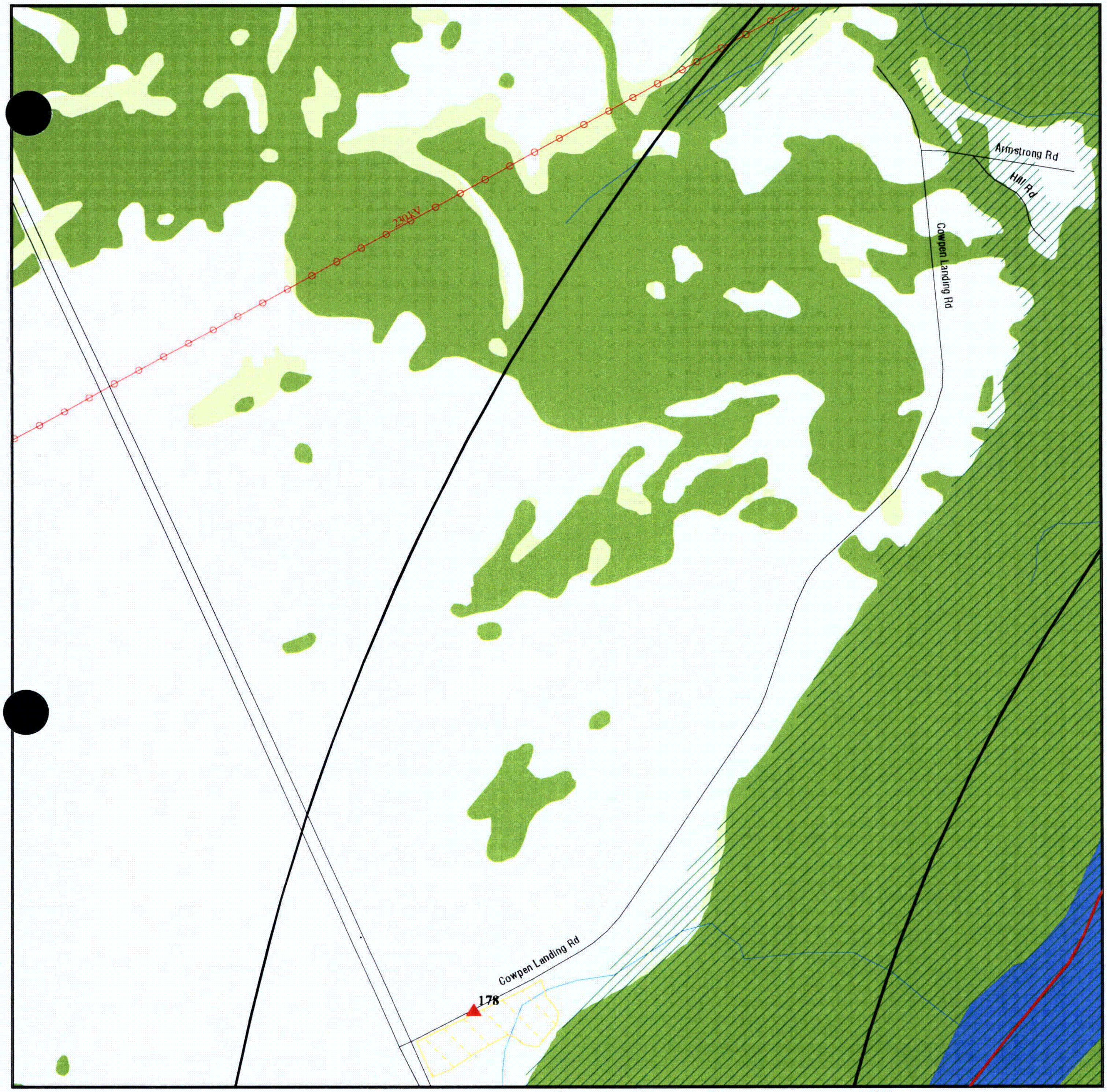
LAT/LONG:	34.3340 / 77.9460	DATE:	July 12, 2007 1:06 pm

DETAIL MAP 6 of 25 - 01977396.1r



0 1/8 1/4 1/2 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
- Power transmission lines
- Oil & Gas pipelines
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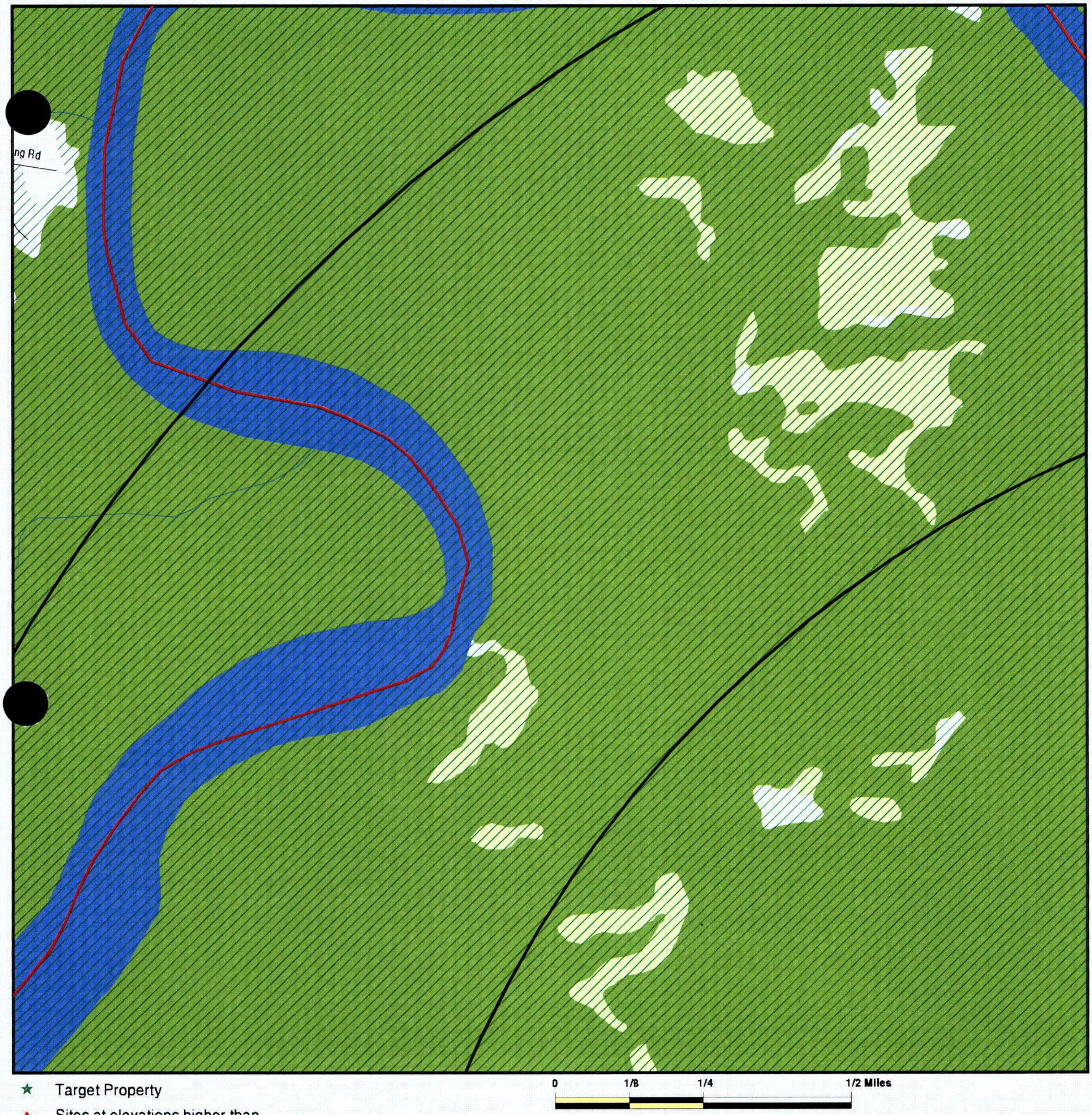
LAT/LONG:	34.3340 / 77.9460	DATE:	July 12, 2007 1:06 pm

DETAIL MAP 7 of 25 - 01977396.1r



- Target Property
- Sites at elevations higher than or equal to the target property
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- Manufactured Gas Plants
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- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
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- 500-year flood zone
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SITE NAME: GLE Wilmington	CLIENT: Research Triangle Institute
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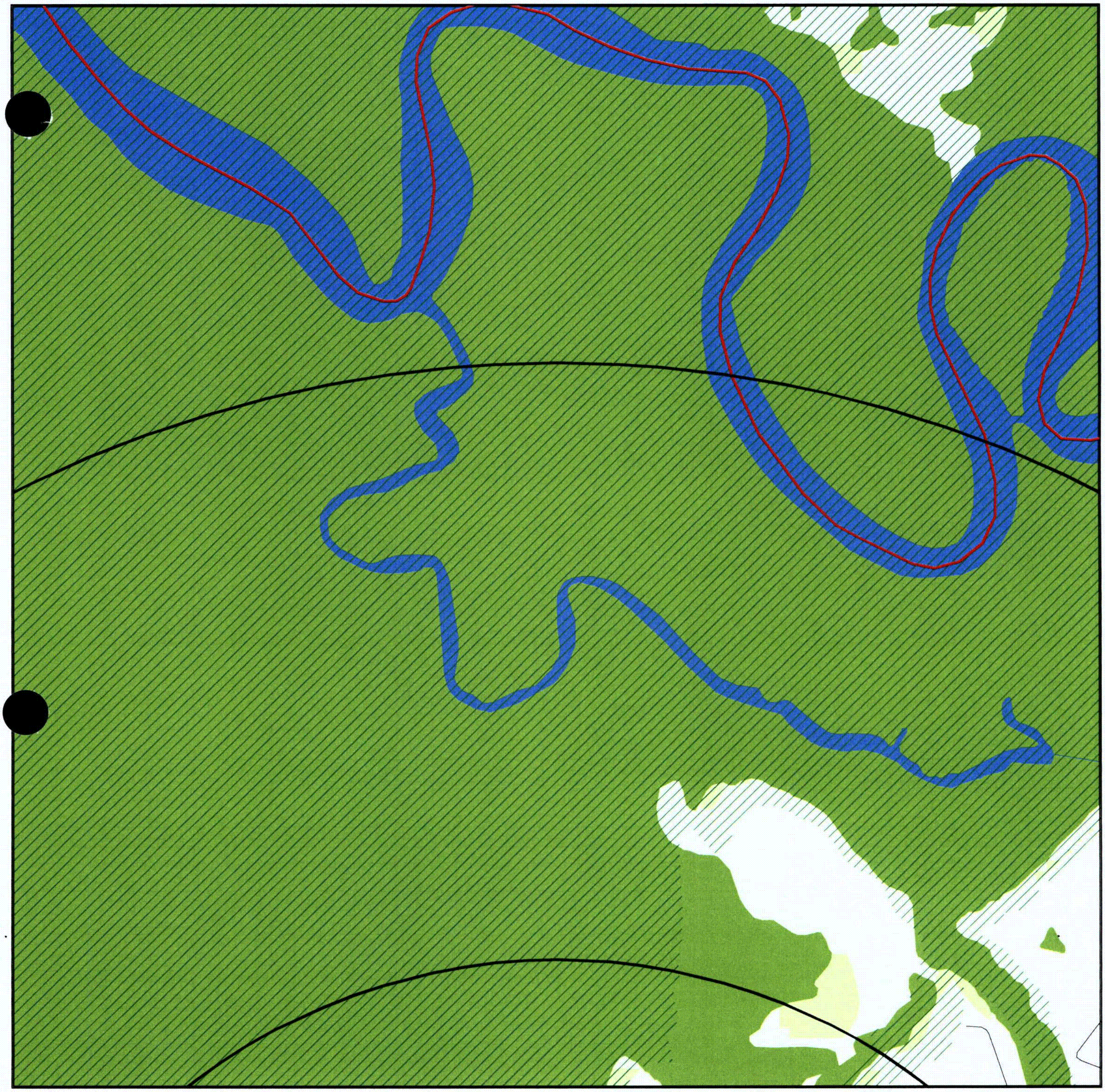
LAT/LONG: 34.3340 / 77.9460	DATE: July 12, 2007 1:06 pm

DETAIL MAP 8 of 25 - 01977396.1r



0 — 1/8 — 1/4 — 1/2 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
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- 100-year flood zone
- 500-year flood zone
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- State Wetlands
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SITE NAME: GLE Wilmington ADDRESS: 3902 Castle Hayne Rd Wilmington NC 28429 LAT/LONG: 34.3340 / 77.9460	CLIENT: Research Triangle Institute CONTACT: Michael Lowry INQUIRY #: 01977396.1r DATE: July 12, 2007 1:06 pm

DETAIL MAP 9 of 25 - 01977396.1r

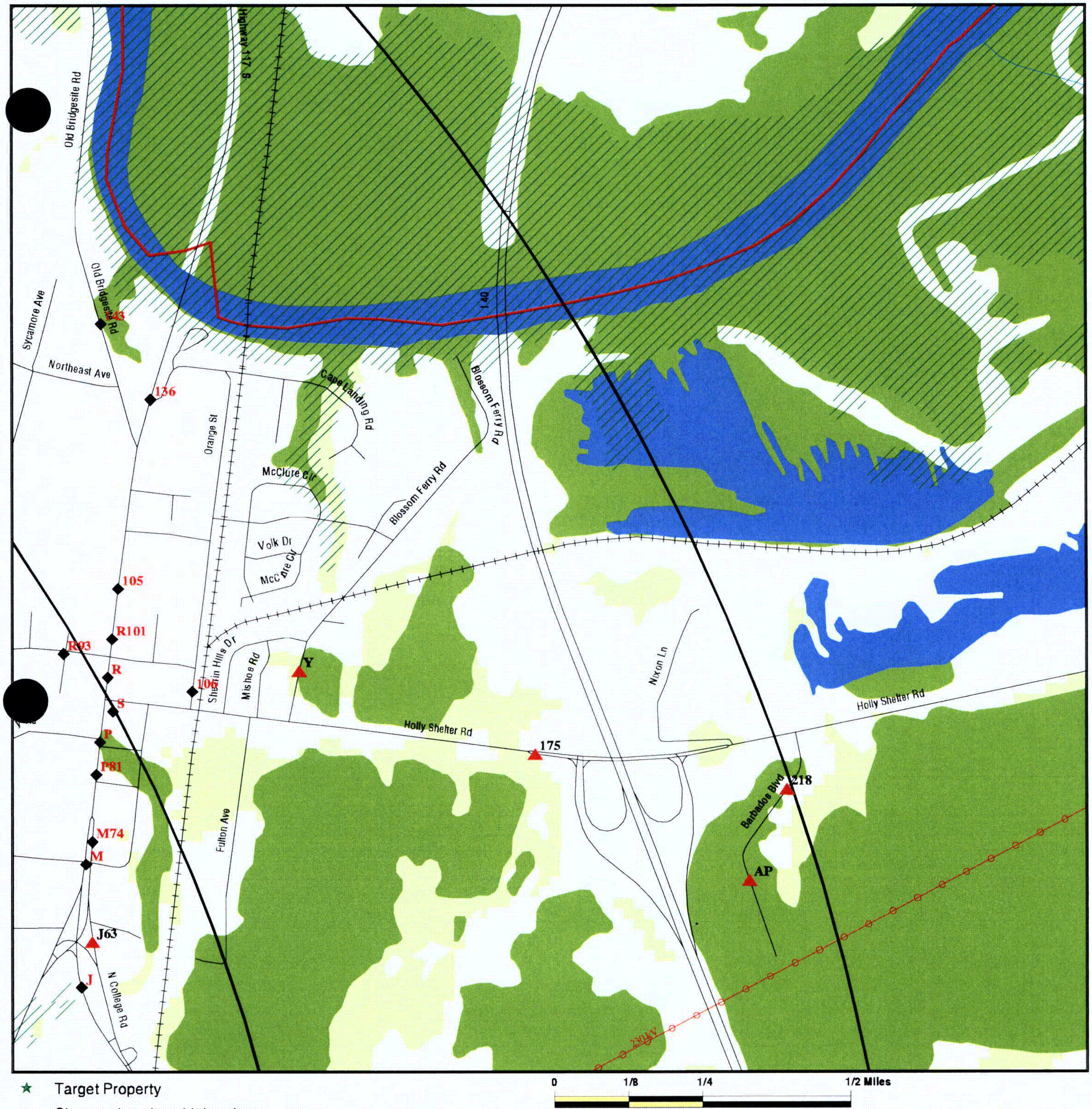
- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites

- Indian Reservations BIA
- County Boundary
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands

- Hazardous Substance Disposal Sites

SITE NAME:	GLE Wilmington	CLIENT:	Research Triangle Institute
ADDRESS:	3902 Castle Hayne Rd	CONTACT:	Michael Lowry
	Wilmington NC 28429	INQUIRY #:	01977396.1r
LAT/LONG:	34.3340 / 77.9460	DATE:	July 12, 2007 1:06 pm

DETAIL MAP 10 of 25 - 01977396.1r



- Target Property
- Sites at elevations higher than or equal to the target property
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- Manufactured Gas Plants
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- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
- Power transmission lines
- Oil & Gas pipelines
- 100-year flood zone
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- National Wetland Inventory
- State Wetlands
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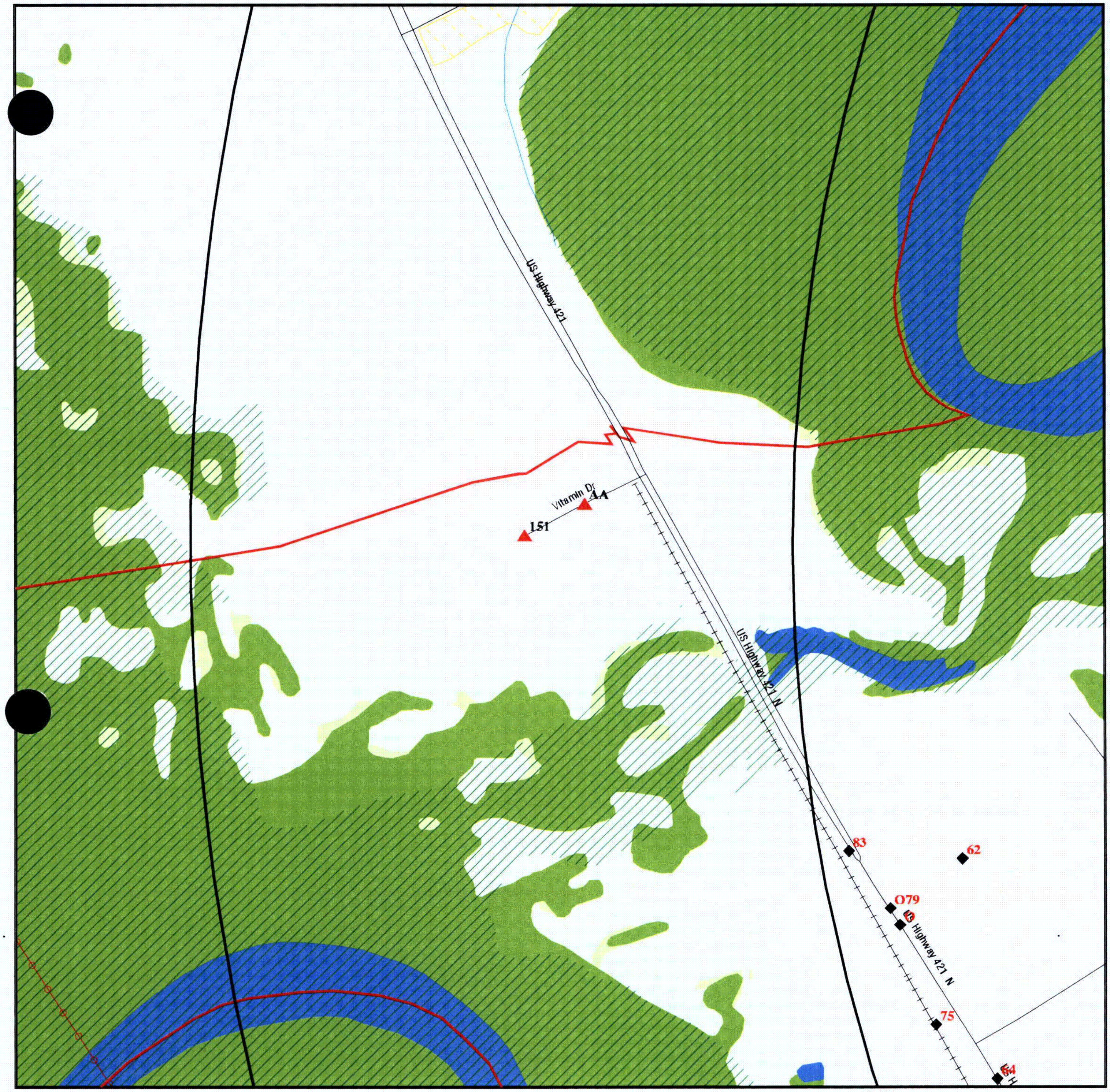
SITE NAME: GLE Wilmington ADDRESS: 3902 Castle Hayne Rd Wilmington NC 28429 LAT/LONG: 34.3340 / 77.9460	CLIENT: Research Triangle Institute CONTACT: Michael Lowry INQUIRY #: 01977396.1r DATE: July 12, 2007 1:06 pm

DETAIL MAP 11 of 25 - 01977396.1r



- Target Property
- Sites at elevations higher than or equal to the target property
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- Indian Reservations BIA
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- 100-year flood zone
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0 1/8 1/4 1/2 Miles

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LAT/LONG: 34.3340 / 77.9460	DATE: July 12, 2007 1:06 pm

DETAIL MAP 12 of 25 - 01977396.1r

★ Target Property
▲ Sites at elevations higher than or equal to the target property
◆ Sites at elevations lower than the target property
Manufactured Gas Plants
Sensitive Receptors
National Priority List Sites
Dept. Defense Sites

0 1/8 1/4 1/2 Miles

Indian Reservations BIA
Oil & Gas pipelines
100-year flood zone
500-year flood zone
National Wetland Inventory
State Wetlands

Hazardous Substance Disposal Sites

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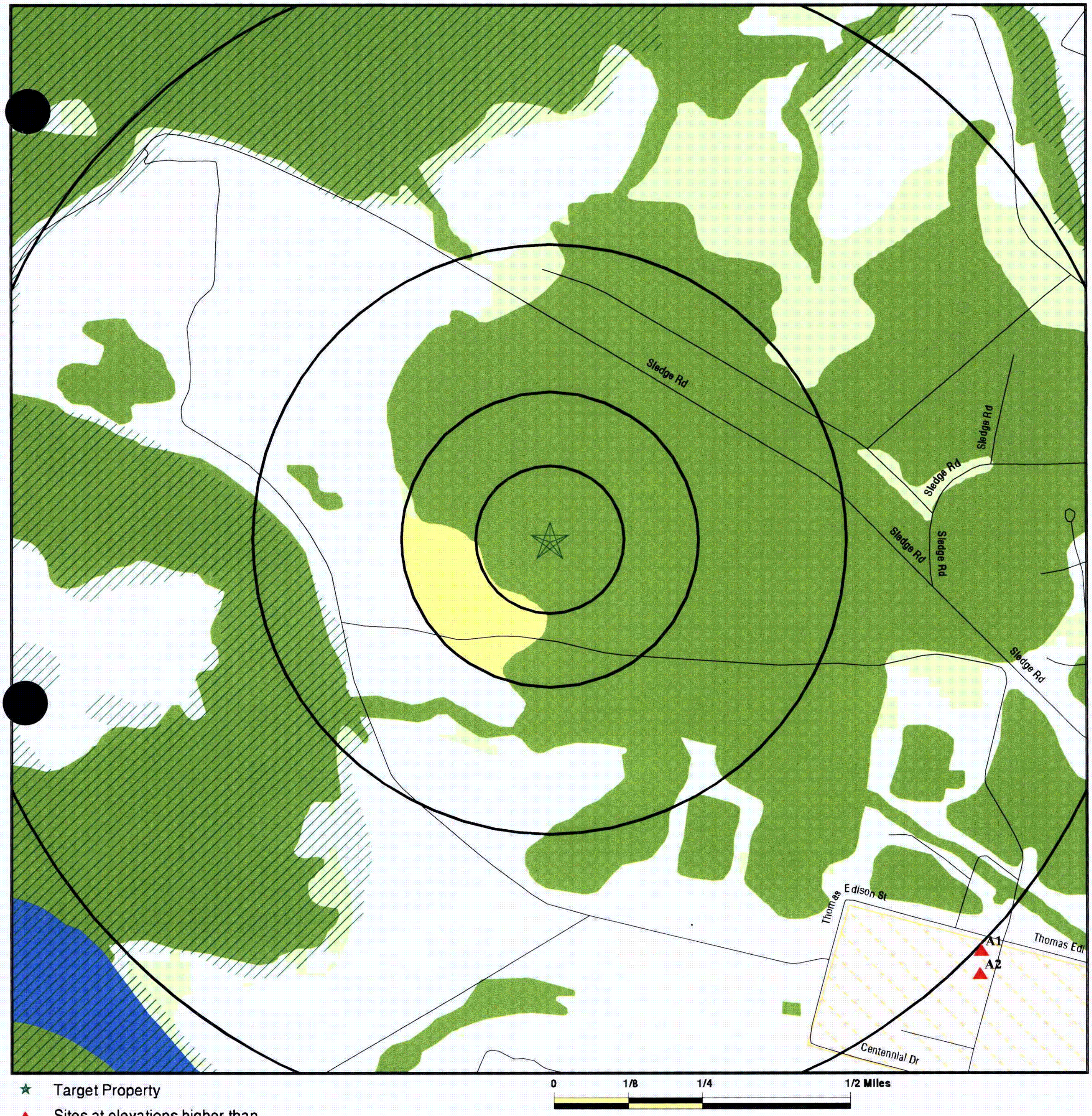
LAT/LONG:	34.3340 / 77.9460	DATE:	July 12, 2007 1:06 pm

DETAIL MAP 13 of 25 - 01977396.1r



- Target Property
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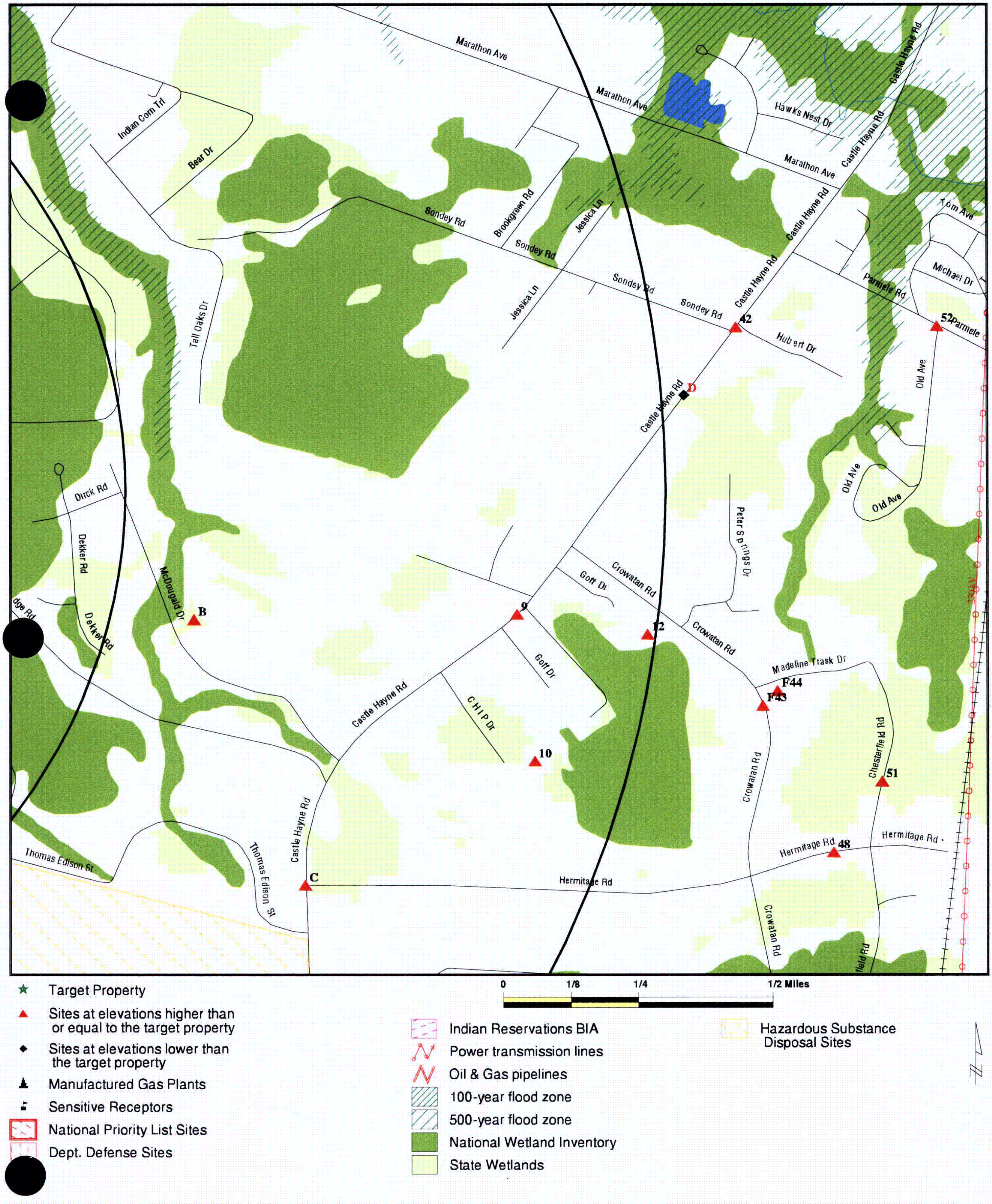
LAT/LONG:	34.3340 / 77.9460	DATE:	July 12, 2007 1:07 pm

DETAIL MAP 14 of 25 - 01977396.1r



SITE NAME: GLE Wilmington	CLIENT: Research Triangle Institute
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LAT/LONG: 34.3340 / 77.9460	DATE: July 12, 2007 1:07 pm

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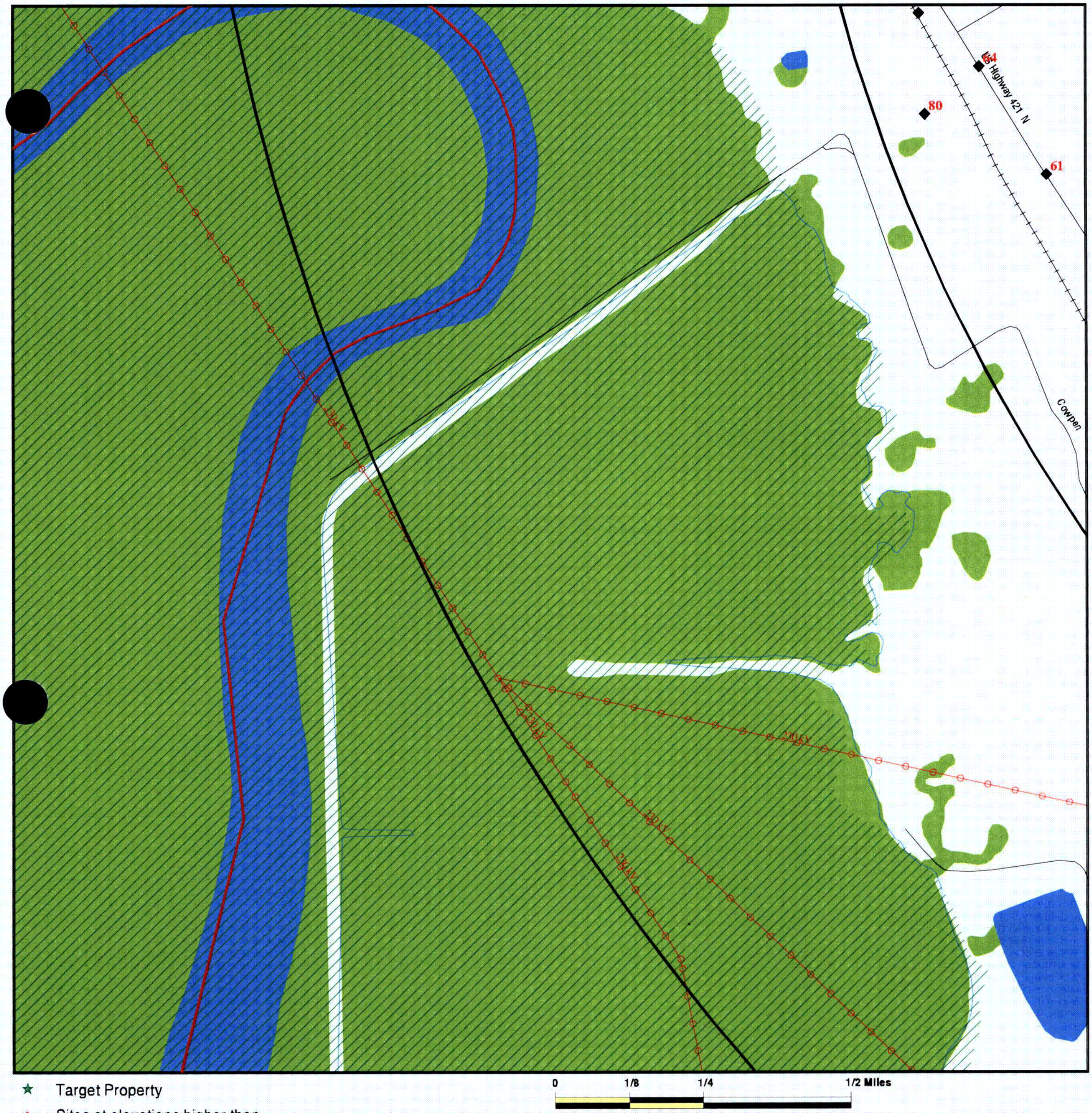
DETAIL MAP 16 of 25 - 01977396.1r



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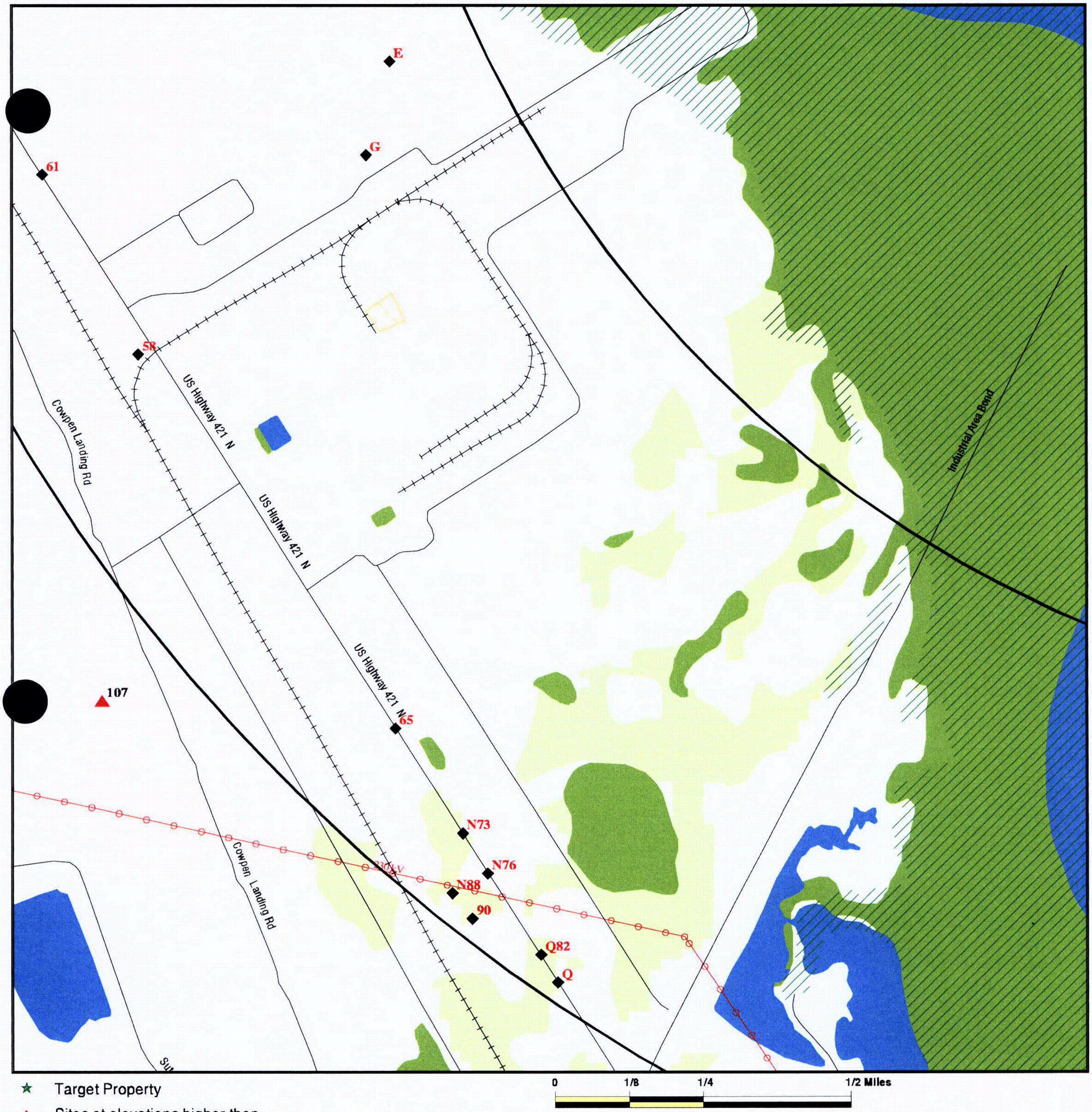

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Sensitive Receptors
National Priority List Sites
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0 1/8 1/4 1/2 Miles

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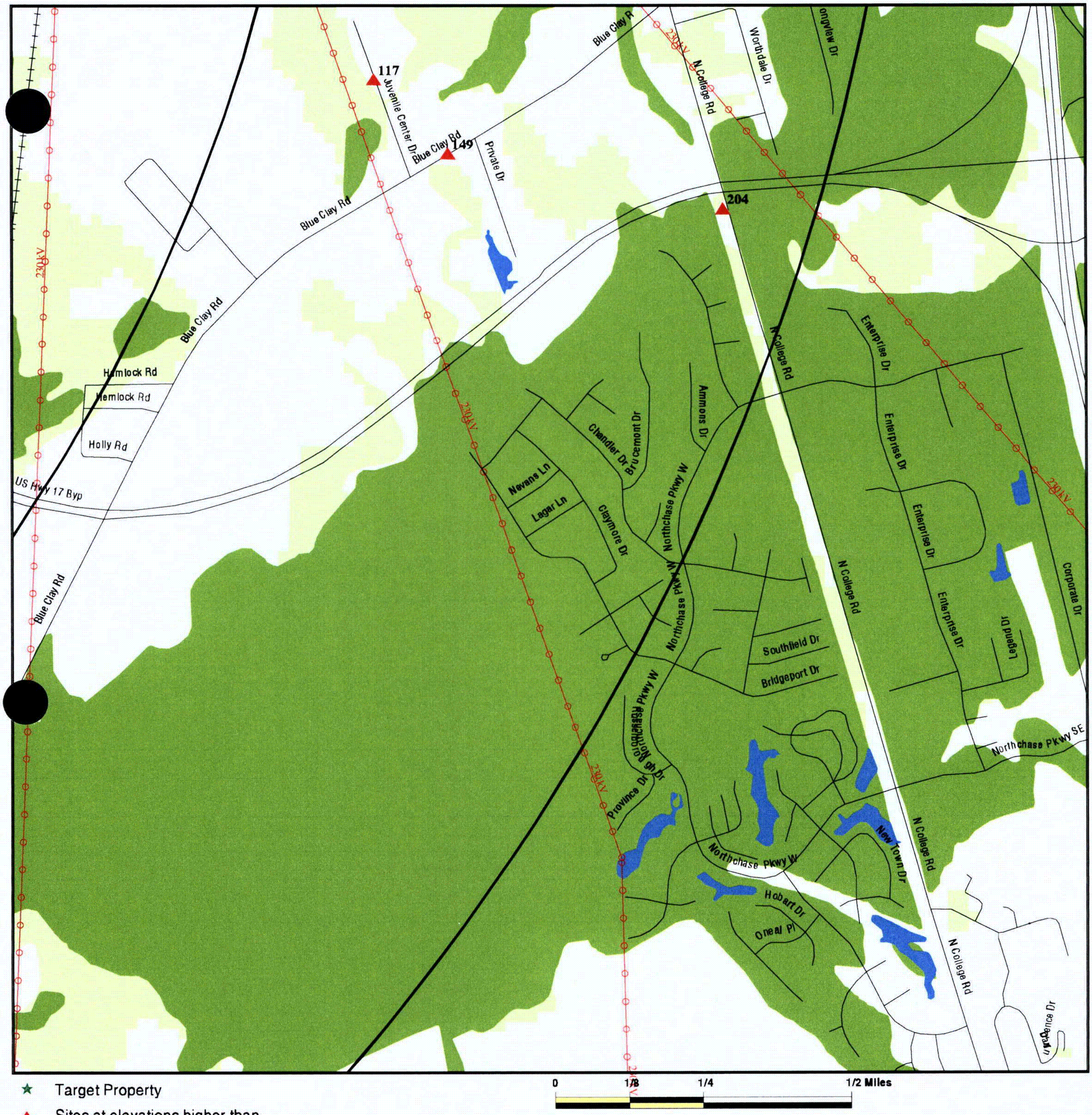
DETAIL MAP 20 of 25 - 01977396.1r



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Dept. Defense Sites

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