BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION
APPLICATION FOR LICENSE FOR MAJOR PROJECT – EXISTING DAM

Cannonsville Hydroelectric Project

FERC Project No. 13287

VOLUME 7

Appendix E-5: Phase IA Archeological Literature Review and Sensitivity Assessment

City of New York

Environmental Protection

February 2012

PHASE IA ARCHEOLOGICAL LITERATURE REVIEW AND SENSITIVITY ASSESSMENT

City of New York

West of Hudson Hydroelectric Project: Cannonsville, Downsville, and Neversink Dams

FERC Project No. 13287

Towns of Deposit, Downsville, and Neversink
Delaware and Sullivan Counties, New York

HAA # 4277-11
OPRHP 09PR03088

Submitted to:
City of New York
New York City Department of Environmental Protection
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MANAGEMENT SUMMARY

SHPO Project Review Number: 09PR03088
Involved State and Federal Agencies: Federal Energy Regulatory Commission
Phase of Survey: IA

LOCATION INFORMATION

Location: Cannonsville Reservoir, Pepacton Reservoir, and Neversink Reservoir
Minor Civil Division: Town of Deposit (02506), Town of Colchester (02503), and Town of Neversink (10512)
Counties: Delaware and Sullivan

SURVEY AREA

Length: variable
Width: variable
Number of Acres Surveyed: Cannonsville approximately 4 acres, Pepacton/Downsville approximately 1 acre, Neversink approximately 1 acre
7.5 Minute Quadrangle Map: Cannonsville Reservoir, Downsville, and Liberty East (Neversink)

RECOMMENDATIONS

The project will be constructed in areas that have been previously disturbed by the construction of the previous dams and reservoirs. If the APE is restricted to these areas of previous disturbance no further archeological study is warranted.

Report Authors: Matthew Kirk and Walter R. Wheeler
Date of Report: June 2011

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12. The valve structure at the north abutment of the Downsville dam. The two-story brick and masonry building houses two valves that regulate minimum flow from the reservoir. The Project proposes to replace one of the valves with a turbine. A switch yard will be built in the immediate vicinity.
13. View west of the valve structure at Downsville dam, the rip-rap of the dam is to the left and to the right beyond the chain-link fence is the spillway channel.
14. A view of the downstream side of the Cannonsville dam. To the right is an access road at the top of the dam. To the lower left is the release chamber below the dam. The proposed powerhouse will be sited next to the existing release chamber. A small cluster of outbuildings are located in the distance, as indicated by the arrow.
15. The doubled-crested waste weir at Cannonsville dam and its associated spillway. The ogee-shaped weir is faced in granite. The spillway channel is cut through bedrock.
16. A small cluster of maintenance buildings remain along the top of the Cannonsville dam. Several other structures, including the Engineer's office and laboratory, were moved and/or demolished over the years, view west. The switchyard or substation will be sited behind the garage.
17. A small pole barn used in the maintenance of the facility currently holds salt and machinery. Another small building is likely a former office that is now largely abandoned. Both structures are located near the top center portion of the dam.
18. The intake structure along the reservoir at the Cannonsville dam, viewed to the southeast. The upstream portion of the dam is lined with stone rip-rap.
19. The release chamber is located at the western abutment of the Cannonsville dam. The proposed powerhouse will be located to the east of the chamber, as indicated by the arrow. The distribution lines extend up the dam face to the maintenance facility.
20. A view west of the proposed location of the powerhouse at Cannonsville dam. The powerhouse will be situated in area (see oval) previously disturbed by the construction of the dam and the deep stilling pool at the end of the release chamber.

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PHASE IA LITERATURE REVIEW AND ARCHEOLOGICAL SENSITIVITY ASSESSMENT

INTRODUCTION

Hartgen Archeological Associates, Inc. (HAA, Inc.) was retained by The City of New York to conduct a Phase IA literature review for the proposed City of New York, West of Hudson Hydroelectric Project at the Cannonsville Dam, Downsville Dam, and Neversink Dam in the Towns of Deposit and Colchester in Delaware County, and the Town of Neversink in Sullivan County New York, respectively (Maps 1a and 1b, 2a-2c, and 3a-3c). The City of New York is currently exploring the possibility of licensing new hydroelectric facilities at these three sites (the Project) as part of the ongoing operation of their dams and reservoirs.

Acting through the New York City Department of Environmental Protection (DEP), the agency responsible for operating and managing the water supply system, the City has filed a Pre-Application Document (PAD) with the Federal Energy Regulatory Commission (FERC) to obtain a preliminary permit to conduct the necessary studies for the application process. The permit was granted in March 2009. The current archeological study is one of many studies being conducted in support of the DEP's efforts in the application process. The cultural resource study is a necessary step in the FERC permitting process, and is a requirement of federal law. Section 106 of the National Historic Preservation Act stipulates that federal agencies must consider the potential effects of the project on historic properties. FERC consults with the Advisory Council on Historic Preservation. The Advisory Council has delegated responsibility for reviewing the project to the New York State Historic Preservation Office (NYSHPO). Therefore, the NYSHPO will be the primary reviewing agency concerning the Project's impact on historic properties. The investigation was conducted according to the New York Archaeological Council's (NYAC) Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New York State (NYAC 1994).

PROJECT INFORMATION

The report is authored by Matthew Kirk, M.A., R.P.A., who also served as the Principal Investigator. Walter R. Wheeler is the architectural historian; he also contributed to the report. A site visit was conducted by Matthew Kirk and Walter R. Wheeler on Tuesday, April 13, 2010 to observe and photograph existing conditions within the project area. The site visit was led by Robert Principe, P.E., Hydro-Plant Engineer for the Bureau of Water Supply (BWS), Western Operations Division. Mr. Principe also provided information concerning the current operations of the facility, as well as insights into the proposed hydroelectric project. We were also assisted by Russell Betters who helped locate appropriate reports in the DEP library.

The site visit included the opportunity to visit the library at the DEP offices in Grahamsville to review pertinent maps, reports, and other material to aid in the cultural resource study. The library contained a wealth of information relative to the historical developments of the dams and associated reservoirs. Among the important materials reviewed were BWS annual reports and contract reports that detailed the construction history of each of the projects. Many of these reports contained maps and historical photographs. A small sample of the most relevant maps, photographs, and reports were copied at the library for inclusion in the current study. Much additional information is still available at the library. A sample of these materials, as well as information and current conditions along with photographs gathered during the site visit, are included in Appendix 1.

Project Location

The Project contemplates development of facilities at four separate reservoirs in the Catskills: Neversink, Pepacton, Cannonsville, and Schoharie (Maps 1a and 1b). In regard to the later Project location, the DEP has not yet come up with a viable project. As such, the Schoharie site is not considered further in this report. Should the DEP find a viable alternative for this location a separate Phase 1A Archeological Literature Review and Sensitivity Assessment will be conducted. The Project area at the Neversink dam includes the area in and immediately around the existing intake structure facility (Maps 2a, 3a, and 4a). The facility is located in the Town of Neversink, Sullivan County, New York. The Pepacton Reservoir is controlled by the

Downsville dam. Here, the Project area includes the existing release water chamber. The proposed hydroelectric turbines will replace an existing valve inside the structure and a small switch yard will be constructed in the immediate vicinity. The structure is located on the west abutment of the dam in the Town of Colchester, Delaware County, New York (Maps 2b, 3b, and 4b). Finally, the proposed development at the Cannonsville dam will entail the construction of a new powerhouse at the base of the dam immediately adjacent to and integral with the existing release water chamber. The release chamber is located near the south abutment of the dam in the Town of Deposit, Delaware County, New York (Maps 2c, 3c, and 4c).

Description of the Project Area

All three of the proposed developments of the Project are located within the existing reservoir systems for New York City (DEP 2009). Each is located within or immediately adjacent to the dams associated with each reservoir. At Neversink, the hydroelectric turbine will replace valves located between the intake structure for the East Delaware Tunnel and the inclined portal tunnel that provides a minimum flow for the Neversink River. Plans also include a small substation along the east elevation of the intake structure and a staging area just south of the intake structure (Map 4a). As will be discussed, the area proposed to be impacted by the Project at Neversink has been previously disturbed by the construction of the dam and its appurtenances.

The Project will also include a hydroelectric turbine at the Downsville dam of the Pepacton Reservoir. The turbine will be located within the existing release water chamber at the spillway (Map 4b). One turbine will replace one of the existing valves in the release water chamber, the other valve will remain to control water when the turbine is off-line and for a bypass system. The valves are located in two, 5.5-foot diameter supply tunnels, that are 90 feet in length and connect to the inclined portal tunnel where water is discharged (DEP 2009).

Finally, the Project will also include a new hydroelectric development at the Cannonsville dam. The Project will include the construction of a new powerhouse adjacent to and integral with the existing release water chamber at the south end of the dam (Map 4c). The powerhouse will include utilizing the existing tailrace composed of various sized pipes. Four turbines will be situated at the end of the pipes which will effectively serve as penstocks. A 78-inch diameter pipe will bifurcate into two 36-inch penstocks that will service one turbine. A second turbine will receive water from a 72-inch diameter penstock, and a 102-inch diameter penstock will bifurcate into two 72-inch pipes that will provide water to two separate turbines. The resulting powerhouse at the end of the penstock will house four new turbines with a capacity of 14.08 MW with a potential for annually generating 37.27 GWh (DEP 2009:2).

Description of the Area of Potential Effects (APE)

The Area of Potential Effects (APE) includes all portions of the property that will be directly or indirectly altered by the proposed undertaking. For the purposes of the current study, the APE for each of the developments within the Project is broadly defined and will be refined/narrowed as the Project designs advance. Based on current project plans the following observations can be made regarding the APE:

Neversink (Map 4a)

- The project will consist of a new turbine replacing an existing valve within the intake structure,
- a substation will be sited along the east elevation of the intake structure,
- a buried electrical line will utilize a ductbank along a steep slope to the east of the intake structure and tie into the existing grid along NY 55,
- a staging area will be utilized immediately south of the intake structure.

Pepacton/Downsville (Map 4b)

- The project will entail replacing the existing valve within the release structure,
- a new substation will be sited northwest of the release structure,
- a short underground electrical line will connect the substation to an existing utility pole to the south of the release structure,
- a staging area will be used immediately northeast of the release structure.

Cannonsville (Map 4c)

- A new powerhouse will be constructed immediately north of the existing release works building on the west face of the earthen dam,
- an existing leach field will be relocated to a site also along the west face of the dam,
- underground electric lines will be sited along the west face of the dam,
- overhead lines will also be used near the top of the dam,
- a new substation or switchyard will be built near the existing maintenance facility,
- existing overhead lines will be used to connect to the larger grid,
- three staging areas will be used downstream of the dam along an existing access road,
- a spoil disposal area will be sited downstream of the dam.

Environmental Background

The environment of an area is significant for determining the sensitivity of the project area for archeological resources. Precontact and historic groups often favored level, well-drained areas near wetlands and waterways. Therefore, topography, proximity to wetlands, and soils are examined to determine if there are landforms in the project area that are more likely to contain archeological resources. In addition, bedrock formations may contain chert or other resources that may have been quarried by precontact groups. Soil conditions can also provide a clue to past climatic conditions, as well as changes in local hydrology.

Present Land Use and Current Conditions

Each of the three components of the proposed Project is located within, and immediately adjacent to, an existing dam and reservoir. As such, these areas have witnessed extensive modifications and previous disturbance during their construction. These changes to the landscape are detailed below in the Historical Development section of the report. The soils, surficial bedrock, physiography and drainage of the areas immediately surrounding the proposed developments have been extensively modified from their original condition. A sense of those original conditions, however, can be gleaned from the historical maps and photographs that are presented as part of this report, as well as existing soil conditions and typography.

Soils

Soil surveys provide a general characterization of the types and depths of soils that are found in an area. This information is an important factor in determining the appropriate methodology if and when a field study is recommended. The soil type also informs the degree of artifact visibility and likely recovery rates. For example, artifacts are more visible and more easily recovered in sand than in stiff glacial clay, which will not pass through a screen easily. The United States Department of Agriculture, Natural Resources Conservation

Service (USDA NRCS) soil maps and units presented here are generated at such a scale as to be largely unreliable for the potential APE (Maps 5a-5c). Also, due to extensive land modification that occurred during the construction of the reservoir system, it is highly likely that virtually all of the soils in and around the proposed developments have been disturbed. These data therefore provide an indication of the types of soils that may have been present at these sites prior to construction of the dams and reservoirs.

Table 1. Soils in Cannonsville Project Area

	Name and Symbol	Soil Horizon Depth cm (in)	Texture, Inclusions	Slope	Drainage	Landform
LaC	Lackawanna flaggy silt loam (LaC)	0-46 cm (0-18 in)	Flaggy Si lo	8-15%	Well drained	drumlinoid ridges, hills, till plains
		46-117 cm (18-46 in)	Channery Si lo, flaggy Si lo, Si lo			
		117-180 cm (46-71 in)	Flaggy Si lo			
		180-310 cm (71-122 in)	Flaggy Si lo			
		310-465 cm (122-183 in)	Channery Si lo, very channery Sa lo, flaggy Lo			
LaD	Lackawanna flaggy silt loam (LaD)	0-46 cm (0-18 in)	Flaggy Si lo	15-25%	Well drained	drumlinoid ridges, hills, till plains
		46-117 cm (18-46 in)	Channery Si lo, flaggy Si lo, Si lo			
		117-180 cm (46-71 in)	Flaggy Si lo			
		180-310 cm (71-122 in)	Flaggy Si lo			
		310-465 cm (122-183 in)	Channery Si lo, Si lo, very channery Sa lo, flaggy Lo			
LaE	Lackawanna flaggy silt loam (LaE)	0-46 cm (0-18 in)	Flaggy Si lo	25-40%	Well drained	drumlinoid ridges, hills, till plains
		46-117 cm (18-46 in)	Channery Si lo, flaggy Si lo, Si lo			
		117-180 cm (46-71 in)	Flaggy Si lo			
		180-310 cm (71-122 in)	Flaggy Si lo			
		310-465 cm (122-183 in)	Channery Si lo, very channery Sa lo, flaggy Lo			
LdE	Lackawanna and Bath soils, very stony (LdE)	0-46 cm (0-18 in)	Flaggy Si lo	15-35%	Well drained	drumlinoid ridges, hills, till plains
		46-117 cm (18-46 in)	Channery Si lo, flaggy Si lo, Si lo			
		117-180 cm (46-71 in)	Flaggy Si lo			
		180-310 cm (71-122 in)	Flaggy Si lo			
		310-465 cm (122-183 in)	Channery Si lo, very channery Sa lo, flaggy Lo			
Ud	Udorthents, graded (Ud)	0-25 cm (0-10 in)	Gra sa lo	0-15%	Somewhat excessively	Man-modified

	Name and Symbol	Soil Horizon Depth cm (in)	Texture, Inclusions	Slope	Drainage	Landform
		25-452 cm (10-178 in)	Channery Lo, very Gra sa lo, Si cl lo		drained	
W	Water (W)	- cm (- in)		-%		

Key: Color: Br-Brown, Dk-Dark, Gr-Gray, Re-Red, Y-Yellow, Bk-Black, Ol-Olive
Texture: Co-Coarse, Fi-Fine, Gv-Gravel(ly), Lo-Loam, Sa-Sand, Si-Silt, Vy-Very, cl-clay

Table 2. Soils in Downsville Project Area

	Name and Symbol	Soil Horizon Depth cm (in)	Texture, Inclusions	Slope	Drainage	Landform
ElE	Elka-Vly channery silt loams, very stony (ElE)	Elka 0-8 cm (0-3 in)	Elka Moderately decomposed plant material	15-35%	Elka Well drained	Elka hills
		8-38 cm (3-15 in)	Channery Si lo			
		38-231 cm (15-91 in)	Channery Si lo, very channery Lo, Si lo, Sa lo			
		231-356 cm (91-140 in)	Very channery Si lo			
		356-465 cm (140-183 in)	Very channery Lo, Si lo, Sa lo			
OrF	Oquaga, Lordstown, and Arnot soils, very rocky (OrF)	0-38 cm (0-15 in)	Channery Si lo	35-70%	Well drained	benches, hills, ridges
		38-155 cm (15-61 in)	Very channery Si lo			
		155-218 cm (61-86 in)	Unweathered bedrock			
Ud	Udorthents, graded (Ud)	0-25 cm (0-10 in)	Gra sa lo	0-15%	Somewhat excessively drained	Man-modified
		25-452 cm (10-178 in)	Channery Lo, very Gra sa lo, Si cl lo			
W	Water (W)	- cm (- in)		-%		

Key: Color: Br-Brown, Dk-Dark, Gr-Gray, Re-Red, Y-Yellow, Bk-Black, Ol-Olive
Texture: Co-Coarse, Fi-Fine, Gv-Gravel(ly), Lo-Loam, Sa-Sand, Si-Silt, Vy-Very, cl-clay

Table 3. Soils in Neversink Project Area

Symbol	Name (Symbol)	Depth	Textures	Slope	Drainage	Landform
ArC	Arnot-Rock outcrop complex (ArC)	0-8 cm (0-3 in)	Moderately decomposed plant material	0-15%	Somewhat excessively drained	benches, hills, ridges
		8-20 cm (3-8 in)	Channery loam			
		20-109 cm (8-43 in)	Very channery loam, very channery silt loam			
		109-135 cm (43-53 in)	Unweathered bedrock			
ArE	Arnot-Rock outcrop complex (ArE)	0-8 cm (0-3 in)	Moderately decomposed plant material	15-35%	Somewhat excessively drained	benches, hills, ridges
		8-20 cm (3-8 in)	Channery loam			

Symbol	Name (Symbol)	Depth	Textures	Slope	Drainage	Landform
		20-109 cm (8-43 in)	Very channery loam, very channery silt loam			
		109-135 cm (43-53 in)	Unweathered bedrock			
Ud	Udorthents, smoothed (Ud)	- cm (- in)		0-15%	Moderately well drained	
WeC	Wellsboro gravelly loam (WeC)	0-46 cm (0-18 in)	Gravelly loam	8-15%	Moderately well drained	drumlinoid ridges, hills, till plains
		46-147 cm (18-58 in)	Channery silt loam, gravelly loam, loam			
		147-386 cm (58-152 in)	Channery sandy loam, gravelly loam, silt loam			
		13-25 cm (5-10 in)	Loam			
		25-180 cm (10-71 in)	Channery fine sandy loam, gravelly sandy loam, loam			
		180-386 cm (71-152 in)	Gravelly fine sandy loam, very gravelly sandy loam, loam			

Key: Color: Br-Brown, Dk-Dark, Gr-Gray, Re-Red, Y-Yellow, Bk-Black, Ol-Olive
Texture: Co-Coarse, Fi-Fine, Gv-Gravel(ly), Lo-Loam, Sa-Sand, Si-Silt, Vy-Very, cl-clay

Bedrock Geology

The bedrock geology of the three proposed sites in the Project and their surrounding environs are largely dominated by Devonian Period sedimentary rocks that were laid down in ancient sea beds over 380 million years ago. At Cannonsville and Neversink, the underlying bedrock is principally Walton Formation shale and sandstone, formed as part of the West Falls Group. The formation at Downsville is slightly older, consisting of Enfield and Kattel Formations of shale, siltstone, and sandstone formed as part of the Sonyea Group. These bedrock formations do not contain chert, quartz, or other types of lithic resources that were frequently exploited by Native American people. Nor are there other types of mineral resources exploited later in the historic period. As such, there is little likelihood of precontact or historic era quarries in the area, despite the fact that bedrock is frequently exposed at the surface.

Physiography

Steeply sloped areas are considered largely unsuitable for human occupation. As such, the standards for archeological fieldwork in New York State generally exclude areas with a slope in excess of 12% from archeological testing (NYAC 1994). Exceptions to this rule include steep areas with bedrock outcrops, overhangs, and large boulders that may have been used by precontact people as quarries or rock-shelters. Such areas may still warrant a systematic field examination, however none are expected in the APE of the Project.

Originally, the three reservoirs and their associated dams were set into narrow river valleys of the Catskill Mountains. In particular, the dams were often situated in the narrowest sections of the valley, thereby utilizing the existing landscape to help in the formation of the resulting reservoir. Virtually all of the proposed APE of the Project will be located in areas where the original landscape has been heavily modified during dam and reservoir construction.

DOCUMENTARY RESEARCH

A pre-screening report was generated by Hartgen Archeological Associates, Inc., in May 2009 to assist with the submission of the Pre-Application Document (PAD) to FERC (DEP 2009). The pre-screening involved systematically searching through the archeological site files kept by the Office of Parks, Recreation and Historic Preservation (OPRHP) and the New York State Museum (NYSM) located at the OPRHP archives on Peebles Island, in Waterford, New York. Information concerning all reported precontact and historic period archeological sites within a three-mile (4.8 km) radius of the dam at each reservoir was collected. In addition, data relating to those sites located within and immediately adjacent to each of the three reservoirs, but outside of the 3-mile (4.8 km) search radius was also collected. The OPRHP's electronic database was also searched for properties listed on or eligible for listing on both the State and National Registers of Historic Places that are located within or immediately adjacent to each of the dam sites.

The site files were reviewed again in April 2010 by Rebecca Glazer, Hartgen's senior researcher, to ensure that no new sites or properties were added to the OPRHP database. No new information was located at each of the three sites.

Cannonsville

Previously Reported Cultural Resources

OPRHP and NYSM Identified Archeological Sites

The NYSM and OPRHP files contain 33 reported sites within three miles (4.8 km) of the Cannonsville dam and 14 reported sites outside of the three-mile (4.8 km) search radius but within or immediately adjacent to the reservoir. These sites include 39 historic sites and eight precontact sites. The nearest site, a mid 19th-century sawmill, was identified during a 1979 historic industrial resources survey and is located immediately adjacent to the east side of the Cannonsville dam. Thirty-four of the historic sites located within three miles (4.8 km) of the Cannonsville dam or within and adjacent to the reservoir were identified over the course of the 1979 historic industrial resources survey by utilizing historic maps rather than subsurface archeological investigation. All of those sites identified during the 1979 survey represent 19th-century industrial complexes that were once located along the Delaware River or its contributing tributaries; many of which are now submerged within the Cannonsville Reservoir. The location, brief description, and National Register status of each site are provided below in Table 4. The National Register status of each resource is determined by the OPRHP. Typically, resources are determined to be eligible or ineligible for listing on the National Register based on criteria developed by the National Park Service (1990, revised 2002). In some circumstances, resources have not been evaluated and are listed as unevaluated, in several other instances there were no records to indicate whether resources were evaluated or unevaluated; and for the purposes of this table are listed as unknown.

Table 4: OPRHP/NYSM Archeological sites within three miles (4.8 km) of the Cannonsville dam and within or immediately adjacent to the reservoir.

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
02506.000001		Cider mill (WBD-139)	Mid 19th-century map documented industrial site	Unevaluated	1.5 miles (2.4 km) northeast (now within reservoir)
02506.000002		Sawmill (WBD-141)	Mid 19th-century map documented industrial site	Unevaluated	Immediately adjacent to the east side of dam
02506.000003		Sawmill (WBD-142)	Mid 19th-century map documented industrial site	Unevaluated	1.3 miles (2 km) northwest
02506.000009		H. Hess Sawmill (WBD-156)	Remains of stone foundation and dam associated with mid 19th-century sawmill	Unevaluated	2.4 miles (3.8 km) northeast

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
02506.000010		Sawmill, Wagon Shop (WBD-157)	Mid 19th-century map documented industrial site	Unevaluated	2.1 miles (3.3 km) north
02506.000011		Blind Manufacture (WBD-158)	Mid 19th-century map documented industrial site	Unevaluated	2.2 miles (3.5 km) northwest
02506.000012		Ira Snyder Carding Mill (WBD-159)	Mid 19th-century map documented industrial site	Unevaluated	1.4 miles (2.2 km) northwest
02506.000013		Ira Snyder Axe Factory (WBD-160)	Mid to late 19th-century map documented industrial site	Unevaluated	1.4 miles (2.2 km) northwest
02506.000014		Ira Snyder Sawmill (WBD 161)	Mid to late 19th-century map documented industrial site	Unevaluated	1.4 miles (2.2 km) northwest
02506.000015		Southern NY Power Co. (WBD-160A)	Foundation remains as well as smokestack, sills, and exterior waterwheel associated with early 19th-century power plant	Unevaluated	1.4 miles (2.2 km) northwest
02506.000016	5851	Briggs Site (SUBi-1124)	Late Archaic and Woodland period camp site	Unevaluated	1.3 miles (2.0 km) northwest
02506.000017		Site 2	Late Archaic camp site	Not eligible	1.7 miles (2.7 km) west
02506.000018		DEL-186	Historic quarry	Unevaluated	1.5 miles (2.4 km) south
02506.000019		DEL-187	Historic quarry	Unevaluated	2.1 miles (3.3 km) southeast
02506.000020		DEL-189	Historic quarry	Unevaluated	2.5 miles (4.0 km) southeast
02506.000024		DEL-9932	Undated stone foundation; possibly a barn	Unevaluated	4,900 ft (1,493 m) southwest
02506.000026		Deposit Airport I Site (SUBi-2048)	Late Archaic, Middle Woodland, and Late Woodland components: chert flakes, fire-cracked rock, points, biface, pottery fragments	Unevaluated	2.5 miles (4.0 km) southwest
02506.000027		Deposit Airport II Site (SUBi-2049)	Archaic through Late Woodland: biface, points, pottery fragments, flakes, and an adze	Unevaluated	2.4 miles (3.8 km) southwest
02506.000028		Wheeler Historic Site (SUBi-2070)	Architectural and domestic deposits dating to the mid-19th century	Unevaluated	2.4 miles (3.8 km) southwest
02518.000002		Sawmill (WBD-97)	Mid 19th-century map documented industrial site	Unevaluated	9.5 miles (15.2 km) northeast
02518.000004		Sawmill (WBD-99)	Mid 19th-century map documented industrial site	Unevaluated	7 miles (11.2 km) northeast (now within reservoir)
02518.000009		N. Boyd Sawmill (WBD-103)	Mid 19th-century map documented industrial site	Unevaluated	6.9 miles (11.1 km) northeast (now within Dryden Brook inlet of reservoir)
02518.000010		Sawmill (WBD-104)	Mid 19th-century map documented industrial site	Unevaluated	6.4 miles (10.2 km) northeast (now within reservoir)

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
02518.000011		Gregory Sawmill (WBD-105)	Early through mid 19th-century map documented industrial site	Unevaluated	6.1 miles (9.8 km) northeast (now within reservoir)
02518.000012		Sawmill (WBD-106)	Early 19th-century map documented industrial site	Unevaluated	5.5 miles (8.8 km) northeast (now within reservoir)
02518.000013		W.H. Sprague Lumber Manufactory (WBD-107)	Mid 19th-century map documented industrial site	Unevaluated	3.6 miles (5.7 km) northeast (now within reservoir)
02518.000014		E.B. & M.W. Owens Wagon Shop, Blacksmith Shop (WBD-109)	Mid 19th-century map documented industrial site	Unevaluated	3.5 miles (5.6 km) northeast (now within reservoir)
02518.000025		J. Tillotson Sawmill (WBD-128)	Mid 19th-century map documented industrial site	Unevaluated	7.9 miles (12.7 km) northeast (now within reservoir)
02518.000026		W. Huggins/W.B. McGibbon Sawmill (WBD-130)	Early through mid 19th-century map documented industrial site	Unevaluated	5.5 miles (8.8 km) northeast (now within reservoir)
02518.000028		Sprague/Ogden & Leal/Jester/Deposit Milling Co./McLaughlin Gristmill (WBD-132)	Early through late 19th-century map documented industrial site	Unevaluated	3 miles (4.8 km) northeast (now within reservoir)
02518.000029		J.A. Kenyon Tannery (WBD-133)	Mid through late 19th-century map documented industrial site	Unevaluated	3 miles (4.8 km) northeast (now within reservoir)
02518.000030		Sawmill (WBD-134)	Early through mid 19th-century map documented industrial site	Unevaluated	3 miles (4.8 km) northeast (now within reservoir)
02518.000031		Huntington Sawmill (WBD-135)	Early through late 19th-century map documented industrial site	Unevaluated	2.1 miles (3.3 km) east (now within reservoir)
02518.000033		E. Boyd Sawmill (WBD-137)	Mid 19th-century map documented industrial site	Unevaluated	2.9 miles (4.6 km) northeast
02518.000034		Burr Map Sawmill (WBD-138)	Early 19th-century map documented industrial site	Unevaluated	1.5 miles (2.4 km) northeast (now within reservoir)
02519.000032		E. Beers/W. Beers/O. Hanford Sawmill (WBD-96)	Mid 19th-century map documented industrial site	Unevaluated	9.4 miles (15.1 km) northeast
02544.000003		Tannery (WBD-162)	Mid 19th-century map documented industrial site	Unevaluated	2 miles (3.2 km) west
02544.000004		Deposit Steam Mill (WBD-163)	Mid 19th-century map documented industrial site	Unevaluated	2 miles (3.2 km) west
02544.000005		R. H. Evans Cottage D Sawmill (WBD-164)	Mid 19th-century map documented industrial site	Unevaluated	1.9 miles (3.0 km) west
02544.000006		W. Evans/B.E. Hadley Sawmill (WBD-165)	Mid 19th-century map documented industrial site	Unevaluated	1.9 miles (3.0 km) west

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
02544.000007		Hadley Steam Mill (WBD-167)	Late 19th-century map documented industrial site	Unevaluated	2.1 miles (3.3 km) west
02544.000008		N.K.W. Sash Factory (WBD-168)	Mid 19th-century map documented industrial site	Unevaluated	2.2 miles (3.5 km) west
02544.000009		Organ Factory and Wagon Shop (WBD-169)	Mid 19th-century map documented industrial site	Unevaluated	2.3 miles (3.7 km) west
02544.000013		Deposit Airport III Site	Chert flakes, cortical chunk, chert shatter fragments	Unevaluated	2.4 miles (3.8 km) west
	761	No information	One fluted projectile point identified as a stray find	Unknown	3 miles (4.8 km) northeast (now within reservoir)
	3131	No information	Reported location of a precontact village burial site	Unknown	1.4 miles (2.2 km) west
	8407	No information	Reported traces of precontact occupation	Unknown	2 miles (3.2 km) west

State and National Register of Historic Places

A review of the OPRHP computer inventory identified no properties listed on the State or National Register of Historic Places or eligible for such a listing immediately adjacent to the Cannonsville dam.

Downsville/Pepacton

Previously Reported Cultural Resources

OPRHP and NYSM Identified Archeological Sites

The NYSM and OPRHP files contain 22 reported sites within three miles (4.8 km) of the Downsville dam and 29 reported sites outside of the three-mile (4.8 km) search radius but within or immediately adjacent to the associated Pepacton reservoir. These sites include 47 historic sites and four precontact sites. The nearest site is a mid 19th-century sawmill located approximately 3,200 feet east of the dam that was identified through a 1979 industrial resource survey which relied primarily upon historic maps to identify historic sites. Of the 47 documented historic sites located within three miles (4.8 km) of the Downsville dam or within and adjacent to the reservoir, 45 were identified during the 1979 historic industrial resources survey representing several 18th- and 19th-century industrial complexes that were once located along the Delaware River or its contributing tributaries. Many of these industrial sites are now submerged within the Pepacton Reservoir. The location, brief description, and National Register status of each site are provided below in Table 5.

Table 5: OPRHP/NYSM Archeological sites within three miles (4.8 km) of the Downsville dam and within or immediately adjacent to the reservoir.

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
02501.000002		Sawmill (EBD-59)	Mid 19th-century map documented industrial site	Unevaluated	11.5 miles (18.5 km) northeast (now within reservoir)
02501.000003		L.D. Jackson Sawmill (EBD-61)	Mid 19th-century map documented industrial site	Unevaluated	11.2 miles (18.0 km) northeast (now within reservoir)

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
02501.000004		L.D. Jackson Gristmill (EBD-62)	Mid 19th-century map documented industrial site	Unevaluated	11.2 miles (18.0 km) northeast (now within reservoir)
02501.000005		Sawmill (EBD-64)	Mid 19th-century map documented industrial site	Unevaluated	10.5 miles (16.8 km) northeast
02501.000006		T. Gregory Sawmill (EBD-65)	Mid 19th-century map documented industrial site	Unevaluated	9.5 miles (15.2 km) northeast (now within reservoir)
02501.000010		H. Hawver/Leander Barnhart & Anson Jenkins Sawmill (EBD-69)	Mid 19th-century map documented industrial site	Unevaluated	6.7 miles (10.7 km) east (now within reservoir)
02501.000011		J. Dickson Sawmill (EBD-71)	Mid 19th-century map documented industrial site	Unevaluated	7.5 miles (12.0 km) northeast (now within reservoir)
02501.000021		James and L.B. McCabe Sawmill (EBD-96)	Mid 19th-century map documented industrial site	Unevaluated	8 miles (12.8 km) northeast
02501.000022		Andrew Hawver Sawmill (EBD-97)	Mid 19th-century map documented industrial site	Unevaluated	7.8 miles (12.5 km) northeast (now within reservoir)
02501.000023		Samuel McCabe & Sons/ Andrew Hawver Tannery (EBD-99)	Early to mid 19th-century map documented industrial site	Unevaluated	7.8 miles (12.5 km) northeast (now within reservoir)
02501.000024		W.B. Shafer Sawmill (EBD-101)	Early to mid 19th-century map documented industrial site	Unevaluated	7.3 miles (11.7 km) northeast (now within reservoir)
02501.000025		George Wilson Sawmill (EBD-102)	Mid 19th-century map documented industrial site	Unevaluated	7.6 miles (12.2 km) northeast (now within reservoir)
02501.000026		James Wilson Sawmill (EBD-103)	Mid 19th-century map documented industrial site	Unevaluated	6.5 miles (10.4 km) northeast (now within reservoir)
02501.000027		Alfred Shaver Sawmill (EBD-105)	Mid 19th-century map documented industrial site	Unevaluated	6.5 miles (10.4 km) east (now within reservoir)
02501.000033		William Shaver Sawmill (EBD-111)	Mid 19th-century map documented industrial site	Unevaluated	6.7 miles (10.7 km) east (now within reservoir)
02503.000004		H.S. Shaver Sawmill (EBD-112)	Mid 19th-century map documented industrial site	Unevaluated	4.5 miles (7.2 km) northeast (now within reservoir)
02503.000005		Shaver Tannery (EBD-113)	Mid 19th-century map documented industrial site	Unevaluated	4.5 miles (7.2 km) northeast (now within reservoir)
02503.000008		Philip Allen Sawmill (EBD-116)	Mid 19th-century map documented industrial site	Unevaluated	4 miles (6.4 km) east (now within reservoir)
02503.000009		Sawmill (EBD-117)	Mid 19th-century map documented industrial site	Unevaluated	4 miles (6.4 km) east (now within reservoir)
02503.000011		A.C. Biggar Sawmill (EBD-121)	Mid 19th-century map documented industrial site	Unevaluated	4.8 miles (7.7 km) northeast

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
02503.000012		Anthony Lloyd Gristmill (EBD-122A)	Late 18th-century map documented industrial site	Unevaluated	4 miles (6.4 km) northeast (now within reservoir)
02503.000014		Cidermill (EBD-124)	Mid 19th-century map documented industrial site	Unevaluated	4 miles (6.4 km) northeast (now within reservoir)
02503.000015		H. Hurlburt Sawmill (EBD-125)	Mid 19th-century map documented industrial site	Unevaluated	4 miles (6.4 km) northeast (now within reservoir)
02503.000016		David Wilson Sawmill (EBD-127)	Mid 19th-century map documented industrial site	Unevaluated	2.7 miles (4.3 km) east (now within reservoir)
02503.000017		John Merit Sawmill (EBD-128)	Mid 19th-century map documented industrial site	Unevaluated	2.4 miles (3.8 km) northeast
02503.000018		Sawmill (EBD-129)	Remains of a masonry dam and foundation associated with a mid19th-century sawmill	Unevaluated	2.2 miles (3.5 km) northeast
02503.000019		John Holmes Sawmill (EBD-130)	Mid 19th-century map documented industrial site	Unevaluated	1.6 miles (2.5 km) northeast (now within reservoir)
02503.000020		Hiram More Sawmill (EBD-131)	Mid 19th-century map documented industrial site	Unevaluated	1.5 miles (2.4 km) northeast
02503.000021		Miller Sawmill (EBD-133)	Mid 19th-century map documented industrial site	Unevaluated	1.7 miles (2.7 km) southeast
02503.000022		Sawmill (EBD-134)	Mid 19th-century map documented industrial site	Unevaluated	3,200 ft (975 m) east
02503.000026		S. Hotchkiss Sawmill (EBD-140)	Stonework remains associated with a mid 19th-century sawmill	Unevaluated	2.1 miles (3.3 km) north
02503.000027		N. Elwood Sawmill (EBD-141)	Remains of foundation and dam associated with a mid 19th-century sawmill	Unevaluated	1.7 miles (2.7 km) north
02503.000029		J. S. William Sawmill (EBD-143)	Mid 19th-century map documented industrial site	Unevaluated	2.5 miles (4.0 km) northwest
02503.000030		Robert Beates Sawmill (EBD-144)	Mid 19th-century map documented industrial site	Unevaluated	1.3 miles (2.0 km) northwest
02503.000036		Sawmill (EBD-150)	Mid 19th-century map documented industrial site	Unevaluated	2.6 miles (4.1 km) northwest
02503.000037		Sawmill (EBD-151)	Mid 19th-century map documented industrial site	Unevaluated	2.4 miles (3.8 km) northwest
02503.000038		William Rose Gristmill (EBD-152)	Revolutionary War period map documented industrial site	Unevaluated	1.7 miles (2.7 km) northwest
02503.000039		George Downs/J.D. Downs Tannery (EBD-153)	Mid 19th-century map documented industrial site	Unevaluated	1.4 miles (2.2 km) northwest
02503.000040		J.D. Downs & Elwood Gristmill (EBD-154)	Mid 19th-century map documented industrial site	Unevaluated	1.3 miles (2.0 km) northwest
02503.000041		Steam Sawmill (EBD-154A)	Late 19th-century map documented industrial site	Unevaluated	2.2 miles (3.5 km) southwest

OPRHP #	NYSM #	Identifier	Description	National Register Status	Location in Relation to Dam
02503.000042		Downs & Elwood Sawmill (EBD-155)	Remains of dam and laid stone foundation associated with a mid 19th-century sawmill	Unevaluated	1.7 miles (2.7 km) southwest
02503.000043		J. & H. & P. Radeker Sawmill (EBD-156)	Remains of dam associated with a mid 19th-century sawmill	Unevaluated	2.2 miles (3.5 km) southwest
02503.000044		A. Campbell Sawmill and Gristmill (EBD-157)	Remains of dam associated with a mid 19th-century sawmill/gristmill	Unevaluated	2.4 miles (3.8 km) southwest
02503.000045		H. Radeker Sawmill (EBD-158)	Remains of a stone dam associated with a mid 19th-century sawmill	Unevaluated	2.8 miles (4.5 km) southwest
02503.000067		14-81-4	Mid to late 19th-century house foundation with cellar hole	Unevaluated	5,000 ft (1,524 m) southeast
02514.000041		N. Tompkins Sawmill (EBD-58)	Mid 19th-century map documented industrial site	Unevaluated	12 miles (19.3 km) northeast
	3124	ACP DELA 6	Apple orchard associated with historic village	Unknown	3 miles (4.8 km) east (now within reservoir)
	3125	ACP DELA 7A	Precontact village site fortified with earthworks and "abundant in arrowheads"	Unknown	12.5 miles (20.11 km) northeast (now within reservoir)
	7316	ACP DELA 7B	Precontact village site fortified with earthworks and trees; trees date fort to approximately 1000 years old	Unknown	11.5 miles (18.5 km) northeast (now within reservoir)
	7317	ACP DELA 7C	Stone battle axe and "abundant arrowheads" uncovered in immediate locality of NYSM 3125 and 7316	Unknown	11.5 miles (18.5 km) northeast (now within reservoir)
	8014	No Information	Precontact village site	Unknown	3.4 miles (5.4 km) northeast (now within reservoir)

State and National Register of Historic Places

A review of the OPRHP computer inventory did not identify any properties listed on the State or National Register of Historic Places or eligible for such a listing immediately adjacent to the Downsville dam.

Neversink

Previously Reported Cultural Resources

OPRHP and NYSM Identified Archeological Sites

The NYSM and OPRHP files contain only one reported site, NYSM 8643, within three miles (4.8 km) of the Neversink dam. NYSM 8643 is described as an "Indian trail" that extends along the entire length of the eastern half of the Neversink Reservoir, including the area now occupied by the dam. No other sites were reported within or immediately adjacent to the reservoir.

State and National Register of Historic Places

A review of the OPRHP computer inventory did not identify any properties listed on the State and National Registers of Historic Places or eligible for such a listing immediately adjacent to the Neversink dam.

Summary

The site file search revealed that a number of archeological sites are located within a three-mile (4.8 km) radius of the dams at each of the proposed sites, as well as along the edges of the shorelines of the associated reservoirs or within the reservoir. In all, 99 sites were located in the vicinity of the three proposed developments of the Project. At Cannonsville 47 sites had been previously reported; 33 within three miles (4.8 km) of the dam and another 14 within or along the reservoir. Near the Downsville dam, there were 22 previously reported sites within a three-mile (4.8 km) radius. Another 29 sites were located within or along the reservoir. Only one site was previously reported at Neversink. The vast majority—85 of 99 sites—were historic. The remaining 14 sites were precontact in age. Of these, four were located during recent cultural resource surveys for the Deposit Airport by the Public Archaeology Facility; the others are reported sites with little additional information.

Many of the 85 historical sites are reported based on a 1979 industrial survey of the area that utilized historical maps of the area. No reconnaissance or fieldwork occurred at any of these sites, and much of the information concerning the sites including their location was gleaned from the maps. Many of the sites are now submerged under the reservoir and not within the immediate vicinity of the Project.

At Cannonsville, a sawmill site is reported immediately behind the dam. A review of the historical maps presented below suggests the site is now under the reservoir and will not be impacted by the Project. Similarly, a sawmill site was reported east of the Downsville dam, over 3,000 feet to the east. This site too is now submerged and will not be impacted by the Project.

There are no State or National Register listed or eligible properties within the immediate vicinity of the APE of the three proposed sites of the Project.

HISTORICAL DEVELOPMENT OF THE PROJECT

Overview

The Neversink, Pepacton, and Cannonsville Reservoirs are part of a large network of related systems that provide the City of New York with drinking water (Maps 1a and 1b). Together, the system consists of over 315 miles of aqueducts and tunnels, 22 dams and storage reservoirs, five distribution and balancing reservoirs, and numerous appurtenances (Bone 2006b:213). The system is broadly divided into the East of Hudson facilities, also known as the New Croton system, which is the earliest of the groups, and the West of Hudson facilities. The West of Hudson facilities can be further divided into the Catskill and Delaware systems. The Delaware system (including the Neversink, Pepacton, and Cannonsville reservoirs) comprises the latest and largest of the aqueducts, dams, and reservoirs and is the focus of the current study (Map 1b). A brief overview of the entire system is provided below, together with more detailed histories of the Neversink, Pepacton, and Cannonsville reservoirs.

The Old Croton system was initiated in the 1830s and represents the first organized attempt by the city government to provide clean and reliable water to its residents. The Old Croton system consisted of damming the Croton River in Westchester County. Water was fed through an aqueduct into two receiving reservoirs in the city itself. By 1911, the system was expanded to include 12 reservoirs which necessitated the construction of a second larger aqueduct started in 1885 (Bone 2006a:12-13).

Despite efforts to expand the water system, New York City grew at a rate that threatened to exceed its supply of water. State legislation created the Board of Water Supply (Board), as a result, and tasked the group with exploring new options for the water system. The Board immediately set out to construct a new Catskill system. The Catskill system eventually grew to include two new reservoirs and over 92 miles of aqueducts.

By 1922, the Catskill system virtually doubled the water supply for New York City. Shortly afterwards, the Board began planning for further expansion of the system and turned its attention to the Delaware River watershed. Over the next few decades, the Board built another four reservoirs and 159 miles of pressurized supply tunnels and an 84-mile long aqueduct. By 1965, the Delaware system added capacity for another 850 million gallons of water per day (although this is rarely if ever reached) from 1,015 square miles of watershed (Bone 2006a:13).

Appendix 1 presents a sample of historical maps, plans, drawings and photographs detailing the construction of the dams. These were found in the DEP Grahamsville office library and were culled from various annual reports of the Board, as well as issued contract specifications. The plans will assist the reader in understanding the various components of the dam and its relationship to the proposed APE of the Project. The photos also provide evidence for the scale and scope of the construction efforts and the impact on the surrounding landscape.

Neversink

The Neversink Reservoir was initially planned around 1927 as part of the New York City drinking water system and draws on the Neversink River watershed (Photos 1-6). The original plan contemplated a site upstream of its present location in the Village of Curry. These plans were changed, however, and the revised concept called for a dam near the Village of Neversink. The new design tripled the amount of water the reservoir could potentially hold (Bone 2006b:208). To make way for the dam and reservoir, farms and 1,500 residents in the hamlets of Neversink and Bittersweet had to be removed.

Site clearance began in 1941. Due to similarities in geophysical conditions, construction techniques mirrored those previously utilized at the Merriman dam (Rondout Reservoir), which was nearly complete by this time. Construction of the reservoir and aqueduct was delayed by World War II, and extended over the next 14 years. The project was completed on October 23, 1955 (Neversink 2010).

At Neversink, the underlying bedrock lay fairly deep. This necessitated a large trench at the site of the core-wall, excavated about 50 feet deep from the original ground surface. Additional excavation was needed to reach the bedrock, which was over 100 feet deep in some places. As a result, individual caissons were sunk down to the bedrock from the bottom of the cut-off trench. Concrete subsequently filled the caissons. Over the caissons, a poured concrete wall completed the cut-off wall. Atop the cut-off wall, construction crews laid an impervious mixture of clay soils. Various grades of material were packed overtop of the impervious core to create the earthen embankment. On the reservoir side stone rip-rap was installed; workers placed topsoil on the downstream side of the dam surface and sowed grass. The resulting lawn is carefully maintained to prevent the growth of trees and brush (Photo 2).

Construction of the spillway was undertaken once the embankment was completed. A portion of the original diversion channel was subsequently incorporated into the waste weir and outlet channel (Photo 3). A new inclined tunnel connected the intake chamber and the outlet channel. Once the dam was completed, flow through the outlet channel and aqueduct was controlled by a series of valves inside the intake structure located at the northeast corner of the dam.

The diversion channel was eventually plugged with concrete and the reservoir began to fill. Work on the reservoir was intermittent due to the war. By 1953, the reservoir was completely filled and water over topped the spillway (Bone 2006b:209). A year later the system was brought on-line. The impoundment at the spillway elevation of 1440 feet above msl covers 93 square miles and consists of a storage capacity of 35 billion gallons of water.

A portion of the water leaving the reservoir is redirected into the inclined tunnel to the outlet channel to provide a minimum flow for the downstream reaches of the Neversink River. The minimum flow is based on a release regime agreed to by the Decree Parties[1] that assists in mitigating flood events, and provides flow in the mainstream and Delaware Bay to help protect ecological health (DEP 2009). As a result, each of the City of New York dams on the Delaware River is equipped with mechanisms for releasing water. At Neversink, the release chamber is situated within the intake structure that regulates flow to the Neversink tunnel. At Cannonsville and Downsville, the intake structures are located at a distance from the dam, therefore separate release water chambers were incorporated into the construction of those dams.

According to the construction documents and related photographs, this area has been heavily disturbed from the construction of the dam and nearby Neversink Tunnel. Early construction documents indicate that grading occurred at least to the 1,500 foot elevation level, or about half of the distance from the intake structure to NY 55. During the site visit, a lack of trees older than 50 years in age along the slope was noted, indicating that the entire hill side was cleared of vegetation and perhaps graded as part of the dam building efforts in the early 1950s (Photo 7).

Downsville/Pepacton

Construction of the Downsville dam and Pepacton Reservoir began in 1947 and was completed around 1954 (Photos 8-13). At the time, the reservoir and dam were the largest in the New York City Water system, holding 140 billion gallons collected from a watershed over 372 square miles in area (Bone 2006b:209). The resulting reservoir stretches over 18.5 miles. To accommodate the new dam and reservoir, nearly 200 buildings and their appurtenant structures and facilities were removed, along with large trees and other vegetation. The communities of Arena, Shavertown, Pepacton, and Union Grove were impacted by the work, resulting in the displacement of over 900 people.

The dam was situated along a narrow of the river valley between the Village of Downsville and the hamlet of Pepacton. John Burroughs, a resident of the area who wrote about his experiences in the valley, identified the word "Pepacton" as an Indian name for the East Branch, meaning "marriage of the waters" (Burroughs 1900:v). According to historical maps, there was sparse development in this area. At least two buildings appear to have been present in the immediate vicinity of the dam, including one in the proximity of the project area at the north abutment of the dam near the spillway. In addition to the buildings, a road along the north shore had to be relocated further up the hill away from the dam, and a section of the Delaware and Hudson Railroad was also moved to higher ground near the south end of the dam.

Cannonsville

The Cannonsville Reservoir is located along the West Branch of the Delaware River in Delaware County in the Towns of Tompkins and Deposit, just east of the Village of Deposit. Constructed between 1960 and 1965, the reservoir has a normal storage capacity of 300,000 acre-feet or 95.7 billion gallons of water (Bone 2006b:213). The reservoir consists of an earth-fill embankment dam, stone masonry sided channel spillway,

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[1] The Decree Parties include the State of New York, the State of New Jersey, the State of Delaware, the Commonwealth of Pennsylvania, and the City of New York and are parties to a 1954 Supreme Court Decree that stipulates the City of New York's right to 850 MGD of water from the Delaware watershed and associated conditions thereof.

overflow weir and its associated stilling basin, concrete intake tower, an intake structure, concrete water release chamber and its associated stilling basin, the West Delaware tunnel aqueduct and its associated intake structure, and the impoundment.

The construction of the dam and reservoir resulted in the displacement of 94 farms and the relocation of all or parts of five settlements with over 900 people along the river. The dam is situated between the modern day Village of Deposit and the former hamlet of Cannonsville. The dam is located in a narrow segment of the valley just downstream from a former mill with its extensive headrace, mill pond, and tailrace. The former mill complex is located behind the current dam and all archeological evidence was likely erased during the construction of the dam and preparation of the land for the subsequent reservoir. The mill complex formed a long, thin island along the main channel of the river.

HISTORICAL MAP REVIEW

In general, the project areas have been heavily modified by the construction of the associated dams and subsequent clearing and filling of the reservoirs. During the course of construction for each of the water supply systems, numerous homes, farms, local industries and businesses, and social institutions were removed and/or relocated. In most instances, the dams were placed at narrows within their respective valleys. As such, there is often relatively sparse development in the immediate vicinities of the dams.

Neversink

According to the 1910 USGS map that was photo-revised in 1932, there are two structures in the vicinity of the Project APE (the current valve house) (Map 6). Later Board maps from 1948 (see Appendix 1) indicate the engineer's house and water tanks approximately in the location of the two structures on the USGS map. Both structures are located well to the northeast. It is unclear if these are the same structures (perhaps the engineer's house was a former residence that was repurposed) or if these structures were removed and the water tanks and engineer's house were built specifically for the project. These structures are no longer extant, nor is there any surface indication of them. The location of the structures is outside of the APE.

Downsville/Pepacton

At Downsville, the historical maps indicate a number of farms in the vicinity of dam and spillway. Early maps such as the Burr 1829 and Gould 1856 maps (not reproduced here) provide a general sense of the vicinity of the project area as intermittently settled with small family farmsteads. According to Beers 1869 map, there are three farms on the north side of the river including those belonging to "I. Teed," "H. Fuller," and "L. Hawley" (Map 7). On the east side, is one farm that was owned by "J. Brorle." Also of note, is a label along the flats of the river, below the current location of the dam, indicating the location of the "Old Indian Camp." The next detailed map of the area was not produced until 1924 by the USGS (Map 8). It appears that the three farms along the north side of the river are still extant, as well as one along the south side. Also by this time, the Delaware and Hudson Railroad had constructed its line along the south side of the river. In 1947, the Board survey map (see Appendix 1) indicates at least five farmsteads on the north side of the river in the vicinity of the dam and outlet channel, each with their own constellation of barns and outbuildings. Also indicated is a single farm along the south side. Several other buildings are also indicated in the general vicinity on both sides of the river. None of the structures are labeled. This map is particularly important since it overlays the proposed construction of the dam, outlet channel, inclined tunnel portal and other important features on former landscape of the area. According to this map, there are no structures in the immediate vicinity of the proposed APE. Further, the map indicates how extensively modified this area is following the construction of the dam and reservoir.

Cannonsville

The early historical maps of the area surrounding Cannonsvillle including the 1829 Burr map provide only a general sense of the development of the area. The Gould map of 1856 (not reproduced here) and the Beers maps of 1869 are very similar, however the Beers map provides more detail. According to the Beers map, there are five structures in the vicinity of the Cannonsville dam; four houses and a sawmill (Map 9). On the north side of the river area structures owned by "Widow W. Commings," "P.L. Burrows", and another by "Mrs. Burrows." The sawmill and "Palmer" house are located on the south side near the vicinity of the proposed powerhouse. Based on the map information, an archeological site—the former location of a sawmill to the east of the dam—has been reported to the OPRHP. The next detailed map of the area was not produced until 1926 by the USGS (Map 10). This map indicates a structure very near the north abutment of the dam, but no structures along the south side. What appears to be the remnants of the mills' headrace, pond, and tailrace are indicated as a narrow side branch of the river on this map, but there is no indication of the Palmer sawmill or house (suggesting that it was no longer extant by this time). The "Burrow" houses on the north side of the river are still extant at this time. Based on comparison with modern topographic maps, it appears that the former "Mrs. Burrows" house is north of the spillway. The "P.L. Burrows" house is located west of the spoil disposal and Staging Area 1, outside of the APE. A series of maps printed for the Board annual report did not indicate any structures that were present around 1960 during the construction of the dam (see Appendix 1). Based on the former topography of the area it is likely that the sawmill and its appurtenant facilities were located to the east of the dam (as indicated on the OPRHP site form). The circa 1960 construction maps also indicate that the land around the current APE has been extensively modified to accommodate the new dam and release chamber, especially those areas along the former river bank and downstream of the dam on the north side of what is now effectively a man-made island. This appears to be confirmed by both the soils maps (Map 5c) and orthoimages (Map 3c) of the areas.

ARCHITECTURAL DISCUSSION

Neversink

The Neversink reservoir consists of an earthen embankment dam, intake chamber, tunneled aqueduct, spillway, waste weir, outlet channel and stilling basin composed of concrete and cut stone, and the impoundment itself (Photos 1-6). The impoundment at the spillway elevation of 1440 feet above msl covers 93 square miles and consists of a storage capacity of 35 billion gallons of water. The dam is 2,830 feet long with a maximum height above the original ground surface of about 190 feet. The Neversink tunnel is approximately 5 miles long and connects to the Rondout Reservoir and eventually the Delaware aqueduct.

Like the dams at Downsville and Cannonsville, Neversink is a large earthen dam (Photos 1 and 2). Dams of this scale had not been previously attempted. Yet with new material, technologies, and machinery, massive projects such as this were suddenly feasible by the second quarter of the 20th century. The dams were all constructed in similar fashion, beginning with the construction of a diversion channel that steers water from the construction of the dam. The cores of the dams at Neversink and Pepacton consist of concrete cut-off walls keyed to the underlying bedrock. At Cannonsville the core-wall was composed entirely of compacted soils (Bone 2006b:212). These cut-off walls are critical in preventing water from seeping under the earthen fill and threatening the integrity of the dam. The core-wall construction differed slightly at each location. The Neversink dam was designed by engineer Medwin Matthews. Contract documents for this structure are dated January 2, 1948 and bear the name of Roger W. Armstrong, chief engineer, along with those of consulting engineers Karl R. Kermison, Thomas H. Wiggin and Silas H. Woodard. The contract for its construction was signed with S. A. Healy Company of White Plains, NY on April 22 of that same year (Contract 365 1948).

The intake structure is a two-story brick and concrete building completed in 1954, and its primary function is to regulate the flow of water through the Neversink tunnel (Photo 4 and 5). A portion of the water, however, is redirected into the inclined tunnel to the outlet channel to provide a minimum flow for the downstream reaches of the Neversink River. At Neversink, the release chamber is situated within the intake structure that regulates flow to the Neversink tunnel.

The proposed turbine will be installed in the release water tunnel between the intake chamber and the waste weir and outlet channel (Photo 6). The turbine will replace the existing valve that regulates the water through the release tunnel. Since the turbine will be installed in an existing facility, ground disturbing activities associated with the new hydroelectric facility will be minimal. A substation will be constructed along the east elevation of the existing intake structure. The switch yard will be approximately 1,000 square feet in size; its final location has yet to be determined. Power will be supplied to the existing grid by tying into an electrical ductbank immediately to the east of the intake structure along a steeply sloped hill below NY 55 (Photo 7).

Downsville/Pepacton

The contract drawings for the Downsville/Pepaction dam and appurtenant structures are dated December 1, 1949. They are signed by Medwin Matthews "designing engineer" (Contract 401 1950). The dam is an earthen embankment approximately 2,400 feet in length with a height of approximately 200 feet above the original ground surface (Photos 8-13). At the core of the dam is a concrete cut-off wall that was buried in a trench and joined to the underlying bedrock, at some locations over 110 feet deep. Above the cut-off wall, a layer of impervious clay fill was placed, over which heavy machinery rolled sorted grades of soil. The crest of the dam is about 45 feet wide and carries a small, paved access road for maintenance of the facility (Photo 8). The interior wall of the dam is protected with stone rip-rap (Photo 9), the downstream wall is grass covered and exposed.

Water is released from the reservoir through three separate facilities. The first is a waste-weir and spillway located at the west abutment of the dam (Photos 10-13). The curvilinear waste weir is a composite of concrete and granite masonry (Photo 10). The S-shape of the waste weir is designed to minimize the impacts of scouring (Bone 2006b:210). The ogee-shaped weir allows excess water in the reservoir into the spillway which was carved out of the surrounding bedrock.

The crest of the spillway is 1,280 feet and it extends 800 feet in length from northeast to southwest. The spillway is lined with a mortared granite facing and is about 950 feet long. The spillway empties water into a 40-foot diameter tunnel (originally the diversion tunnel during dam construction) (Bone 2006b:210) (Photo 11). In the event water flow exceeds the tunnel, there is a waste channel above the tunnel. Both the tunnel and upper waste channel discharge into a stilling pool with 10-foot high concrete steps to slow the force of the water before entering an open waste channel that flows into the East Delaware River downstream. The water is further calmed by a small, concrete weir in the river approximately 2000 feet from the spillway (Bone 2006b:210).

An intake structure is located immediately to the south of the spillway to regulate a minimum flow of water back into the East Delaware when water is below the crest of the waste weir (Photos 12 and 13). It was designed by Chester W. Allen, architect, and drawings of it were included in the original contract documents dated December 1, 1949 (Contract 401 1950). The intake is an 8-foot diameter tunnel that transitions to two 5-foot diameter pipes that enter the release chamber. A series of valves regulate the flow. The valves are controlled in the two-story brick and concrete superstructure above the release water chamber. The structure was completed in 1954 as evidenced by a date-stone incorporated into a large frieze just below the second floor windows. Water exits through a stilling chamber and into the 40-foot diversion tunnel that is part of the spillway.

The East Delaware tunnel intake is located approximately 3.5 miles upstream of the dam. The intake chamber has two inlets separated by a concrete pier. The inlets are further divided vertically providing four different levels of flow that can be regulated via sluice gates. The pressure tunnel is bored through bedrock and has a diameter of about 11 feet. The tunnel walls are supported by gunite (a sprayable concrete mixture), concrete arches, and/or steel frames. Its capacity is 700 million gallons of water per day. The East Delaware tunnel or aqueduct extends 25 miles to the southeast and, like the West Delaware aqueduct, empties into the Rondout Reservoir for settling (Bone 2006b:210). A maintenance shop and garage were constructed in 1969.

Cannonsville

The Cannonsville reservoir is located along the West Branch of the Delaware River in Delaware County in the Towns of Tompkins and Deposit, just east of the Village of Deposit. Constructed between 1960 and 1965, the reservoir has a normal storage capacity of 300,000 acre-feet or 95.7 billion gallons of water (Bone

2006b:213). The contract drawings are dated July 2, 1956, and are signed by Stanley M. Dore, chief engineer and by consulting engineers Thomas H. Wiggin, Malcolm Pirnie, and Karl R. Kennison. Medwin Matthews was Acting Executive Design Engineer and George E. Hugh was Acting Division Engineer (Contract 462 1956).

The reservoir consists of an earth-filled embankment dam, stone masonry sided channel spillway, overflow weir and its associated stilling basin, concrete intake tower, an intake structure, concrete water release chamber and its associated stilling basin, the West Delaware tunnel aqueduct and its associated intake structure, and the impoundment.

The dam at Cannonsville is slightly different from those at Neversink and Downsville, instead of a concrete core-wall keyed to the underlying bedrock, the core of the dam consists of impervious soils tightly packed together (Bone 2006b:213). A cut-off trench was still constructed to ensure that water did not seep under the dam. And although made of compacted soil, the core-wall was much smaller than the ones utilized at Neversink and Downsville. The dam is situated in a narrow of the steeply-sided valley of the West Branch and stands 204 feet above the original ground surface. The dam is faced on the impoundment side with stone rip-rap. On the downstream side, the earthen fill was capped with topsoil and grass planted over top (Bone 2006b:213) (Photo 14).

The overflow weir was excavated through bedrock and is largely faced with granite masonry (Photo 15). Its total length is 800 feet. Two separate crests at the north and south end of the weir regulate water into the overflow weir. The lower crest is an ogee weir about 240 feet long at an elevation of 1,150 feet. The upper crest is 560 feet long and with an elevation of 1,158 feet. Water exits the weir into an impressive side channel that was excavated through bedrock that extends approximately 1,760 feet downstream to a stilling pool.

The earthen dam is topped with a small, paved road that extends from the waste weir to the release chamber at the east end of the dam (Photo 14). A small complex of maintenance structures was once located toward the west end of the dam, near the waste weir. The structures included the engineer's office and soils laboratory, a large garage, several smaller barns/outbuildings, and several sheds and a small pump house that provides water to the buildings. According to the current maintenance supervisor, Kim Scanlon, the engineer's office and soils laboratory were demolished by the DEP approximately 15 years ago. Other garages, sheds and outbuildings are still extant, including one structure constructed as a soils laboratory or as a field office for project engineers (Photos 16 and 17). Other structures associated with the construction of the facility, including housing, were razed some time after completion of the project.

Water enters the water supply system through the West Delaware tunnel located well upstream of the dam near the Cannonsville Bridge in the Town of Andes. The intake structure, a two-story brick and masonry building, houses the valves that regulate the flow of water into the aqueduct. The aqueduct itself consists of an 11.3–foot diameter, concrete-lined pressure tunnel that was bored through the bedrock. The tunnel has a capacity of over 500 million gallons of water per day. It stretches over 44 miles to the southeast eventually carrying water into the Rondout Reservoir (Bone 2006b:212). From the Rondout, water is collected into the Delaware aqueduct which extends 85 miles to the southeast under the Hudson River and into the West Branch Reservoir in Putnam County where the water is settled.

The intake tower on the left abutment of the dam controls the minimum flow discharged into the river (Photo 18). The water is released through an 11 foot 11-inch concrete conduit controlled by a gatehouse above the release water chamber. The gates are attached to eight steel pipes of varying size which release water into the stilling basin and eventually into the river (Photo 19).

Access to the facility is provided by a small access road. A recently constructed bridge carries the access road over the West Branch just below the release chamber. Just north of the bridge the road forks; to the southeast access is provided to the release water chamber and stilling pool and to the northwest access is provided to the top of the dam and maintenance structures.

The proposed powerhouse will be situated at the bottom of dam immediately adjacent to the release chamber (Photo 20). A short tailrace will return water into the existing stilling pool. A switch yard will be located near the maintenance facilities near the top of the dam. A new transmission line will carry power from the powerhouse to the switchyard and from the switchyard to a set of existing transmission lines nearby.

ARCHEOLOGICAL SENSITIVITY ASSESSMENT

The archeological sensitivity of a project area is based on a combination of factors that include the current environmental conditions, past environmental conditions, soils, topography, and the like, as well as a project area's proximity to other known archeological sites and map-documented structures. The first portion of this report provides information regarding these pertinent environmental conditions in addition to the known resources of the area as documented in existing literature.

In general, the Project proposes to construct hydroelectric turbines in the Delaware and Neversink River drainages along existing reservoir systems within the Catskill Mountains. These drainages are known to contain archeological sites associated with precontact people who lived, hunted, and gathered resources in the area for millennia. European settlers first arrived in the area following the American Revolution, when the last substantial groups of Native Americans left the area. Settlement started slowly at first, driven by New England farmers searching for new agricultural lands to exploit. Later the large supply of timber fostered sawmills and related industries that relied on harvesting wood. Despite the rich agriculture and woodlands, the population of the area remained relatively small. Historical maps of the area suggest the proposed APEs of the Project were often in marginal areas away from large farms or dense areas of settlement. The topography of the APEs of the Project is typically along the valley walls, at the abutments of the dam. The natural soils in these areas are largely glacially derived, suggesting that archeological sites, if they were present, would not be deeply buried. The former topography of these areas, prior to dam building, was such that the areas were sloped. It is unlikely that large, substantial precontact archeological sites would be located on such landforms.

According to the OPRHP site files, at Cannonsville, a 19th-century sawmill was formerly located in the vicinity of the APE. Analyses of the maps, however, indicate the site was located to the south of the existing dam. Aside from buildings utilized in the construction of the dam, the historical maps do not indicate any other map-documented structures within or immediately adjacent to the proposed APEs.

Overall, the archeological sensitivity of the Project area is moderate for precontact archeological sites and moderate for historic archeological sites.

ARCHEOLOGICAL POTENTIAL

Although the APEs of the Project have moderate sensitivity for both precontact and historical archeological sites, the potential for locating intact archeological sites that may be eligible for the National Register has been greatly diminished by the later construction of the reservoir systems. Land clearing, moving, and building associated with each of the massive dams at Neversink, Downsville, and Cannonsville has thoroughly disturbed the APEs of the Project. There is no likelihood of locating archeological sites at the proposed location of the turbines and powerhouse, nor at the proposed switchyards. The associated distribution lines will also be located in disturbed areas. Staging areas will also be located in areas of previous disturbance. At Cannonsville, three staging areas will be located along the river just downstream from the dam outfall. Soil maps and project plans suggest this area was disturbed during dam construction to create a stable river bank. Also at Cannonsville, a spoil disposal area is planned for an area downstream of the dam. Similarly, soil maps and the site visit suggest this area was previously disturbed by the dam development and may have been used previously as a spoil area. Overall, there is no potential for locating archeological sites in, or immediately around the proposed APEs of the Project.

RECOMMENDATIONS

Both of the proposed turbines at Neversink and Pepacton will involve replacing existing valves in the release structures. As a result, there is no proposed disturbance in areas that have not been previously disturbed. Similarly, the powerhouse, switchyard, and distribution lines at Cannonsville will be located within the footprint of the existing dam which has been previously disturbed. The distribution lines at Pepacton and Neversink will utilize existing power lines and poles and ductbanks. As a result, no further archeological work is recommended for the Project based on the current APE and design plans.

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MAPS

N

10 0 10 20
Miles

15 0 15 30
Kilometers

Project Location (DEP 2009)

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Map 1a

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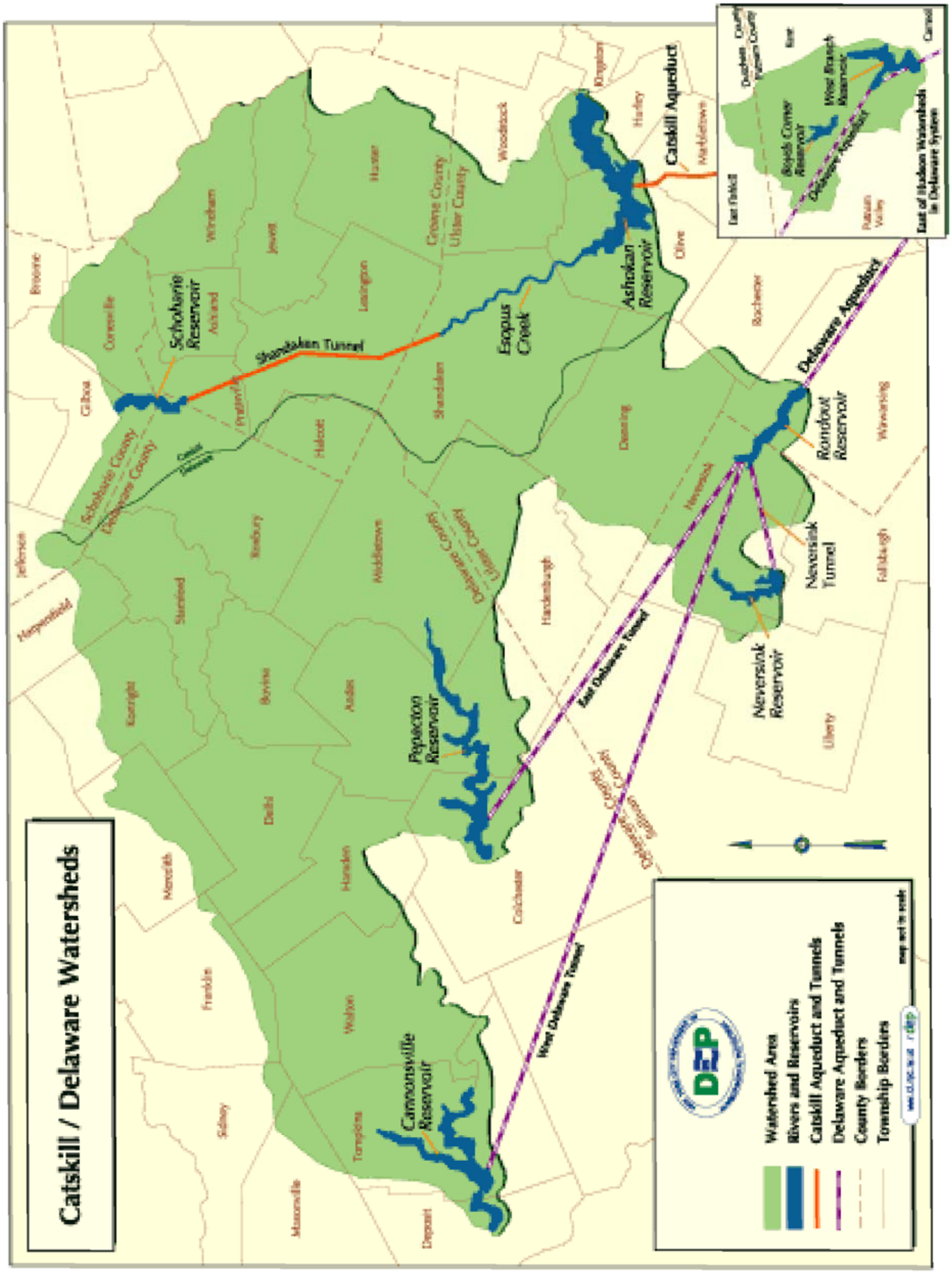

9 0 9
Miles

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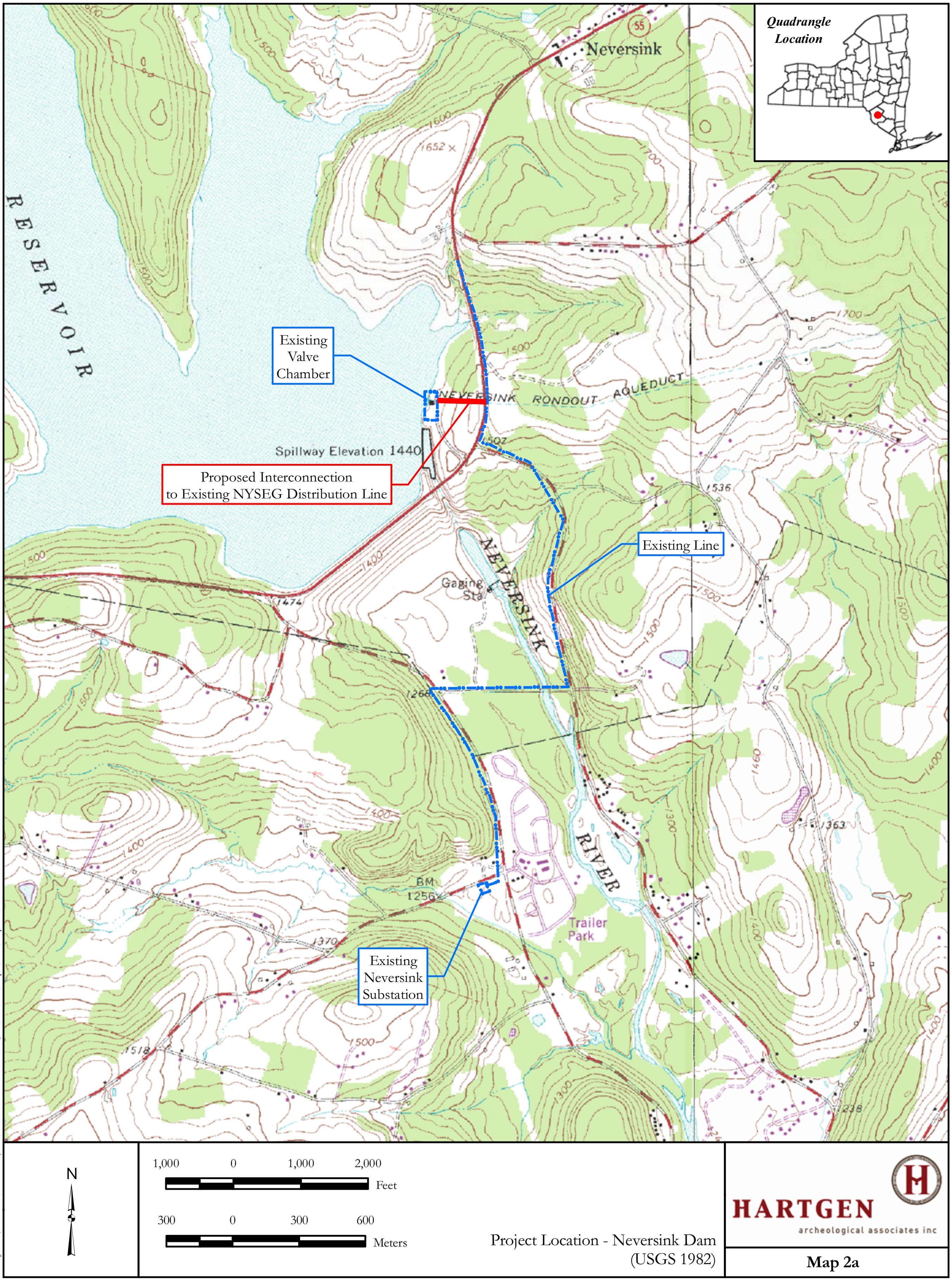
Kilometers

Project Location (DEP 2009)

HARTGEN
archeological associates inc

Map 1b



Project Location - Neversink Dam
(USGS 1982)

HARTGEN archeological associates inc

Map 2a

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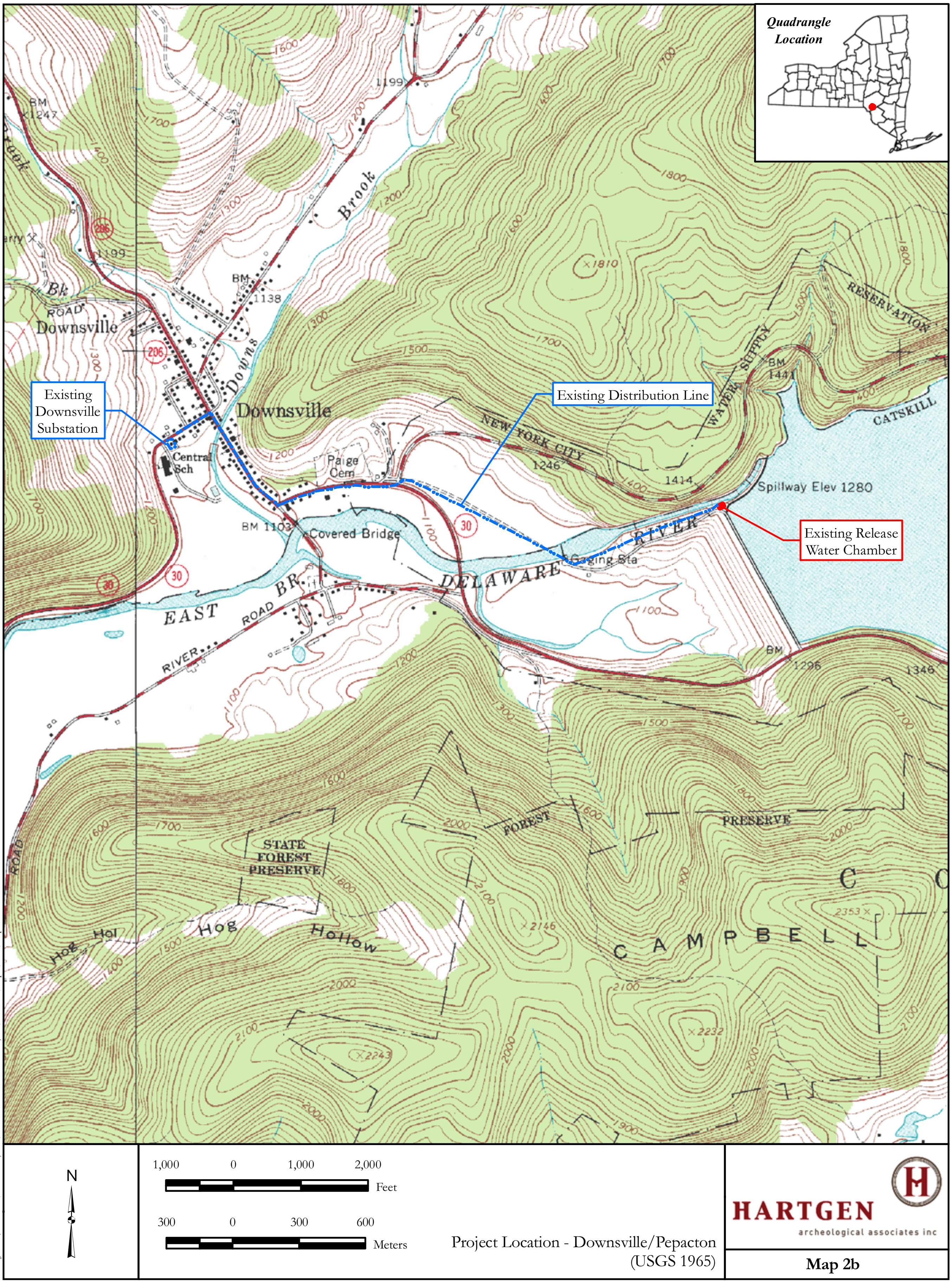

Project Location - Downsville/Pepacton
(USGS 1965)

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Map 2b

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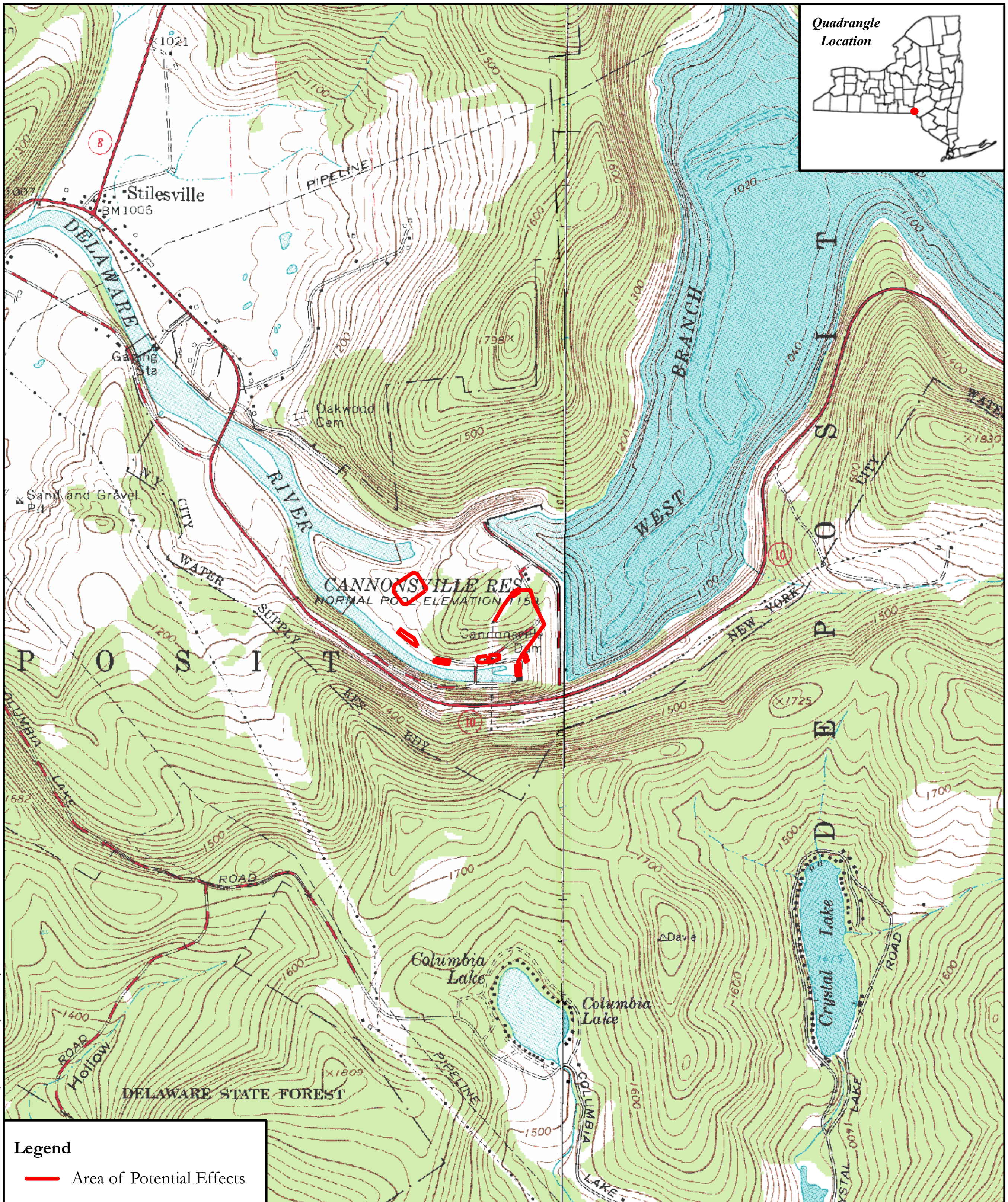

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Feet

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Meters

Project Location - Cannonsville Dam
(USGS 1965, 1981)

HARTGEN archeological associates inc

Map 2c

TSM May 27, 2011 R:\Active Projects\4227 West of Hudson Project\4227-11\Maps\GIS\Map 2c-USGS.mxd

N

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Feet

80 0 80 160
Meters

Project Location - Neversink Dam
(NYSOCSCI 2004)

HARTGEN
archeological associates inc

Map 3a

TSM May 25, 2011 R:\Active Projects\4227 West of Hudson Project\4227-11\Maps\GIS\Map 3a-Orthos.mxd

Project Location - Downsville/Pepacton
(NYSOCSCI 2004)

Map 3b

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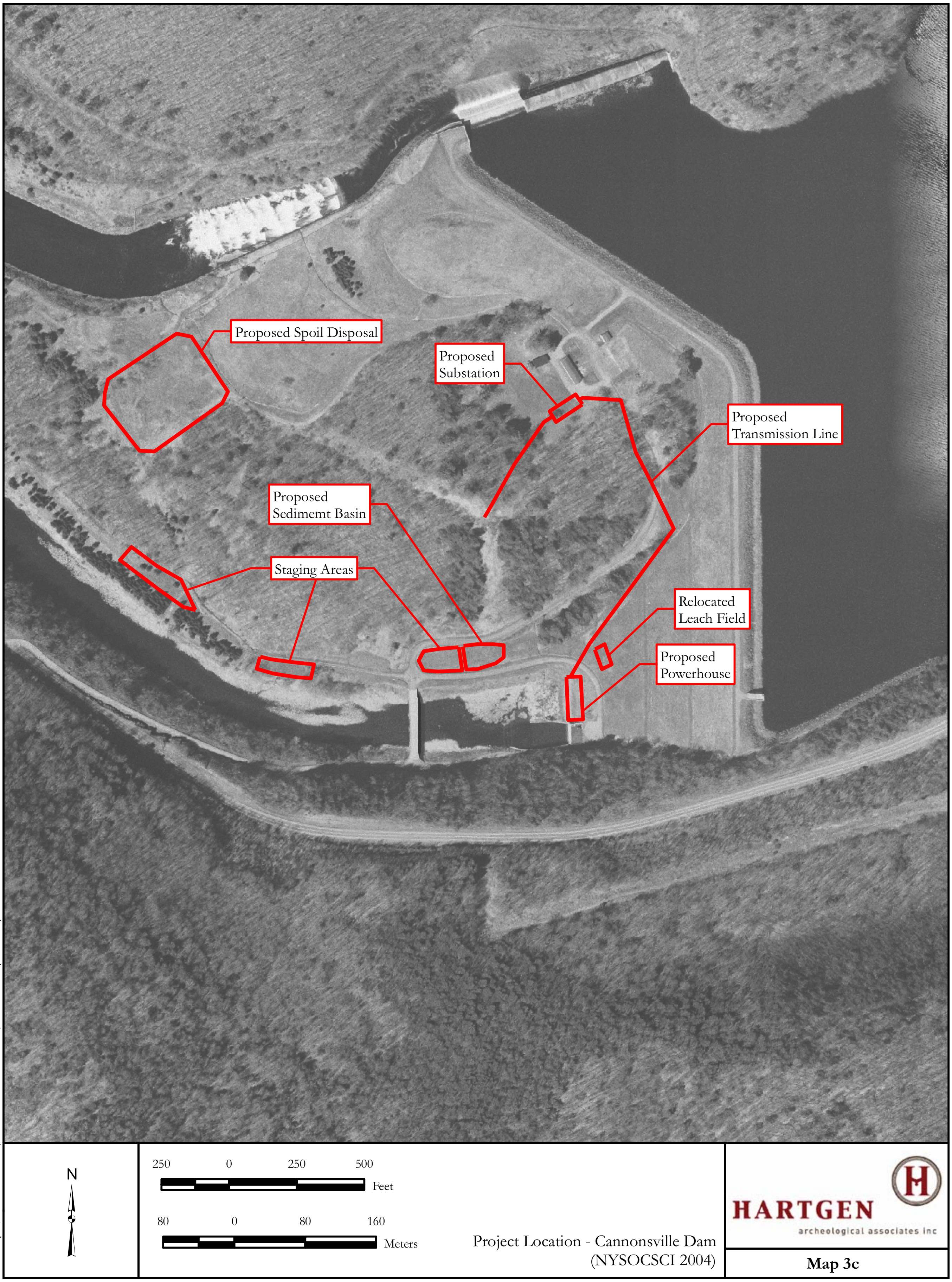

Project Location - Cannonsville Dam
(NYSOCSCI 2004)

HARTGEN archeological associates inc

Map 3c

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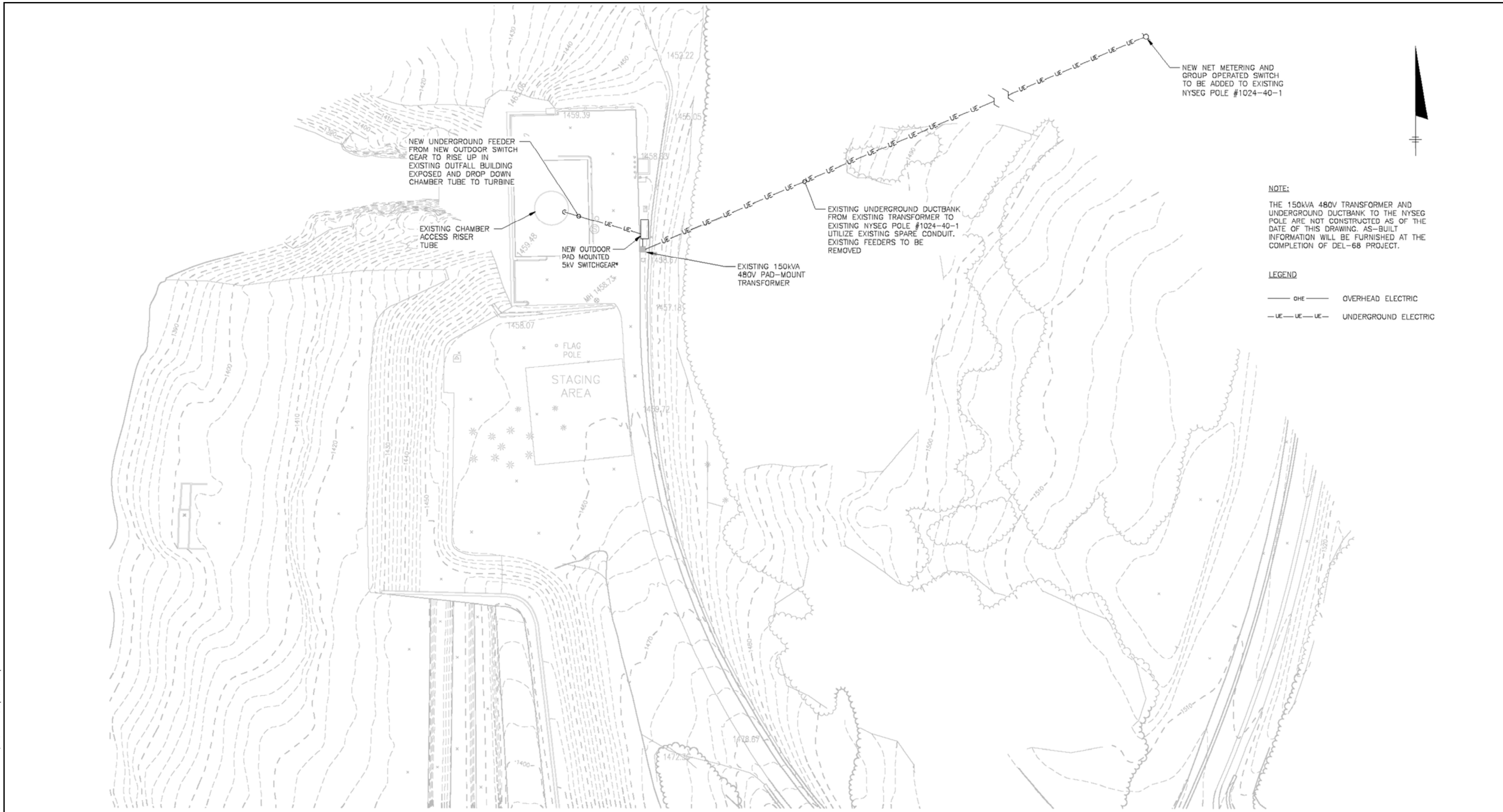

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Note: Contour interval is 2 feet.

Conceptual Plan of Neversink
(DEP and O'Brien & Gere)

HARTGEN archeological associates inc

Map 4a

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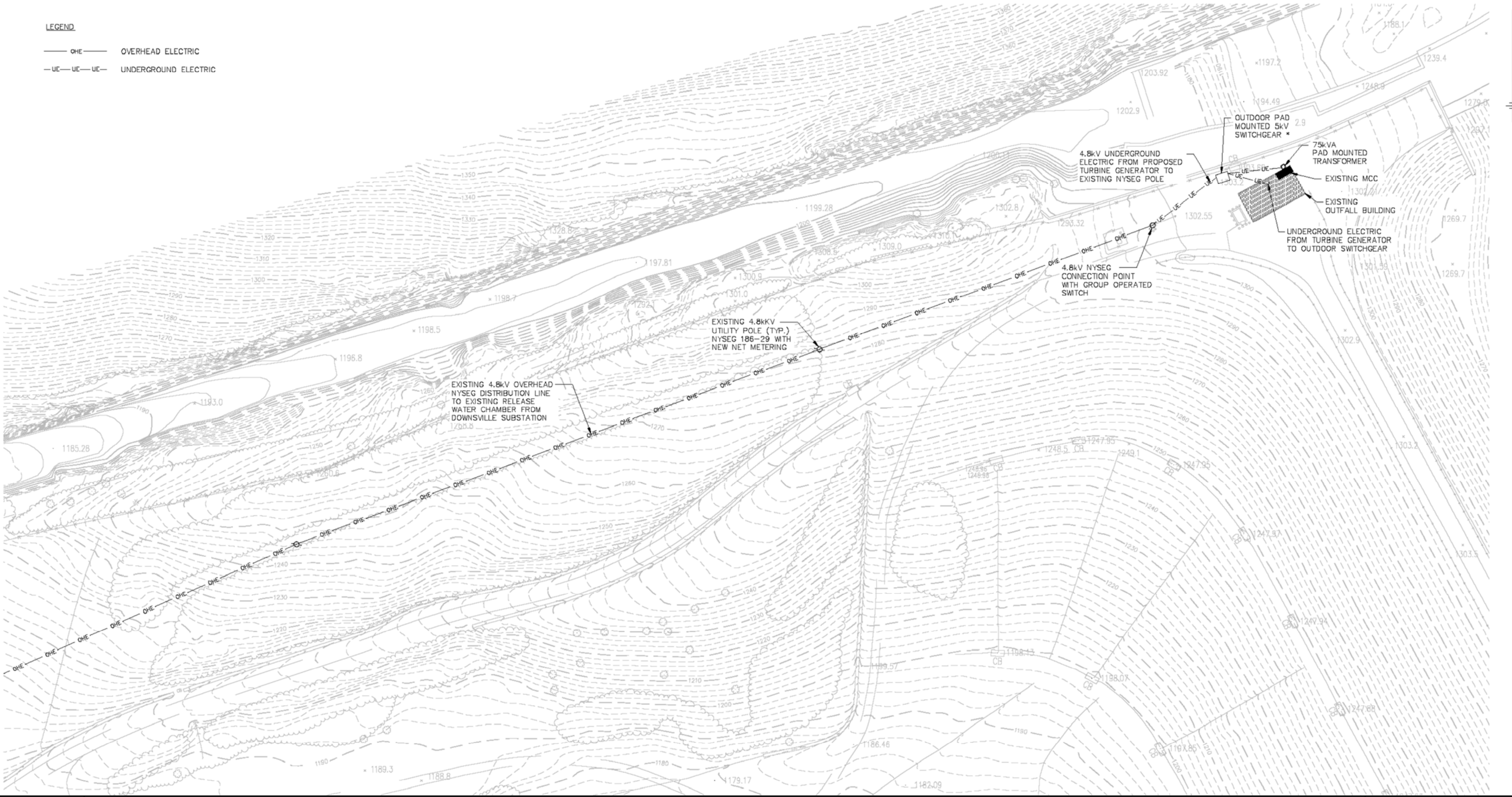

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Note: Contour interval is 2 feet.

Conceptual Plan of Pepacton
(DEP and O'Brien & Gere)

HARTGEN archeological associates inc

Map 4b

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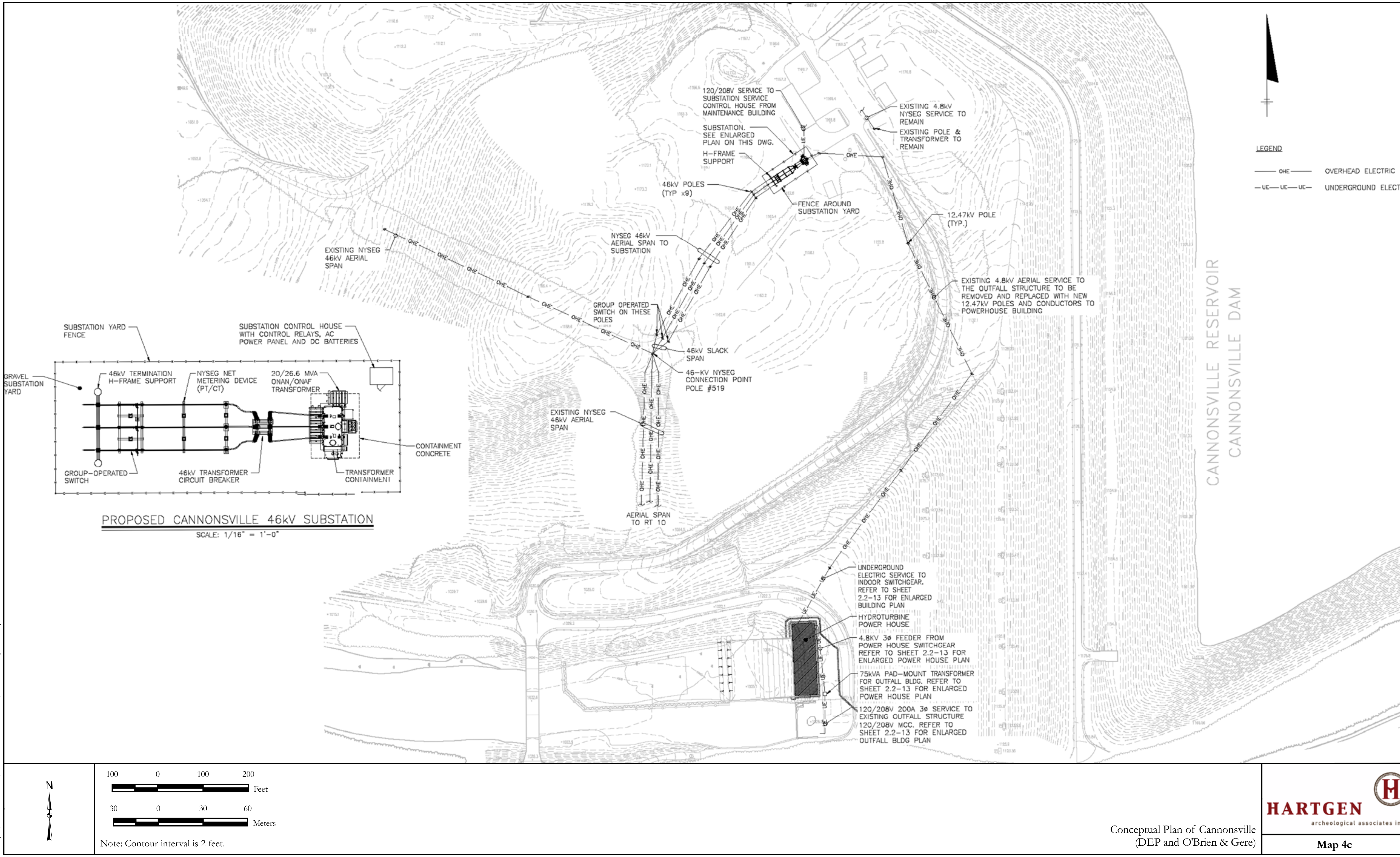
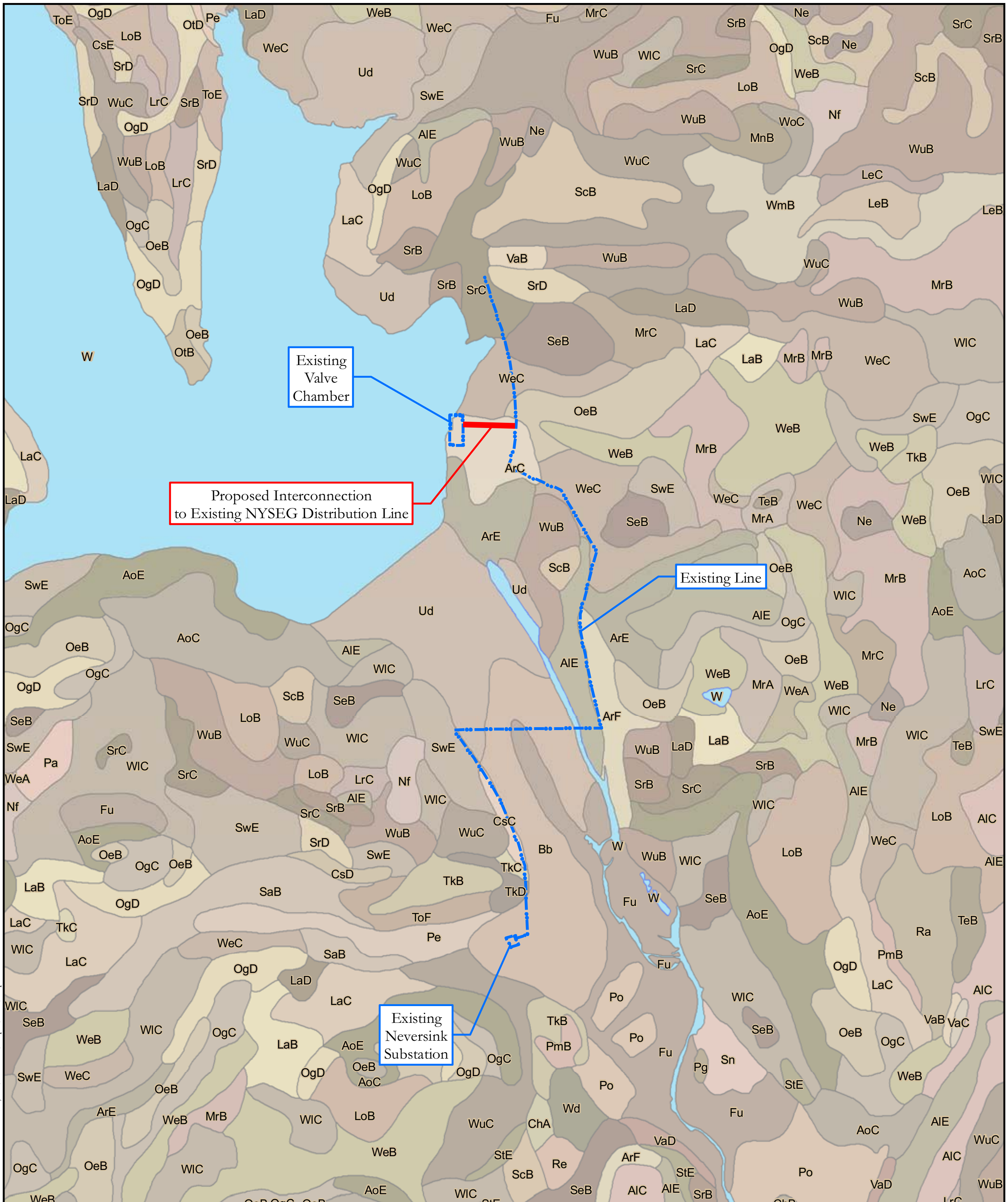


Note: Contour interval is 2 feet.

Conceptual Plan of Cannonsville
(DEP and O'Brien & Gere)

HARTGEN archeological associates inc

Map 4c



N

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Soil Map - Neversink Dam
(USDA NRCS 2008)

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Map 5a

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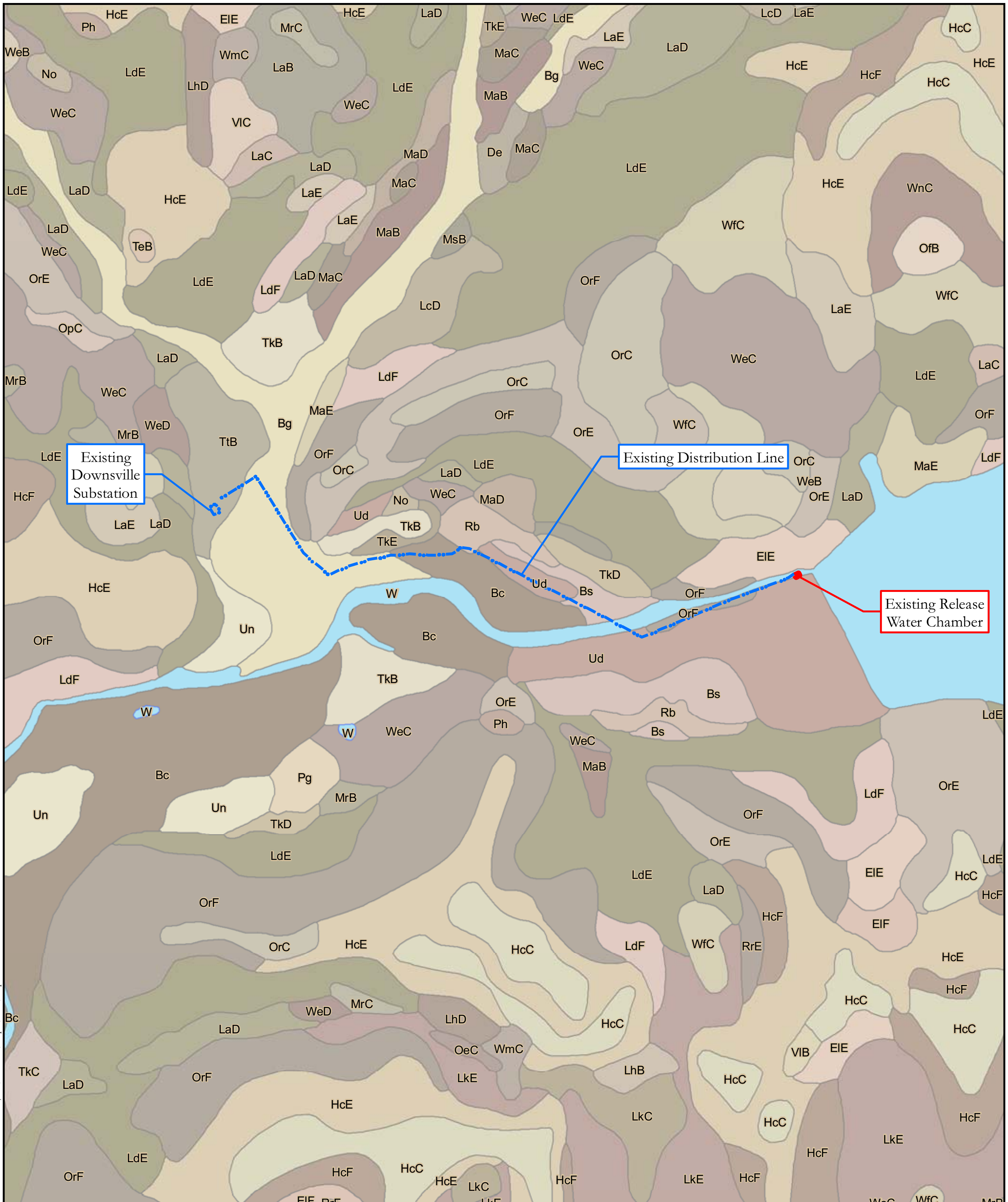

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Soil Map - Downsville/Pepacton
(USDA NRCS 2008)

HARTGEN archeological associates inc

Map 5b

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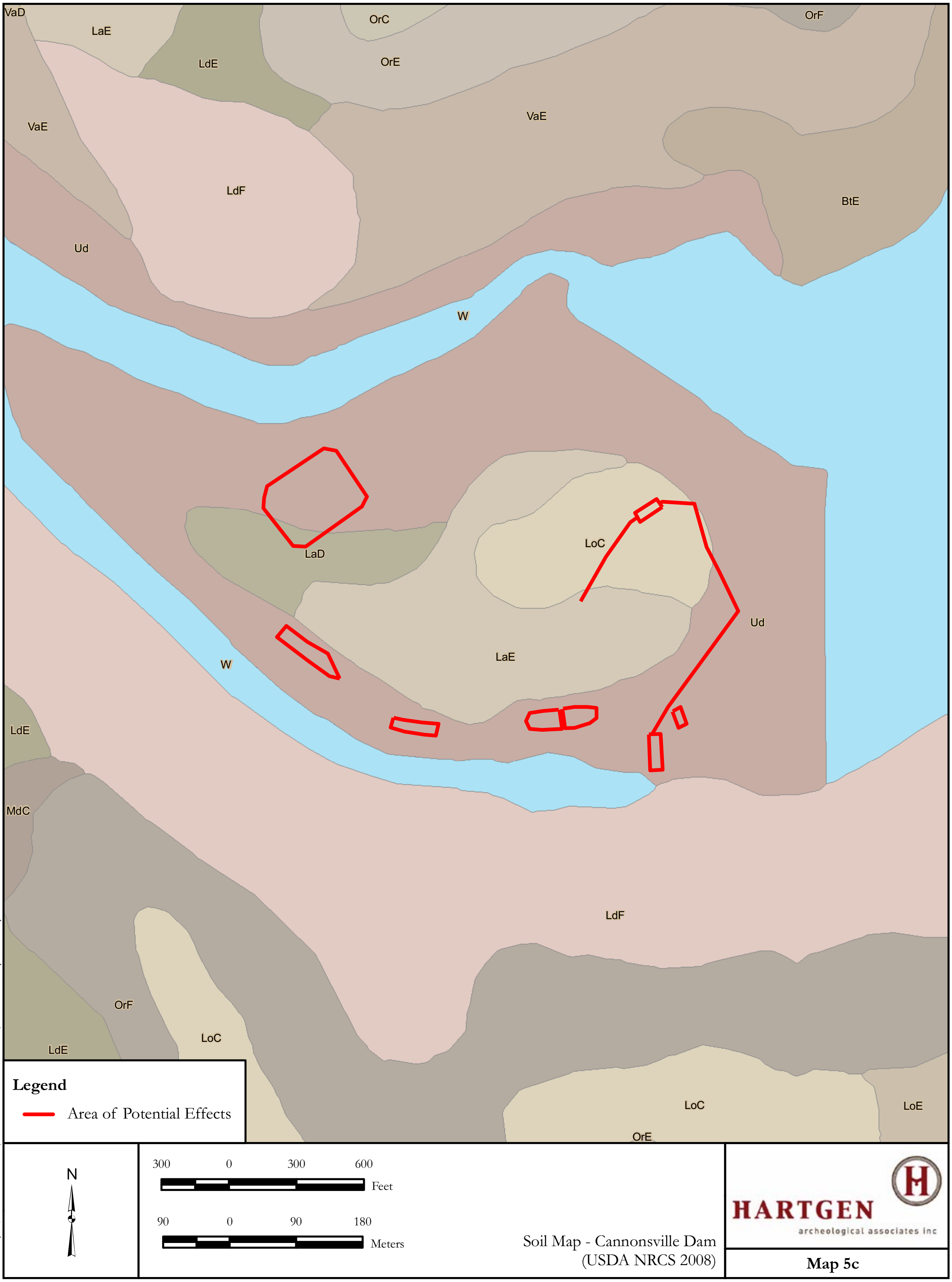

Soil Map - Cannonsville Dam
(USDA NRCS 2008)

HARTGEN archeological associates inc

Map 5c

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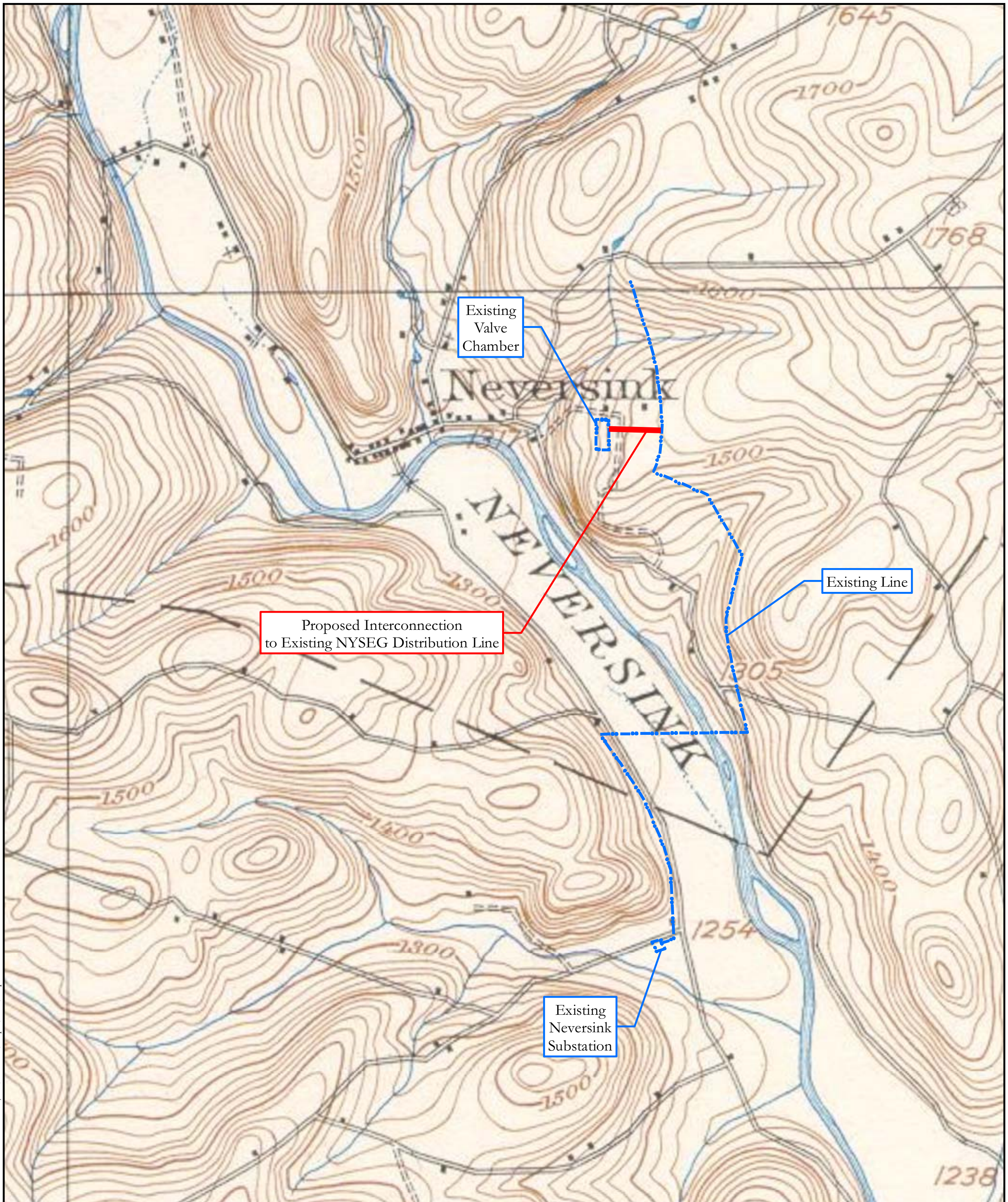

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Neversink Dam
(USGS 1910)

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Map 6

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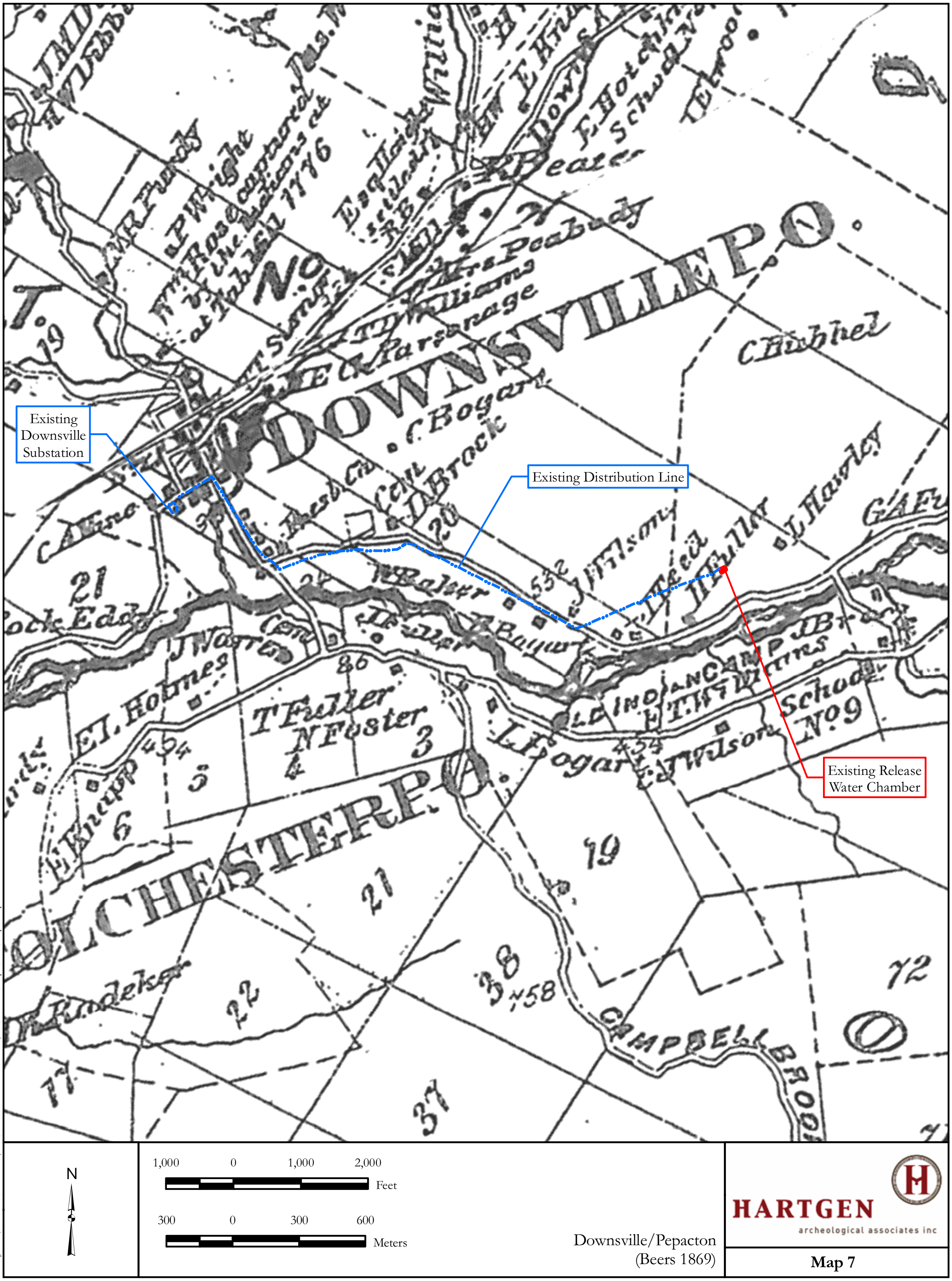
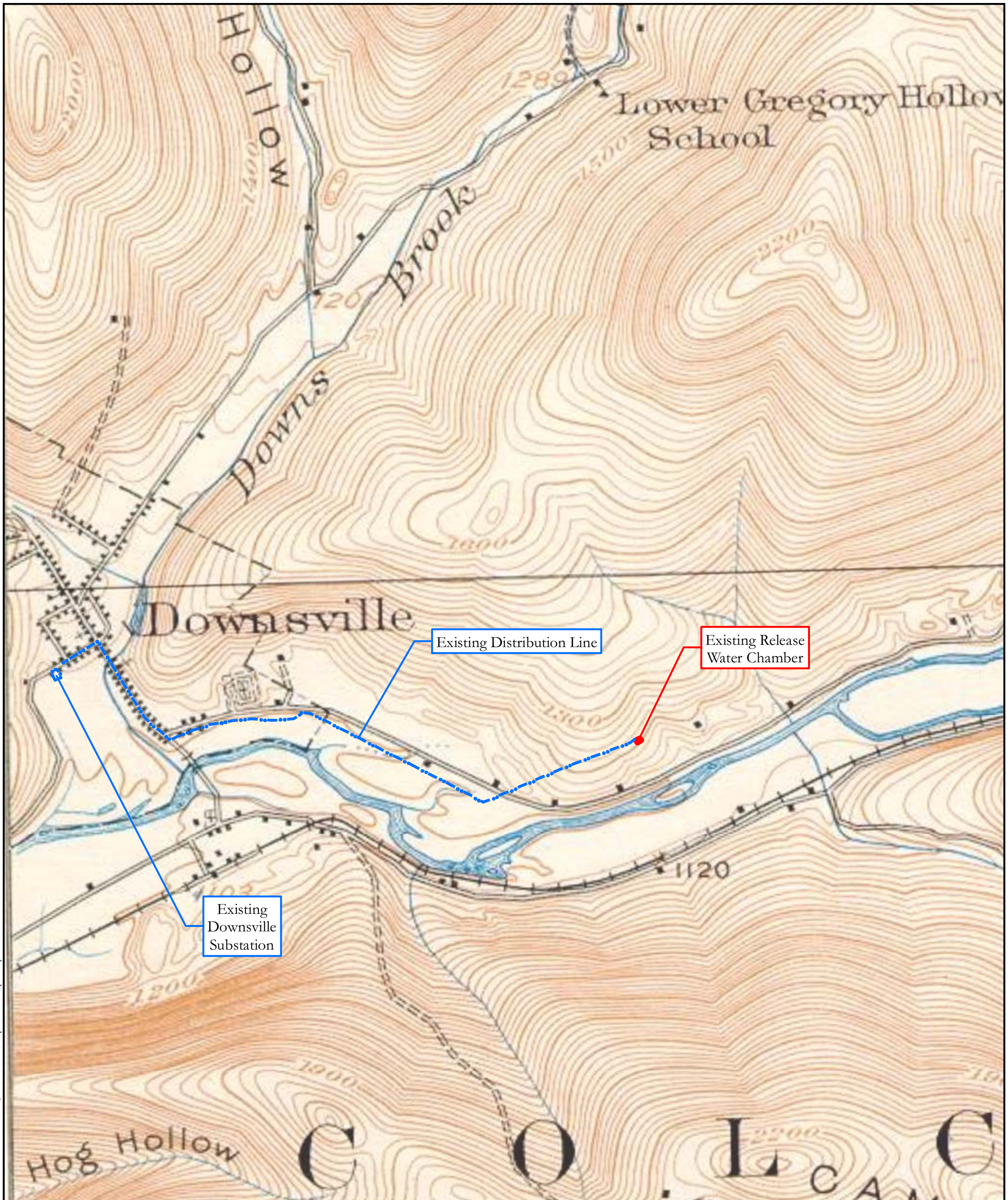


Downsville/Pepacton
(Beers 1869)

HARTGEN archeological associates inc

Map 7



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Feet

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Meters

Downsville/Pepacton
(USGS 1924)

HARTGEN
archeological associates inc

Map 8

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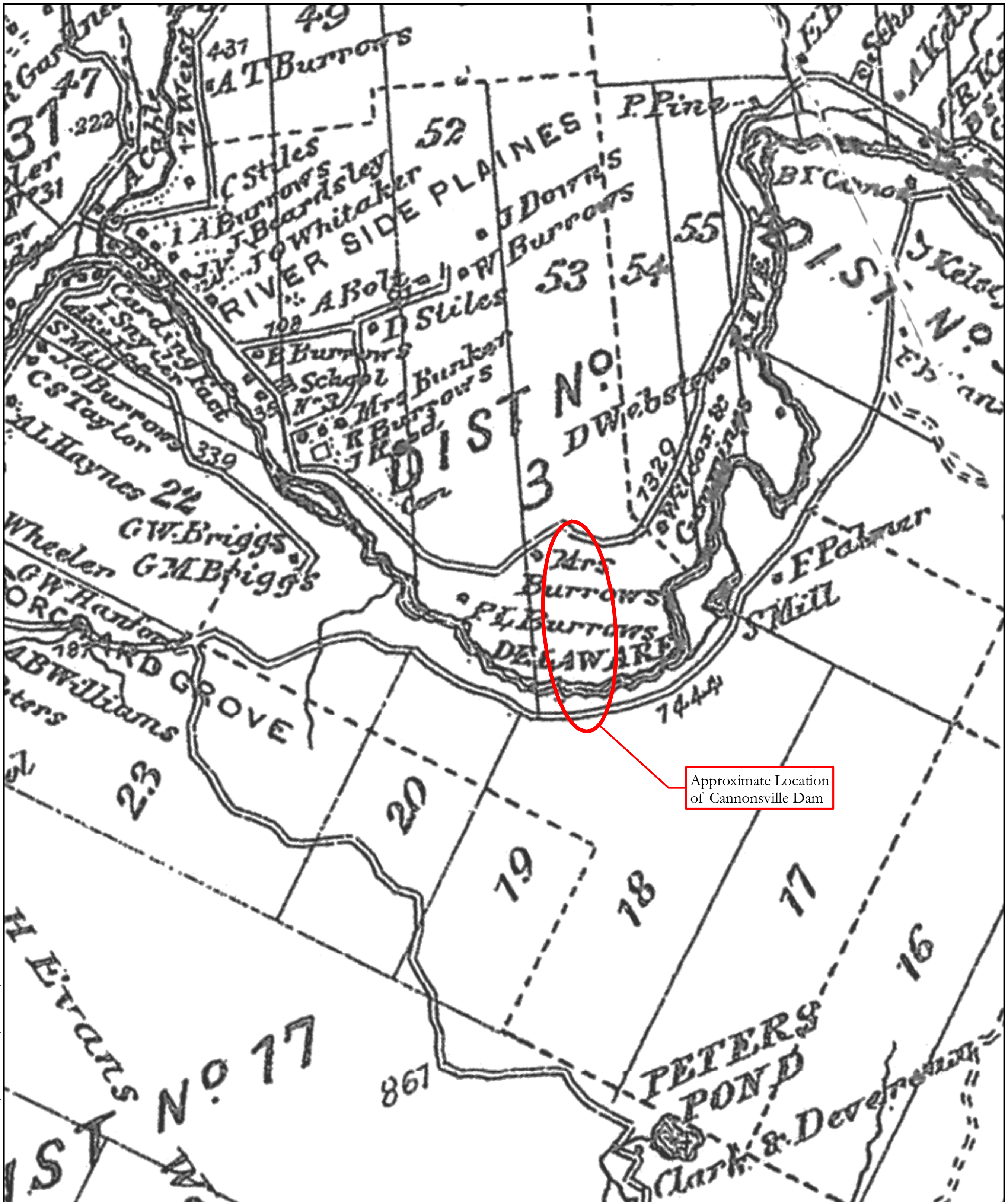

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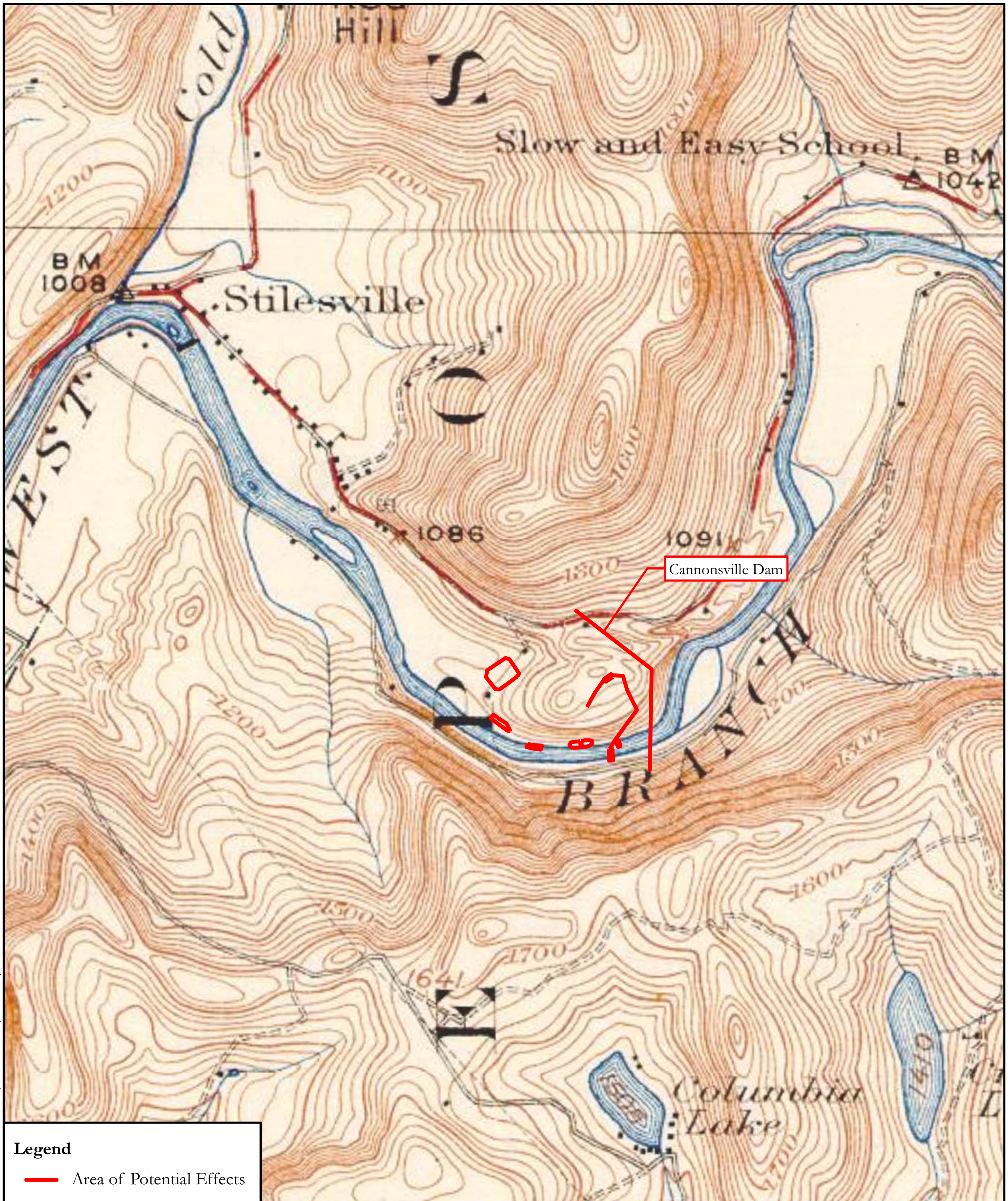
Cannonsville Dam
(Beers 1869)

HARTGEN archeological associates inc

Map 9



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300 0 300 600 Meters

Cannonsville Dam
(USGS 1926)

HARTGEN archeological associates inc

Map 10

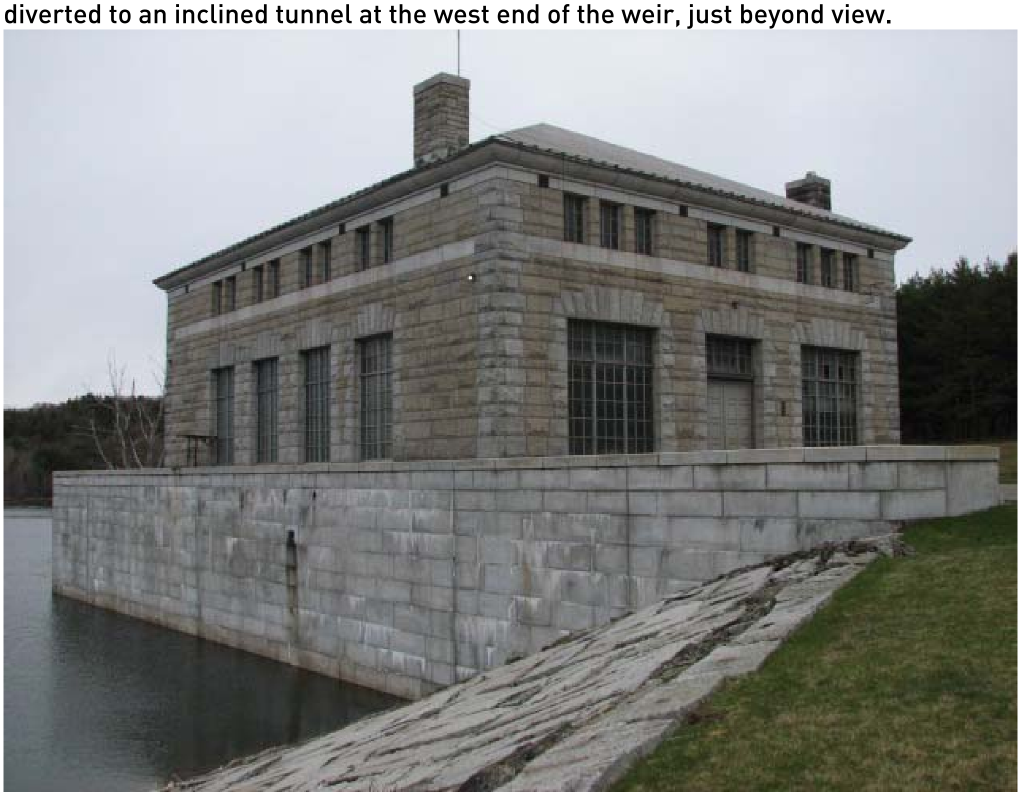
TSM May 25, 2011 R:\Active Projects\4227-11\Maps\GIS\Map 10-Cannonsville1924.mxd

PHOTOGRAPHS

Photograph 1. The Neversink dam as viewed on the upstream portion towards the east. In the distance the intake structure can be seen, the Project proposes to replace one of the valves with a hydroelectric turbine.

Photograph 2. View east of the downstream portion of the earthen dam at Neversink. The dam was constructed in 1953.

Photograph 3. The waste weir or spillway at the Neversink dam as viewed from the northeast. The weir is composed of three large steps faced in granite to minimize the effects of scouring. The water is diverted to an inclined tunnel at the west end of the weir, just beyond view.



Photograph 4. The intake structure at the Neversink dam and tunnel. The structure regulates water flow through the Neversink Tunnel and a minimum flow to the Neversink River through the former diversion tunnel. The Project proposes to replace one of the existing valves with a hydroelectric turbine.

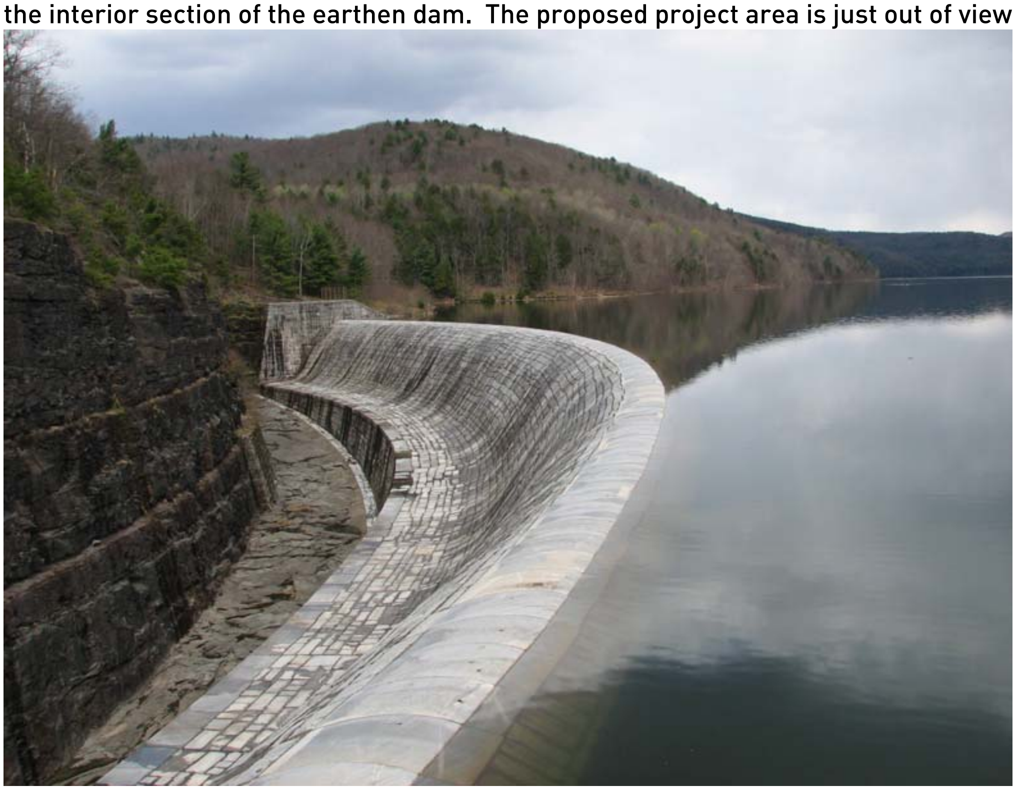
Photograph 5. The intake structure at Neversink as viewed west.

Photograph 6. The Project proposes to replace an existing valve at the structure with a hydroelectric turbine. The valve releases water into an inclined tunnel located below the lawn in the foreground. The tunnel empties into the spillway channel and to an outlet into the Neversink River. A staging area is likely to be located south (to the right) of the intake structure.

Photograph 7. The current plans for the Project include a distribution line that will utilize an existing underground ductbank located along this steep bank to NY 55 (in the background).

Photograph 8. View north of the downstream portion of the earthen dam at Downsville created for the Pepacton Reservoir. The proposed turbine will be installed in the valve control structure at the north end of the dam, seen at a distance in the photograph.

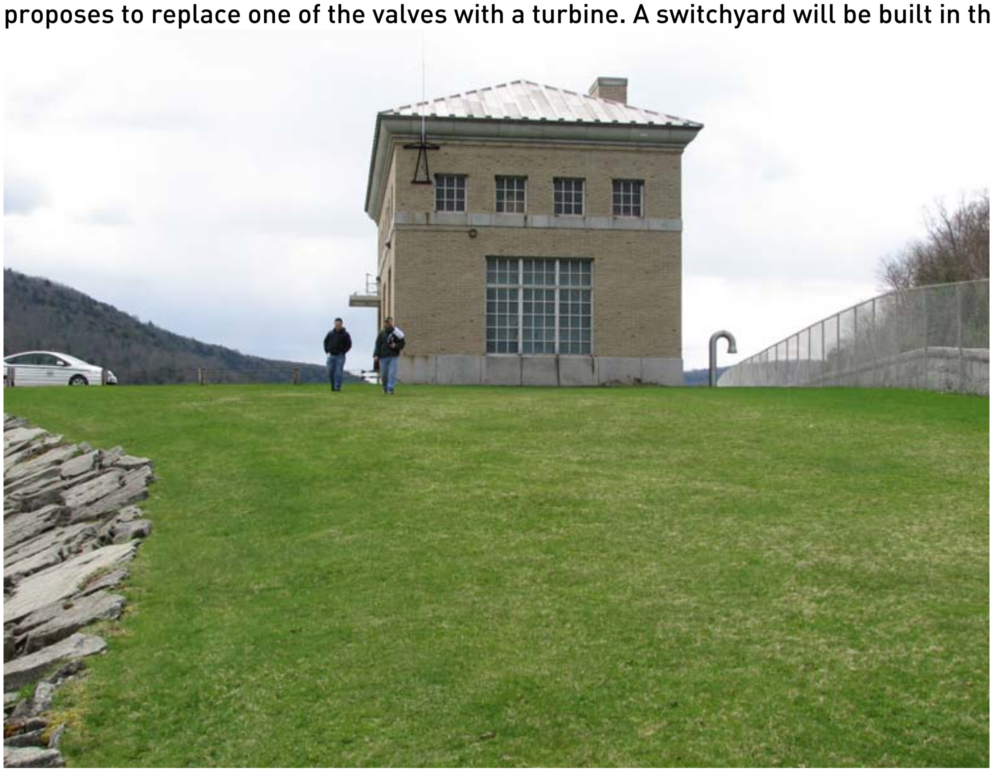
Photograph 9. Upstream portion of the Downsville dam as viewed to the southwest. Stone rip-rap lines the interior section of the earthen dam. The proposed project area is just out of view to the right.



Photograph 10. View east of the waste weir of the Downsville dam. The ogee crest of the weir is faced with granite. A waste channel to the left is excavated out of bedrock.

Photograph 11. View west of the spillway channel of the Downsville dam. Below is the inclined tunnel lined in concrete that was once part of the diversion tunnel. The valve structure regulates a minimum flow of water from the reservoir and is located just out of view to the left. Water released from the valve structure enters the inclined tunnel below. Above the inclined tunnel is a secondary spillway channel for overflow at peak discharges. The Project proposes to replace the valve with a turbine.

Photograph 12. The valve structure at the north abutment of the Downsville dam. The two-story brick and masonry building houses two valves that regulate minimum flow from the reservoir. The Project proposes to replace one of the valves with a turbine. A switchyard will be built in the immediate vicinity.

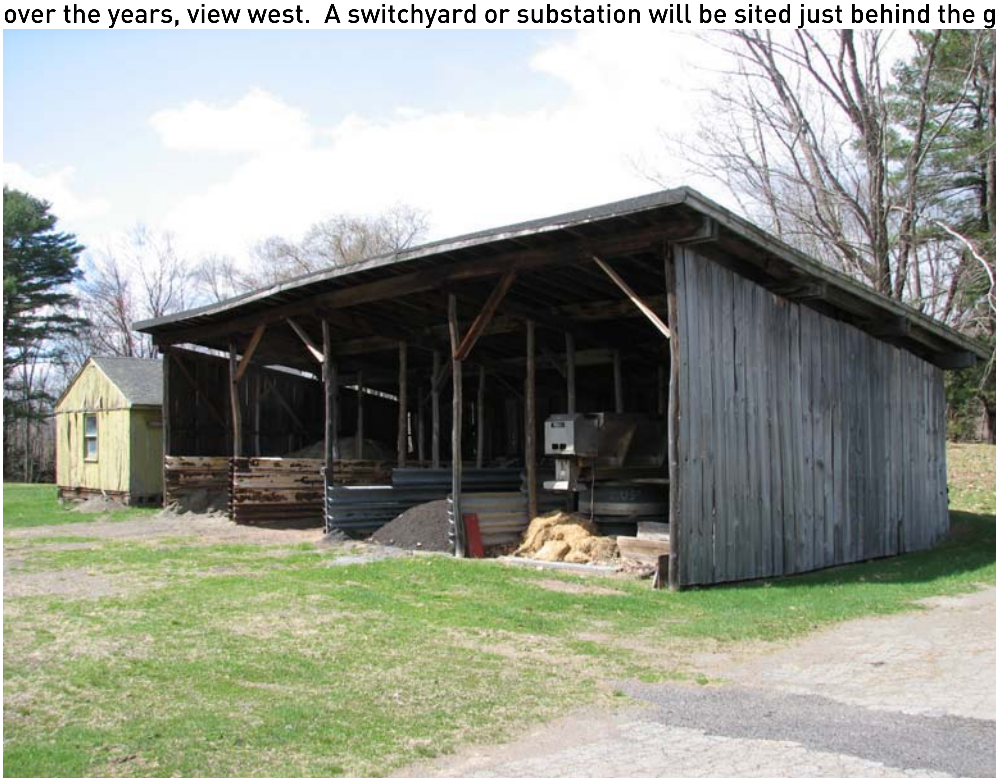


Photograph 13. View west of the valve structure at Downsville dam, the rip-rap of the dam is to the left and to the right beyond the chain-link fence is the spillway channel.

Photograph 14. A view of the downstream side of the Cannonsville dam. To the right is an access road at the top of the dam. To the lower left is the release chamber below the dam. The proposed powerhouse will be sited next to the existing release chamber. A small cluster of outbuildings are located in the distance, as indicated by the arrow.

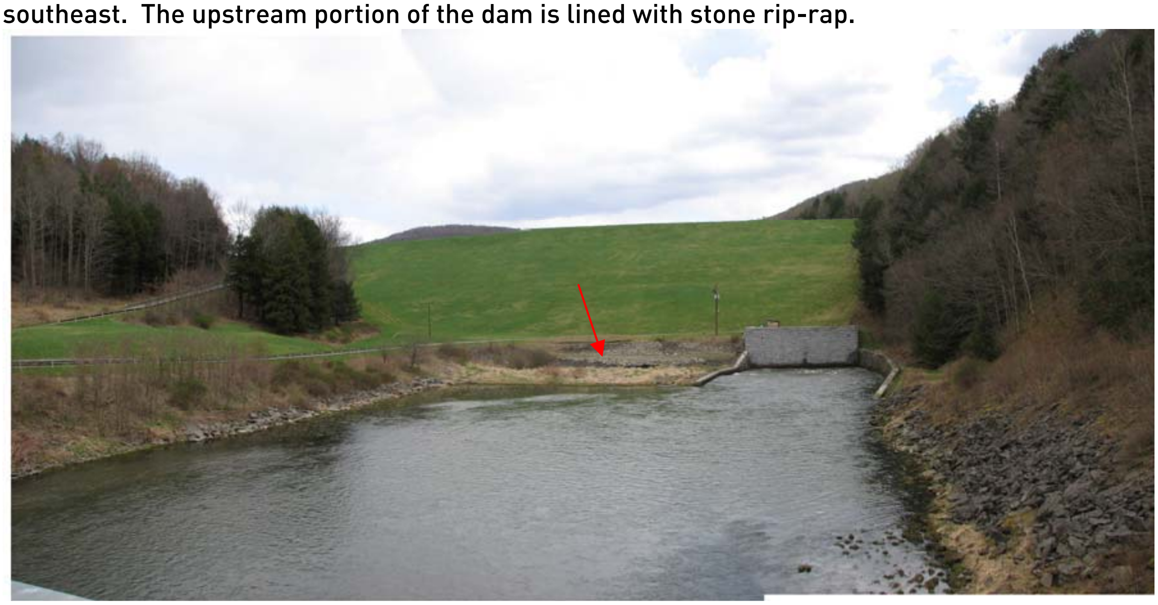
Photograph 15. The doubled-crested waste weir at Cannonsville dam and its associated spillway. The ogee-shaped weir is faced in granite. The spillway channel is cut through bedrock.

Photograph 16. A small cluster of maintenance buildings remain along the top of the Cannonsville dam. Several other structures, including the Engineer's office and laboratory, were moved and/or demolished over the years, view west. A switchyard or substation will be sited just behind the garage.



Photograph 17. A small pole barn used in the maintenance of the facility currently holds salt and machinery. Another small building is likely a former office that is now largely abandoned. Both structures are located near the top center portion of the dam.

Photograph 18. The intake structure along the reservoir at the Cannonsville dam, viewed to the southeast. The upstream portion of the dam is lined with stone rip-rap.



Photograph 19. The release chamber is located at the western abutment of the Cannonsville dam. The proposed powerhouse will be located to the east of the chamber, as indicated by the arrow. The distribution lines will extend up the dam face to the maintenance facility.

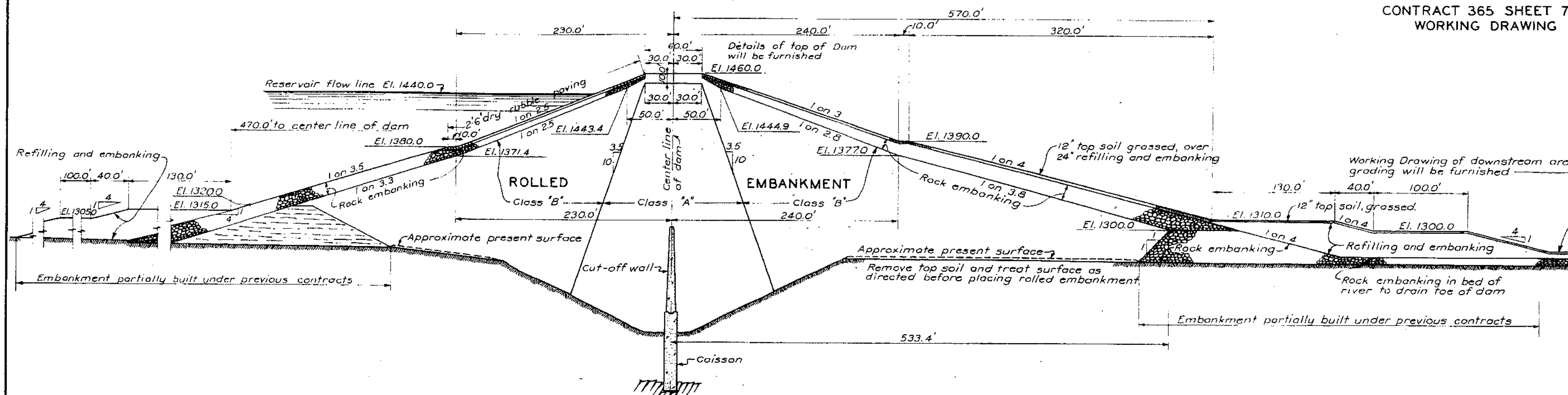
Photograph 20. A view west of the proposed location of the powerhouse at Cannonsville dam. The powerhouse will be situated in the area (see oval) previously disturbed by the construction of the dam and the deep stilling pool at the end of the release chamber.

APPENDIX 1: Historic Plans, Maps and Photos (Board)

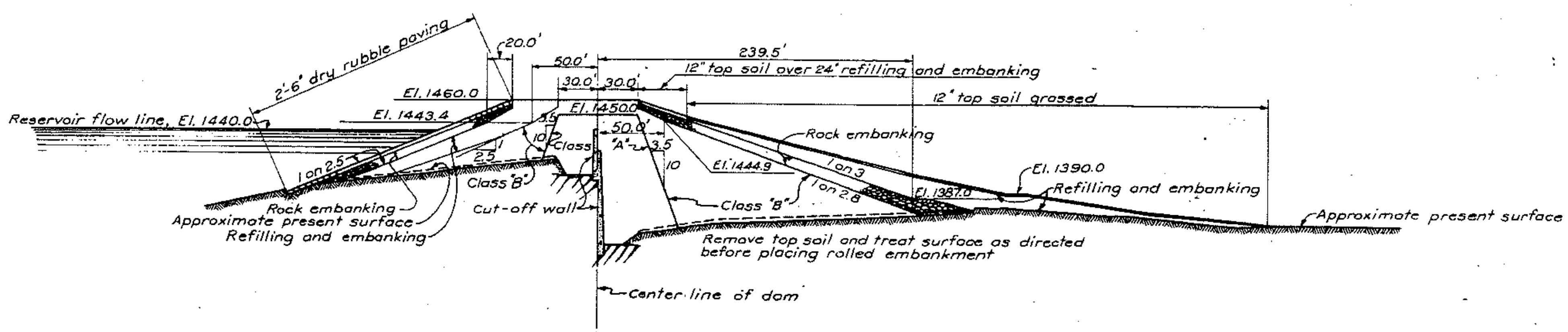
Historic Photos, Plans, and Maps of the Neversink Dam

As taken from the Board of Water Supply of the City of New York, Annual Reports Dated 1936 to 1950

CONTRACT 365 SHEET 7A
WORKING DRAWING

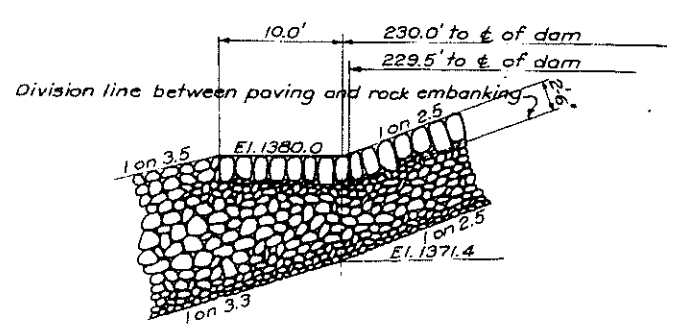


TYPICAL SECTION

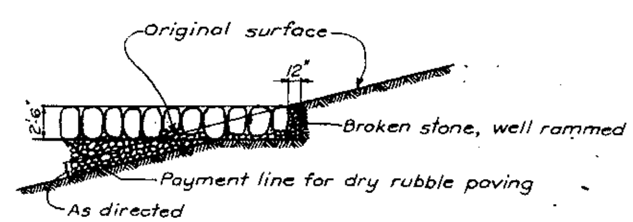


SECTION A-A

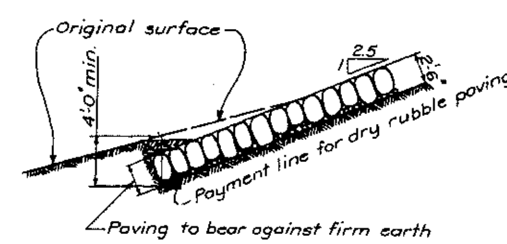
Dimensions given for finished surface do not apply at ends of dam.
For plan showing surface grading of ends of dam and location of Sections A-A, B-B and C-C, see Sheet 5A, Acc. 64187.
For downstream slope drainage, see Sheet 7B, Acc. 64168.



DRY RUBBLE PAVING



SECTION B-B



SECTION C-C

10 2 6 10 14 18 22 Ft.

Drawn A.C.
Traced H.W.W.
Checked K.W.A.U.
Designing Eng

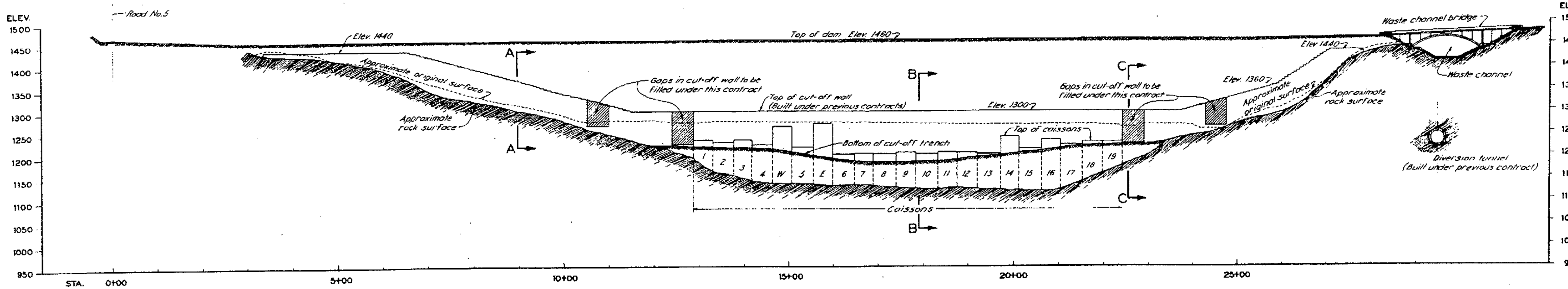
Ref-Acc 63867

Dept Eng Hdqrs
Chief Eng

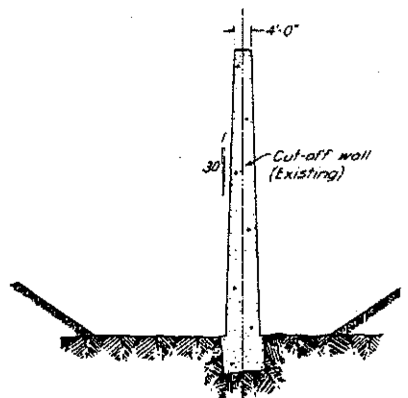
City of New York
BOARD OF WATER SUPPLY
NEVERSINK DAM
SECTIONS
60 0 60 120 Ft.
MARCH 18, 1949

File Cont. 365-3.4 N. Acc 64155

CONTRACT 365 SHEET 6
SHEETS IN SET, 26

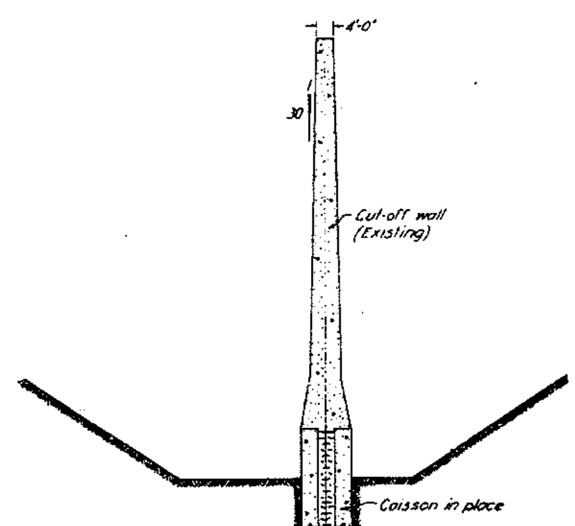


PROFILE OF DAM ON CENTER LINE
(Looking upstream)



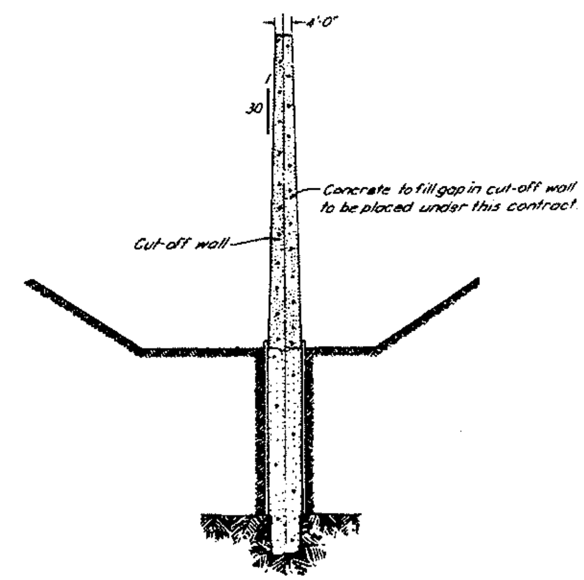
SECTION A-A

20 0 20 40FT.



SECTION B-B

20 0 20 40FT.



SECTION C-C

20 0 20 40FT.

For plan of dam see Sheet 5, Acc 63365
For sections of dam see Sheet 7, Acc 63366
For highways see Sheet 23, Acc 63326

City of New York
BOARD OF WATER SUPPLY
NEVERSINK DAM
PROFILE
100 0 100 200Ft
JANUARY 2, 1948

Drawn K.T.J.
Traced C.R.
Checked R.W.A.J. & B.B.
Medwin Matthews
Designing Eng.

Leon G. Cutts
Dept. Eng. Hdqrs.

File - Cont. 365-3.4 N

Acc. 63394

Ref - Acc. 61091

APE is in the foreground out of view

ACCESSION HEADQUARTERS D-7220, 7221, 7222

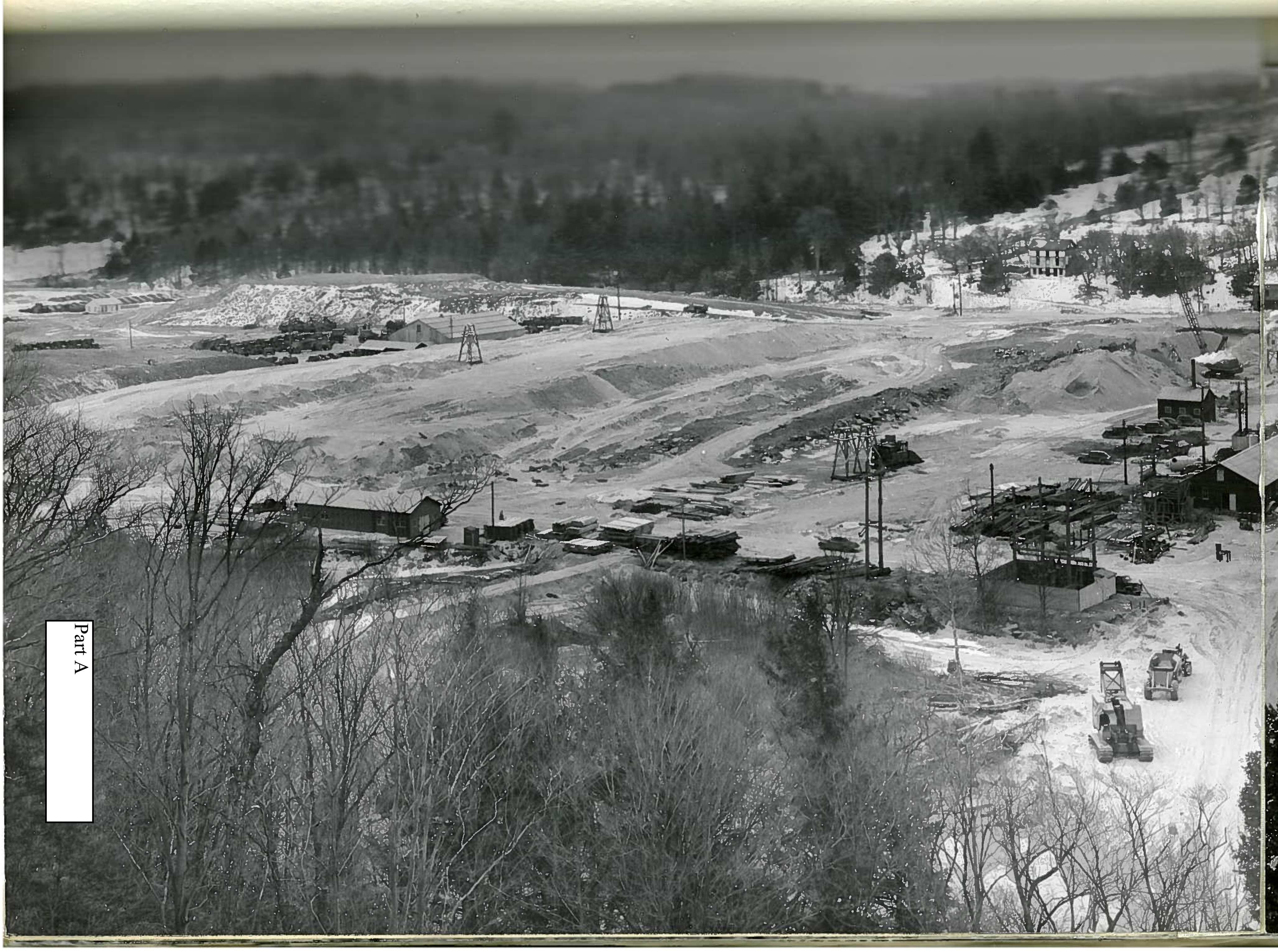
Neversink Reservoir - Neversink Dam

Contract 384 - S.A.Healy Company, Contractor

Dam Area.

Camera located on center line of dam at Station 28+00 looking west. In the center of the picture can be seen the cut-off trench excavation in which the following equipment is at work: A P & H shovel with 3 cubic yard bucket, a Northwest rigged as a dragline with a 2-1/2 cubic yard bucket, and a Lima crane and several rear dump Euclid trucks of 10 yard capacity. On both slopes of the cut-off trench can be seen the wellpoint rings and the small buildings over the pumps and the discharge lines running up the slope. The line of buildings along the road on the left are, starting in the foreground, the compressor house (with a new building being constructed over a boiler), a locker house, contractor's office and B.W.S. office. In back of these buildings there is a boiler house and concrete aggregate batching plant. Beyond the batching plant are the aggregate stock piles. To the left of the stock piles is the rock embankment placed under Contract 360 and to the left of that is the downstream embankment placed under Contract 384. The mound in the left background is the storage pile of the topsoil placed under Contract 360. Just in front of that is the roof of the Contractor's garage and machine shop. Near the left of the picture, just above the top of the trees is the carpenter shop. To the right of the trench is the upstream cofferdam constructed under Contract 360 and beyond it is the upstream embankment area. In the center background the trees have been cut and the brush cleared preparatory to excavating the cut-off trench on the west abutment.

February 20, 1947.



Part A

Part B

Part C

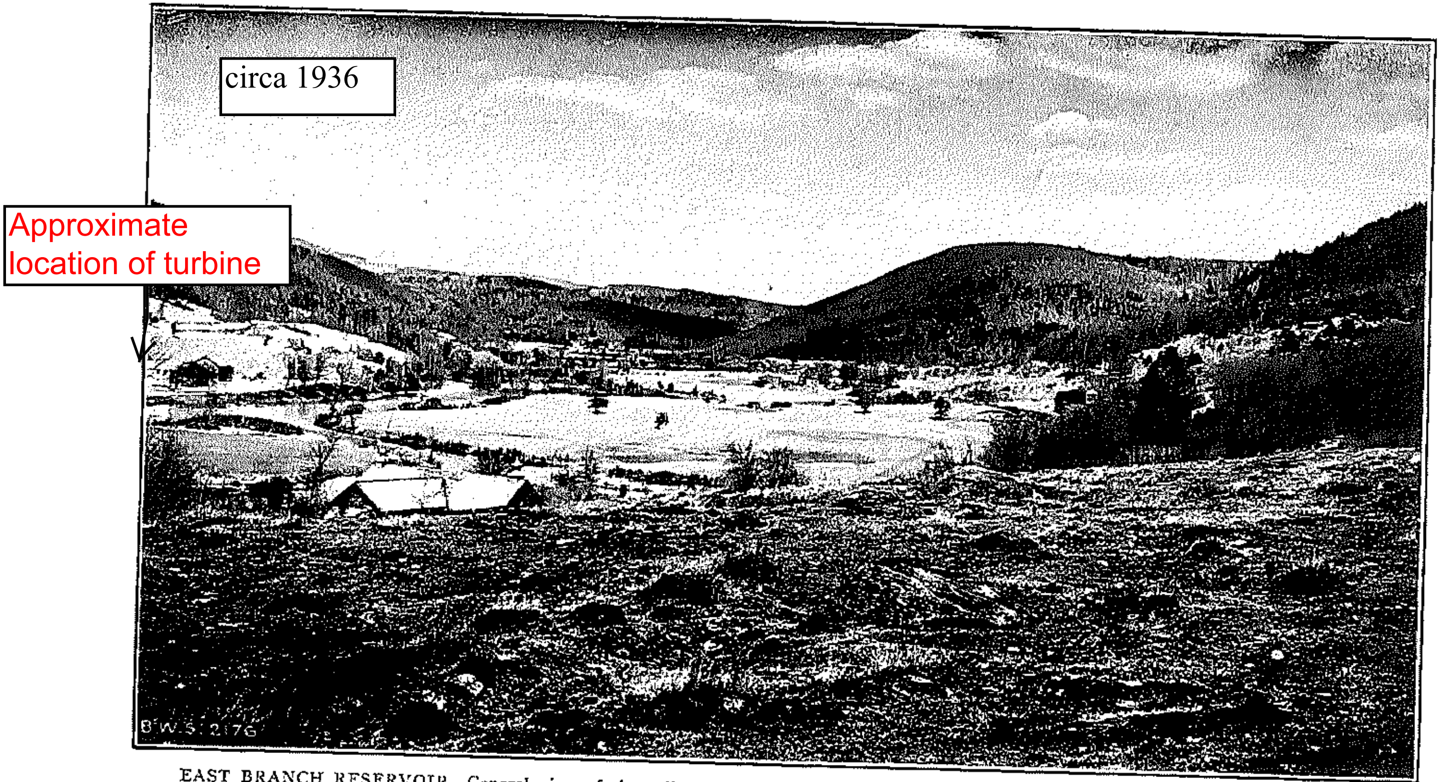
substituted highway Road 2. The batching plant and aggregate [illegible] be seen at left center. Note terraced construction of downstream class "B" embankment at center left. Rolled embankment operations of both class "A" and class "B" were in progress when photo was taken. The elevation of fill adjacent to cut-off wall on downstream side is about 1082, with upstream side about 2.5 feet higher. On the right may be seen the upstream coffer-dam and the temporary reinforced concrete spillway and the upstream rock embanking. In the background across the center of the panorama may be seen the excavation for waste and weir channels. At extreme right is a portion of substituted highway Road 2 as constructed under Contract 402.

October 21, 1950.

Historic Photos, Plans, and Maps of the Downsville Dam

As taken from the Board of Water Supply of the City of New York, Annual Reports and Contract Specifications Dated 1947 to 1951

PLATE 1



EAST BRANCH RESERVOIR—General view of the valley at the proposed Downsville dam site on the East Branch of the Delaware river.

PEPACTON RESERVOIR - DOWNSVILLE DAM

CONTRACT 401 - BIANCHI, CENTRAL, MUNROE-LANGSTROTH, RUGO, CONTRACTOR

Plate No. 16

Acc. Hdq. D. 10449

View of excavation for weir cut-off trench which has been carried down 2 feet more or less below red shale bed. Note close drill marks in lower right foreground. Close drilling was ordered to minimize over-breakage in cut-off trench. At upper right center may be noted the badly jointed and fractured condition of the overlying sandstone bed. In center background is the head frame over the release water control shaft and at the left a portion of the concrete cut-off wall of the dam.

July 13, 1951

PEPACTON RESERVOIR - DOWNSVILLE DAM

CONTRACT 401 - BIANCHI, CENTRAL, MUNROE-LANGSTROTH, RUGO, CONTRACTOR

Plate No. 29

Acc. Hdq. D. 10392

View shows inlet channel and diversion tunnel portal, both constructed under Contract 400. In center background is rock cut for overflow spillway weir and at left is a portion of the concrete cut-off wall. To the right of the wall is the steel headframe used during the construction of the release water control shaft and tunnel.

May 25, 1951

PEPACTON RESERVOIR - DOWNSVILLE DAM

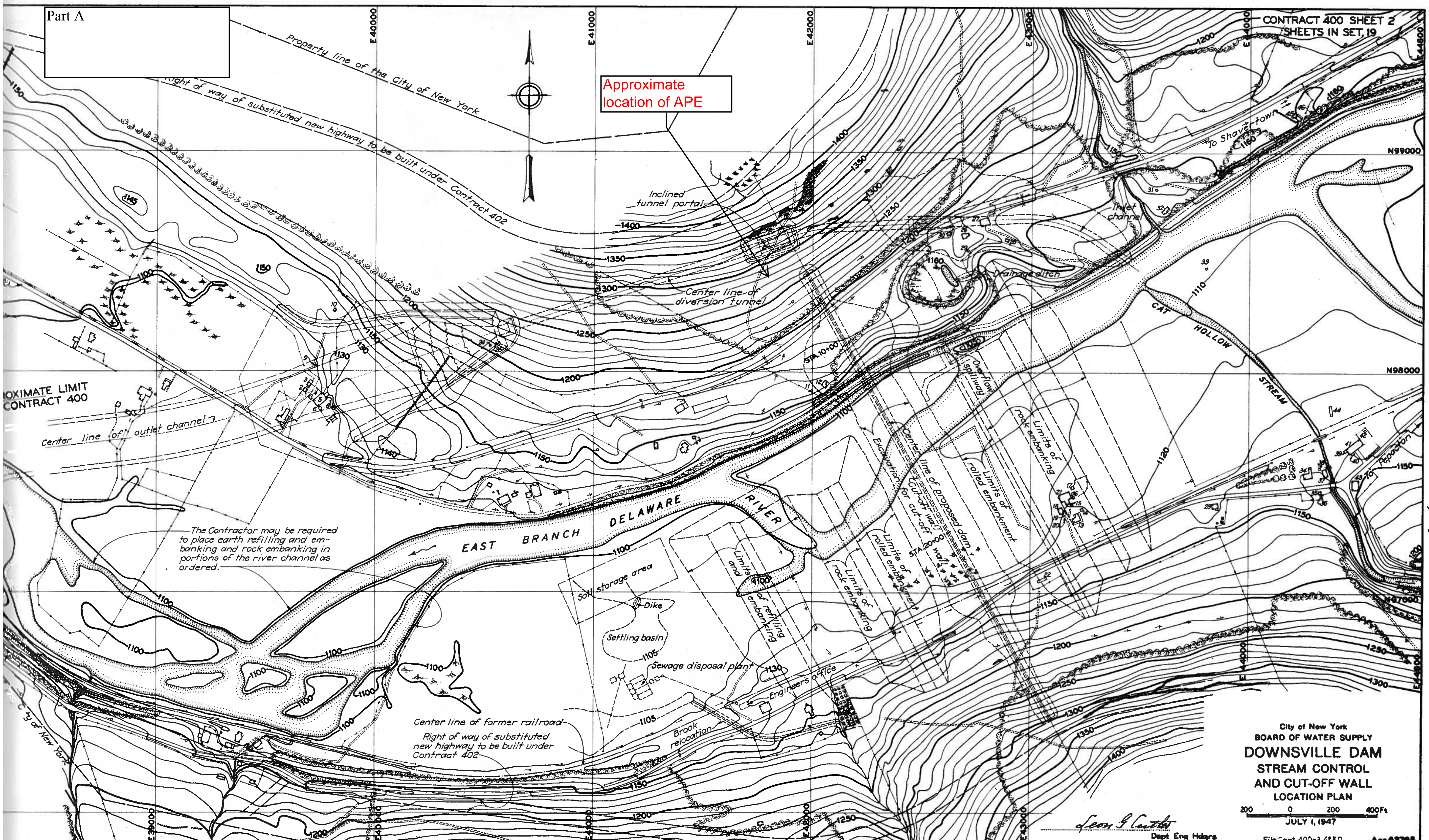
CONTRACT 401 - BIANCHI, CENTRAL, MUNROE-LANGSTROTH, RUGO, CONTRACTOR

Plate No. 1

Acc. Hdq. D. 10266

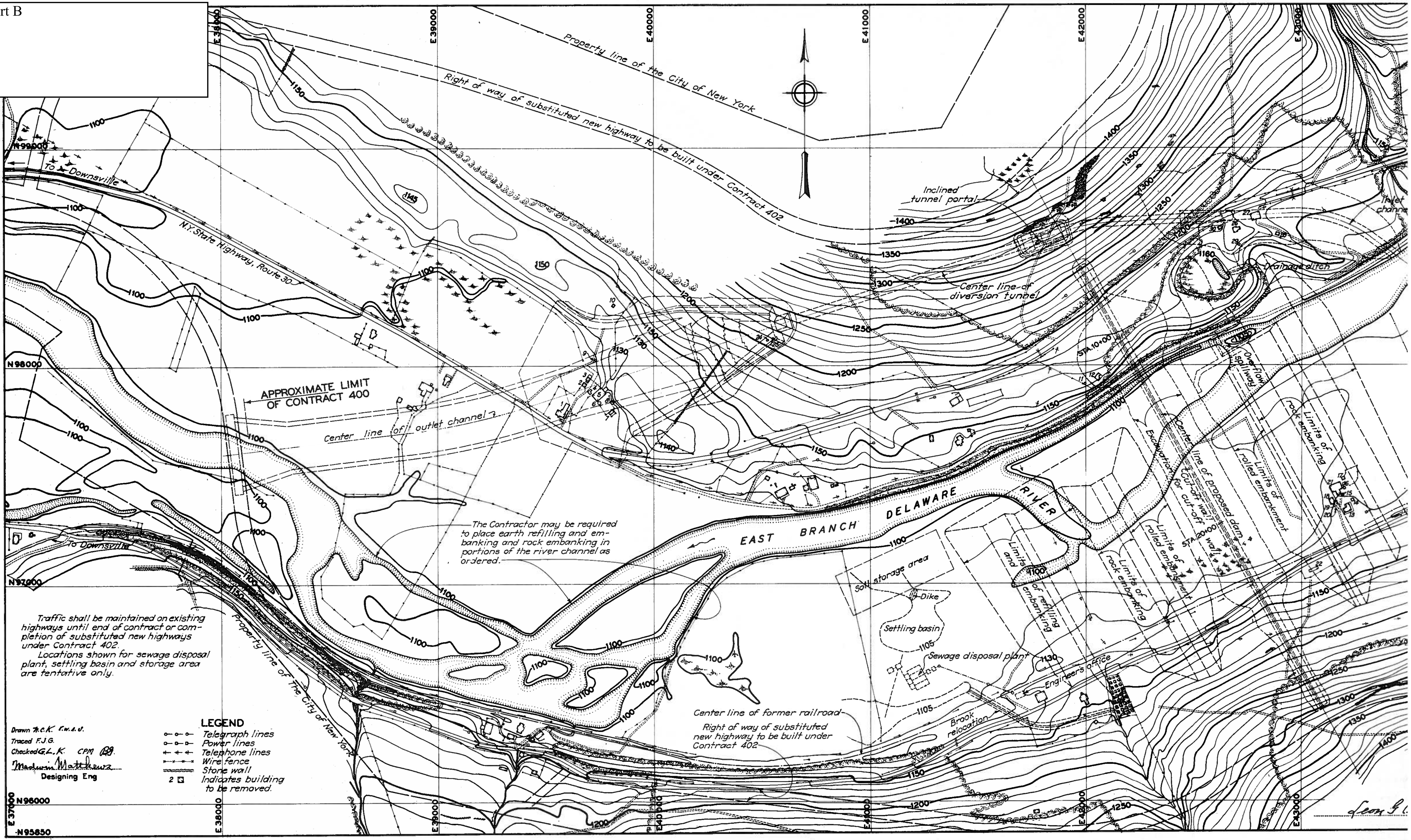
View shows cut-off wall and upstream dam embankment during unwatering of trench. Water surface at elevation 1090±. Temporary overflow spillway on left. At right of spillway, upstream coffer-dam built under Contract 400. Downstream embankment on right. View shows stockpiling on upstream rock embanking section of rock excavated for overflow weir channel.

April 10, 1951

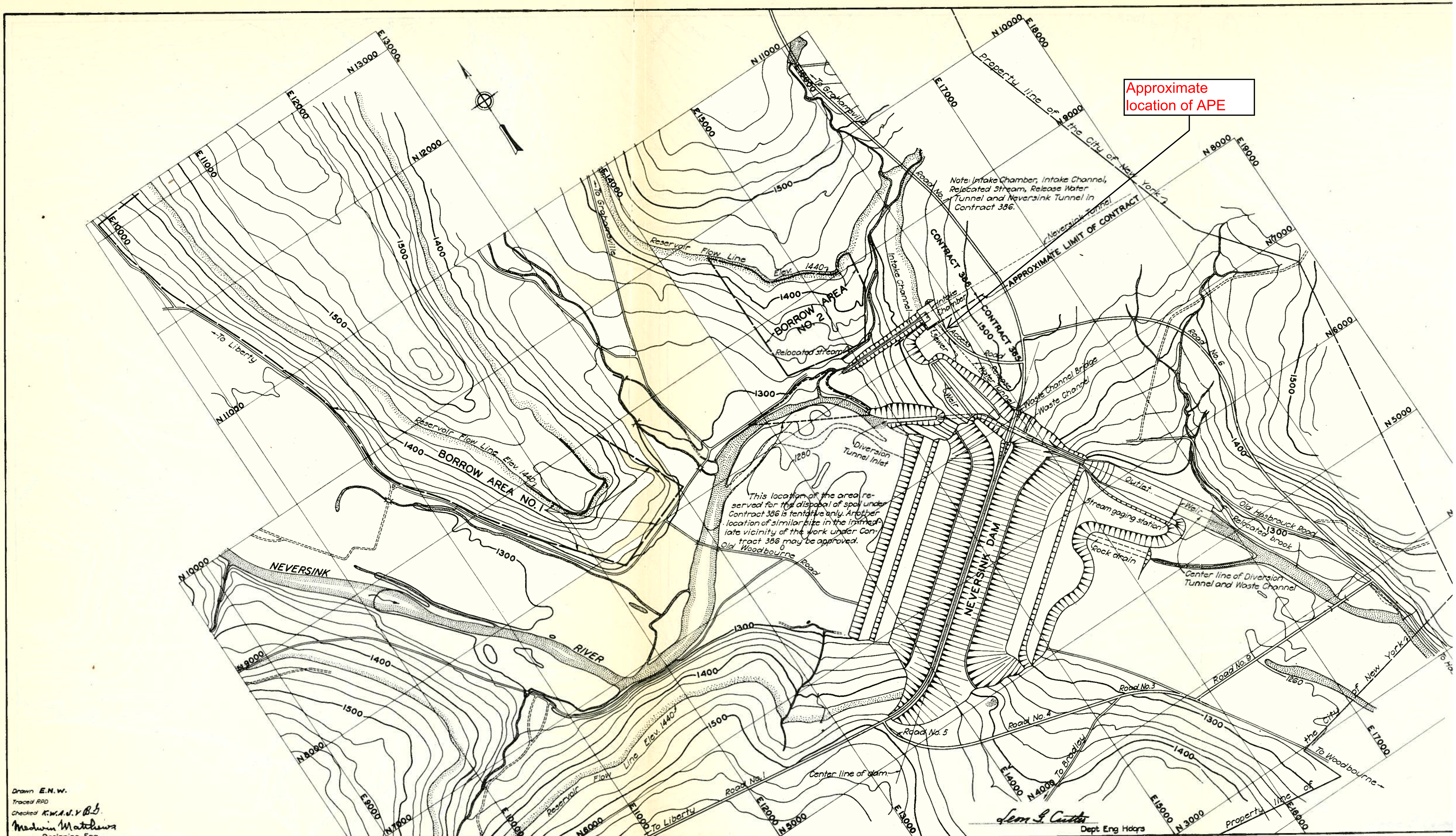


Part A
Approximate location of APE
CONTRACT 400 SHEET 2
SHEETS IN SET, 19
Property line of the City of New York
Right of way of substituted new highway to be built under Contract 402
Inclined tunnel portal
Center line of diversion tunnel
APPROXIMATE LIMIT CONTRACT 400
Center line of outlet channel
To Shavertown
Inlet channel
Drainage ditch
CAT HOLLOW STREAM
To Pepacton
Overflow spillway
Limits of rock embankment
Limits of rolled embankment
Center line of proposed dam
Center line of cut-off wall
Excavation for cut-off wall
STA.10+00
STA.20+00
Limits of rolled embankment
Limits of rock embanking
Limits of refilling and embanking
EAST BRANCH DELAWARE RIVER
The Contractor may be required to place earth refilling and embanking and rock embanking in portions of the river channel as ordered.
Soil storage area
Dike
Settling basin
Sewage disposal plant
Engineers office
Brook relocation
Center line of former railroad
Right of way of substituted new highway to be built under Contract 402
City of New York
N99000
N98000
N97000
E 39000
E 40000
E 41000
E 42000
E 43000
E 44000
E 44800
City of New York
BOARD OF WATER SUPPLY
DOWNSVILLE DAM
STREAM CONTROL
AND CUT-OFF WALL
LOCATION PLAN
200 0 200 400Ft
JULY 1, 1947
Dept Eng Hdqrs
File Cont. 400-3.42ED

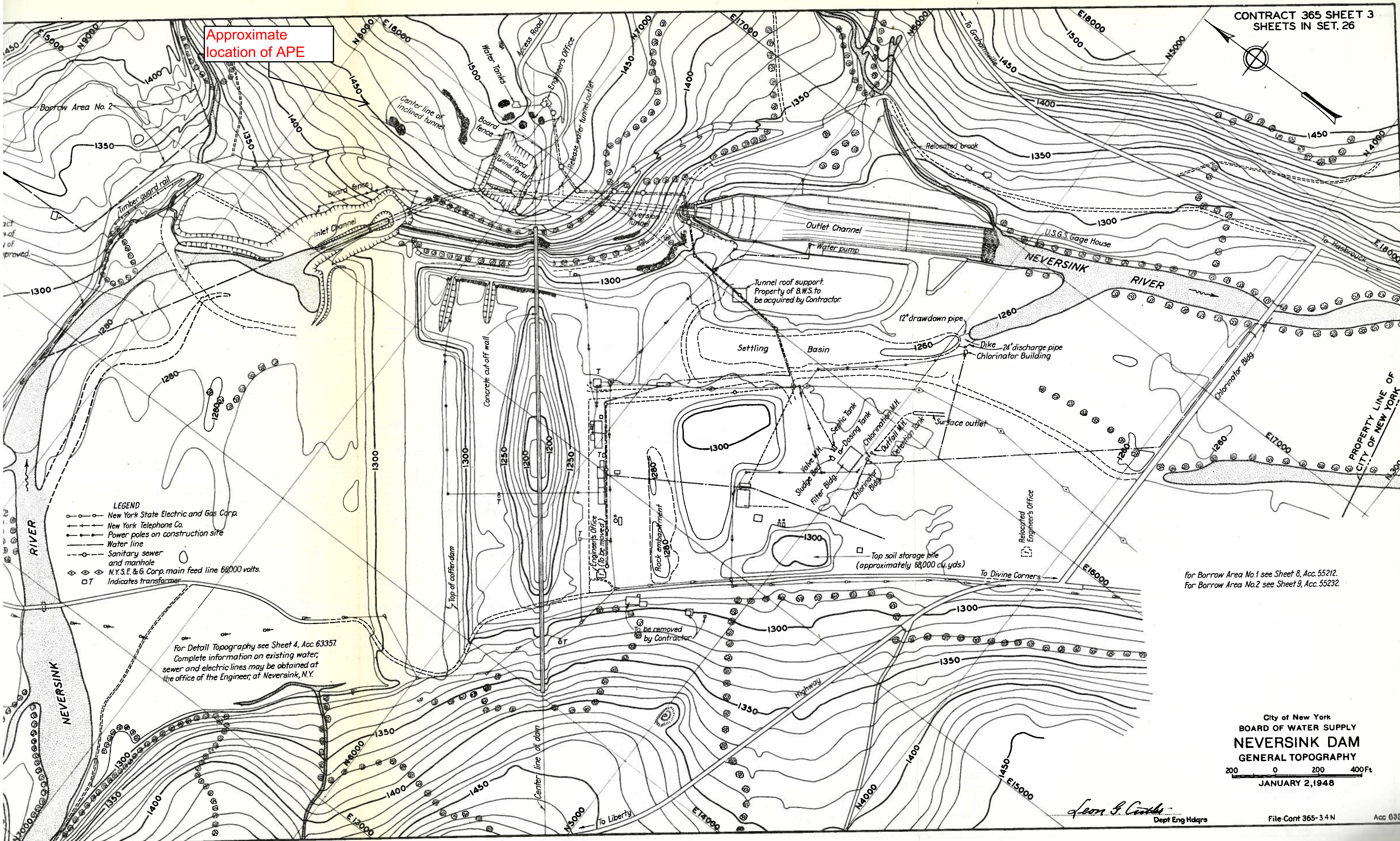
Part B



Property line of the City of New York
Right of way of substituted new highway to be built under Contract 402
To Downsville
N.Y. State Highway, Route 30
APPROXIMATE LIMIT OF CONTRACT 400
Center line of outlet channel
Inclined tunnel portal
Center line of diversion tunnel
Drainage ditch
Overflow spillway
Limits of rock embanking
Limits of rolled embankment
Center line of proposed dam
Cut-off wall
Excavation for cut-off wall
EAST BRANCH DELAWARE RIVER
The Contractor may be required to place earth refilling and embanking and rock embanking in portions of the river channel as ordered.
Soil storage area
Dike
Settling basin
Sewage disposal plant
Engineers office
Brook relocation
Limits of refilling and embanking
Center line of former railroad
Right of way of substituted new highway to be built under Contract 402
Traffic shall be maintained on existing highways until end of contract or completion of substituted new highways under Contract 402.
Locations shown for sewage disposal plant, settling basin and storage area are tentative only.
LEGEND
Telegraph lines
Power lines
Telephone lines
Wire fence
Stone wall
2 Indicates building to be removed.
Drawn
Traced F.J.G.
Checked G.L.K.
Designing Eng



Ref.-Acc G3829

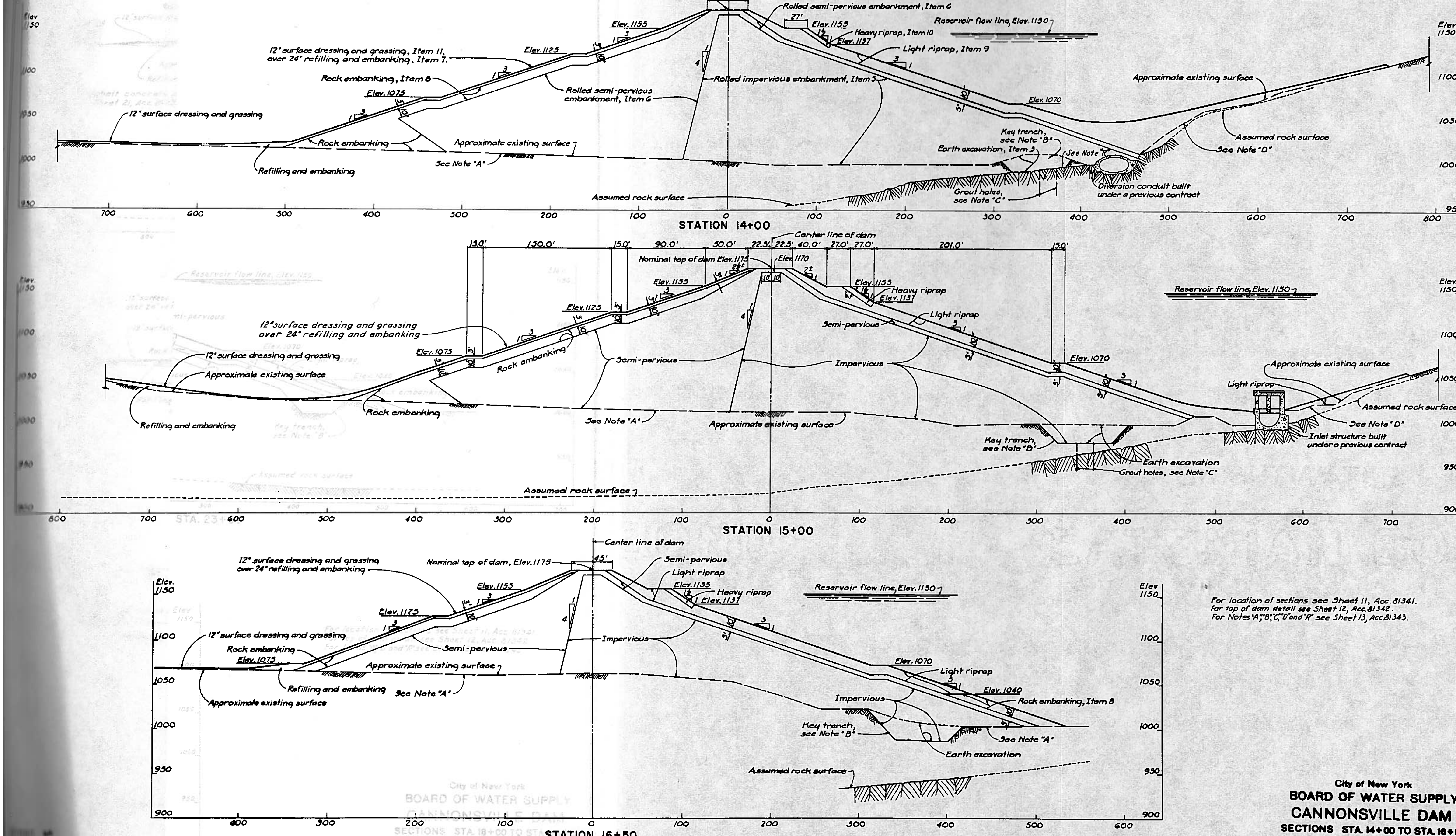


CONTRACT 365 SHEET 3
SHEETS IN SET, 26
Approximate location of APE
Borrow Area No. 2
Center line of inclined tunnel
Water Tanks
Access Road
Engineer's Office
Board fence
Inclined Tunnel Portal
Release water tunnel outlet
Timber guard rail
Board fence
Inlet Channel
Diversion Tunnel
Outlet Channel
Water pump
Relocated brook
U.S.G.S. Gage House
To Grahamsville
To Hasbrouck
NEVERSINK RIVER
Tunnel roof support. Property of B.W.S. to be acquired by Contractor.
12" drawdown pipe
Settling Basin
Dike
24" discharge pipe
Chlorinator Building
Chlorinator Bldg.
Concrete cut off wall
Top of coffer-dam
Septic Tank
Dosing Tank
Chlorination M.H.
Outfall M.H.
Detention Tank
Surface outlet
Valve M.H.
Sludge Bed
Filter Bldg.
Chlorinator Bldg.
Engineer's Office (to be moved)
Rock embankment
Top soil storage pile (approximately 68,000 cu. yds.)
Relocated Engineer's Office
PROPERTY LINE OF CITY OF NEW YORK
To Divine Corners
For Borrow Area No.1 see Sheet 8, Acc. 55212.
For Borrow Area No.2 see Sheet 9, Acc. 55232.
LEGEND
New York State Electric and Gas Corp.
New York Telephone Co.
Power poles on construction site
Water line
Sanitary sewer and manhole
N.Y.S.E. & G. Corp. main feed line 66,000 volts.
T Indicates transformer
For Detail Topography see Sheet 4, Acc. 63357. Complete information on existing water, sewer and electric lines may be obtained at the office of the Engineer, at Neversink, N.Y.
To be removed by Contractor
Highway
Center line of dam
To Liberty
NEVERSINK RIVER
City of New York
BOARD OF WATER SUPPLY
NEVERSINK DAM
GENERAL TOPOGRAPHY
200 0 200 400 Ft
JANUARY 2, 1948
Leon G. Cutler
Dept Eng Hdqrs
File Cont 365-3-4 N
Acc 63978

Historic Photos, Plans, and Maps of the Cannonsville Dam

As taken from the Board of Water Supply of the City of New York, Annual Reports and Contract Specifications Dated 1960 to 1972

CONTRACT 465 SHEET 14
SHEETS IN SET, 127



For location of sections see Sheet 11, Acc. 81341.
For top of dam detail see Sheet 12, Acc. 81342.
For Notes "A", "B", "C", "D" and "R" see Sheet 13, Acc. 81343.

City of New York
BOARD OF WATER SUPPLY
CANNONSVILLE DAM
SECTIONS STA. 14+00 TO STA. 16+50

50 0 50 100 Ft.

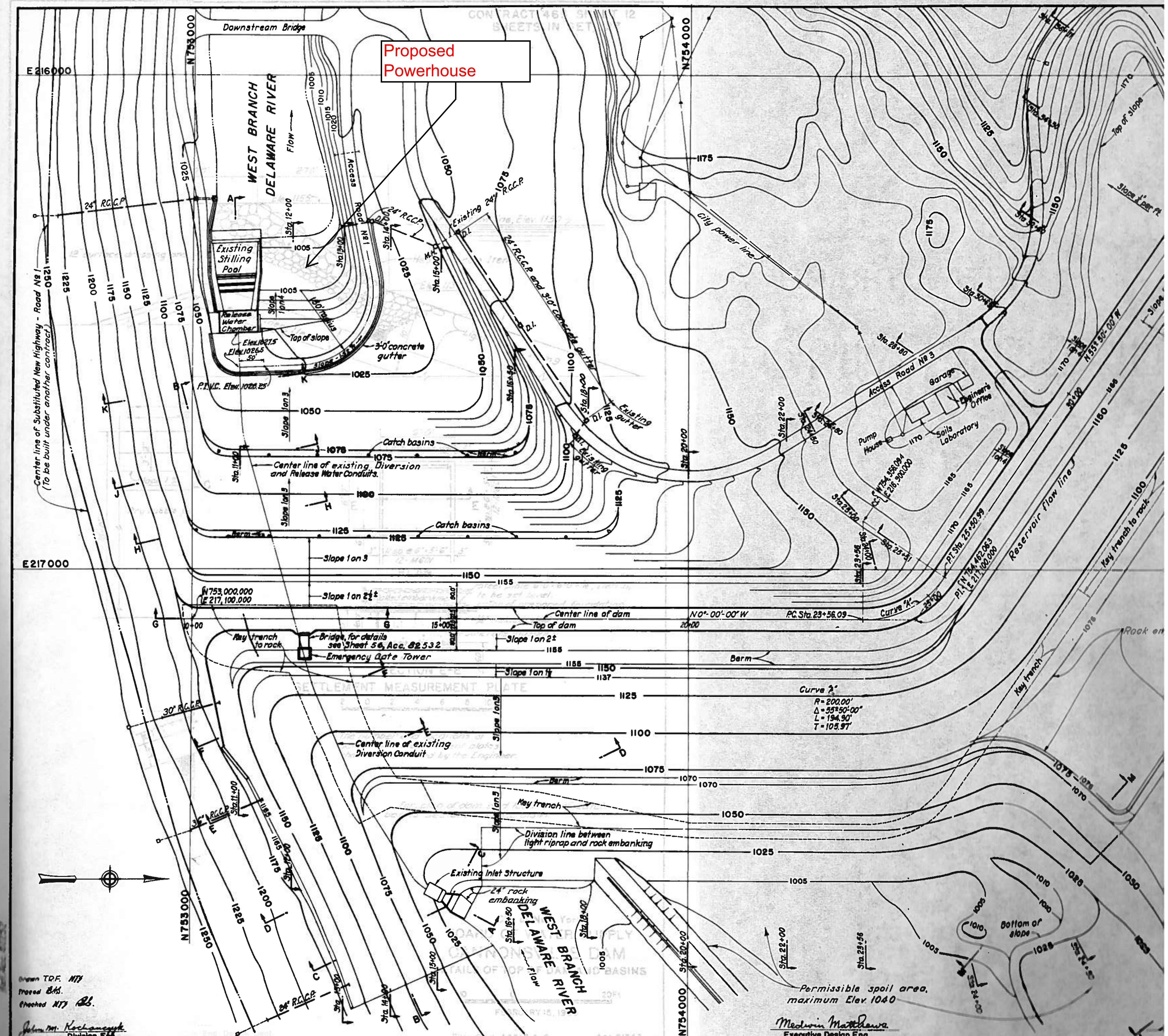
FEBRUARY 15, 1960

Division Eng.

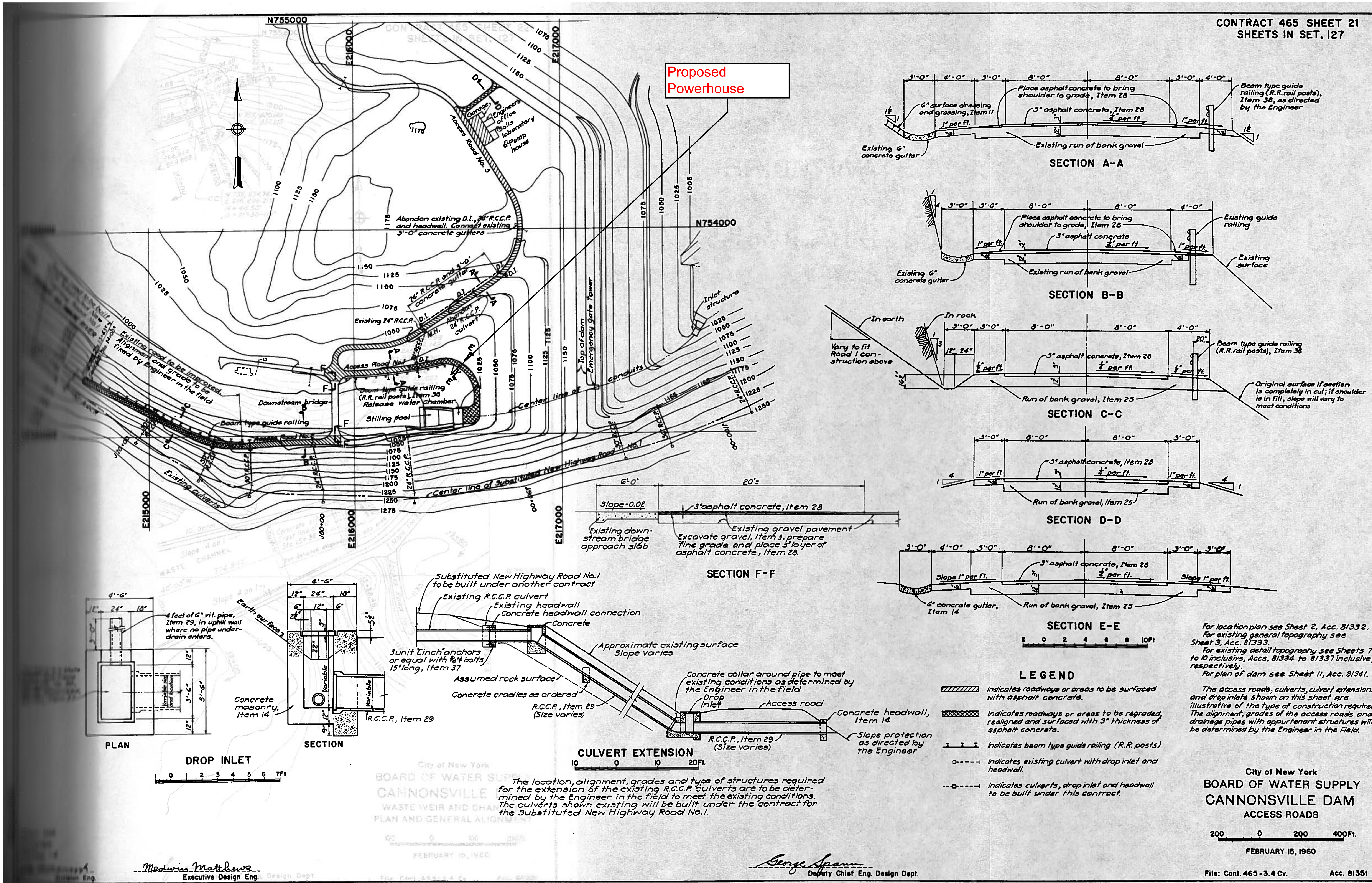
Medwin Matthews
Executive Design Eng.

George Spann
Deputy Chief Eng. Design Dept.

File: Cont. 465-3.4 Cv.   Acc 81344



Proposed Powerhouse
Downstream Bridge
E216000
N753000
N754000
E217000
WEST BRANCH DELAWARE RIVER
Flow
Access Road
Existing Stilling Pool
Release Water Chamber
Top of slope
3'-0" concrete gutter
Existing 24" R.C.C.P.
24" R.C.C.P. and 3'-0" Concrete gutter
City power line
Existing gutter
Catch basins
Center line of existing Diversion and Release Water Conduits
Center line of Substituted New Highway - Road No 1 (To be built under another contract)
Access Road No 3
Garage
Engineer's Office
Pump House
Soils Laboratory
Reservoir flow line
Key trench to rock
Slope 1 on 3
Slope 1 on 2½
N753,000.000 E217,100.000
Center line of dam
N0°-00'-00"W
P.C. Sta. 23+56.09
Top of dam
Key trench to rock
Bridge, for details see Sheet 56, Acc. 82532
Emergency Gate Tower
Slope 1 on 2
Slope 1 on 1½
Berm
Curve "A"
Curve "B"
R = 200.00'
Δ = 55°50'-00"
L = 194.90'
T = 105.97'
Center line of existing Diversion Conduit
Key trench
Division line between light riprap and rock embanking
Existing Inlet Structure
24" rock embanking
WEST BRANCH DELAWARE RIVER
Permissible spoil area, maximum Elev. 1040
Bottom of slope
Drawn T.R.F. NTY
Traced B.H.
Checked NTY
John M. Kochancyk
Division Eng.
Medwin Matthews
Executive Design Eng.



CONTRACT 465 SHEET 21
SHEETS IN SET. 127
Proposed
Powerhouse
N755000
N754000
E215000
E216000
E217000
Access Road No. 3
Garage
Engineers office
Soils laboratory
& Pump house
Abandon existing D.I., 24" R.C.C.P. and headwall. Connect existing 3'-0" concrete gutters
24" R.C.C.P. and 3'-0" concrete gutter
Existing 24" R.C.C.P.
Abandon 24" R.C.C.P. culvert
Access Road No. 1
Beam type guide railing (R.R. rail posts), Item 38
Release water chamber
Stilling pool
Downstream bridge
Beam type guide railing
Existing road to be improved. Alignment and grade to be fixed by Engineer in the field
Existing culverts
Center line of Substituted New Highway Road No. 1
Center line of conduits
Top of dam
Emergency gate tower
Inlet structure
SECTION A-A
Place asphalt concrete to bring shoulder to grade, Item 28
6" surface dressing and grassing, Item 11
3" asphalt concrete, Item 28
Existing 6" concrete gutter
Existing run of bank gravel
Beam type guide railing (R.R. rail posts), Item 38, as directed by the Engineer
SECTION B-B
Existing guide railing
Existing surface
SECTION C-C
In earth
In rock
Vary to fit Road I construction above
Run of bank gravel, Item 25
Beam type guide railing (R.R. rail posts), Item 38
Original surface if section is completely in cut; if shoulder is in fill, slope will vary to meet conditions
SECTION D-D
SECTION E-E
6" concrete gutter, Item 14
SECTION F-F
Slope-0.02
3" asphalt concrete, Item 28
Existing gravel pavement
Existing downstream bridge approach slab
Excavate gravel, Item 3, prepare fine grade and place 3" layer of asphalt concrete, Item 28.
DROP INLET
PLAN
SECTION
4 feet of 6" vit. pipe, Item 29, in uphill wall where no pipe underdrain enters.
Concrete masonry, Item 14
R.C.C.P., Item 29
CULVERT EXTENSION
Substituted New Highway Road No. 1 to be built under another contract
Existing R.C.C.P. culvert
Existing headwall
Concrete headwall connection
Concrete
3 unit "Cinch" anchors or equal with 3/4" bolts 15" long, Item 37
Approximate existing surface Slope varies
Assumed rock surface
Concrete cradles as ordered
R.C.C.P., Item 29 (Size varies)
Concrete collar around pipe to meet existing conditions as determined by the Engineer in the field.
Drop inlet
Access road
Concrete headwall, Item 14
Slope protection as directed by the Engineer
The location, alignment, grades and type of structures required for the extension of the existing R.C.C.P. culverts are to be determined by the Engineer in the field to meet the existing conditions. The culverts shown existing will be built under the contract for the Substituted New Highway Road No. 1.
LEGEND
Indicates roadways or areas to be surfaced with asphalt concrete.
Indicates roadways or areas to be regraded, realigned and surfaced with 3" thickness of asphalt concrete.
Indicates beam type guide railing (R.R. posts)
Indicates existing culvert with drop inlet and headwall.
Indicates culverts, drop inlet and headwall to be built under this contract.
For location plan see Sheet 2, Acc. 81332.
For existing general topography see Sheet 3, Acc. 81333.
For existing detail topography see Sheets 7 to 10 inclusive, Accs. 81334 to 81337 inclusive, respectively.
For plan of dam see Sheet 11, Acc. 81341.
The access roads, culverts, culvert extensions and drop inlets shown on this sheet are illustrative of the type of construction required. The alignment, grades of the access roads and drainage pipes with appurtenant structures will be determined by the Engineer in the field.
City of New York
BOARD OF WATER SUPPLY
CANNONSVILLE DAM
ACCESS ROADS
FEBRUARY 15, 1960
Medwin Matthews
Executive Design Eng.
George Spamer
Deputy Chief Eng. Design Dept.
File: Cont. 465-3.4 Cv.
Acc. 81351