HISTORICAL PERSPECTIVES INC.

ALTERNATIVES ANALYSIS
FOR THE
JEROME PARK RESERVOIR AND AQUEDUCT REHABILITATION

City of New York Department of Environmental Protection
Bureau of Engineering Design and Construction

NYSOPRHP #15PR05283

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January 2017

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1.0 PROJECT SUMMARY

The New York City Department of Environmental Protection (NYCDEP) is charged with maintaining, securing, and improving the city's water supply system. In fulfillment of this responsibility, the NYCDEP has proposed rehabilitation of the Jerome Park Reservoir (Reservoir) as a necessary component in the overall plan to repair and upgrade the infrastructure of the Croton Water Supply System. The focus of the rehabilitation project is to improve the water quality, to improve site safety and to maintain the functionality of the Reservoir. The Reservoir is a man-made structure that was constructed between 1895 and 1905 and has a capacity of approximately 773 million gallons of water. Currently, it is fed by the New Croton Aqueduct (NCA) but the former water conduit, the Old Croton Aqueduct (OCA) is also a part of the east wall of the Reservoir (Figure 1).

While the original OCA predates the Reservoir by 60 years, the section within the immediate Reservoir complex was reportedly disassembled and reconstructed to the west of its original location so that it sits parallel to the New Croton Branch Aqueduct (NCBA) within the Reservoir's eastern perimeter wall. The OCA National Register (NR) designation form concurs that a section of the horseshoe-shaped brick underground conduit was disassembled and moved and what exists now dates to ca. 1899 (Figure 2).

The East Basin Outlet (EBO) is another ca. 1899 tunnel below and east of the OCA within the east wall of the Reservoir; it runs south of Gate House No.5 for approximately 2,100 linear feet. Originally, the EBO tunnel was intended to feed the Reservoir's east basin but was abandoned when the full size of the Reservoir was unrealized.

The Reservoir and surrounding structures (i.e., gate houses) are recognized as a State/National Register of Historic Places District (S/NR District). The OCA and the NCA are also S/NR-listed properties and the OCA was designated a National Historic Landmark (NHL) in 1992. The approximately 125-acre Reservoir complex is a substantial and significant presence in the community, including both above- and below-grade resources related to the early engineering of the city's water system. Open water comprises approximately 94 acres (25-feet deep). See Appendix B.

Subsequent to the S/NR listings, the NYCDEP entered into a Memorandum of Agreement (MOA) with the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) in July 2000 concerning the continued operation of the Reservoir and upgrades needed in conjunction with the erection of a new Water Treatment Plant (WTP) (Appendix D). In this agreement, NYSOPRHP acknowledged that the Reservoir is an integral part of NYC's water supply system and that NYCDEP has in the past, and would, in the future, require the rehabilitation, modification, upgrade and/or expansion of structures or appurtenances. A review procedure for activities involving significant alterations to the site is outlined in the MOA.

As per item III of the MOA, the Review Procedures for Activities Involving Significant Alterations to Listed Surface Structures, the NYCDEP is continuing to submit architectural and site improvement drawings for ongoing projects. For the currently proposed project, documents were submitted to the NYSOPRHP for review in 2015. NYCDEP received a formal response from NYSOPRHP, dated October 9, 2015, which states that the agency reviewed the following proposed actions:

- Addition to the Reservoir of a bird deterrent system;
- Repairs to the Reservoir interior east wall including repointing mortar joints and reset loose/missing stone and construction of a concrete buttress wall;
- Securing and abandonment of the below ground portions of the Old Croton Aqueduct that runs within the Reservoir east wall;
- Securing previously abandoned below ground portions of the East Basin Outlet; and,
- Replacement of the interior fence between Gate House Nos. 6 and 5.

Beth Cumming, the Senior Historic Site Restoration Coordinator and NYSOPRHP reviewer, noted that the proposed rehabilitation project constitutes a significant modification to the Reservoir but approved the proposed work based on two conditions. The No Adverse Effect conditions, as noted in the NYSOPRHP letter of 10/9/15 (Appendix A), are:

(1) The cast-in-place concrete buttress wall proposed to be constructed against the existing east reservoir wall shall, under normal operations, be below the water line.

(2) For any of the proposed work where a "new capstone" is proposed; the new capstone shall match the historic.

If either of these conditions cannot be met, NYSOPRHP would anticipate submission of a full Alternatives Analysis (AA) of the proposed rehabilitation, as per the MOA and Section 106 of the National Historic Preservation Act of 1966 (Beth Cumming, personal communication to Cece Saunders, HPI, 3/28/16).

According to the most current design plans (Appendix C), there are revisions and additions to the earlier proposed Reservoir rehabilitation based on a variety of factors, including the NYCDEP decision against installation of a bird deterrent system, recent geotechnical test results, and the completed Value Engineering (VE) process. The changes are beneficial to the historic fabric of the Reservoir, including reduction of the proposed concrete buttress wall to a thinner concrete liner wall. Additional efforts, based on recent structural test results, are repairs to the submerged infrastructure and portal elements, the Wingwall and Archway. This change and additional effort are discussed in full in the following section on project needs.

The revised rehabilitation designs for the Reservoir continue to meet the NYSOPRHP stipulations on matching introduced masonry with the historic fabric and basin water levels. For more than a decade of extended work on the Reservoir and Gate House Nos. 5 and 7, the NYCDEP consulted with James Warren and/or Beth Cumming of NYSOPRHP to meticulously meet the MOA stipulations on sensitive improvements such as choices on grout colors and replacement stones and quality of masonry workmanship.[1] The agency is fully aware of its responsibility to the state, local advocacy groups, and the resource itself.

In addition, the NYCDEP does not anticipate a permanent change in the water level in either the north or south basin. At times one basin may be drained and remain emptied for periods of up to one (1) year thus a portion of the proposed wall liner might be exposed for a period of up to one (1) year until the basin is refilled (A. Brown, NYCDEP, personal communication to C. Saunders, HPI, 11/7/16).

Creating the following AA for the significant repairs and changes to the Reservoir was a NYCDEP-driven decision to establish the existing conditions, clarify the project needs, and evaluate the available rehabilitation options within a framework of preferred engineering solutions.

2.0 PROJECT NEED

The following project needs include identification of repairs and proposed improvements that will be both visible and invisible. The project need discussions will be carried forward into the AA section as indicated.

2.1 Description of the Proposed Project: Repairs to the Reservoir Interior East Wall

As part of the Croton Water Supply System, raw water travels from the upstate reservoirs to the Reservoir where it is stored prior to treatment at the new Croton Water Treatment Plant (WTP). The NYCDEP has identified areas of work that will be crucial to the continued successful operation of the Reservoir and the new WTP. Specifically, the east wall of the basin will need to be rehabilitated so as to ensure its continued stability and prevent water leakage in to and out of the Reservoir. Specifically, NYCDEP is proposing two courses of action: repointing mortar joints and resetting loose and/or missing stone and construction of a concrete liner wall.

[1] Historical Perspectives, Inc. (HPI) has authored a number of these submissions to the state and has consulted with NYSOPRHP as each action has moved forward. A sample of NYCDEP's historic restoration efforts in compliance with the MOA includes Overflow Weir, New Shaft and Meter Chamber, and Jerome Park Reservoir, 2007; Old Croton Aqueduct Documentation, Jerome Park Reservoir, Shaft and Meter Chamber Site, 2010a; Window Glass-Block Replacements, 2010b; Gate House No. 5 Electrical Installation, 2011; Perimeter Wall Repair Update, 2012; New Shaft and Meter Chamber, 2016.

2.1.1 Repoint Mortar Joints and Reset Loose and/or Missing Stone

Portions of the Reservoir wall will be subject to repointing of the mortar joints, as well as resetting loose stone where necessary. The new mortar to be used will have significantly improved properties that will provide greater durability and freeze/thaw resistance, as well as provide greater resistance to water seepage.

2.1.2 Construction of a Concrete Liner Wall

A cast-in-place concrete liner wall will be constructed against the existing east reservoir wall to prevent further displacement of the lower random rubble stone. This liner will also impede the transfer of water in and out of the Reservoir through the mortar joints. Under normal operations, the 25-foot high liner wall will be at or below the basin water level and will not be visible to the public.

Based on current NYCDEP design plans, the extent of the liner wall will be limited to the east wall north of Gate House No. 5 and a section south of Gate House No. 5. On the south side of the Gate House, the liner wall will run the very short distance from Station 81.21 to 80.0; on the north side of the Gate House, the liner wall will run from Station 80.75 to 63.66 (Appendix C: S-340).

The following AA discussion will present an early alternative design for reinforcing the Reservoir's East Wall.

2.2 Description of the Proposed Project: Securing and Abandonment of the Below Ground Portions of the Old Croton Aqueduct within the Reservoir East Wall

The OCA, which was originally built between 1837 and 1842, was partially rebuilt in ca.1899 within what would have been the dividing wall of a much larger Reservoir. With the abandonment of the east basin from the originally planned Reservoir, the dividing wall is now the eastern wall of the north and south basins. The east wall also contains the New Croton Branch Aqueduct (NCBA) and two lower outfall tunnels. The OCA approaches the Reservoir from the north, spans the entire length of the reservoir from Gate House No.7 to Gate House No. 6 and continues southward. The OCA remained in service until 1955 and is no longer in use.

The NYCDEP proposes in this project to secure and abandon the OCA between Gate House No. 7 and Gate House No. 6. Securing will consist of filling the entire cross section of the horseshoe-shaped aqueduct with Controlled Low Strength Material (CLSM) for a total length of approximately 4,600 linear feet, from approximately 50 feet north of Gate House No.7 to approximately 50 feet south of Gate House No.6 (Appendix C: S-331 and S-332).

The following AA discussion will present an alternative design approach for securing the OCA within the Reservoir East Wall.

2.3 Description of the Proposed Project: Securing the Below Ground Portions of the Previously Abandoned East Basin Outlet

The NYCDEP proposes sealing both the north and south bulkheads of the EBO and filling the entire cross section of the EBO with CLSM. No modifications will be visible above grade. Due to the extra depth of this tunnel, access to the top of the tunnel will require some excavation. Several access ports will need to be opened prior to filling (Appendix C: S-331 and S-332). It may be necessary to obtain a temporary easement from Lehmann College for one or more access points in their parking lot on the north side of Goulden Avenue. See Photograph 1.

2.4 Description of the Proposed Project: Repair of Utility Road and Replacement of Interior Fence between Gate House Nos. 6 and 5[2].

Secure fencing is a necessity for water quality control and public safety. Currently, there are two sets of chain link fences around the Reservoir; one immediately at the top of the basin wall, which is the ten-foot fence to be replaced with a four-foot fence, and a second fence running along the outside of the perimeter road. See Photograph 2.

[2] The NYSOPRHP review letter of 10/9/2015 (Appendix A) approved of the proposed replacement of the interior chain link fence between Gate House Nos. 6 and 7. [Gate House No. 5 is situated between Gate House Nos. 6 and 7.] However, the proposed fence replacement plans have always been limited to that smaller section of the east basin wall between Gate House Nos. 6 and 5.

The proposed installation of four-foot high chain-link fencing on the inside of the perimeter road from south of Gate House No. 5 to Gate House No. 6 does not adversely impact the historic character of the Reservoir Historic District since it represents the replacement of an existing and more intrusive ten-foot high chain link fence. As noted by the NYSOPRHP, the necessary replacement of a capstone will not be an adverse impact as long as the new capstone shall match the historic (Appendix A).

Also, improvements to the perimeter utility road are necessary, including new pavement. The roadway will be re-graded to direct water away from the reservoir and into on-site retention structures and/or swales. (NYCDEP 2015)

A box beam guiderail along the east wall between Gate House Nos. 5 and 6 is proposed. There is no guiderail currently on the perimeter road and the proposed improvement would introduce a modern necessary safety feature onto the landscape. However, the guiderail will be partially obscured by the existing outer chain-link fencing that already visually separates the public along Goulden Avenue from the basin wall. The guiderail and fence improvements will provide safety protection for staff walking and driving around the perimeter of the Reservoir and roadway improvement will provide improved stormwater management and alleviate current ponding and icy roadway conditions. (NYCDEP 2015)

Since the guiderail is a necessity for safety reasons, it must be added to the complex. However, the MOA provides a framework for selecting newly introduced features, such as the guiderail, that will minimize discordant visual impacts. The MOA ensures that materials and the design for this new element will be selected to maintain harmony with the surrounding area and minimize visual intrusiveness.

The estimated budget for the new fencing, road improvements, and guiderail is $2,955,768.

No in-depth alternatives analysis for this section of in-kind fence replacement of a less visually intrusive variety will be carried forward.

2.5 Description of the Proposed Project: Wingwall and Archway Repair [within the Reservoir basin] at Gate House No. 7

The submerged features, which currently exhibit some visual deterioration, serve as a portal between Gate House No.7 and the north basin (Appendix C: S-350.0 – 354.0). See Photograph 3. The wing wall and archway were recently subjected to concrete testing by Mott MacDonald. The specific purpose of this concrete investigation was to evaluate the current condition of the reservoir wall in this northeast corner of the north basin and, if possible, determine the cause of deterioration of the outer concrete surface, as well as determine potential depth of the attack and internal distress of the wall and these features. This information will also be used to analyze the feasibility of the intended repair method which is to construct an eight-inch thick concrete membrane wall fastened into the existing archway and wing walls, and support the design of dowels/anchors for the proposed construction. A total of five core samples were taken through the archway and wing walls at the Gate House No. 7 inlet in June of 2016 and subjected to lab tests for compression and carbonation. Test results indicate that the concrete is in adequate condition for construction of the proposed eight-inch thick membrane wall fastened to the existing structure by steel dowels and grouting with a chemical adhesive. (MM 2016a)

It is anticipated that the surface concrete at this inlet area will need to be removed to some extent in order to expose sound concrete. This will be conducted chiefly by mechanical means such as by a power chisel or scabblers. Demolition may include use of water blasting, grit blasting and saw cutting. (NYCDEP 2015)

The estimated budget for the Wingwall and Archway Repair is $248,019 (NYCDEP 2016).

No in-depth alternatives analysis for necessary repair of submerged features, which meets the intent of the MOA, will be carried forward.

2.6 Description of the Proposed Project: Repair Retaining Wall Adjacent to Lehman College Parking Lot

The “plain concrete” retaining wall along the southeastern portion of the Reservoir access road adjacent to the Lehman College parking lot is currently spalled and in disrepair, particularly a significantly deteriorated area approximately 150 ft. long (between S21+50 and S23+00). It is anticipated that the retaining wall in this area, which rests on top of the outside of the Reservoir’s East Wall will be removed and replaced with a new concrete wall. The demolition will be coordinated with the existing wall joints. A temporary bracing system is required to be

in place during the reconstruction of the wall. Currently, most of the capstones topping the retaining wall, which are original cut stones, are displaced. The demolition work shall include the removal and stockpile of all the capstones. After wall re-construction the capstones will be repositioned and pointed as per the MOA.

The estimated budget for the concrete wall replacement is $331,286 (NYCDEP 2016).

No in-depth alternatives analysis for this section of in-kind concrete wall replacement, which complies with the MOA stipulations pertinent to treatment of the capstones, will be carried forward.

3.0 HISTORY AND SIGNIFICANCE OF THE JEROME RESERVOIR AND OLD CROTON AND NEW CROTON AQUEDUCTS[3]

The Reservoir, situated directly west of Harris Park and extending west of and parallel to Goulden Avenue, is an important element in New York City's water system; its construction in the early twentieth century reflects the evolution of the water system as the city expanded. The Reservoir is the oldest system supplying water to New York City and is the one closest to the city. The major architectural features of the Reservoir structure itself are low ring walls of massive rock-faced, stone blocks. On the west side and on much of the north side, the Reservoir wall is built above the level of the street, and the water is not visible. Physically, the basins of the Reservoir are set apart from their surroundings. Much of the perimeter wall is raised above eye-level, and its use and design are different from that of the surrounding neighborhood. It is, however, a structure that due to its scale and placement in the area, is a defining element of the neighborhood.

The construction of the Reservoir basin, as we see it today, was completed in 1906. Critical to understanding the placement of gate house chambers and the changes to the Reservoir over time is an appreciation of the original design. First proposed ca. 1884 as a part of the construction plans for the New Croton Aqueduct system, it was to function as a receiving and distributing reservoir to ensure the city of at least a 10-day consumption source. The design flow was 50 million gallons a day. The location, on the grounds of the Jerome Park Racetrack, was selected in 1885 due to its elevation. The plans specified construction of the Reservoir bottom at an elevation that would guarantee gravity flow into the reservoirs in Central Park in Manhattan. "A study of the available topographical maps showed that Jerome Park and vicinity contained the only site in the Annexed District [24th Ward aka the Bronx] at the proper elevation for the construction of such reservoir" (DWSG&E 1907). Construction plans did not move forward for many years.

When the contract for the proposed reservoir was first circulated in 1894, the planned capacity was 1.5 billion gallons, corresponding nominally to seven and one-half days' drinking water supply for the City. However, by 1895 the plans and specifications were amended to increase the capacity to two billion gallons. As envisioned at that time, the reservoir was to be comprised of an easterly and westerly basin, with a massive stone dividing wall running the north-south length of the entire reservoir. The north-south division wall would support a new conduit to replace the old aqueduct (OCA), and a new aqueduct (NCA) was to pass approximately 100 feet beneath the reservoir. A series of shafts and tunnels would connect the flow of water between the basin and aqueducts. (DWSG&E 1907)

Construction, under the supervision of John B. McDonald of McDonald & Onderdonk, was not completed in 1902 as originally scheduled. By that year, the contract was amended again to the following reduced capacity: easterly basin, 1.13 billion gallons and the westerly basin, 773.4 million gallons. When the Reservoir was officially opened in 1906 only the smaller westerly basin was completed and functioning.

The second basin, east of the division wall, was still planned at that time, and the land was cleared and partially excavated in preparation for construction. Two Gate Houses , No. 4 and No. 6, were first erected well east of what is now the eastern ring wall of the reservoir on the assumption that the proposed two-basin reservoir would be completed. In 1912, the two-basin plan was officially abandoned, and the excavated area of the east basin was eventually filled and graded. The site was turned over to the City for other uses and it was later developed with

[3] The Jerome Park Reservoir has been the subject of several cultural resource investigations completed by HPI in conjunction with the federally mandated construction of a Croton Water Treatment Plant to treat the New York City's Croton water supply. Primary documentary research was originally undertaken in 1994 and updated in 1998. Subsequent research and field investigations provide for a comprehensive history of this resource, much of which is repeated herein (HPI 1994, 1998, 2010).

Lehman College, a subway yard, three high schools, a park, and several public housing developments.

Because of the abandonment of the east basin plans, Gate Houses Nos. 4 and 6, which were subterranean systems in 1906, never functioned. Gate House No. 4 was eventually abandoned. Gate House No. 6 was rebuilt, and the control chambers and valves moved to the southern tip of the west basin where it stands today.

Extant architectural features of the Reservoir complex include the brick gate house superstructures. Two of these, Gate House No. 5 on Goulden Avenue at West 205th Street, and Gate House No. 7 at the corner of Goulden Avenue and Sedgwick Avenue, are substantial structures, while the others are smaller buildings. Gate houses were built for the proper distribution and handling of water. Their substructures, buried below grade, host the vital piping and pumps necessary to maintain the required water flow. Visible to the public on today's landscape are the gate house superstructures that serve as above-grade access structures for the piping and pump mechanisms. Although the Reservoir was completed in 1906, none of the superstructures were erected at that time. In 1938, brick and stone Art Deco designs were prepared for Gate House Nos. 2, 5, and 7 by the WPA and funds became available for construction.

The east-west dividing wall that currently separates the north and south basins was built in the 1980s as part of a water quality improvement plan. The top of the wall serves as a road to connect the west side of the Reservoir with Shaft No. 21 and the east side of the Reservoir. Approximately the top 10 feet of the dividing wall is faced with rock face granite to match the perimeter wall (NR 2000).

3.1 Significance of the Jerome Park Reservoir Historic District

As concluded on the NR-nomination form (2000), "The Jerome Park Reservoir is a significant example of late nineteenth and early twentieth century civic architecture and engineering in the Bronx which retains a relatively high degree of integrity of location, design, setting, materials, workmanship, feeling, and association. Its historic park-like surroundings further add to the period integrity of the reservoir." The District is a 125-acre complex that conveys both visual and contextual impact from two perspectives. First, the stone walls and surrounding grade level vegetation provide a park-like setting. Secondly, the 94-acre water feature provides a visual focus from the elevated perspective of surrounding homes, schools, and residential towers. See Appendix B.

4.0 ALTERNATIVES ANALYSIS TO CONSTRUCTING THE LINER WALL

The Reservoir's "massive ancient Roman-inspired basin walls" are a significant element of the historic complex (NR 2000). The east wall, running parallel to Goulden Avenue, was constructed to a height of approximately 28'-6" above the finished reservoir floor and houses as many as four tunnels: the OCA, the NBCA, the South Outfall and the East Outfall. It was constructed in two distinct portions. The lower portion is approximately 13'6" tall and the exposed face is composed of large random rubble stone, backed up by cyclopean and mass concrete. The upper portion is approximately 15-feet tall composed of exposed course dimensioned stone with mortar joints. (NYCDEP 2015: Appendix 8) Between Gate House Nos. 5 and 7, the east wall is 30-feet wide with the two aqueducts side-by-side; south of Gate House No. 5, the east wall is 35-feet thick at the base with the OCA running on top of the NCA (Ibid.). "Within the Reservoir basin, the lower portion of the east wall is constructed of large blocks and stone excavated at the site, and the upper portion consists of the rock-face granite of the OCA, laid with broken range and random range jointing. The coping stones are rough-pointed with a tooled margin" (NR 2000).

Numerous investigations have documented substantial water transfer between the OCA and the reservoir through large cracks and damaged mortar joints. This water transfer through the damaged wall areas coupled with poor freeze/thaw characteristics of the joints and the repetitive reservoir drawdown which allowed for intermittent exposure of the wall to climatic effects, has caused the reservoir wall to substantially degrade.

Both large scale and small scale actions are necessary to repair the reservoir wall. Based on NYCDEP design plans of 2017 (Appendix C), two different but complementary actions are proposed for the east wall. First, individualized attention to repointing mortar joints and resetting loose or missing stones along the east wall is necessary. There has been significant loss of joint material which has resulted in localized settlement or movement of the dimension stone and rubble stone as well as leaks (NYCDEP 2015: Appendix 8). As NYCDEP has consistently complied with the MOA currently in effect, the repointing and resetting will be executed with great care to match grout color, grout texture, and the grout application method of the original east wall structure. Replacement of missing stones will be guided by the MOA to replace "in kind" as per the Secretary of the Interior's Standards for Rehabilitation. It is anticipated that the localized repointing of mortar joints and resetting of missing stones will be necessary regardless of further in-depth and intensive repairs.

The second and more involved repair will be focused on a limited portion of the east wall. Sections of the east wall which are immediately to the south and north of Gate House No. 5 demonstrate the most wall deterioration and the localized repointing will not suffice. On the south side of the Gate House, the need for focused, large-scale repairs runs the short distance from Station 82.0 to 81.50; on the north side of the Gate House, the need for focused, large-scale repairs runs from Station 80.75 to 75.0.

The following discussion presents an alternative robust concrete buttress wall design as well as the preferred alternative – the installation of a thinner concrete liner wall. The discussion provides a comparison of the benefits for the city's reliable water quality, constructability, cost considerations and impacts to the historical integrity of the Reservoir of the following alternatives.

- The No Action Alternative;
- Installation of a Concrete Buttress Wall Alternative; and,
- Installation of a Concrete Liner Wall Alternative.

4.1 The No Action Alternative

As noted in a Hatch Mott MacDonald inspection report in 2015, "Due to the many years the Jerome Park Reservoir has been in service and as a result of climatological impacts, physical weathering and operational influences, the east wall has continued to experience degradation. In particular, there has been significant loss of joint material which has resulted in localized settlement or movement of the dimension stone and rubble stone as well as leaks both above and below the invert of the OCA. As noted in the previous inspection report by GeoDesign titled "Jerome Park Reservoir Inspection, Bronx County, New York, NYCDEP Contract No: CRO-312OS-G", dated May 24, 2012, there has been substantial water transfer between the OCA and the reservoir through large cracks and damaged mortar joints. This water transfer through the damaged wall areas coupled with poor freeze/thaw characteristics of the joints and the repetitive reservoir drawdown which allowed for intermittent exposure of the wall to climatic effects, has caused the wall to substantially degrade" (NYCDEP 2015: Appendix 8).

As noted above for other critical repairs to this active water supply system, the "no action" alternative is not tenable. NYCDEP is charged with ensuring a supply of clean and potable water and maintaining the Jerome Park Reservoir clearly falls within that responsibility. The recent Value Engineering analysis observed that repairs were critical to reducing seepage through the masonry and, thereby, extending the structural life of the reservoir by reducing the potential for chemical leaching from the concrete and reducing the environmental stresses on the structure (NYCDEP 2016).

4.2 The Installation of a Concrete Buttress Wall Alternative

The concrete buttress wall design, which was the initial NYCDEP vision, is a very robust approach for a total of 388.33 linear feet of the East Wall, divided by Gate House No. 5. It entails a battered concrete buttress wall on a concrete footing, applied directly to the cleaned and prepared East Wall. The demolition of the basin floor foundation slab must accommodate a seven-foot-wide footing for the wall which tapers to a three-foot-wide top width. Foundation plans depict twin steel casings and rock-socketed caissons supporting the wall's footing where soil underlies the reservoir floor slab, which is the condition of the South Basin. (NYCDEP 2016)

The top of the concrete buttress wall is estimated to extend approximately 2.5 feet above the interface between the dimensional/coursed ashlar stone and the random rubble stone. (NYCDEP 2016)

4.3 The Liner Wall Installation Alternative

The preferred alternative is construction of a more slender, 16-inch thick concrete "facing" of the exposed rubble masonry façade of the selected section of the East Wall, a portion of both the North and South Basins adjacent to Gate House No. 5. As noted in the 2016 Value Engineering review, "The primary function of the buttress is to limit seepage and provide stability to the existing stone façade. This can be achieved with a reduced wall thickness in comparison to the buttress wall…" (NYCDEP 2016).

The Value Engineering stipulates a pre-concrete chemical grout injection along the liner/masonry interface and along the transverse floor slab joints beneath the footprint of the new, 16-inch liner. The liner would be applied directly to the cleaned and prepared East Wall for an approximate total of 388.33 linear feet. Two-foot drilled and grouted dowels would be embedded into the concrete and secured into the masonry East Wall. The liner would terminate at the surface of the existing basin floor slab, rather than demolishing the slab and continuing the

placement below grade. Again, the Value Engineering stipulates installation of a surface-applied retrofit waterstop along the existing floor slab. (NYCDEP 2016)

Another advantage of the liner wall is the applicability of standard vertical form liners versus the non-standard form liners required for the battered wall design.

4.4 Summary of Impacts of Preferred Liner Wall Alternative

The NR data on the Reservoir notes that the typical height of the stone reservoir walls is 28 feet from the concrete slab basin floor to the top of the capstoned wall, with two-and-a-half feet of wall exposed above the high water level (NR Nomination Form 2000). The NYSOPRHP reviewed the initially proposed buttress wall in compliance with the established MOA. The agency has opined that the buttress wall will not constitute an adverse effect as long as the new wall is under the water line during normal operations (B. Cumming, NYSOPRHP, personal communication to D. Lord, NYCDEP, 10/9/15).

Over the last twenty years of repairs on this inter-connected city system, the water level in one or both basins has been lower than the anticipated level to cover the proposed wall. According to Eric Bodnar, PE (Project Manager, Water, NYC Metro, 6/10/16), the intent of the NYCDEP - once the improvements have been completed - is to maintain a water height of approximately 25 feet in the north basin when that basin is being used, and the south basin water level should be assumed to be the equivalent of the north basin.

The repair and support system for the East Wall, between ST 82.0 and 81.5 in the South Basin and between ST 80.75 and 75.0 1 in the North Basin, is not slated for a load-bearing function and installation of a less robust design than the buttress wall is certainly adequate. The liner wall alternative is only 16 inches wide while the battered buttress wall alternative is from three feet to seven feet wide, and also entails excavating into the basin floor slab.

If the water level is maintained at 25 feet above the basin slab, on a routine basis, after all of the repairs and improvements at the Reservoir are realized, the NYSOPRHP review stipulations will be met, regardless of whether the East Wall is repaired and strengthened with a buttress wall or a liner wall. However, the preferred alternative of a liner wall "facing" is more sensitive to the Reservoir's historical presence and integrity than the larger buttress wall alternative.

The preferred alternative of a thinner concrete wall liner is estimated to cost approximately $2,091,269 less than the concrete buttress wall alternative (NYCDEP 2016).

5.0 ALTERNATIVES ANALYSIS TO SECURING AND ABANDONMENT OF THE BELOW GROUND PORTIONS OF THE OLD CROTON AQUEDUCT WITHIN THE RESERVOIR EAST WALL

The following discussion presents three alternatives to Securing and Abandonment of the Below Ground Portions of the Old Croton Aqueduct within the Reservoir East Wall as well as the preferred alternative. The discussion provides a comparison of the benefits for the city's reliable water quality, constructability, cost considerations and impacts to the historical integrity of the Reservoir of the following alternatives.

- The No Action Alternative;
- Securing and Abandonment with Structural Concrete Alternative; and,
- Securing and Abandonment with a Controlled Low Strength Material Alternative.

5.1 The No Action Alternative

As noted in the NR nomination form (2000: No. 7 Narrative Description), "The Old Croton Aqueduct, constructed between 1837 and 1842, originally consisted of a forty-mile long, enclosed conduit running from a dam on the Croton River… The massive gravity-fed, enclosed conduit carried the Croton River's fresh water across undulating terrain. The extraordinary early public works project played an essential role in New York City's growth and development during the nineteenth century." Subsequently, when the Reservoir was under construction, the mid-nineteenth century OCA which traversed the construction zone was dismantled and rebuilt within the East Wall. Along with the OCA, the eastern wall of the reservoir contains the NCBA and, at a lower depth, two outfall tunnels (See Figure 2). The OCA approaches the reservoir from the north, spans the entire length of the reservoir from Gate House No. 7, under and around Gate House No. 5, to Gate House No. 6 and continues southward.

Condition assessment surveys of this rebuilt section of the OCA were conducted in 2009, 2011, and 2012. The 2009 survey indicated that several areas had deteriorated since reconstruction in ca.1899. The deteriorations within these

areas include longitudinal cracks with significant efflorescence buildup and spalling of the concrete and brick lining. The longitudinal cracking was most prominent within the western half where roughly 350 linear feet of cracking was observed, both near the top of the arch and along the bottom near the tunnel invert. Some of these cracks were as deep as 12-inches. Similar, but not as severe, was the observed cracking along the eastern portion. There, heavy efflorescence deposits were observed along both the western and eastern walls of the OCA, however the deposits were most notably observed between the western wall of the OCA and the eastern wall of the reservoir. The scale and magnitude of these deposits is an indication that the transfer of water had been present over a long duration. (NYCDEP 2015: Appendix 7)

An inspection report detailed by GeoDesign, titled "Jerome Park Reservoir Inspection, Bronx County, New York, NYCDEP Contract No: CRO-312OS-G" and dated May 24, 2012 along with an independent evaluation by Ingo Fox, indicated that the tunnel walls within the portion of the aqueduct that was inspected consisted of a brick facing in some areas and cast-in-place concrete in others, both of which were in fair condition at the time of the inspection (NYCDEP 2015: Appendix 7).[4]

As noted in the 2012 inspection, the aqueduct is constructed of either brick or concrete lining, both of which are generally in fair condition with significant efflorescence and calcium deposit buildup, particularly along the west (basin) side of the aqueduct. The cross sectional dimensions of the aqueduct are in line with archive drawings. Water seepage into and out of the aqueduct is apparent at locations around Gate House No. 5. In the portion of the aqueduct along the south basin, horizontal cracks in both the top and bottom of the brick lining over an approximate 300-foot length are consistent with previous inspections. The cracks at the bottom of the aqueduct are located along the invert and eastern side. The crack at the top is along the arch section on the east side.

Without action to halt the seepage from the OCA, water from the OCA will continue to exfiltrate into the reservoir through the north and south basin's east wall. It is anticipated that without abatement of this OCA seepage, the deterioration of the east wall mortar joints will continue.

5.2 Securing and Abandonment with Structural Concrete Alternative

One alternative approach to the water seepage into and out of the aqueduct is to secure the OCA by filling the entire cross section of the aqueduct with Class 25 structural concrete. An 18-inch to 24-inch thick reinforced concrete bulkhead will be constructed at each end of the aqueduct to bind the filled area. North of Gate House No. 7, a 24-inch reinforced concrete pipe will be installed to collect the running water within the OCA and divert the flow to an adjacent sewer line near Shaft 3. (NYCDEP 2015: Appendix 7)

The concrete mix formula will conform to NYCDEP specifications for Class 25 concrete, including Type II Portland cement, admixtures, and water. Modifications will be made to the mix to reduce the heat of hydration by maximizing the use of pozzolanic material and large aggregate not to exceed 3-inches in diameter. The design mix will produce a minimum compressive strength of 2,500 psi and meet NSF 61 Standard requirements for safe use in potable water. (NYCDEP 2015: Appendix 7)

It is anticipated that laborers would be required to access the interior of the aqueduct in order to direct the concrete flow. Concrete would be pumped through the existing site manholes and along the interior of the aqueduct so that it can be deposited in lifts. Bulkheads and forms will be used where required. Concrete placement will be considered as mass concrete and must conform to NYCDEP specifications and applicable ACI provisions for proportioning, placement, consolidation and curing. As noted in the summary below, these efforts will increase the cost for sealing when compared to the Controlled Low Strength Material Alternative, or flowable fill preferred alternative.

No additional repairs to the tunnel walls are included.

[4] A second inspection of the OCA in the Reservoir's east wall was completed last year by Mott MacDonald (MM). MM's report to the NYCDEP confirmed that the current condition of the OCA is consistent with observations from the previous inspection report by GeoDesign (2012). The limits of the MM underground inspection included approximately 100 LF north of Gate House No. 7 to an existing bulkhead, then continued approximately 4,600 LF south and beyond Gate House No. 6 (MM 2016b).

For calculation and cost estimating purposes, the OCA was approximated to be 9-feet in diameter, which equates to nearly 11,000 cubic yards of structural concrete. The cost to plug the aqueduct with Class 25 concrete is estimated at approximately $5.43 million (NYCDEP 2015: Appendix 7).

5.3 Securing and Abandonment with a Controlled Low Strength Material Alternative

The NYCDEP's preferred alternative approach to the water seepage into and out of the aqueduct is filling the entire cross section of the aqueduct with Controlled Low Strength Material **(**CLSM), referred to as flowable fill. An 18-inch to 24-inch thick reinforced concrete bulkhead will be constructed at each end of the aqueduct to bind the filled area. North of Gate House No. 7, a 24-inch reinforced concrete pipe will be installed to collect the running water within the OCA and divert the flow to an adjacent sewer line near Shaft 3. (NYCDEP 2015: Appendix 7)

The flowable fill material will conform to NYCDEP specifications which will include sand, Type II Portland cement, admixtures, and water. The design mix will produce a compressive strength in the range of 50 psi to 100 psi, a slump from 7 to 10 inches, and meet NSF 61 Standard requirements for safe use in potable water. (NYCDEP 2015: Appendix 7)

In order to completely fill the aqueduct, it will be necessary to construct a reinforced concrete bulkhead at the southern end of the aqueduct. A 12-inch hole will then be cored near the bulkhead from existing grade down through the top of the aqueduct. A hose will be placed through the core hole to allow for the flowable fill to be directly deposited within the aqueduct. The flowable fill will be permitted to spread laterally under its own weight until full. As illustrated on the 90% design plans in Appendix C (S-331 and S-332), additional coring and filling locations will be spaced along the aqueduct at lengths dependent on specific factors such as the size/slope of the aqueduct, the viscosity material mix and time for initial set. A northern bulkhead will be required but should not be installed until just prior to work on the final segment. (NYCDEP 2015: Appendix 7)

No additional repairs to the tunnel walls are included.

For calculation and cost estimating purposes, the OCA was approximated to be nine feet in diameter, which equates to nearly 11,000 cubic yards of flowable fill. The cost to seal the aqueduct with flowable fill is estimated at approximately $3.27 million (NYCDEP 2015: Appendix 7).

5.4 Summary of Impacts of Securing and Abandonment Preferred Alternative

The 1899 reconstructed OCA adjacent to the NCBA in the east wall will be directly impacted by the NYCDEP proposed action. However, the NYCDEP's plan provides for the increased, long term stability of the Reservoir and allows for the architectural and engineering characteristics of a portion of the NHL to be maintained *in situ*. The abandonment in place also preserves the post-1899 relationship of the OCA to the Reservoir and the NCA.

The adverse impact of the abandonment is the permanent alteration of the interior finish of the 1899 section of the OCA, and the original intended function of the aqueduct will no longer be possible. Although the archives have proven to be less than absolutely complete in detailing the construction of the Reservoir, there are considerable files, drawings, and photographs of the construction and years of maintenance of the total complex. Additional archival recordation of the interior of the OCA after infilling and final abandonment will be impossible.

The MOA has an established framework for consultation with NYSOPRHP on mitigating adverse impacts, if necessary. The contract specifications recognize this responsibility and notice is given to contractors "to avoid damage to the aqueduct" (Appendix C: S-331 and S-332). The state review agency has opined that the proposed infill of the 1899 east-wall section of the OCA is not an adverse effect (Cumming 2015; See Appendix A.).

The preferred alternative of securing the OCA with Controlled Low Strength Material Alternative is estimated to cost approximately $2.16 million less than the structural concrete alternative (NYCDEP 2015: Appendix 7).

6.0 ALTERNATIVES ANALYSIS TO SECURING AND ABANDONMENT OF THE BELOW GROUND PORTIONS OF THE EAST BASIN OUTLET

The EBO is one of two circular tunnels below and east of the OCA within the east wall of the Reservoir and south of Gate House No. 5. The two tunnels are each assumed to be 11 feet in diameter and approximately 2,100 feet in

length. See Figure 2. They begin at Gate House No. 5 and travel southward towards Gate House No. 6. Today, the tunnels terminate at the South Portal, which feeds the extant South Basin of the Reservoir. However, the original extension of the East Basin Outlet tunnel is believed to terminate short of Gate House No. 6 near station S21+00 where it turns eastward. The East Basin Outlet tunnel, which was intended to feed the unrealized east basin but was abandoned, "is now buried under the Lehman College parking lot along Goulden Avenue" (NR Nomination Form 2000).

The following discussion presents three alternatives to Securing and Abandonment of the Below Ground Portions of the EBO within the Reservoir East Wall as well as the preferred alternative. The discussion provides a comparison of the benefits for the city's reliable water quality, cost considerations, constructability, and impacts to the historical integrity of the Reservoir of the following alternatives.

- The No Action Alternative;
- Securing and Abandonment with Structural Concrete Alternative; and,
- Securing and Abandonment with a Controlled Low Strength Material Alternative.

6.1 The No Action Alternative

In contrast to the well documented OCA, there is less documentation of the ca.1899 EBO. There is one inspection report, complete with photographs, available since it was abandoned soon after construction. J.F. White Contracting Company performed a confined space inspection of the EBO for GeoDesign in 2012. The first attempt at an inspection failed due to the extent of water inside the tunnel. Subsequent to dewatering, the EBO was accessed through a 21-inch diameter manhole located just outside the south face of Gate House 5. J.F. White engineers summarized the inspection as follows: "the brickwork of the abandoned East Outfall Tunnel is in generally good condition and exhibits no significant deformation, loss of brick, offsets between courses, or distortion of the round tunnel cross-section. The south end of the tunnel is plugged only by rubble and soil, and not a solid brick or concrete bulkhead wall. Significant efflorescence was observed throughout many segments of the tunnel in both circumferential and longitudinal patterns, however, no major cracks or discrepancies were observed in the mortar lines beneath these formations. Considerable quantities of muck, timber, and metal debris were deposited along the length of tunnel" (GeoDesign 2012).

It is assumed that the abandoned and water-filled EBO tunnel might contribute to the exfiltration of water into the Reservoir's East Wall and increase the rate of deterioration of the exposed masonry. As with the OCA, the NYCDEP considers the "no action alternative" as untenable. Without action to halt the seepage from the tunnels and aqueducts in the Reservoir's East Wall, water will continue to exfiltrate into the reservoir through the north and south basin's east wall.

6.2 Securing and Abandonment with Structural Concrete Alternative

It is assumed that – like the OCA – an alternative approach to the potential water seepage into and out of the BOE tunnel is to secure it by filling the entire cross section of the tunnel with Class 25 structural concrete. A 24-inch thick reinforced concrete bulkhead would need to be constructed at each end of the EBO tunnel to bind the filled area. Due to the extra depth of this tunnel, access to the top of the tunnel will require some excavation. Several access ports will need to be opened prior to filling; access ports are estimated at every 300 linear feet. It may be necessary to obtain a temporary easement from Lehmann College for one or more access points in their parking lot (NYCDEP 2015: Appendix 7).

6.3 Securing and Abandonment with a Controlled Low Strength Material Alternative

The currently proposed preferred alternative is a treatment similar to the filling of the OCA with CLSM. Like the ca.1899 OCA which rests in the same reservoir wall, the EBO will be sealed and filled with CLSM. A 24-inch thick reinforced concrete bulkhead would need to be constructed at each end of the EBO tunnel to bind the filled area. Due to the extra depth of this tunnel, access to the top of the tunnel will require some excavation. Several access ports will need to be opened prior to filling; access ports are estimated at every 300 linear feet. It may be necessary to obtain a temporary easement from Lehmann College for one or more access points in their parking lot.

6.4 Summary of Impacts of Securing and Abandonment Preferred Alternative

The abandoned EBO tunnel in the east wall south of Gate House 5 will be directly impacted by the NYCDEP proposed action. The adverse impact of the abandonment is the permanent alteration of the interior finish of the outlet tunnel. However, the EBO is not a visible component of the Reservoir complex from either a pedestrian or vehicular perspective. Also, the NYCDEP's plan provides for the increased, long term stability of the Reservoir and

allows for the architectural and engineering characteristics of an element of the NR Reservoir District to be maintained *in situ*. The abandonment in place also preserves the engineering approach to the original intent of the Reservoir – an east and west basin.

Archival recordation of the entire length of the EBO prior to infilling and final abandonment is not possible. The EBO is probably once again filled to a depth of eight feet of water which would make access too difficult, very costly, and dangerous. Luckily, the J.F. White inspection for GeoDesign in 2012 has fully documented the EBO and this record can be submitted to SHPO.

The state review agency has opined that the proposed treatment of the 1899 east-wall section of the OCA is not an adverse effect (Appendix A). The contract specifications for filling the EBO recognize this responsibility and notice is given to contractors that hand excavations may be necessary to avoid damage to the tunnel (Appendix C: S-331 and S-332).

For calculation and cost estimating purposes, the EBO was approximated to be 11 feet in diameter, which equates to nearly 7,391 cubic yards of flowable fill. The cost to seal the aqueduct with flowable fill is estimated at approximately $2,610,000 million (NYCDEP 2015: Appendix 7). It is assumed that the alternative choice of structural concrete would be more costly, as calculated for the OCA.

7.0 SUMMARY

The proposed repairs and rehabilitation of the Reservoir are necessary to maintain, secure, and improve the city's water supply system, which is the responsibility of the NYCDEP. The extant MOA guarantees, at the same time, that the integrity of the Reservoir complex is maintained to the extent possible while in active service. In compliance with the MOA, NYSHPO earlier reviewed many of the proposed improvements and determined that the repairs were not adverse effects as long as the water level in the two basins was maintained above the height of the new concrete surface applied to the interior of the East Wall, and replacement of any disturbed capstones was executed carefully and with in-kind materials.

A number of repairs and improvements are critical but will not introduce new elements to the Reservoir or impact visible, significant features of the Reservoir. These actions, as outlined in the above section 2.0 Project Need, include replacing road pavement and chain link fencing. Repairs also include a submerged concrete wingwall and archway that connects Gate House No. 7 with the North Basin and the above-grade concrete retainer wall between the Lehman College parking lot and the South Basin. Installation of a low-profile guiderail along the perimeter service road is a new element but is needed for safety.

As discussed in depth above, two proposed new treatments have been analyzed and alternative actions have been reviewed by the NYCDEP in an effort to ensure that the Reservoir integrity is maintained.

- The interior masonry face of the East Wall of the Reservoir is seriously degraded, particularly just to the immediate south and north of Gate House No. 5. Numerous investigations have documented substantial water transfer between the OCA, which is inside the East Wall, and the reservoir through large cracks and damaged mortar joints. This water transfer through the damaged wall areas coupled with poor freeze/thaw characteristics of the joints and the repetitive reservoir drawdown, which allowed for intermittent exposure of the wall to climatic effects, has caused this visible damage. Individualized attention to repointing mortar joints and resetting loose or missing stones along the east wall is necessary and will be accomplished within the restrictions of the established MOA.

  In addition to the individual mortar joint and loose stone repairs, the NYCDEP has investigated an additional effort to stabilize the most degraded sections of the East Wall that are just north and south of Gate House No. 5. The addition of a layer of concrete to the most degraded sections of the original masonry wall has been proposed; the additional concrete will be largely invisible when both basins are full of water. One alternative design was a robust, battered wall seven feet thick at the footing that required removal of a portion of the basin floor. The preferred alternative, which is also less expensive, is a16-inch thin concrete liner wall that extends only to the top of the basin slab.

  The preferred alternative is the installation of a limited concrete liner wall.

- Water seepage from the OCA, and possibly the EBO contribute to the degradation of the Reservoir's East Wall. Both below-grade conduits have been abandoned for years, and funding for repairs and maintenance are not anticipated. The NYCDEP's plan to secure the OCA and the EBO by filling them provides for the increased, long term stability of the Reservoir and allows for the architectural and engineering characteristics of a portion of the historic landmark to be maintained *in situ*. The abandonment in place also preserves the post-1899 relationship of the OCA and the EBO to the Reservoir and the NCA.

The alternatives analysis compared infilling with structural concrete and with Controlled Low Strength Material (CLSM), referred to as flowable fill. The flowable fill alternative is estimated to cost approximately $2.16 million less than the structural concrete alternative.

The preferred alternative is the infilling of the OCA and the EBO with flowable fill.

8.0 BIBLIOGRAPHY

Cumming, Beth, Senior Historic Site Restoration Coordinator and NYSOPRHP reviewer
2015 Personal communication to Donald Lord, NYCDEP, 10/9/15. See Appendix A.

Department of Water Supply, Gas & Electric (DWSG&E)
1907 Annual Report. New York, NY.

GeoDesign
2012 Jerome Park Reservoir Inspection, Bronx County, New York, NYCDEP Contract No: CRO-312OS-G, dated May 24, 2012.

Historical Perspectives, Inc (HPI)

1994 *Cultural Resource Assessment, Jerome Park Reservoir, Kingsbridge, Bronx, New York. CEQR No. 93DEP103.* Prepared For Metcalf and Eddy, Hazen and Sawyer, New York on behalf of the New York City Department of Environmental Protection.

1998 *Croton Water Treatment Plant, Jerome Park Reservoir, Kingsbridge, Bronx, New York. CEQR NO. 98DEP027, SEQR NO. 98PRO056.* Prepared For Metcalf and Eddy, Hazen and Sawyer, New York on behalf of the New York City Department of Environmental Protection.

2007 *Addendum to Cultural Resources Assessment Overflow Weir, New Shaft and Meter Chamber, and Jerome Park Reservoir, Bronx, NY, CEQR No. 05DEP017X, 06PR02855.* August 2007.

2010a Old Croton Aqueduct Documentation, Jerome Park Reservoir, Shaft and Meter Chamber Site, CEQR No. 05DEP017X, 09PR06191 (part of 06PR00285), Bronx, New York.

2010b *Window Block Replacement Memorandum, Jerome Park Reservoir Gate House Nos. 2, 3, 5 and 7, Bronx, NY, CEQR NO. 05DEP017X, OPRHP 06PR02855*. June 14, 2010

2011 *Gate House No. 5 Electrical Installation Memo, Jerome Park Reservoir, Bronx, NY, OPRHP 06PR02855*. December 13, 2011

2012 *Jerome Park Reservoir, Perimeter Wall Repair Update, Bronx, NY, DEP CONTRACT 313, CEQR NO. 05DEP017X, OPRHP 06PR02855*. December 31, 2012.

2016 *Gate House No. 5 Staircase Masonry, New Shaft and Meter Chamber, Jerome Park Reservoir, Bronx, NY. CEQR NO. 05DEP017X, OPRHP 06PR0285*. 10/27/16.

Mott MacDonald (MM)
2016a "Jerome Park Reservoir & Aqueduct Rehabilitation Investigation of Wing Wall & Archway at Gate House No. 7," Memo to A. Brown, NYCDEP, 10/5/16.

2016b "Jerome Park Reservoir & Aqueduct Rehabilitation Inspection of Old Croton Aqueduct," Memo to A. Brown, NYCDEP, 11/3/16.

National Register of Historic Places Nomination Form (NR)
2000 *Jerome Park Reservoir, National Register of Historic Places Nomination Form.* Prepared by Kathleen Howe, NYS OPRHP Field Services Bureau, 2000. Available at: http://www.lehman.cuny.edu/lehman/whatisnew/landmarkstatus/form.pdf. Site accessed January 18, 2010.

New York City
2014 City Environmental Quality Review, Technical Manual.

New York City Department of Environmental Protection (NYCDEP)
2003 Memorandum of Agreement Concerning the Continued Operation of Jerome Park Reservoir after Listing to the New York State and National Registers of Historic Places, 11/12/03.

New York City Department of Environmental Protection (NYCDEP), Bureau of Engineering Design and Construction

2013 Jerome Park Reservoir, Jerome Park, Bronx, NY, Fence and Roadway Improvements, Civil Sections, Drawing Sk-2, 2/20/13.

2015 Jerome Park Reservoir, Jerome Park, Bronx, NY, Contract: JRAQ-REH. Jerome Reservoir & Aqueduct Rehabilitation, Basis of Design Report, July 2015.

2016 Value Engineering Proposal: Jerome Reservoir and Aqueduct Rehabilitation, Reduce the Mass of the East Buttress Wall, Proposal No. RI-3.

New York City Department of Environmental Protection (NYCDEP), Bureau of Water Supply

2014 Waterfowl Management Program Annual Report, Division of Watershed Water Quality Operations. Available at: http://www.nyc.gov/html/dep/pdf/reports/fad_4.1_waterfowl_management_progran_-annual_report_09-14.pdf Site accessed 11/7/16.

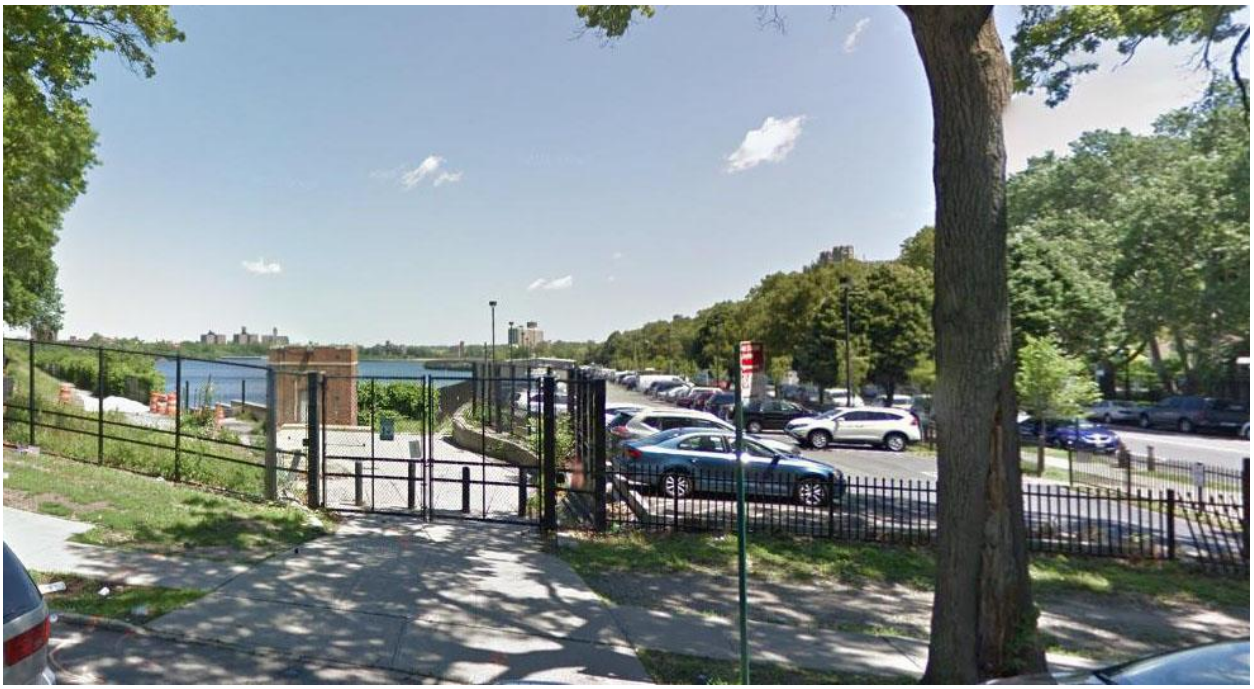
United States Department of the Interior

2016 Secretary of the Interior's Standards for Rehabilitation. https://www.nps.gov/tps/standards/rehabilitation/rehab/stand.htm Site accessed 8/6/16.

United States Environmental Protection Agency (EPA)

1989 Drinking Water: National Primary Drinking Water Regulations; Filtration, Disinfection; Turbidity, Giardia lamblia, Viruses, Legionella, and Heterothrophic Bacteria; Final Rule. 54 Fed. Reg. 27486. June 29, 1989. WH-FRL-3607-7. Washington, D.C.

2016 Drinking Water Requirements for States and Public Water Systems, Surface Water Treatment Rules. Available at: http://water.epa.gov/lawsregs/rulesregs/sdwa/swtr/upload/guidsws.pdf Site accessed 8/6/16.



Photograph 1

View of the Jerome Park Reservoir South Basin from the sidewalk grade at the intersection of Goulden Avenue, on the right, and Reservoir Avenue: view: south to north. Lehman College parking lot in foreground. 2016

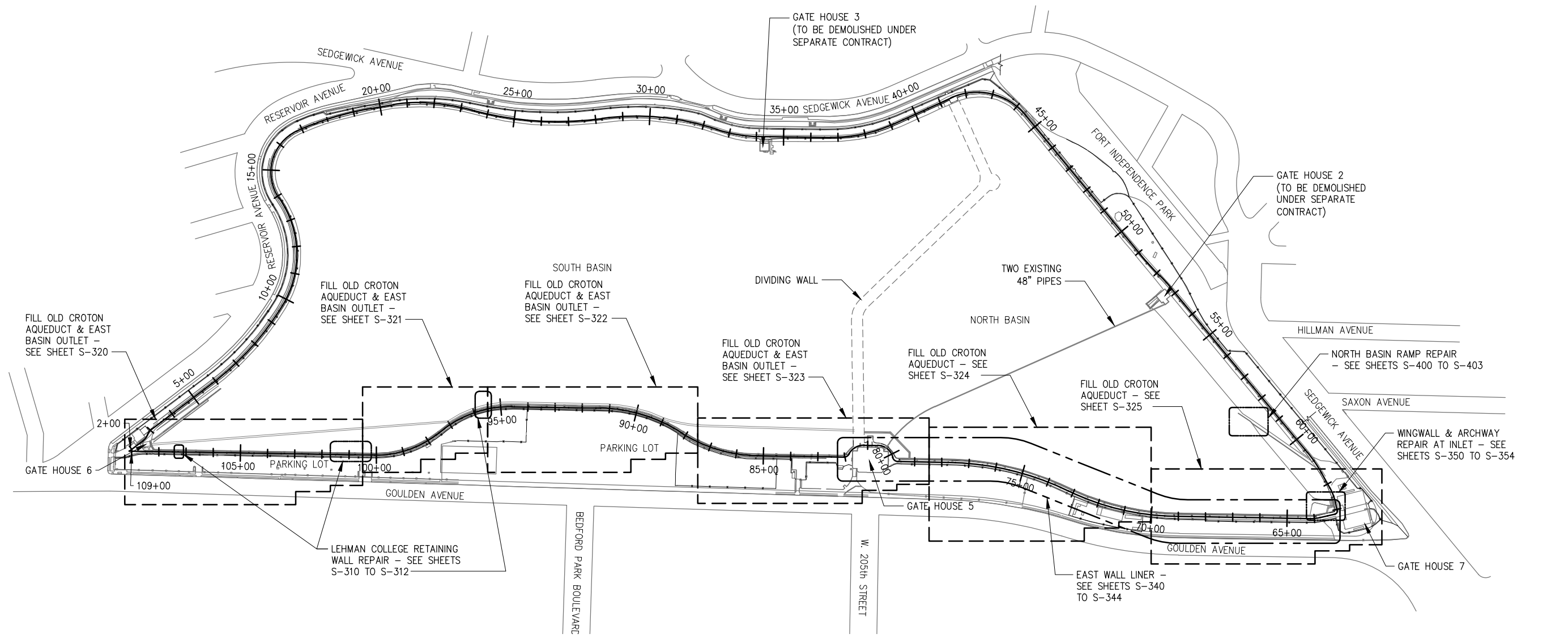
Photograph 2

Jerome Park Reservoir Perimeter Road, between Gate Houses 5 and 6, view: north to south with Lehman College parking lot on the left. Note two chain link fences encircling the east side of the South Basin. 2016

Photograph 3

Wing Wall and Archway at Gatehouse No.7, Jerome Park Reservoir. [Note: Locations of Core Tests in red.]

2016



PROPOSED LAYOUT PLAN

SCALE: 1"=200'

0 200 400 FT.

1"=200'

Figure 1: Project site location (NYCDEP 90% Design, Structural Proposed Site Plan Layout, S-304, 2017).

90% DESIGN SUBMITTAL

SUBMITTAL DATE: 01/27/2017

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DESIGN LEAD: J. CARUSO
SECTION MANAGER: J. CARUSO

MOTT MACDONALD

Environmental Protection

ACCOUNTABLE MANAGER: ANTHONY BROWN
PORTFOLIO MANAGER: MICHAEL LOEHR, P.E.
DIRECTOR, IN HOUSE DESIGN: PATRICK O'CONNOR, P.E.

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CONTRACT No: JRAQ-REH
JEROME PARK, RESERVOIR & AQUEDUCT REHABILITATION
STRUCTURAL
PROPOSED SITE PLAN LAYOUT
KEY PLAN

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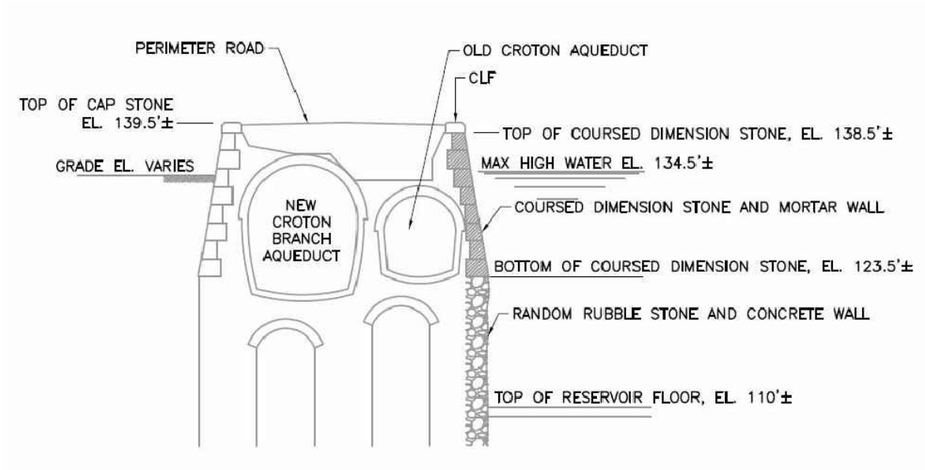

EXISTING RESERVIOR WALL

NOT TO SCALE

EAST RESERVOIR WALL - PHOTO #1

EAST RESERVOIR WALL - PHOTO #2

Figure 2: Existing Reservoir Wall (NYCDEP 2013).

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NYC Environmental Protection

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DIRECTOR, IN HOUSE DESIGN
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JEROME PARK RESERVOIR
JEROME PARK, BRONX, NEW YORK
FENCE & ROADWAY IMPROVEMENT

DATE: 02/20/2013
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SHEET NO:
OF 50
DRAWING NO.

APPENDIX A: Relevant Correspondence

NEW YORK STATE OF OPPORTUNITY.

Parks, Recreation, and Historic Preservation

ANDREW M. CUOMO
Governor

ROSE HARVEY
Commissioner

October 9, 2015

Mr. Donald Lord
NYC Department of Environmental Protection
59-17 Junction Blvd., 11th Floor
Flushing, NY 11373

Re: EPA
Jerome Park Reservoir and Aqueduct Rehabilitation Project (JRAQ-REH)
The Jerome Park Reservoir Site
15PR05283

Dear Mr. Lord:

Thank you for requesting the comments of the New York State Historic Preservation Office (SHPO). We have reviewed the provided documentation in accordance with Section 106 of the National Historic Preservation Act of 1966 and the Memorandum of Agreement (MOA) in place for the Jerome Park Reservoir. These comments are those of the SHPO and relate only to Historic/Cultural resources. They do not include other environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the National Environmental Policy Act and/or the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8).

We concur that the proposed rehabilitation project constitutes a significant modification to the Jerome Park Reservoir (JPL) and that we are consulting under section III subsection B of the MOA. We understand the project includes the following elements: Addition to JPR of a bird deterrent system, reservoir interior east wall repair, securing and abandonment of the below ground portions of the Old Croton Aqueduct, Securing of previously abandoned below ground portions of the East Basin Outlet and Interior fence replacement between Gatehouses 6 and 7.

Based upon our review, it is OPRHP's opinion the proposed work will have No Adverse Effect upon historic resources provided the following conditions are met:

1. The cast-in-place concrete buttress wall proposed to be constructed against the existing east reservoir wall shall, under normal operations, be below the water line.
2. For any of the proposed work where a 'new capstone' is proposed; the new capstone shall match the historic.

Overall, we understand that the proposed work will ensure the longevity of JPL in its primary function of providing clean water to New York City. If you have any questions, I can be reached at (518) 268-2181.

Sincerely,

Beth A. Cumming
Senior Historic Site Restoration Coordinator
e-mail: beth.cumming@parks.ny.gov via e-mail only

APPENDIX B: National Register Nomination

OMB No. 10024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer to complete all items.

1. Name of Property

historic name Jerome Park Reservoir

other names/site number

2. Location

street & number Goulden, Reservoir, and Sedgwick Avenues [ ] not for publication

city or town Bronx [ ] vicinity

state New York code NY county Bronx code _____ zip code _____

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this [x] nomination [ ] request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements as set forth in 36 CFR Part 60. in my opinion, the property [x] meets [ ] does not meet the National Register criteria. I recommend that this property be considered significant [ ] nationally [ ] statewide [x] locally. ([ ] see continuation sheet for additional comments.)

Deputy Commissioner for Historic Preservation
Signature of certifying official/Title — Date

New York State Office of Parks, Recreation & Historic Preservation
State or Federal agency and bureau

In my opinion, the property [ ] meets [ ] does not meet the National Register criteria. ([ ] see continuation sheet for additional comments.)

Signature of certifying official/Title — Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is: — Signature of the Keeper — date of action

[ ] entered in the National Register
[ ]see continuation sheet

[ ] determined eligible for the National Register
[ ] see continuation sheet

[ ] determined not eligible for the National Register

[ ] removed from the National Register

[ ] other (explain) _____

5. Classification

Ownership of Property
(check as many boxes as apply)

[ ] private
[x] public-local
[ ] public-State
[ ] public-Federal

Category of Property
(Check only one box)

[ ] building(s)
[x] district
[ ] site
[ ] structure
[ ] object

Number of Resources within Property
(Do not include previously listed resources in the count)

Contributing	Noncontributing	
5	3	buildings
3	1	sites
11	1	structures
0	0	objects
19	**5**	**TOTAL**

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing)

N/A

Number of contributing resources previously listed in the National Register

1 (Old Croton Aqueduct)

6. Function or Use

Historic Functions
(enter categories from instructions)

GOVERNMENT: Public Works
RECREATION: Outdoor Recreation
INDUSTRY: Waterworks
LANDSCAPE: Park

Current Functions
(Enter categories from instructions)

GOVERNMENT: Public Works
RECREATION: Outdoor Recreation
INDUSTRY: Waterworks
LANDSCAPE: Park

7. Description

Architectural Classification
(Enter categories from instructions)

Late Victorian: Civic Roman-inspired design
Modern Movement: Art Deco
Late 19th and Early 20th Century Landscaping:
The Pleasure Ground movement

Materials
(Enter categories from instructions)

foundation stone
walls stone, brick
roof asphalt
other earth, water

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets)

Jerome Park Reservoir
Name of Property

Bronx County, New York
County and State

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

[X] **A** Property associated with events that have made a significant contribution to the broad patterns of our history.

[ ] **B** Property is associated with the lives of persons significant in our past.

[X] **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

[ ] **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all boxes that apply.)

[ ] **A** owned by a religious institution or used for religious purposes.

[ ] **B** removed from its original location

[ ] **C** a birthplace or grave

[ ] **D** a cemetery

[ ] **E** a reconstructed building, object, or structure

[ ] **F** a commemorative property

[ ] **G** less than 50 years of age or achieved significance within the past 50 years

Areas of Significance:
(Enter categories from instructions)

Engineering, Architecture,
Community Planning and Development,
Landscape Architecture, Recreation

Period of Significance:

1895- 1950

Significant Dates:

1895-1906

Significant Person:

Cultural Affiliation:

Architect/Builder:

A Fteley, F. S. Cook

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

9. Major Bibliographical References

Bibliography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

[ ] preliminary determination of individual listing (36 CFR 67) has been requested.
[ ] previously listed in the National Register
[ ] previously determined eligible by the National Register
[ ] designated a National Historic Landmark
[ ] recorded by historic American Building Survey
_____
[ ] recorded by Historic American Engineering Record
_____

Primary location of additional data:

[x] State Historic Preservation Office
[ ] Other State agency
[ ] Federal Agency
[ ] Local Government
[ ] University
[ ] Other repository: _____

10. Geographical Data

Acreage of Property approx. 125-130 acres

UTM References
(Place additional UTM references on a continuation sheet.)

		Zone	Easting	Northing
1		18	593632	4585840
2		18	592698	4584558
3		18	592621	4585287
4		18	593973	4584614

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By (See Continuation Sheet)

name/title Contact: Kathleen Howe, Historic Preservation Specialist

organization NYS OPRHP- Field Services Bureau date March 28, 2000

street & number Peebles Island , P.O. Box 189 telephone (518) 237-8643 ext. 3266

city or town Waterford state NY zip code 12188-0189

Additional Documentation
Submit the following items with the completed form:

Continuation Sheets
Maps
A **USGS map** (7.5 or 15 minute series) indicating the property's location
A **Sketch map** for historic districts and properties having large acreage or numerous resources.
Photographs
Representative **black and white photographs** of the property.

Additional items
(Check with SHPO or FPO for any additional items)
Property Owner (Complete this item at the request of the SHPO or FPO)

Name New York City

street & number City Hall telephone

city or town New York state NY zip code 10007

7. Narrative Description

Introduction

The Jerome Park Reservoir is a 125-acre reservoir-park in the northwest Bronx, New York. It is comprised of approximately 94 acres of open water (25-feet deep), surrounded by 30 acres of constructed and landscaped earth. Built from 1895 to 1906 as part of the Croton Aqueduct system, the reservoir contains both the Old and New Aqueducts, which run through the massive east wall of the basin. The Old Croton Aqueduct, a portion of which runs along the Jerome Park Reservoir, was designated a National Historic Landmark in 1992[1]. The district is bounded by Sedgwick Avenue and Fort Independence Park on the north and west, Goulden Avenue on the east, and Old Fort No. 4 Park on the south. The nomination consists of 5 contributing buildings (Gate Houses 2, 3, 5, 6, 7); 11 contributing structures (basin, east wall, west wall, core wall dam, conduits of the Old and New Croton Aqueducts, system of stabilizing revetments, Shaft no. 21, waste weir, pipe vault portal, south portal); and 3 contributing sites (Old Fort No. 4 Park, Fort Independence Park, Harris Park Annex). Also within the district are 3 non-contributing buildings (screen building, demonstration water filtration plant, Lehman College reservoir building), one non-contributing structure (mid-1980s dividing wall), and one non-contributing site (Lehman College parking lot).

The massive ancient Roman-inspired basin walls, gate houses and other reservoir features are constructed of stone, with voussoir-arched inlet and outlet openings. The WPA-era gate house superstructures are constructed of brick and stone in the Art Deco style. The north end of the reservoir is a masonry core wall dam with sloped earthen embankments. The original landscaped reservoir grounds include the Jerome Park Reservoir, and the present Harris Park Annex, Lehman College's parking lot, Goulden Avenue, Old Fort No. 4 Park, Reservoir Avenue, Sedgwick Avenue, and Fort Independence Park. Landscaping includes stone retaining walls, 94 acres of water, grass-covered berms, stone gateposts, paths, terraces, iron fences and railings, roadways, specimen plantings, rock outcroppings, and park furniture.

Historic Stone Walls

There are several types of stone walls at the Jerome Park Reservoir. They generally fall into three categories: the east wall of the reservoir basin (original division wall); the basin wall from Gate House No. 6 to Gate House No. 2; and site retaining walls, which were built to accommodate site elevation changes, create boundaries, and provide dignified landscaping.

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[1] The Old Croton Aqueduct, constructed between 1837 and 1842, originally consisted of a forty-mile long, enclosed conduit running from a dam on the Croton River, through eastern Westchester and Bronx Counties, and southward to Central Manhattan. The massive gravity-fed, enclosed conduit carried the Croton River's fresh water across undulating terrain. This extraordinary early public works project played an essential role in New York City's growth and development during the nineteenth century. More for the entirety and scope of its design than for any single engineering development, the Old Croton Aqueduct is considered as one of the most significant engineering projects of the early nineteenth century. The portion of the Old Croton Aqueduct that is included in the NHL designation and runs along the Jerome Park Reservoir begins at the northeastern tip of the Reservoir, following along the east side of the Reservoir, along Goulden Avenue, and passing the intersection with Kingsbridge Road.

The East Wall (Original Division Wall)

The east wall along present Goulden Avenue was intended to be the division wall between two reservoir basins. As it turned out only the west basin was completed. The east basin was excavated but work was halted, and it was eventually turned over for other government functions. When the east basin was partially filled in adjacent to the division wall, Goulden Avenue was created.

The east wall is a massive stone structure within which the Old and New Croton Aqueducts run, along with conduits intended to supply the reservoir basins. The Jerome Park Reservoir was designed to straddle the existing Old Croton Aqueduct, which passed through the site as a raised berm. The Old Croton Aqueduct could not reasonably be adapted to be the nucleus of the dividing wall: its original foundation was not large or deep enough to accommodate the excavation of the reservoir, and it could not support the lateral load of a full basin on one side while the other basin was empty. The Old Croton Aqueduct was temporarily removed from the site and then reconstructed in the new wall in its original size, shape and materials. This reconstruction was completed about 1899. The roadway along the east bank of the reservoir is directly over the Old Croton Aqueduct, which is now a National Historic Landmark.

The Jerome Park branch of the New Croton Aqueduct runs alongside the original Old Croton Aqueduct from Gate House No. 1 in Van Cortlandt Park south to Jerome Park. The portion of wall from Gate House No. 7 at the north end of the reservoir to Gate House No. 5 is 30 feet wide and contains the Old Croton Aqueduct side-by-side with the horseshoe-arched New Croton Aqueduct branch (Section F-F of the 1907 reservoir plan).

The portion of the wall south of Gate House No. 5 to the South Portal is 35-feet thick at the base. It contains the Old Croton Aqueduct on top. Two 11 foot diameter brick conduits built side-by-side beneath the aqueduct were intended to supply the east and west basins (Section E-E of the reservoir plan). The conduits end at the west-facing outlet, known as the South Portal, which feeds the reservoir today. The east-facing outlet, which was intended to feed the east basin, is now buried in fill under the Lehman College parking lot along Goulden Avenue.

South of the South Portal, the wall is approximately 16 feet thick, and carries the Old Croton Aqueduct. The wall continues past Gate House No. 6 at the southern end of the reservoir, and runs beneath Reservoir Avenue to Kingsbridge Road where the reconstructed portion of the Old Croton Aqueduct rejoins the original aqueduct (Section D-D of the reservoir plan).

Within the reservoir basin, the lower portion of the east wall is constructed of large blocks and stone excavated at the site, and the upper portion consists of the rock-face granite of the Old Croton Aqueduct, laid with broken range and random range jointing. The coping stones are rough-pointed with a tooled margin.

Basin Wall

The basin wall of the reservoir runs from Gate House No. 6 at the south end along the south and west sides, past Gate House No. 3 and the Waste Weir, and terminates at Gate House No. 2. The basin wall is rubble ashlar masonry with a quarry face, composed of stone quarried at the site. The lower portion of the walls is typically cyclopean blocks of stone, and the upper courses are of somewhat smaller units. The coping stones have a rock face or pointed finish.

The typical height of the stone reservoir walls is twenty-eight feet from the reservoir floor to the top of the wall, with two and a half feet of wall exposed above the high water level. Typically, the water level is lower, exposing more of the stone wall.

The wall varies in thickness. The typical wall construction is about three feet thick at the top, battered out to about sixteen feet thick at its foundation (Section C-C of the reservoir plan). The resistance to the lateral force of the water in the reservoir was provided by the stone walls in conjunction with bedrock, such as at Reservoir Avenue/Old Fort No. 4 Park, and Fort Independence Park. At other areas, the wall was backed up with an embankment of compacted fill, such as the west side of the reservoir along Sedgwick Avenue.

Site Retaining Walls

There are numerous site retaining walls with a range of finishes and jointing, from uncoursed fieldstone to dressed stone elements such as gateposts. The most common type of retaining wall is of quarry face stone laid as squared-stone masonry or coursed rubble. The retaining wall along the south end of the reservoir roadway is of particular interest for its large stones and dry-laid construction. Other notable retaining walls are the toe wall along Sedgwick Avenue on the west side of the reservoir; and the original reservoir boundary wall along the west and north sides of what is now Fort Independence Park.

Core Wall Dam

The northern end of the reservoir, from Gate House No. 2 to Gate House No. 7, is a dam. It is composed of earth embankments reinforced by a masonry core wall (Section A-A). The inner-facing bank is covered with a concrete apron. The Aqueduct Commissioners used this type of dam at other reservoirs during this period, including the East Branch, Titicus and Carmel dams.

Basin

The stone walls and earth embankments form the irregular, picturesque shape of the basin. The basin is approximately 28 feet deep with a concrete slab floor.

Gate Houses

The Gate Houses of the Jerome Park Reservoir were constructed between 1895 and 1905 in a Neo-classical style reminiscent of ancient Roman public works. Most consist of a substructure with a superstructure. Stone voussoir arches span the inlet openings. The walls are built of rock face granite laid with broken range and random range jointing. Portions, such as the intrados of the arches, have a rough pointed finish with a tooled margin. Gate Houses Nos. 2, 3, 5, 6, and 7 are included in the nomination boundaries. Gate Houses Nos. 1 and 4 are off-site elements of the reservoir and are not included in the boundaries.

The tops of the gate houses are set three and a half feet above the top of the reservoir walls. With the reservoir filled they appear about six feet above the water level. They are, in fact, more than thirty feet tall, rising from the reservoir floor. The cast iron valves and cast iron floor plates (over chambers) on top of the gate houses were intended to be protected by stone superstructures. The construction of permanent superstructures was postponed for over three decades after the completion of the gate houses. The brick superstructures of the gate houses were constructed in 1938 by the WPA in the restrained Art Deco style characteristic of public works projects of that era. They are of red brick masonry with limestone and granite trim at sills, copings, string courses, and window and door architraves. There are also carved limestone panels, inset in the brick field or included in the coursing of limestone bands, with inscriptions identifying the reservoir and the gate houses. Of particular interest are the superstructures of Gate Houses Nos. 5 and 7.

Gate House No. 1 is located off-site, approximately one mile north of the reservoir in Van Cortlandt Park, at Shaft No. 20 of the New Croton Aqueduct. This is where the Jerome Park Branch Aqueduct originates. The New Croton Aqueduct proper drops into a pressure tunnel that runs beneath the reservoir, and continues south, crossing under the Harlem River, to the 135th Street Gate House in Manhattan. Gate House No. 1 is below grade. A stone superstructure was designed but never built.

Gate House No. 2 is located at the northwest end of the reservoir. It has arched inlets at three levels to admit water from the reservoir basin into a chamber. Another chamber is supplied by two 48-inch pipes from Gate House No. 5, the main gate house. These chambers supply water into the city mains for local distribution. Gate House No. 2 also has a waste chamber (making the plan L-shaped) with the capacity to drain the reservoir into the city sewer system. The pipes leading from Gate House No. 2 to the street pass through a vaulted brick culvert, which was constructed through the west end of the core wall dam (in order to protect the dam from water damage from leaking pipes).

Gate House No. 3 along the west side of the reservoir, is similar to Gate House No. 2, except that it does not have the additional waste chamber. A stone balcony supported by stone modillions projects from the east facing façade of Gate House No. 3. The balcony is level with the coping of the substructure.

Gate House No. 4 is an off-site element of the unfinished east basin whose remnants are located in the transit yard. This structure is not included in the nomination. Gate House No. 4 was constructed to supply water to the High

Pumping Station[2] on Jerome Avenue (National Register listed November 10, 1983) and to the local mains. This Gate House was also similar to Gate House No. 2.

Gate House No. 5 is the main gate house, and is constructed in the East Wall of the reservoir. The Old Croton Aqueduct passes through it, and it is the terminus of the horseshoe-arched, gravity portion of the New Croton Aqueduct (via the Jerome Park Branch). Gate House No. 5 feeds the reservoir through conduits in the East Wall. This structure connected the basins; controlled the pipes feeding Gate Houses Nos. 2, 3 and 4; and could direct water from the reservoir into either the new or old aqueduct, or allow water to bypass the reservoir and continue down either aqueduct. The most dramatic expression of Gate House No. 5 was a bridge of six stone voussoir arches linking the gate house to Shaft No. 21. This bridge was demolished in the 1980's as part of the contract to build the new dividing wall.

The Gate House No. 5 superstructure has a central portal facing east on axis with West 205th Street. The portal combines random range rock face granite with limestone ashlar. The door is framed by a limestone architrave bearing an inscription. The monumental entry stair and portal of Gate House No. 5 are constructed of stone matching the original granite, as a gesture of unifying the old and new construction. Gate House No. 5 is a unifying structure in other ways as well. It at roughly the center of the reservoir, with the most public face of any of the gate houses, as well as being the juncture of the Old and New Croton Aqueducts, and the central control point for the reservoir.

The original Gate House No. 6 was at the southern tip of the unfinished East Basin, at Kingsbridge Road. It may have been incorporated in the foundation of the Kingsbridge Armory. The current Gate House No. 6 is not one of the gate houses from the 1890's and does not have a stone substructure.

Gate House No. 7, at the north end of the reservoir, was built about 1906. It connected to the Old and New Croton Aqueducts, and anticipated the construction of the Van Cortlandt Siphon of the Catskill Aqueduct. The cast-in-place concrete substructure of Gate House No. 7 has a horseshoe-arched tunnel portal facing the reservoir basin. A mirror-image portal for the east basin is buried under Harris Park Annex. The Gate House No. 7 superstructure has a central portal facing north on axis with the Old and New Croton Aqueducts. The portal covers an open passage through the gate house.

Shaft No. 21

Shaft No. 21 of the New Croton Aqueduct connects the reservoir with the pressure tunnel of the aqueduct, which runs beneath. The shaft rises 30 feet from the reservoir floor, encased in a stone cylinder of 45 feet diameter. A cast iron cover of 8 feet diameter covers the top of the shaft. Shaft No. 21 is connected to Gate House No. 5 by a

[2] The High Pumping Station is individually listed on the National Register. It is located on Jerome Avenue, south of Mosholu Parkway, adjacent to the unfinished east berm. Although historically associated with the Reservoir, it is outside the boundaries of the Jerome Park Reservoir historic district nomination. This off-site resource, completed in 1906, was constructed simultaneously with the Reservoir. It was constructed in the Romanesque Revival style and is significant as an example of turn-of–the-century utilitarian civic architecture.

pipe beneath the reservoir floor, and was connected by an arched stone bridge until the 1980's when the bridge was demolished to facilitate the construction of a dividing wall across the reservoir basin. The shaft wall is constructed of the same type of stone as the gate houses.

Waste Weir

The Waste Weir is a structure along the West Wall of the reservoir, just south of the new dividing wall. It has no superstructure. It is located behind three rectangular openings in the basin wall that allow water to waste out of the reservoir.

Pipe Vault Portal

The Pipe Vault Portal is an arched opening in the Reservoir Boundary Wall providing access to the Pipe Vault behind Gate House No. 2 along Sedgwick Avenue. It has a semicircular stone voussoir arch with metal-clad double doors, approached by stone stairs. It is of particular interest for its design and workmanship. Behind the portal is a masonry barrel vault that passes through the entire earthen embankment behind Gate House No. 2. It is intended to prevent structural damage to the dam from pipe leaks.

South Portal

The South Portal is an arched opening in the east wall of the reservoir. It terminates the conduit from Gate House No. 5 and feeds the water of the Old or New Croton Aqueducts into the West Basin. It is a projecting element of range squared stone rock face granite, with a beveled rough pointed coping. The inlet opening is a large stone voussoir arch. Buried beneath the Lehman College parking lot is an equivalent opening that would have fed the abandoned East Basin: this opening is circular rather than arched.

Park Landscaping

The reservoir setting is notable for its intact historic park features. Park landscaping exists within both the current and original reservoir grounds, including what is now Old Fort No. 4 Park (1913, 1931, 1934), Harris Park Annex (1940), Fort Independence Park (1915), Reservoir Avenue and Sedgwick Avenue. Landscaping includes stone retaining walls (see above), 94-acres of water, stairways, paths, paved areas, iron fences, benches, rock outcroppings, and specimen plantings. Of particular interest are the rock outcroppings and flagstone-paved overlook in Old Fort No. 4 Park; allees of pin oaks along Reservoir and Sedgwick Avenues; and granite cobble paved overlook in Fort Independence Park. Typical park landscaping consists of asphalt paving, hexagonal pavers, granite cobbles and edging, and New York City standard park benches.

Non-Contributing Buildings/Structures

There are three non-contributing buildings (the screen building, the demonstration water filtration plant, and the Lehman College reservoir building), one non-contributing structure (the reservoir dividing wall), and one non-

contributing site (Lehman College parking lot) within the boundaries of the Jerome Park Reservoir. The screen building is a small cinder block structure dating from the second half of the 20th century, located near Gate House No. 6. The Demonstration Water Filtration Plant is a large prefabricated temporary structure constructed to the south of Gate House No. 5 along the east side of the reservoir. It was constructed in the late 1980's. The Reservoir Building owned by Lehman College is a prefabricated ca. 1970s structure located to the south of the Demonstration Water Filtration Plant along the east side of the reservoir, within the Lehman College parking lot. The parking lot was installed in the 1960s on land that was once part of the Harris Park Annex.

The dividing wall of the reservoir was constructed in the mid-1980's as part of the preparation for construction of a filter plant in the north end of the reservoir. (This project proposed for Jerome Park Reservoir has since been cancelled.) The wall crosses the reservoir east-west in a dog leg shape, spanning from Gate House No. 5 to the West Wall between the Waste Weir and Gate House No. 2. The top of the dividing wall is a roadway that connects the west side of the reservoir with Shaft No. 21 and the east side of the reservoir. The wall divides the reservoir into a North Basin of about 1/3 of the area of the reservoir, and a South Basin of about 2/3 of the area. The top 8 to 10 feet of the Dividing Wall is faced with rock face granite.

Historic Integrity

The Jerome Park Reservoir is a significant example of late nineteenth and early twentieth century civic architecture and engineering in the Bronx which retains a relatively high degree of integrity of location, design, setting, materials, workmanship, feeling, and association. Its historic park-like surroundings further add to the period integrity of the reservoir.

8. Narrative Statement of Significance

Introduction

Jerome Park Reservoir, which was built from 1895 to 1906 in Kingsbridge Heights in Bronx County, New York, is a significant site under Criterion A in the areas of engineering, architecture, community planning and development, landscape architecture, and recreation. As a major component of the Croton Aqueduct System, it exemplifies one of the nation's great engineering masterpieces. The Old and New Croton Aqueducts, both hand-built masonry tunnels, are incorporated in its massive stone walls. The reservoir is also significant under Criterion C as an important architectural resource. The reservoir's walls, gate houses and other structures were constructed by stonemasons in an ancient Roman-inspired design, under the direction of the same team of men that designed and built the rest of the New Croton Aqueduct. Jerome Park Reservoir also played a unique role in the history of New York City and Bronx County. It was planned to meet the City's ever-expanding need for water, and to encourage development of an area that had recently been annexed from Westchester County. The reservoir was set into the Frederick Law Olmsted street plan of 1877, and it became and remains the largest body of water in the Bronx. An outstanding example of a landscaped reservoir-park, it was designed during the "New Parks" movement that led to the creation of the adjacent Mosholu Parkway and Van Cortlandt Park. Parts of the original landscaped reservoir grounds have been incorporated into the city's park system.

The Old Croton Aqueduct was built between 1837 and 1842. It was a unique stone and brick structure that stretched 40 miles, from a dam on the Croton River to a reservoir on 42nd Street, on the site of the current New York Public Library. Within a few years of its completion, however, it could not adequately supply water to the exploding population of the City.

The City's campaign to increase the water supply included the construction of the Central Park Reservoir, the High Bridge Tower and Reservoir, and many storage reservoirs and dams in Westchester and Putnam Counties. It was called the Croton Waterworks Extension.

In 1874 New York City annexed a large portion of southern Westchester County, from the Bronx River west to the Hudson. In response to the renewed threat of water shortages, plus the need for a water supply system for the new district, the Croton Waterworks Extension was expanded in 1875 to include plans for an additional aqueduct and a new distributing reservoir: the New Croton Aqueduct and Jerome Park Reservoir. They were to be interconnected with the Old Croton Aqueduct in the newly acquired territory. The New York City Department of Public Parks selected Frederick Law Olmsted, landscape architect, and J.J.R. Croes, civil and topographical engineer, to prepare a comprehensive design for the new area. Their plan of 1877-1878 was adopted by the city. Portions of the plan were altered to allow denser and more commercial development, but the street plan in some areas, including the area around Jerome Park Reservoir, was constructed as designed.

In 1895 Italian immigrant stonemasons began building the Jerome Park Reservoir. They positioned the two Croton Aqueducts within a thirty-foot thick stone retaining wall that runs down the eastern edge of the reservoir,

and constructed a number of thirty-foot-high stone gatehouses that are reminiscent of ancient Roman structures. Their work was completed in 1906.

In its original design, the Jerome Park Reservoir was to be over twice as large as it is today, and was to include two islands and a peninsula. It was to serve as a receiving and distributing reservoir, and a final settling-basin for Croton water. The Chief Engineer noted that it would also "add greatly to the attractiveness of the surrounding grounds." There is some evidence suggesting that Frederick Law Olmsted had a hand in Jerome Park's design.

The original site was 309 acres. 212 acres were to be water and most of the rest landscaped. It was designed to be the world's largest distributing reservoir.[3]

When the Jerome Park Reservoir opened, it was a reservoir-park. Some of the original land that had been part of the reservoir's landscape became city parks. Old Fort No. 4 Park and Fort Independence Park were created on the sites of Revolutionary War forts, and have retained their picturesque natural topography and spectacular views across the water. Harris Field and Harris Park Annex provided a green border for the eastern edge of the water.

Jerome Park Reservoir is a century-old component of the Croton Aqueduct System, one of America's oldest and greatest engineering masterpieces. The reservoir is remarkable for its stone structures, its Olmsted-inspired landscaping, its place in the history of the Croton System, and its role in the development of the Bronx.

History of the Jerome Park Community

Early History

There was widespread occupation of the modern Jerome Park area by Native Americans before the arrival of European settlers. However, this site has been so extensively excavated in construction of the reservoir that the mounds adjacent to Fort Independence Park are thought to be the only undisturbed area where Native American artifacts or remains of early European settlements might be found.

The American Revolution

The Kingsbridge Heights neighborhood of the Bronx was an area of great strategic importance in the Revolutionary War era. The area was known in the late eighteenth century as the manor of Fordham. Its heights overlooked and dominated the Harlem River and the plain where the Van Cortlandt House and the King's Bridge were located, in the valley of the Tibbett's Brook, between the heights and Riverdale (once known as Cordlands Hill). The King's Bridge over the Harlem River was Manhattan Island's overland connection with the mainland.

[3] Stephen Jenkins, *The Story of the Bronx*, G.P. Putnam's Sons, 1912, p. 336.

At this point the road from the city divided and led to the three major routes to the north-- the post roads to Albany, White Plains and Boston.

In 1776, General George Washington closely examined the area and a plan was developed for a series of forts along the heights from Fordham to Spuyten Duyvil.[4] They were to dominate the Harlem River, the King's Bridge, and the post roads. Two of the forts were constructed approximately where Old Fort Four Park and Fort Independence Park are today. General Washington stayed at the nearby Van Cortlandt mansion and made a temporary headquarters there during the Revolutionary War. The New York City area fell to the British in September 1776. To avoid capture, General Washington and his forces slipped away by cover of night, leaving camp fires burning to deceive the British. General Washington also stayed in the Van Cortlandt mansion on the night before his triumphant return to New York City at the end of the war. Revolutionary war relics were found during construction of the Jerome Park Reservoir.

The Nineteenth Century

In the second half of the 19th century, the Kingsbridge Heights area still primarily consisted of large estates and farmland, such as the Augustus Van Cortlandt and John Dickinson Estates, with the beginnings of residential development. The future reservoir site was on the border between the towns of Kingsbridge and West Farms.

In 1866, the James Bathgate Farm was acquired by the Jerome Park Villa Site Improvement Company.[5] It was soon leased by the American Jockey Club which developed a racetrack in Kingsbridge Heights called Jerome Park, named for Leonard W. Jerome, the Wall Street speculator whose daughter, Jennie Jerome, would later become famous as Winston Churchill's mother. The track was located approximately where Lehman College is today. Jerome, who was head of the New York Jockey Club, had been encouraged by the success of the track at Saratoga Springs, New York. Jerome Park was the first formal, commercial racetrack in New York City, and its high reputation helped lift American horse racing from disrepute. It was the original home of the Belmont Stakes race, named for August Belmont, one of Jerome's friends and backers. The Jerome Park track was closed in 1887.[6]

The Croton Waterworks Extension

On the 4th of July in 1842, first flowed into Manhattan via the Croton Aqueduct. The Croton Aqueduct consisted of a forty-mile long, enclosed conduit running from a dam on the Croton River in Westchester County, south to the Bronx, and central Manhattan. New York's population grew persistently faster than expected in the second half of the 19th century due to the unanticipated rise in immigration, and the flow of Croton water that seemed so abundant in 1842 appeared insufficient only a few years later. In 1849, the year after the High Bridge went into service, the Croton Aqueduct Department was created. It quickly developed a plan, called the Croton Waterworks Extension, to increase the flow of water through the aqueduct, and to

[4] Valentine's Manual of Old New York, No. 7, New Series, 1923, pp. 254 - 260
[5] Stephen Jenkins, *The Story of the Bronx*, G.P. Putnam's Sons, 1912, p. 290.
[6] Ron Hale, "New York Tracks - A Short History", The Mining Company, General Internet Inc. v5.2, December, 1997, p.1

increase the storage of water by building additional dams and reservoirs to impound water along the Croton River in Westchester and Putnam Counties.

The New Central Park Receiving Reservoir at Yorkhill, built from 1858 to 1863, was the first major project of the Croton Waterworks Extension. It was designed to fit into the new Central Park. The next projects included the installation of larger pipes, storage tower, and expanded landscaping at High Bridge. Other major projects were delayed by the Civil War, but at its cessation work resumed to create the High Bridge Tower and Reservoir and the Boyd's Corners Dam, and to continue expanding service to all parts of the city.

The Croton Aqueduct Department was taken over by the Department of Public Works in 1870. The significance of the water supply system, along with the road paving and sewer operations, was immediately recognized by the first Commissioner of Public Works, William Marcy "Boss" Tweed, who harnessed it for his bold schemes of malfeasance and racketeering. His corruption and its lingering effects shook the faith of the public, and in 1883 control of the design and construction of new works was turned over to the newly appointed Aqueduct Commissioners. Benjamin S. Church, who had been the Resident Engineer of the Old Croton Aqueduct since 1861 (and had a pre-Tweed reputation) was appointed Chief Engineer. He would be the mastermind behind the New Croton Aqueduct, which greatly increased the size and capacity of the city's water supply system. In 1888, Alphonse Fteley, who had been the Consulting Engineer, succeeded Church. Aqueduct Commissioners reports were issued covering the periods from 1883 to 1887, 1887 to 1895, and 1895 to 1907. These reports were lavishly illustrated by the Draughting Bureau, which was headed by Assistant Engineer Frederick S. Cook. Cook was responsible for the architectural appearance of most of the New Croton Aqueduct, dams and reservoirs.

The New Croton Aqueduct, with a receiving and distributing reservoir at Jerome Park, was part of the Aqueduct Commission's original design from 1884. The City decided to build the aqueduct first, and the construction of the Jerome Park Reservoir did not begin until five years after the aqueduct went into service.

Role of Olmsted and Croes

Jerome Park was in the 24th Ward of New York City, a part of the territory annexed from Westchester County in 1874. The Jerome Park Reservoir was first formally recommended in 1875, when Commissioner of Public Works Gen. Fitz John Porter ordered a survey. According to Edward Wegmann, the Aqueduct Commissioners' Assistant Engineer for Construction, "Two routes... were surveyed, commencing a quarter of a mile below the head of Croton Lake and terminating near Jerome Park, where it was proposed to construct a large receiving reservoir. Nothing more was done towards constructing this work."[7]

The 1875 survey occurred at about the same time as the survey work for the comprehensive city plan of the 23rd and 24th Wards. In 1877, the Department of Public Parks issued plans of existing streets and planned streets and parks designed by Frederick Law Olmsted, Landscape Architect and J. J. R. Croes, Civil and Topographical Engineer. This project was intended to develop the newly acquired districts in a way that would preserve the

[7] Edward Wegmann, *The Water Supply of the City of New York 1658 - 1895*, John Wiley & Sons, 1896, p. 90

beauty and park-like character of certain areas, such as Riverdale and Kingsbridge Heights. According to Charles E. Beveridge, Editor of the Frederick Law Olmsted Papers, the plan for the 23rd and 24th Wards was Olmsted's, "...largest and most comprehensive city planning project for which he actually prepared plans as well as written reports...the closest thing to a full city plan that Olmsted ever attempted."[8] Their street plans were adopted by the city in 1877 and 1878, and subsequently constructed in large part as designed.[9]
The area surrounding the Jerome Park Reservoir is a remarkably intact portion of the Olmsted and Croes plan of 1877.[10] According to Daniel J. Donovan, the Topographic Engineer of the Borough of the Bronx:

> "To determine the extent to which Olmsted's design was actually followed in the Kingsbridge Heights vicinity, the plan [Adopted Map D No. 23] was compared with the final adopted map: *Section 21 of Final Maps and Profiles of the 23rd and 24th Wards*, dated June 17, 1895, Topographical Bureau, Louis A. Risse Chief Engineer. Comparison of these plans confirms that the Final Map of 1895 is substantially in conformance with the 1877 Olmsted plan, much of it, in fact, in exact conformance. The most significant change in the Kingsbridge Heights vicinity from the 1877 Olmsted design to the Final Map of 1895 is the inclusion of the Jerome Park Reservoir."[11]

It is clear that Olmsted's intent in providing neighborhoods like Kingsbridge Heights with narrow, curvilinear streets was to assure that they would maintain their residential character, discourage inappropriate development, and preserve their existing natural beauty. The charming character of the residential neighborhoods surrounding the reservoir is due not to chance, but to the intervention of Olmsted, whose influence similarly saved Riverdale from the imposition of a rectilinear street grid.

One of the great distinctions between Olmsted's work in Central Park and in the Riverdale and Kingsbridge Heights areas was that the site on which Central Park was built was not considered attractive: it consisted of empty lots, squatter camps, marshes and even a bone boiling yard. The landscape of the park is almost entirely artificial. Riverdale and Kingsbridge Heights, on the other hand, had a naturally exquisite landscape that had only to be enhanced with the skillful introduction of curved roadways. Commercial areas were limited and were to serve the extensive residential neighborhoods.

It is unfortunate that Olmsted's ambitious and sophisticated design for the Bronx, undertaken just a few years after the opening of Central Park in 1874, is so little known. While his plans for the Bronx were adopted by the city and went into construction, Olmsted fought bitterly against politicians whom, "...he accused of interfering with his

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[8] Charles E. Beveridge, Editor of the Frederick Law Olmsted Papers, Department of History, The American University, Wahington, D.C., in a letter to Bronx Borough President Stanley Simon, July 3, 1984
[9] Adopted Map D No. 23, Dept. Of Public Parks, Plan of Streets, Roads and Avenues Lying West of Jerome Avenue and South of the Road from Mosholu to Williams-Bridge, in the Twenty-fourth Ward, 1877, signed by Frederick Law Olmsted, Landscape Architect, and J. J. R. Croes, Civil and Topographical Engineer.
[10] Adopted Map D No. 23, Dept. Of Public Parks, Plan of Streets, Roads and Avenues Lying West of Jerome Avenue and South of the Road from Mosholu to Williams-Bridge, in the Twenty-fourth Ward, 1877, Topographic Bureau, Office of the Bronx Borough President
[11] Daniel J. Donovan, RA, Topographic Engineer, in a letter to Jerome Park Conservancy Preservation Committee Chairman Robert Kornfeld, Jr., February 6, 1998

designs and according more importance to patronage than to ... proper administration."[12] Olmsted's correspondence with Croes reflects their frustration.

Olmsted was dismissed by the Department of Public Parks in 1878. He moved to Brookline, Massachusetts in 1882, but he is known to have, "...continued to concern himself with the fate of public parks in New York City..."[13]

According to the *Encyclopedia of the City of New York*:

> "[Olmsted] considered his landscapes both works of art and social experiments that would have a civilizing influence. He denounced the gridiron system of streets as a relic of an earlier stage of urbanization and envisioned instead a compact business district surrounded by more open residential neighborhoods and spacious, naturalistic parks; this vision is most clearly set forth in his proposals for the Bronx and for the Parkways in Brooklyn. Although often frustrated by political maneuvering and competing ideas of what a park should be, Olmsted and his collaborators had a profound influence on New York City."[14]

The editors of the Frederick Law Olmsted Papers have assigned an Olmsted "job number" to Jerome Park. The current contents appear to be limited to proposals related to the clubhouse. It has not yet been determined if Olmsted played a direct role in the design of the reservoir, although the plans of the reservoir prepared by the Aqueduct Commissioners in the 1880's and 1890's unmistakably show his influence. There is a reasonable likelihood that they were based on a preliminary design by Olmsted and Croes, which may exist in the numerous sketches and notes from the design of the 23rd and 24th Wards that have not yet been catalogued.

In 1885, as part of the process of designing the Jerome Park Reservoir, the Aqueduct Commissioners passed a resolution requesting the Department of Public Parks and the Department of Public Works to furnish the Commissioners with, ". . . any preliminary surveys, results thereof, and reports thereon . . . for a reservoir to be connected with the New Croton Aqueduct, and located north of the Harlem River."[15] The reference to the Department of Public Parks apparently refers to the work of Olmsted and Croes, but there is no description of what was furnished. Olmsted and Croes were surely aware that a reservoir would eventually be built on the site. Croes had an extensive engineering career in the Croton Aqueduct Department. He took over preparation of drawings for the New Central Park Receiving Reservoir in 1860,[16] was Resident Engineer for the High Bridge improvements starting in 1862,[17] and was in charge of construction of the Boyd's Corners Reservoir and dam, which was completed in 1874.[18]

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[12] Kenneth Jackson ed., *The Encyclopedia of the City of New York*, Yale University Press, 1995, p. 864
[13] Jackson, p. 864
[14] Jackson, p. 864
[15] Walter H. Sears, Report of Chief Engineer, City of New York Aqueduct Commission, *Report on the New Croton Aqueduct, Reservoirs and Dams, 1895-1907*, 1907, p. 122.
[16] Wegmann, p. 71
[17] Wegmann, p. 73
[18] Wegmann, p. 79

The Olmsted and Croes 1877 plan shows the Jerome Park race track but does not indicate the reservoir.[19] Being an adopted plan for construction, it could not indicate proposed or future elements. The City kept a low profile concerning its plans for Jerome Park right up until the land was acquired in order to discourage speculation. The Olmsted and Croes street plan essentially blocks out territory for the reservoir, bounded by Sedgwick Avenue to the west, Kingsbridge Road to the south, Jerome Avenue to the East, and what would become Mosholu Parkway and Van Cortlandt Park to the north. They also removed the existing Old Boston Road from across the site. This open area which contained the race track, service roads and outbuildings, is reflected in the Map of Location and Environs published by the Aqueduct Commissioners in 1895. The detailed design of the reservoir was produced by the Aqueduct Commissioners during the years that the Olmsted and Croes street plan was under construction.

There were other professional contacts that also suggest that Olmsted and Croes would have been aware of the plans for Jerome Park Reservoir. Benjamin Church, Chief Engineer of the Aqueduct Commissioners, was a familiar figure to both Croes and Olmsted from the 1860's when they were all involved with work in Central Park. Olmsted and Church were club-mates at the Union League Club. Croes was a colleague and admirer of Church's: the copy of Church's *Notes and Suggestions on the Croton Water Works and Supply for the Future*, from 1876, in the collection of the New York Public Library, was donated by Croes, with a note, "With the compliments of J. James R. Croes, Civil and Topographical Engineer Department of Public Parks, NYC." Croes would also go on to join several committees of experts to review design issues of the New Croton Aqueduct.

Construction of Jerome Park Reservoir

There was public debate as to whether a new receiving reservoir was necessary or not. The Jerome Park Reservoir was not included in the recommendations for a new aqueduct in the report of Isaac Newton, Chief Engineer of the Croton Aqueduct (under the Department of Public Works) in 1882. Its necessity was supported in the report of W. E. Worthen, C. E., who was subpoenaed by the Aqueduct Commissioners to testify at a public hearing in early 1884. Worthen wrote that, "No provision has been made in the Quaker Bridge plans for additional storage reservoirs within the city limits...This is the fundamental error of the project."[20]

The decision to build the Jerome Park Reservoir was reached by the Aqueduct Commissioners in early 1884, soon after their appointment. It was not yet known when the site would be obtained or the funding approved.[21] The first objective was the completion of the New Croton Aqueduct conduit.

The purpose in constructing the Jerome Park Reservoir was to create a storage and distributing reservoir along both the Old and New Aqueducts. It would provide water to the city if either or both of the Aqueducts had to be shut off for repairs. Also, it would provide local supply in the area of the 23rd and 24th Wards. According to Church,

[19] Adopted Map D No. 23, Dept. Of Public Parks, 1877
[20] W. E. Worthen, "Report of W. E. Worthen, C. E. on the Projected Reservoir and Aqueduct for 'The Additional Water-Supply of New York City.'", 1884
[21] Wegmann, p. 209

"80 to 100 million gallons were reserved for the Twenty-third and Twenty-fourth Wards."[22] An examination and survey for a Receiving and Distributing Reservoir at Jerome Park were performed in 1885.[23]

Church pushed for immediate construction of the Jerome Park Reservoir, believing that the city's water supply was in danger of serious interruption until it was completed. The project was delayed due to the opinion of Newton that it would not be needed for at least ten years.[24]

The schematic representation of the Jerome Park Reservoir shown in the system map of 1887 shows a curvilinear form reminiscent of the New Central Park Reservoir. The location and environs plan published by the Aqueduct Commissioners in the 1895 report has a similar but revised form, and is completely integrated with the Olmsted and Croes street plan, including two "Proposed New Avenues," Reservoir Avenue (from Sedgwick Avenue east and south to Kingsbridge Road) and Sedgwick Avenue North (from Van Cortlandt Avenue West northeast to Goulden Avenue).

A more detailed plan published in 1895 reveals a design that had advanced remarkably, and had achieved a level of landscaping sophistication that did not exist previously in the Croton System. It can be seen that rather than being like the New Central Park Reservoir, the 1895 design of the Jerome Park Reservoir actually had more stylistic kinship with the Lake and the Pond in Central Park, smaller bodies of water designed by Olmsted. In scale, it resembled the picturesque artificial lakes of the storage reservoir system in the Croton Watershed.

The 1895 design of the Jerome Park Reservoir called for sloped earth embankments rather than a retaining wall around most of the reservoir. This design also had two islands and a peninsula. Jerome Park Clubhouse Island and Oak Ridge Clubhouse Island, one in each basin, were planned for existing highpoints where existing clubhouses from the race track would be preserved. The peninsula, at the northwest side of the reservoir, was the intended location of Shaft No. 21. The roadway on the dividing wall (the East Basin Wall along the Goulden Avenue side of the as-built Reservoir) jogged to provide access to both islands. The bridge from Gate House No. 5 to Shaft No. 21 would have allowed access to Gate House No. 5 from the peninsula, which projected from the area where Fort Independence Park is today.

Chief Engineer Alphonse Fteley wrote in 1895 that, "...it is expected that the new reservoir will add greatly to the attractiveness of the surrounding grounds."[25] When the Jerome Park Reservoir went into construction, the surrounding streets had single family homes and a few small farms. As the twentieth century progressed, apartment buildings were constructed to take advantage of the view of the reservoir and its grounds. Olmsted's curvilinear streets were lined with trees, including a mile-long row of pin oaks that runs from the south end of the Jerome Park Reservoir, along Reservoir and Sedgwick Avenues, through Fort Independence Park, to Hillman Avenue.

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[22] Benjamin S. Church, Report of Chief Engineer, City of New York Aqueduct Commission, *Report on the New Croton Aqueduct, 1883 to 1887*, 1887, p. 43

[23] Benjamin S. Church, Report of Chief Engineer, 1887, pp. 48, 49

[24] City of New York Aqueduct Commission, *Report on the New Croton Aqueduct, Reservoirs and Dams, 1887 to 1895*, 1895, pp. 37, 38

[25] Alphonse Fteley, Report of Chief Engineer, City of New York Aqueduct Commission, *Report on the New Croton Aqueduct, Reservoirs and Dams, 1887 to 1895*, 1895, p.80

The designers were instructed in 1895 to revise the plan to allow for more water storage without increasing the footprint of the site, so the islands and peninsula were eliminated to allow for more excavation.[26] In the final design, as reflected in the plan from the 1907 Commissioners Report, the jog in the wall remains though the islands have been eliminated, and the bridge from Gate House No. 5 to Shaft No. 21 remains. Also stone face walls were planned all around the reservoir rather than the earthen banks, except for a short strip along the northern side, where a core wall dam with sloped earthen banks was designed.

The construction of the reservoir aroused several controversies. The Merchants' Association demanded a grand jury investigation into poor workmanship at the New Croton Dam and Jerome Park Reservoir. It was reported that the reservoir's walls were not watertight, that, "...the commissioners seldom visit the Jerome Park Reservoir and that the [New Croton] dam was like a sieve with water spouts gushing through cracks with such force to permit a man to walk under the arch of the streams without getting wet..."[27]

To investigate the allegations concerning the reservoir, a Special Committee of Engineers was set up under William Burr and John Freeman. Their 1903 report, submitted to the Aqueduct Commissioners, contains an evaluation and remedial recommendations for the concrete floor of the reservoir, the workmanship of the stone walls, and the use of "stone dust" from the site as aggregate for mortar. The report did not find major flaws, but called for more careful inspection. The mortar composition was approved.[28]

According to Walter H. Sears, Chief Engineer in 1907, "Assistant Engineer F. S. Cook had charge of the Draughting Bureau of the Aqueduct Commissioners, where all the important works constructed by the Commissioners were designed, from January 23, 1884, to March 1, 1905, when he was promoted to the position of Division Engineer and placed in charge of the construction of the Jerome Park Reservoir."[29]

Gate House Superstructures

By the time Cook took charge in the field, much of the reservoir's basin and gate houses had been completed, but designs for the gate house superstructures had not been shown in the 1887 or 1895 reports. Preliminary designs were underway as of 1903 (and probably much earlier). Proposed designs, along with a model of Gate House No. 5 were publicly exhibited by Cook at the 1904 Louisiana Purchase Exposition in St. Louis, Mo., in a joint display of the Aqueduct Commissioners and the Department of Water Supply,[30] but they were not published in the 1907 Report to the Aqueduct Commissioners.

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[26] Aqueduct Commission, 1907
[27] Mary Josephine D'Alvia, *The History of the New Croton Dam*, 1976, p.162
[28] Prof. Wm. H. Burr and Mr. John Freeman, "Report of the Special Committee of Engineers Upon Certain Details of Construction of the Jerome Park Reservoir, July 27 1903"
[29] Walter H. Sears, Report of Chief Engineer, City of New York Aqueduct Commission, *Report on the New Croton Aqueduct, Reservoirs and Dams, 1895 - 1907*, 1907, p. 138
[30] Cook and Taber, pp. 14, 16

The substructures of Gate Houses Nos. 1 to 7 were completed in 1905. Trowbridge and Livingston, Architects were retained to prepare plans and specifications for the superstructures, and their design drawings were dated 1906.[31] Trowbridge and Livingston, Architects were a well known New York firm whose work included the St. Regis Hotel, and the B. Altman Department Store on 34th Street. It is not clear why a consultant was retained for this project, while the other works had been designed in-house by the Aqueduct Commissioners. It may be that the Aqueduct Commissioners' engineers wanted to impress upon a fickle city government the significance of the reservoir at a time when its future was in doubt. It may be that the Draughting Bureau could not produce the work: they were occupied with engineering problems of the reservoirs and the New Croton Dam, and were without Cook, who had directed their architectural designs.

The proposed superstructure designs for the reservoir gate houses were not published in the Report to the Aqueduct Commissioners. This may reflect an ongoing effort by the Department of Water Supply, inherited from the Department of Public Works, to minimize the scope and cost of the reservoir, and to delay or prevent its being built.

The 1907 report states that, "...the construction of the superstructures has been postponed at the request of the Department of Water Supply, Gas and Electricity until it is decided whether a filter plant is to be built in the East Basin of the Jerome Park Reservoir."[32] This is a reference to the 1905 Burr-Hering-Freeman Commission recommendation to filter the water of the Croton through a slow sand filter in the East Basin of the Jerome Park Reservoir. Jerome Park had originally been intended to purify water by subsidence, with the idea that most of the water of the new aqueduct would pass through the reservoir to allow settlement. The Burr-Hering-Freeman Commission recommended filtration of the proposed Catskill system as well (land was purchased in Westchester County for the purpose, but the filters never materialized).[33]

The Bureau of Water Supply, Gas and Electricity requested the Aqueduct Commissioners to suspend construction of the East Basin of the Jerome Park Reservoir until it was decided whether to build the filter there. In 1907 the Bureau requested permission to, "install an experimental filter station by the National Roche Filtering Company at the Jerome Park Reservoir."[34] In 1910 it was decided to add chemicals to the water, particularly chlorine, in the gate houses of the West Basin, and not to filter the water.

There were several structures of the Croton system designed by the Department of Water Supply personnel even after the Aqueduct Commissioners were given general design responsibility. The Amawalk dam and reservoir was designed by the Department of Water Supply.[35] The Amawalk dam made visual reference back to the heritage of the Old Croton Aqueduct: the spillway had the sinusoidal curve of Jervis's Old Croton Dam, and the neo-Egyptian portal over the tunnel entrance is reminiscent of the original receiving and distributing reservoirs. Perhaps this reflects a nostalgia for the days before the Aqueduct Commissioners.

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[31] Aqueduct Commission, 1907, p. 15
[32] Aqueduct Commission, 1907, p. 15
[33] Charles H. Weidner, *Water for a City*, Rutgers University Press, 1974, p. 104
[34] *Minutes of the Aqueduct Commissioners*, 1907, p. 94
[35] Cook and Taber, p.12

The High Pumping Station on Jerome Avenue was also designed by the Department of Water Supply, under George W. Birdsall, Consulting Engineer, and constructed from 1901 to 1906. While contemporary with, and connected to, the Jerome Park Reservoir, the pumping station is stylistically different, being Romanesque Revival, rather than the style of the Aqueduct Commissioner's work. Also, the High Pumping Station is constructed of brick, whereas the Jerome Park Reservoir structures, like all of the works of the Croton system, were of stone.

The High Pumping Station is now listed on the State and National Registers of Historic Places. It was constructed next to the Jerome Park Reservoir Keeper's House, one of the finest of the architectural works designed in Cook's Draughting Bureau. (The Keeper's House, which stood at the intersection of Jerome Avenue and Mosholu Parkway, was demolished in the twentieth century to make way for Tracey Towers, a high-rise housing project.)

The Aqueduct Commissioner's work was descended from the Roman-inspired work of the Old Croton Aqueduct with traces of Renaissance Revival, Italianate and Romanesque. The sub-structures of their work, such as the Jerome Park gate houses, tended to be pure, muscular Roman-inspired architecture. The style of their designs was consistent over the twenty-seven years that their works were under construction, while it also had an eclectic quality that enriched the system. The 135th Street Gatehouse and the New Croton Dam, for example, had a Romanesque flavor while maintaining the essential character of Croton system architecture. This consistency is appealing, because it gives the whole Croton system a coherence, even though it evolved in numerous campaigns in far-flung places over 75 years.

The Aqueduct Commissioners prepared a new set of designs for the Gate House Superstructures at the Jerome Park Reservoir, that superseded the Trowbridge and Livingston designs. The new designs were produced by the Draughting Bureau while Cook had risen to the position of Acting Chief Engineer. They were completed in 1909, and were signed prominently by Cook. Contract Drawings and Specifications were prepared and approved by the Corporation Counsel of the Commissioners for bidding on September 21, 1909 for Gate Houses No's 2, 3, 4, 6 and 7, and on October 13, 1909 for Gate Houses No's 1 (in Van Cortlandt Park) and 5.[36] The new design of the Gate House No. 5 superstructure included a tower nearly ninety feet tall with a red terra-cotta tile roof that would have projected a commanding presence across the expanse of the reservoir.

The Aqueduct Commissioners were gearing-up to complete the Jerome Park Reservoir, the gate house superstructures and the unfinished East Basin, as the final masterpiece of the Croton system. But the Aqueduct Commission was abolished on June 1, 1910, and their plans for Jerome Park were indefinitely shelved. In 1911, the Department of Water Supply, Gas and Electricity constructed wooden frame sheds over the gate houses to shelter them until such time as superstructures might be constructed.

Because the Department of Water Supply, Gas and Electricity had decided not to filter the water, they turned over the unfinished East Basin to other city agencies for their use. The additional storage capacity was not needed due

[36] Minutes of the Aqueduct Commissioners, 1909, pp. 52, 67, 88, 94

to the Catskill Aqueduct then under construction. In 1912 construction began on the Eighth Coastal Artillery (Kingsbridge) Armory, in the south end of the East Basin. In the following years, a number of public schools and other city facilities were constructed in the East Basin.

Gate house superstructures were finally constructed at the Jerome Park Reservoir in 1938, after being on hold for forty years. They were built by the Design Unit of the Works Progress Administration, under the direction of T. Hochlerner, Division Engineer, and Patrick Quilty, Acting Chief Engineer of the Bureau of Water Supply. The gate house superstructures at the Jerome Park Reservoir were built a year after construction had begun on the Delaware Aqueduct system, whose buildings are principally made of brick masonry. The Jerome Park Reservoir gate houses were constructed of brick masonry with stone trim in a muted Art Deco style that was integrated with the architecture of the original stone gate houses.

This 1938 work at Jerome Park was about the same time as other works at city reservoirs under the WPA, including the infilling of Williamsbridge Reservoir to make a park/playground, the conversion of High Bridge Reservoir to a public swimming pool, and the demolition of the original Yorkhill Receiving Reservoir in Central Park to create the Great Lawn.

Jerome Park as Parkland

Jerome Park Reservoir was designed during the "New Parks" movement that led to the creation of the nearby Van Cortlandt Park and Mosholu Parkway. This movement, which began in the early 1880s, recognized that large parcels of land in the newly annexed territory could become parkland without incurring a large cost. Van Cortlandt Park and Bronx Park were already filled with natural beauty and were to be connected by Mosholu Parkway, a wide tree-lined boulevard.

Jerome Park Reservoir, which is the largest body of water in the Bronx, was set into a street plan designed by Frederick Law Olmsted. Earlier in the nineteenth century, a large reservoir had been placed within his design for Central Park. This mix of blue water in a green landscape caught the attention of Olmsted's son, who wrote "All reservoirs have, in addition to their essential quality of storing water, an element of landscape effect; namely, that of an expanse of clear sparkling water. This same element forms the chief feature of many landscapes in public parks, where it is created at large cost, and it is clearly a thing of great value to the public when it can be made available. In itself, regardless of its outline or setting, a body of water is beautiful and refreshing, and its value to the public is so well recognized that provision is often made for giving public access to the enclosure about a reservoir, whence its surface may be seen."[37]

When Jerome Park Reservoir opened in 1906, it was a reservoir-park. As time went on, portions of the property were stripped from the reservoir to create distinct public parks: Fort Independence Park (1915), Old Fort No. 4 Park (1913, 1931, and 1934), and Harris Park (1940, known as Harris Field and Harris Park Annex). Original reservoir landscaping, such as stone walls, gate posts and wrought iron fences, remain at some of these parks.

[37] Frederick Law Olmsted, Jr., *The Relation of Reservoirs to Parks*, 1899

The walls of Fort Independence Park along Sedgwick Avenue, for example, show how the perimeter of the reservoir was originally landscaped.

Randall Comfort wrote in 1923 that, "To-day the vast Jerome Park Reservoir covers Mr. Bathgate's pastures with its rippling waters of perfect blue, while seagulls fly in swarms over the site of the Bathgate Mansion of other days."[38]

After the reservoir was completed, the land in the proposed east basin was turned over to other City agencies. Goulden Avenue became known as "education mile," because of the five schools that line its eastern edge: DeWitt Clinton High School, Bronx High School of Science, Hunter College (now Lehman College), Walton High School, and PS 86. The large and historic Kingsbridge Armory was constructed at the southern end of the reservoir.

Unfortunately, Jerome Park Reservoir was fenced off during World War II, and this barrier to public enjoyment and recreation has not been removed. In spite of this, Jerome Park remains an integral part of the fabric of green space that extends from Riverdale to Bronx Park. The Old Croton Aqueduct Trailway, which runs from the New Croton Dam in Westchester County to the Manhattan side of High Bridge, passes along the eastern edge of Jerome Park Reservoir. And the adjacent parks, Old Fort No. 4 Park, Fort Independence Park, and Harris Park, share scenic vistas across the water. Combined with surrounding roads such as the curvilinear, tree-lined Sedgwick and Reservoir Avenues, they are an extension of the greenbelt surrounding the reservoir.

The Jerome Park Reservoir exemplifies Olmsted's landscape and city planning principles, providing a naturalized setting, and serving to create beauty, serenity and outdoor recreation in the midst of urban residences and institutions. The reservoir, parks, and roadways, combined with their landscape elements of stone walls, paved walks, terraces, seating areas, and stairs, and natural elements of trees and rock outcroppings, evoke the style of other Olmsted landscapes in the city, such as Central and Riverside Parks. Were it not for this reservoir, there would not be a majestic, landscaped body of water in the Bronx.

[38] Valentine's Manual, p. 244

9. Bibliography

Adopted Map D No. 23, Dept. Of Public Parks, Plan of Streets, Roads and Avenues Lying West of Jerome Avenue and South of the Road from Mosholu to Williams-Bridge, in the Twenty-fourth Ward, 1877, signed by Frederick Law Olmsted, Landscape Architect, and J. J. R. Croes, Civil and Topographical Engineer.

Annual Report of the Croton Aqueduct Department Made to the Common Council of the City of New York for the Year 1858, January 3, 1859.

Annual Report of the Croton Aqueduct Department Made to the Common Council of the City of New York for the Year 1866, January 7, 1867.

Burr, William H. and Mr. John Freeman. "Report of the Special Committee of Engineers Upon Certain Details of Construction of the Jerome Park Reservoir, July 27 1903."

Butler, George B., Esq. "Croton-Water Supply for the City of New York", New York Municipal Society, 1876.

Church, Benjamin S. and Alphonse Fteley, *Reports on the Quaker Bridge Dam*, 1889.

Church, Benjamin S., C.E. "Notes and Suggestions on the Croton Water Works and Supply for the Future," with Discussions and Transactions of the American Society of Civil Engineers, 1876.

City of New York Aqueduct Commission, *Report on the New Croton Aqueduct, 1883 to 1887*, 1887.

City of New York Aqueduct Commission, *Report on the New Croton Aqueduct, Reservoirs and Dams, 1887 to 1895,* 1895.

City of New York Aqueduct Commission, *Report on the New Croton Aqueduct, Reservoirs and Dams, 1895 to 1907,* 1907.

Cook, Frederick S. and George Taber. "The Water Supply of the City of New York, Exhibits at the Louisiana Purchase Exposition," 1904.

Cooper, Linda Gilbert. *A Walker's Guide to the Old Croton Aqueduct*, 1992.

Dolkart, Andrew S. *Guide to New York City Landmarks*. New York City Landmarks Preservation Commission, 1992.

Douglass, D. B. Engineer's Report, *Report of the Commissioners... Relative to Supplying the City of New York with Pure and Wholesome Water*, 1833.

Galusha, Diane. *Liquid Assets: A History of New York City's Water System*. Purple Press, Ltd., 1999.

Jenkins, Stephen. *The Story of the Bronx*. G.P. Putnam's Sons, 1912.

Jervis, John B. *Description of the Croton Aqueduct*, Slamm and Guion, 1842.

Lange, Robie S. National Register of Historic Places Registration Form on the Old Croton Aqueduct. History Division, National Park Service, October 1991.

Minutes of the Aqueduct Commissioners, 1907, 1909.

Mullaly, John. *The New Parks Beyond the Harlem*. Record and Guide, 1887.

New York City Mayor's Office, *The Catskill Aqueduct and Earlier Water Supplies of the City of New York*, 1917.

Olmsted, Jr., Frederick Law. *The Relation of Reservoirs to Parks*. Rockwell and Churchill Press, 1899.

Rogers, Elizabeth Barlow. *Rebuilding Central Park*. the Central Park Conservancy, MIT Press, 1987.

Schramke, T. *Description of the New York Croton Aqueduct*, 1846.

The Old Croton Aqueduct: Rural Resources Meet Urban Needs. The Hudson River Museum of Westchester, 1992.

Tower, F. B. *Illustrations of the Croton Aqueduct*, 1843.

Tweed, William M. *Annual Report of Commission of Public Works of the City of New York for the Year 1870-71.*

Union League Club, "The Water Supply of New York. The Club Favors a Comprehensive System, and the Construction by a Commission to be Appointed by the Governor and Senate, of such Additional Works as may be needed," January, 1882.

Valentine's Manual of Old New York, No. 7, New Series, 1923.

Wegmann, Edward. *The Water Supply of the City of New York 1658 – 1895*. John Wiley & Sons, 1896.

Weidner, Charles H. *Water for a City*. Rutgers University Press, 1974.

10. Geographical Data

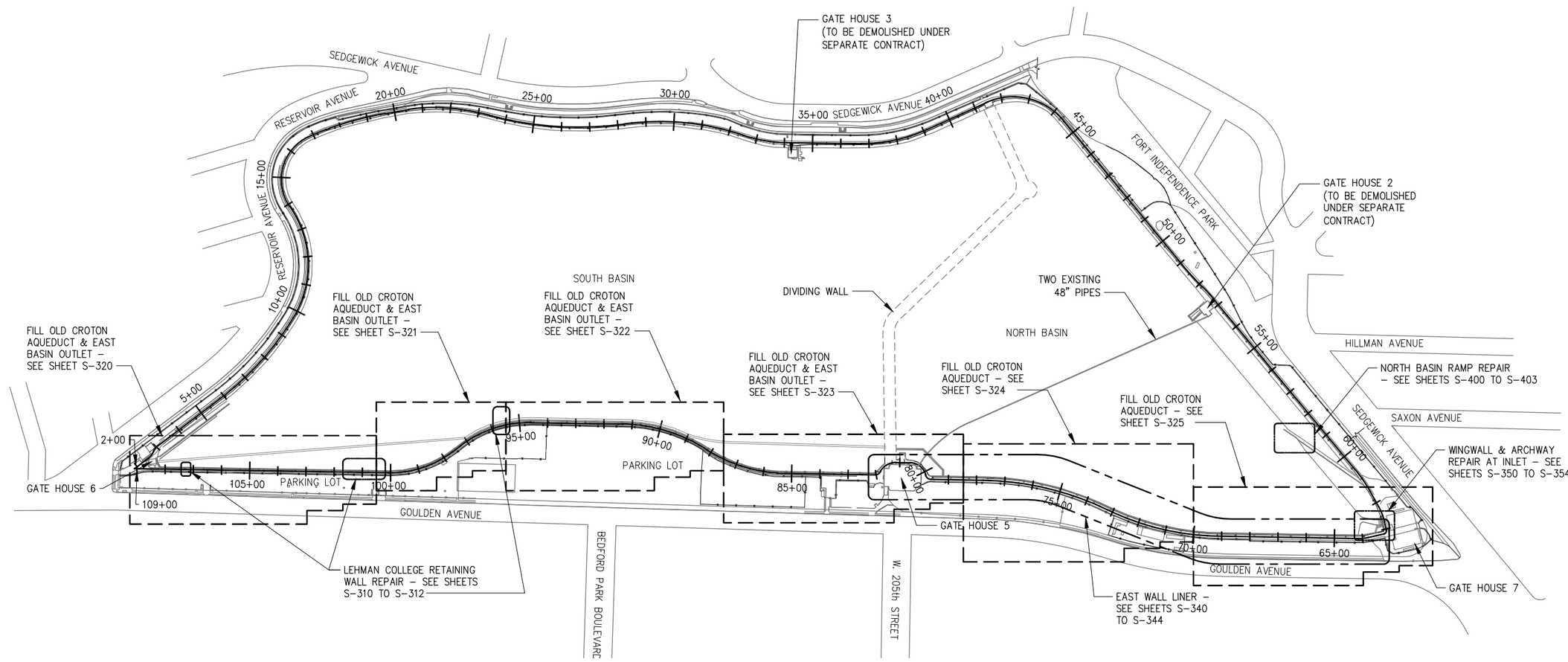
Verbal Boundary Description
The boundary of this nomination is outlined on the accompanying land map.

Boundary Justification
The nomination boundary includes the Jerome Park Reservoir and surrounding city parks that are historically associated with this property. The surrounding parkland was developed, in part, from land that was once part of the reservoir. The boundaries incorporate features that are visible above the waterline of the basin (such as the superstructures of the gate houses, stone walls, berms, etc.) and those features that are underwater (such as substructures of the gate houses, stone walls, the conduit of the Old and New Croton Aqueducts, etc.).

Form researched and prepared by:

Robert J. Kornfeld, Jr., AIA
Chairman
Preservation Committee of the Jerome Park Conservancy
3965 Sedgwick Avenue, 1C
Bronx, New York 10463

APPENDIX C: Plans and Designs, 2017



PROPOSED LAYOUT PLAN

SCALE: 1"=200'

0 200 400 FT.
1"=200'

90% DESIGN SUBMITTAL

SUBMITTAL DATE: 01/27/2017

GRAPHIC SCALES
CHECK BEFORE USE

IF SHEET IS LESS THAN 22" X 34"
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SCALE ACCORDINGLY

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REVISIONS

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DRAWN BY: M. FERRARA
CHECKED BY: J. CARUSO
DESIGN LEAD: J. CARUSO
SECTION MANAGER: J. CARUSO

MOTT MACDONALD

Environmental Protection

ACCOUNTABLE MANAGER: ANTHONY BROWN
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CONTRACT No: JRAQ-REH
JEROME PARK, RESERVOIR & AQUEDUCT REHABILITATION
STRUCTURAL
PROPOSED SITE PLAN LAYOUT
KEY PLAN

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DRAWING NO. S-304.00

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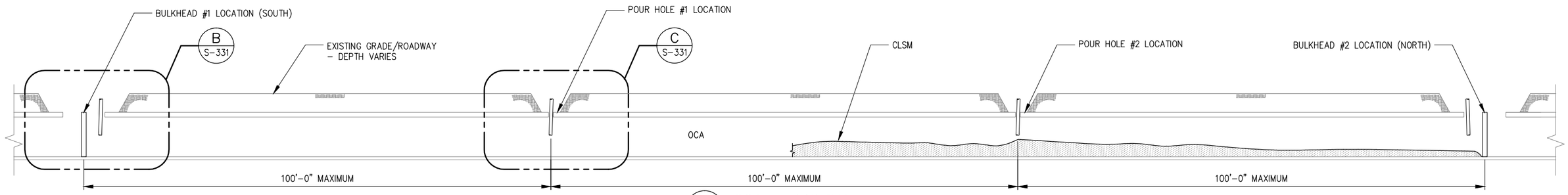


A S-322 OCA – PROFILE
SCALE: 3/32"=1'–0"

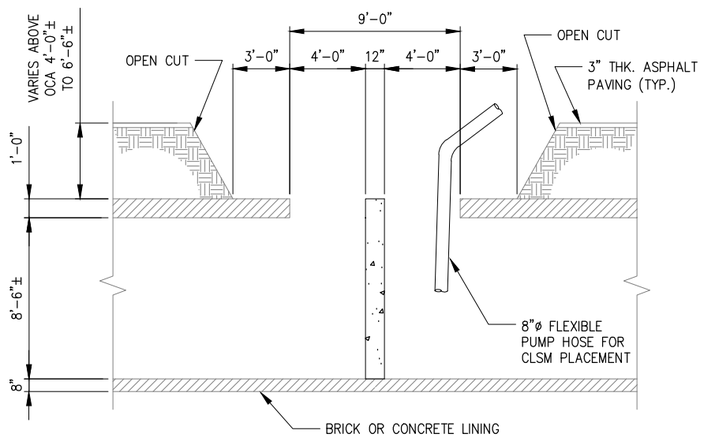
SUGGESTED SEQUENCE OF CONSTRUCTION – FILLING OLD CROTON AQUEDUCT:

THE SUGGESTED SEQUENCE OF CONSTRUCTION FOR FILLING THE ABANDONED OLD CROTON AQUEDUCT (OCA) DOES NOT PRECLUDE THE CONTRACTOR FROM BEING FULLY RESPONSIBLE TO CONDUCT THEIR WORK IN THE SEQUENCE THEY DEEM NECESSARY AND IN ACCORDANCE WITH THEIR PROPOSED MEANS AND METHODS. A SEQUENCE OF CONSTRUCTION SHALL BE SUBMITTED BY THE CONTRACTOR TO THE ENGINEER FOR REVIEW AND APPROVAL FOR CONFORMANCE WITH THE DESIGN INTENT PRIOR TO THE START OF ANY CONSTRUCTION. IT IS RECOMMENDED THAT THE CONTRACTOR BEGIN FILLING OPERATIONS SOUTH OF GATEHOUSE 5 (STATION 82+00) AND PROCEED SOUTH TOWARDS GATEHOUSE 6, THEN RESTART NORTH OF GATEHOUSE 5 (STATION 79+50) AND PROCEED NORTH TOWARDS GATEHOUSE 7. THE FINAL FILL SEGMENT WILL THE TAKE PLACE AROUND GATEHOUSE 5 (FROM STATION 79+50 TO 82+00). UNDER NO CIRCUMSTANCES SHALL THE PLACEMENT OF CLSM COMMENCE WITH WATER IN THE RESERVOIR HIGHER THAN 2–FEET BELOW THE INVERT OF THE OCA.

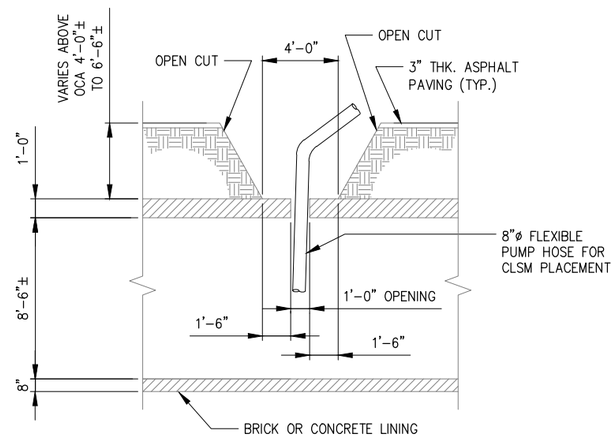
1. PRIOR TO THE START OF ANY CONSTRUCTION ACTIVITIES, LOCATIONS SHALL BE MARKED OUT ALONG THE ROADWAY AND DESIGNATED AS POUR HOLE LOCATIONS AND BULKHEAD CONSTRUCTION LOCATIONS. AS SHOWN IN THE CONTRACT DOCUMENTS, BULKHEADS ARE TO BE BUILT EVERY 300LF WITH A MINIMUM OF TWO POUR HOLES LOCATED EQUIDISTANT BETWEEN BULKHEADS. THE SPACING BETWEEN ANY TWO OPENINGS SHALL BE NO GREATER THAN 100LF. THE BULKHEAD AND FILL HOLE PENETRATIONS ARE TO BE LOCATED AND VERIFIED TO BE WITHIN A 1–FOOT TOLERANCE ALONG THE CENTERLINE OF THE AQUEDUCT.
2. AT THE BULKHEAD LOCATIONS, EXCAVATE THE EXISTING ROADWAY AND FILL MATERIAL TO EXPOSE THE TOP OF THE AQUEDUCT. HAND DIGGING MAY BE NECESSARY TO AVOID DAMAGE TO THE AQUEDUCT. THE TOP OF THE AQUEDUCT SHALL BE SUFFICIENTLY EXPOSED IN ACCORDANCE WITH CONTRACT DOCUMENTS.
3. SAW CUT AN OPENING THROUGH THE TOP OF THE OCA FOR THE LIMITS INDICATED IN THE CONTRACT DOCUMENTS. CONSTRUCT A PERMANENT REINFORCED CONCRETE BULKHEAD. PROVIDE SANDBAGS AND A DEWATERING SYSTEM UPSTREAM OF THE WORK LOCATION TO PREVENT THE BUILD–UP OF WATER AGAINST THE BULKHEAD.
4. AT THE POUR HOLE LOCATIONS, EXCAVATE TO THE TOP OF THE AQUEDUCT AS NOTED IN STEP 2 AND CORE A 12" DIAMETER HOLE THROUGH THE TOP OF THE AQUEDUCT. THE POUR HOLE SHALL BE LOCATED ALONG THE CENTERLINE OF THE CROWN.
5. ONCE COMPLETED, THERE SHOULD BE FOUR OPENINGS IN TOTAL PER SEGMENT; TWO BULKHEADS AND TWO INTERMEDIATE POUR HOLES LOCATED BETWEEN THE BULKHEADS.
6. EXTEND AN 8"DIAMETER FLEXIBLE PUMP HOSE THROUGH EACH OF THE INTERMEDIATE POUR HOLES TO ALLOW THE CONTROLLED LOW STRENGTH MATERIAL (CLSM) TO BE DIRECTLY DEPOSITED WITHIN THE AQUEDUCT. THIS CAN BE DONE AT BOTH FILL HOLE LOCATIONS SIMULTANEOUSLY. WHILE FILLING, VIDEO MONITORING SHALL BE SETUP TO PROVIDE A REAL–TIME FEED THAT TRANSMITS IMAGES TO A TOPSIDE CONTROL STATION. LIGHTING SHALL BE PROVIDED FOR THE CAMERA. THE CLSM IS TO FLOW FROM THE FILL HOLE LOCATIONS TOWARDS THE BULKHEADS IN BOTH DIRECTIONS. SHOULD THE CLSM TRAVEL IN THE DOWNSTREAM DIRECTION ONLY, AN ADDITION FILL HOLE SHALL BE INSTALLED TO WITHIN 20 FEET TO THE UPSTREAM BULKHEAD.
7. MONITOR THE HEIGHT OF THE CLSM FILL AT BULKHEAD LOCATIONS AND TAKE PERIODIC MEASUREMENTS. AT NO POINT SHOULD THE HEIGHT OF PLASTIC CLSM EXCEED 2'–10"AGAINST THE BULKHEAD. ONCE THE FILL HEIGHT REACHES 2'–10"AGAINST EITHER BULKHEAD, OPERATIONS SHALL BE TERMINATED. ALLOW FOR FILL TO COMPLETELY SET BEFORE PROCEEDING WITH SUBSEQUENT LIFT.
8. FINAL FILLING PROCEDURES SHOULD CEASE WHEN THE FLOWABLE FILL HAS REACHED THE CROWN OF THE AQUEDUCT AT BOTH POUR HOLE LOCATIONS. SHOULD THE FILL NOT EXTEND TO THE CROWN OF THE AQUEDUCT AT THE BULKHEAD OPENING, SUBSEQUENT FILL HOLE PENETRATIONS SHALL BE MADE AT HALF THE DISTANCE BETWEEN OPENINGS TO PROVIDE ADDITIONAL FILLING. THIS PROCESS SHOULD BE REPEATED UNTIL THE FILL HAS REACHED THE TOP OF ALL POUR HOLE LOCATIONS AND AT BOTH BULKHEADS.
9. REPEAT STEPS #6 THROUGH #8 CONSECUTIVELY ALONG THE AQUEDUCT UNTIL THE FINAL BULKHEAD LOCATION IS REACHED AS NOTED ON CONTRACT DOCUMENTS.

NOTES:

1. THE CONTRACTOR MUST ENSURE THAT THE PROPOSED SUPPORT OF EXCAVATION SYSTEM IS NOT BEING VERTICALLY SUPPORTED BY THE TOP OF THE EXISTING AQUEDUCT.
2. A MONITORING PROGRAM SUCH AS OPTICAL SURVEYING AND VIBRATION MONITORING SHALL BE IN PLACE ON ADJACENT STRUCTURES AT THE SITE TO MEASURE HORIZONTAL AND/OR VERTICAL MOVEMENTS DURING CONSTRUCTION.
3. THE SUPPORT OF EXCAVATION SYSTEM SHOULD BE INSTALLED IN A MANNER TO ENSURE THE SIDE WALLS REMAIN PLUMB TO THE REQUIRED DEPTH OF EXCAVATION.
4. FLEXIBLE HOSE SHALL BE LOWERED WITHIN AQUEDUCT TO WITHIN 4'–0" OF INVERT OR PLACED FILL.
5. SEE SHEET S–300 FOR CONSTRUCTION LOAD LIMITATIONS ON ROADWAY OVER OCA. ALL PROPOSED CONSTRUCTION ACTIVITIES SHALL COMPLY WITH THIS REQUIREMENT.
6. SIGNED AND SEALED CALCULATIONS SHALL BE SUBMITTED FOR THE DESIGN OF THE SUPPORT OF EXCAVATION SYSTEM BY A PROFESSIONAL ENGINEER CURRENTLY LICENSED IN THE STATE OF NEW YORK.



B S-331 BULKHEAD & OPENING DETAIL
SCALE: 1/4"=1'–0"



C S-331 TYPICAL POUR HOLE OPENING DETAIL
SCALE: 1/4"=1'–0"

1/4"=1'–0" 0 4 8 FT.
3/32"=1'–0" 0 5 10 15 20 FT.

90% DESIGN SUBMITTAL
SUBMITTAL DATE: 01/27/2017

GRAPHIC SCALES CHECK BEFORE USE
IF SHEET IS LESS THAN 22" X 34" IT IS A REDUCED PRINT. SCALE ACCORDINGLY

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CHECKED BY: J. CARUSO
DESIGN LEAD: J. CARUSO
SECTION MANAGER: J. CARUSO
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STRUCTURAL
OCA & EAST BASIN OUTLET REPAIR
OCA SUGGESTED SEQUENCE OF CONSTRUCTION

DATE: 01/27/2017
SCALE: AS NOTED
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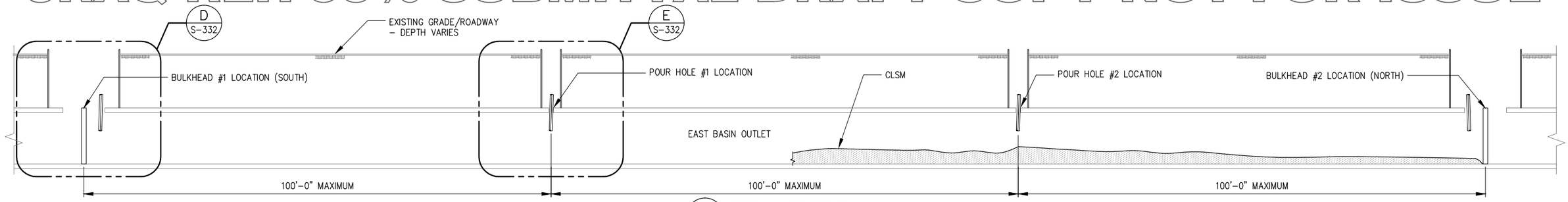


A S-322 EBO – PROFILE
SCALE: 3/32"=1'–0"

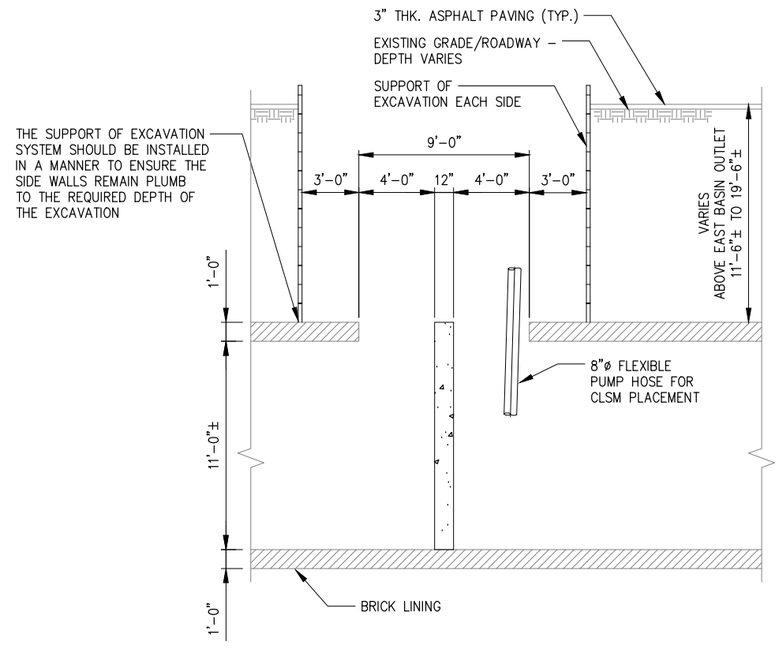
SUGGESTED SEQUENCE OF CONSTRUCTION – FILLING EAST BASIN OUTLET TUNNEL:

THE SUGGESTED SEQUENCE OF CONSTRUCTION FOR FILLING THE EAST BASIN OUTLET (EBO) DOES NOT PRECLUDE THE CONTRACTOR FROM BEING FULLY RESPONSIBLE TO CONDUCT THEIR WORK IN THE SEQUENCE THEY DEEM NECESSARY IN ACCORDANCE WITH THEIR PROPOSED MEANS AND METHODS. A SEQUENCE OF CONSTRUCTION SHALL BE SUBMITTED BY THE CONTRACTOR TO THE ENGINEER FOR REVIEW AND APPROVAL FOR CONFORMANCE WITH THE DESIGN INTENT PRIOR TO THE START OF ANY CONSTRUCTION. IT IS RECOMMENDED THAT THE CONTRACTOR BEGIN FILLING OPERATIONS AT GATEHOUSE 5, WHERE THE TUNNEL BEGINS, AND CONTINUE SOUTH APPROXIMATELY 2100LF TOWARDS THE PLUGGED END. COORDINATION WITH ADJACENT PROPERTY OWNERS WILL BE REQUIRED.

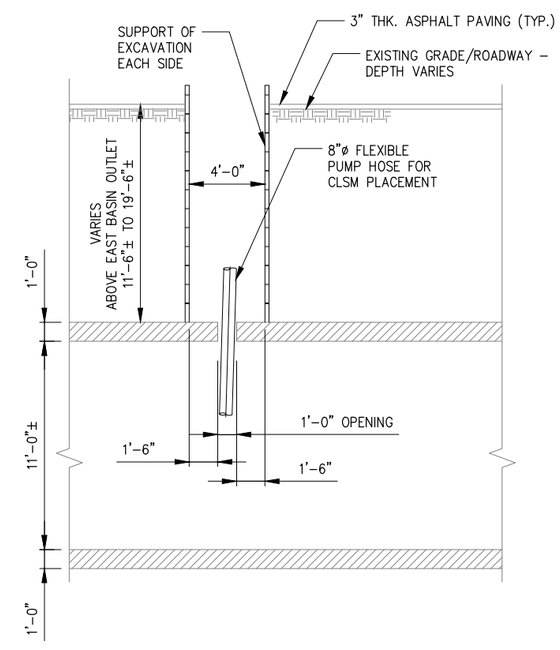
1. PRIOR TO THE START OF ANY CONSTRUCTION ACTIVITIES, LOCATIONS SHALL BE MARKED OUT ALONG GRADE AND DESIGNATED AS POUR HOLE LOCATIONS AND BULKHEAD CONSTRUCTION LOCATIONS. AS SHOWN IN THE CONTRACT DOCUMENTS, BULKHEADS ARE TO BE BUILT EVERY 300LF WITH A MINIMUM OF TWO POUR HOLES LOCATED EQUIDISTANT BETWEEN BULKHEADS. THE SPACING BETWEEN ANY TWO OPENINGS SHALL BE NO GREATER THAN 100LF. THE BULKHEAD AND FILL HOLE PENETRATIONS ARE TO BE LOCATED AND VERIFIED TO BE WITHIN A 1–FOOT TOLERANCE ALONG THE CENTERLINE OF THE TUNNEL.
2. DRAIN THE TUNNEL OF ALL EXISTING STANDING WATER PRIOR TO EXCAVATION ACTIVITIES. WATER SHALL BE PUMPED OUT FROM THE 21"DIAMETER MANHOLE LOCATED OUTSIDE THE SOUTH FACE OF GH5. WATER DISCHARGE LOCATION SHALL BE COORDINATED WITH BWS AND ADHERE TO MANDATORY DISCHARGE REGULATIONS. IF THERE IS INDICATION THAT WATER IS SEEPING INTO THE TUNNEL DURING CONSTRUCTION, THE RESERVOIR SHOULD BE FULLY DRAINED AND/OR A CONTINUOUS DEWATERING SYSTEM SHALL BE PUT IN PLACE TO MAINTAIN A DRY TUNNEL UNTIL FILLING OPERATIONS HAVE BEEN COMPLETED.
3. AT THE BULKHEAD LOCATIONS, EXCAVATE THE EXISTING ROADWAY AND FILL MATERIAL TO EXPOSE THE TOP OF THE TUNNEL. PROVIDE A SUPPORT OF EXCAVATION (SOE) SYSTEM AS EXCAVATION PROGRESSES. THE SOE SHALL BE NO SMALLER IN SIZE THAN INDICATED ON THE CONTRACT DOCUMENTS. HAND DIGGING MAY BE NECESSARY TO AVOID DAMAGE TO THE TUNNEL. THE TOP OF THE AQUEDUCT SHALL BE SUFFICIENTLY EXPOSED IN ACCORDANCE WITH CONTRACT DOCUMENTS.
4. SAW CUT AN OPENING THROUGH THE TOP OF THE EBO FOR THE LIMITS INDICATED IN THE CONTRACT DOCUMENTS. CONSTRUCT A PERMANENT REINFORCED CONCRETE BULKHEAD.
5. AT THE POUR HOLE LOCATIONS, EXCAVATE TO THE TOP OF THE TUNNEL AS NOTED IN STEP 3 AND CORE A 12"DIAMETER HOLE THROUGH THE TOP OF THE TUNNEL. THE POUR HOLE SHALL BE LOCATED ALONG THE CENTERLINE OF THE CROWN.
6. ONCE COMPLETED, THERE SHOULD BE FOUR OPENINGS IN TOTAL PER SEGMENT; TWO BULKHEADS AND TWO INTERMEDIATE POUR HOLES LOCATED BETWEEN THE BULKHEADS.
7. EXTEND AN 8"DIAMETER FLEXIBLE PUMP HOSE THROUGH EACH OF THE INTERMEDIATE POUR HOLES TO ALLOW THE CONTROLLED LOW STRENGTH MATERIAL (CLSM) TO BE DIRECTLY DEPOSITED WITHIN THE TUNNEL. THIS CAN BE DONE AT BOTH FILL HOLE LOCATIONS SIMULTANEOUSLY. WHILE FILLING, VIDEO MONITORING SHALL BE SETUP TO PROVIDE A REAL–TIME FEED THAT TRANSMITS IMAGES TO A TOPSIDE CONTROL STATION. LIGHTING SHALL BE PROVIDED FOR THE CAMERA. THE CLSM IS TO FLOW FROM THE FILL HOLE LOCATIONS TOWARDS THE BULKHEADS IN BOTH DIRECTIONS. SHOULD THE CLSM TRAVEL IN THE DOWNSTREAM DIRECTION ONLY, AN ADDITION FILL HOLE SHALL BE INSTALLED TO WITHIN 20 FEET TO THE UPSTREAM BULKHEAD.
8. MONITOR THE HEIGHT OF THE CLSM FILL AT BULKHEAD LOCATIONS AND TAKE PERIODIC MEASUREMENTS. AT NO POINT SHOULD THE HEIGHT OF PLASTIC CLSM EXCEED 3'–8"AGAINST THE BULKHEAD. ONCE THE FILL HEIGHT REACHES 3'–8"AGAINST EITHER BULKHEAD, OPERATIONS SHALL BE TERMINATED. ALLOW FOR FILL TO COMPLETELY SET BEFORE PROCEEDING WITH SUBSEQUENT LIFT.
9. FINAL FILLING PROCEDURES SHOULD CEASE WHEN THE FLOWABLE FILL HAS REACHED THE CROWN OF THE TUNNEL AT BOTH POUR HOLE LOCATIONS. SHOULD THE FILL NOT EXTEND TO THE CROWN OF THE TUNNEL AT THE BULKHEAD OPENING, SUBSEQUENT FILL HOLE PENETRATIONS SHALL BE MADE AT HALF THE DISTANCE BETWEEN OPENINGS TO PROVIDE ADDITIONAL FILLING. THIS PROCESS SHOULD BE REPEATED UNTIL THE FILL HAS REACHED THE TOP OF ALL POUR HOLE LOCATIONS AND AT BULKHEADS.
10. REPEAT STEPS #7 THROUGH #9 CONSECUTIVELY ALONG THE AQUEDUCT UNTIL THE FINAL BULKHEAD LOCATION IS REACHED AS NOTED ON CONTRACT DOCUMENTS.

NOTES:

1. THE CONTRACTOR MUST ENSURE THAT THE PROPOSED SUPPORT OF EXCAVATION SYSTEM IS NOT BEING VERTICALLY SUPPORTED BY THE TOP OF THE EXISTING AQUEDUCT.
2. A MONITORING PROGRAM SUCH AS OPTICAL SURVEYING AND VIBRATION MONITORING SHALL BE IN PLACE ON ADJACENT STRUCTURES AT THE SITE TO MEASURE HORIZONTAL AND/OR VERTICAL MOVEMENTS DURING CONSTRUCTION.
3. THE SUPPORT OF EXCAVATION SYSTEM SHOULD BE INSTALLED IN A MANNER TO ENSURE THE SIDE WALLS REMAIN PLUMB TO THE REQUIRED DEPTH OF EXCAVATION.
4. FLEXIBLE HOSE SHALL BE LOWERED WITHIN TUNNEL TO WITHIN 4'–0" OF INVERT OR PLACED FILL.
5. SEE SHEET S–300 FOR CONSTRUCTION LOAD LIMITATIONS ON ROADWAY OVER OCA. ALL PROPOSED CONSTRUCTION ACTIVITIES SHALL COMPLY WITH THIS REQUIREMENT.
6. SIGNED AND SEALED CALCULATIONS SHALL BE SUBMITTED FOR THE DESIGN OF THE SUPPORT OF EXCAVATION SYSTEM BY A PROFESSIONAL ENGINEER CURRENTLY LICENSED IN THE STATE OF NEW YORK.



D S-332 BULKHEAD & OPENING DETAIL
SCALE: 1/4"=1'–0"



E S-332 TYPICAL POUR HOLE OPENING DETAIL
SCALE: 1/4"=1'–0"

1/4"=1'–0" 0 4 8 FT.
3/32"=1'–0" 0 5 10 15 20 FT.

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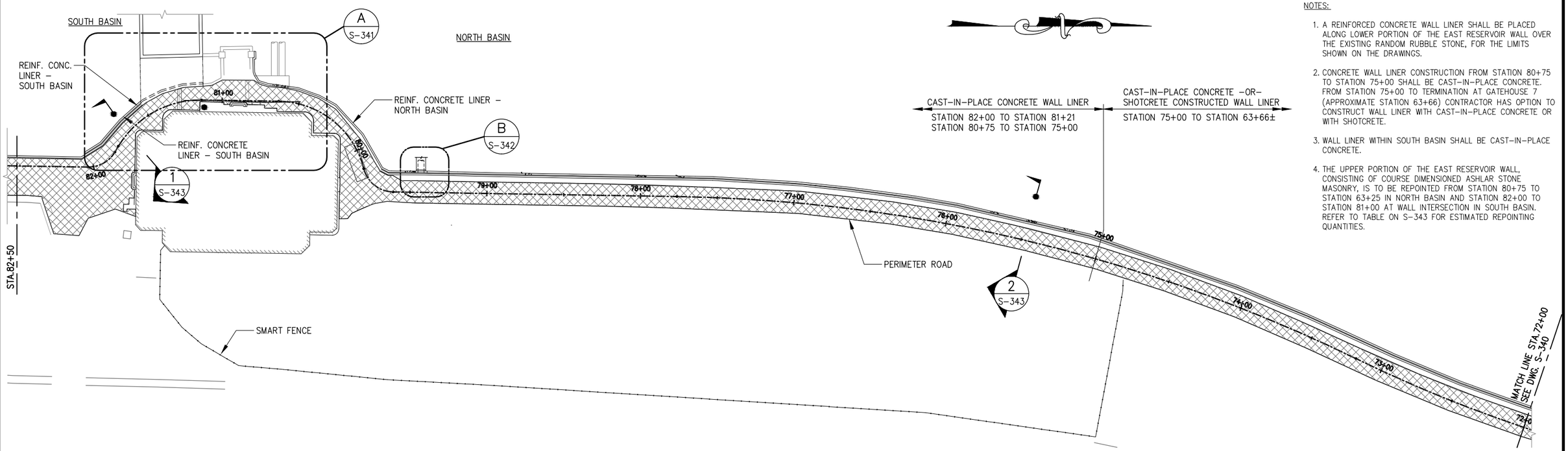


CAST–IN–PLACE CONCRETE WALL LINER
STATION 82+00 TO STATION 81+21
STATION 80+75 TO STATION 75+00

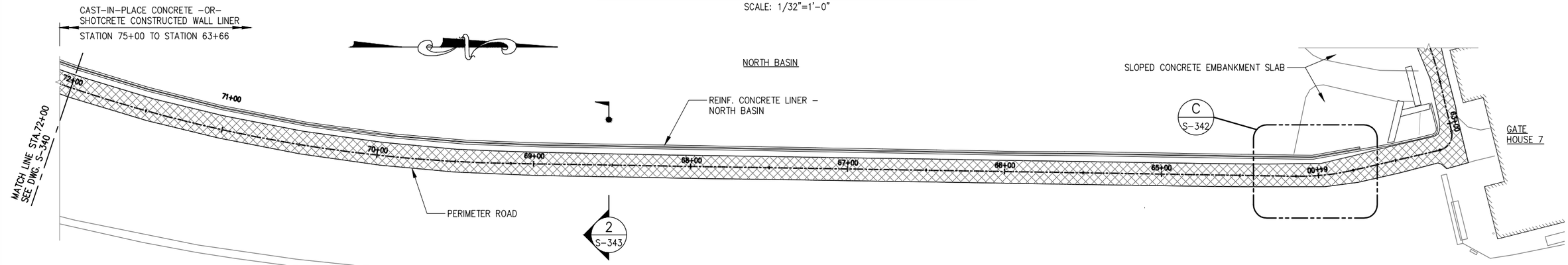
CAST–IN–PLACE CONCRETE –OR– SHOTCRETE CONSTRUCTED WALL LINER
STATION 75+00 TO STATION 63+66±

NOTES:

1. A REINFORCED CONCRETE WALL LINER SHALL BE PLACED ALONG LOWER PORTION OF THE EAST RESERVOIR WALL OVER THE EXISTING RANDOM RUBBLE STONE, FOR THE LIMITS SHOWN ON THE DRAWINGS.
2. CONCRETE WALL LINER CONSTRUCTION FROM STATION 80+75 TO STATION 75+00 SHALL BE CAST–IN–PLACE CONCRETE. FROM STATION 75+00 TO TERMINATION AT GATEHOUSE 7 (APPROXIMATE STATION 63+66) CONTRACTOR HAS OPTION TO CONSTRUCT WALL LINER WITH CAST–IN–PLACE CONCRETE OR WITH SHOTCRETE.
3. WALL LINER WITHIN SOUTH BASIN SHALL BE CAST–IN–PLACE CONCRETE.
4. THE UPPER PORTION OF THE EAST RESERVOIR WALL, CONSISTING OF COURSE DIMENSIONED ASHLAR STONE MASONRY, IS TO BE REPOINTED FROM STATION 80+75 TO STATION 63+25 IN NORTH BASIN AND STATION 82+00 TO STATION 81+00 AT WALL INTERSECTION IN SOUTH BASIN. REFER TO TABLE ON S–343 FOR ESTIMATED REPOINTING QUANTITIES.

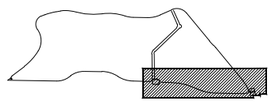
EAST WALL LINER – PLAN STA. 82+50 TO 72+00

SCALE: 1/32"=1'-0"



EAST WALL LINER – PLAN STA. 72+00 TO 62+00

SCALE: 1/32"=1'-0"



KEY PLAN

1/32"=1'-0" 0 5 15 25 75 FT.

90% DESIGN SUBMITTAL
SUBMITTAL DATE: 01/27/2017

GRAPHIC SCALES
CHECK BEFORE USE

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REVISIONS

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DRAWN BY: C. THOMPSON
CHECKED BY: J. CARUSO
DESIGN LEAD: J. CARUSO
SECTION MANAGER: J. CARUSO
MOTT MACDONALD

Environmental Protection

ACCOUNTABLE MANAGER: ANTHONY BROWN
PORTFOLIO MANAGER: MICHAEL LOEHR, P.E.
DIRECTOR, IN HOUSE DESIGN: PATRICK O'CONNOR, P.E.

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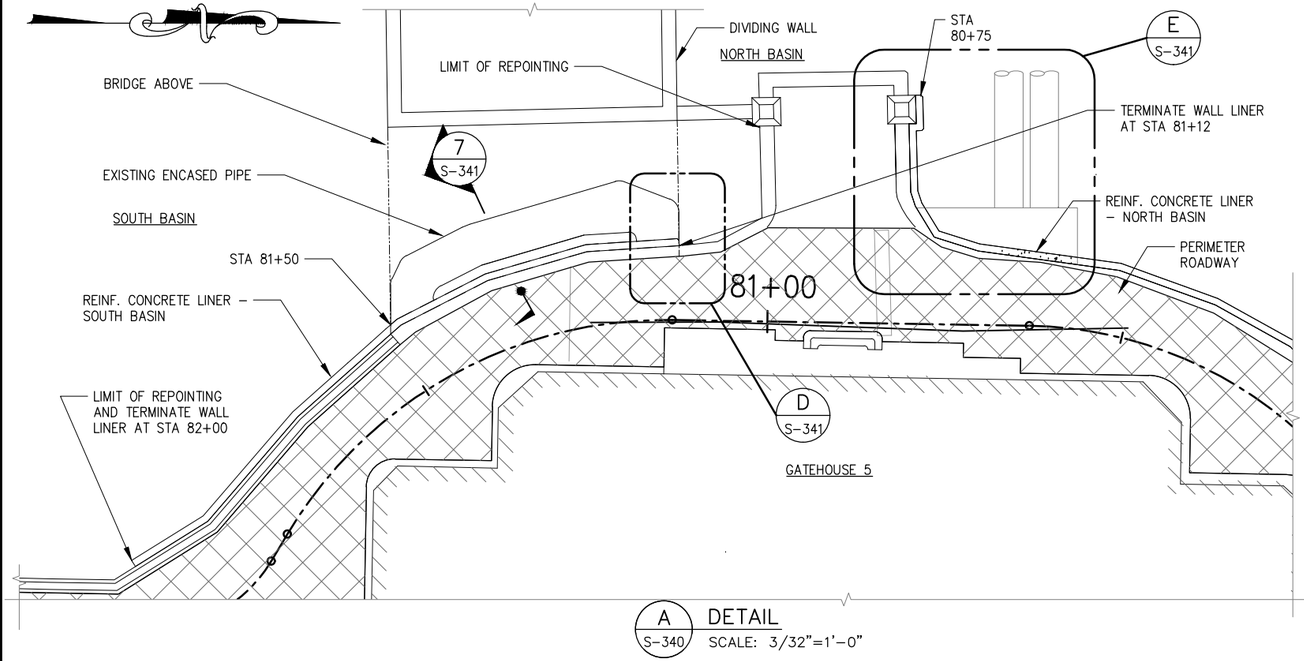
CONTRACT No: JRAQ-REH
JEROME PARK, RESERVOIR & AQUEDUCT REHABILITATION
STRUCTURAL
EAST WALL LINER
PLAN - STA. 82+50 TO 62+00

DATE: 01/27/2017
SCALE: AS NOTED
SHEET NO: 1 OF 116
DRAWING NO. S–340.00

Last Saved By & Date: Tho35064, Friday, January 06, 2017 and Date Plotted: Friday, January 06, 2017
Paper Size: ANSI full bleed B (11.00 x 17.00 Inches) Plot Scale: 1:2 XREF Plot Style Table: BEDC_11x17_Reduced_Size.ctb
Drawing Name: & Location: C:\pwworking\hmm\water_wastewater\ter61681\d0143455\S-340.00.dwg

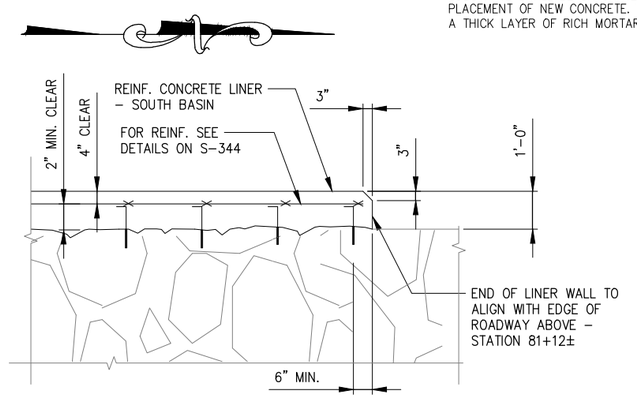
JRAQ-REH 60% SUBMITTAL DRAFT COPY NOT FOR ISSUE



A S-340 DETAIL
SCALE: 3/32"=1'-0"

NOTE:

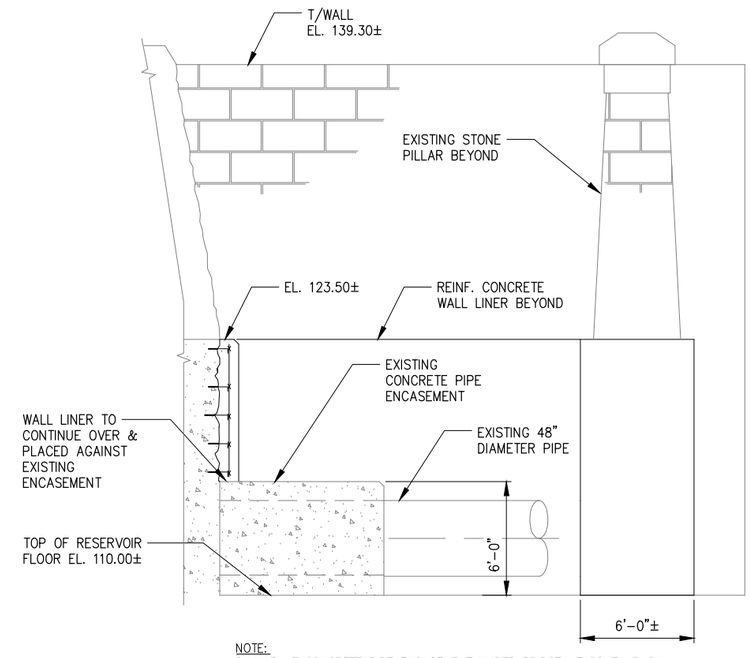
1. CONCRETE WALL LINER SHALL CONTINUE OVER AND BE PLACED AGAINST THE EXISTING CONCRETE ENCASEMENT FOR THE TWIN 48" DIAMETER PIPES. THE EXISTING CONCRETE ENCASEMENT SHALL BE WATER BLASTED AND ROUGHENED TO A CONCRETE SURFACE PROFILE (CSP) OF 4 TO 6, THOROUGHLY CLEANED AND MADE FREE OF LAITANCE AND DEBRIS. THE SUBSTRATE SHALL BE SATURATED SURFACE DRY WITH NO STANDING WATER PRIOR TO THE PLACEMENT OF NEW CONCRETE. THE CONCRETE SUBSTRATE SHALL BE PREPARED BY PLACING A THICK LAYER OF RICH MORTAR ON THE SURFACE WHICH IS TO RECEIVE FRESH CONCRETE.



D S-341 DETAIL
SCALE: 1/2"=1'-0"

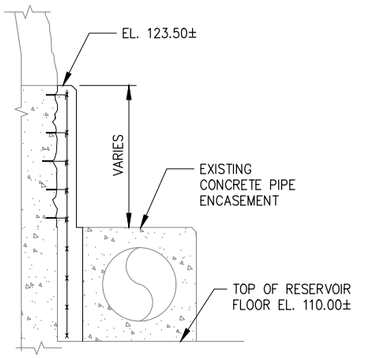
3 S-341

E S-341 DETAIL
SCALE: 1/4"=1'-0"

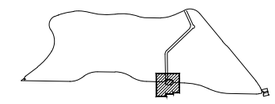


NOTE:
SIMILAR AT CONCRETE PIPE ENCASEMENT UNDER BRIDGE AT SOUTH BASIN.

3 S-341 SECTION
SCALE: 1/4"=1'-0"



7 S-341 SECTION
SCALE: 1/4"=1'-0"



KEY PLAN

1/2"=1'-0" 0 1 2 3 4 FT.
1/4"=1'-0" 0 4 8 FT.
3/32"=1'-0" 0 5 10 15 20 FT.

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SUBMITTAL DATE: 01/27/2017

GRAPHIC SCALES
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		REVISIONS	

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MOTT MACDONALD

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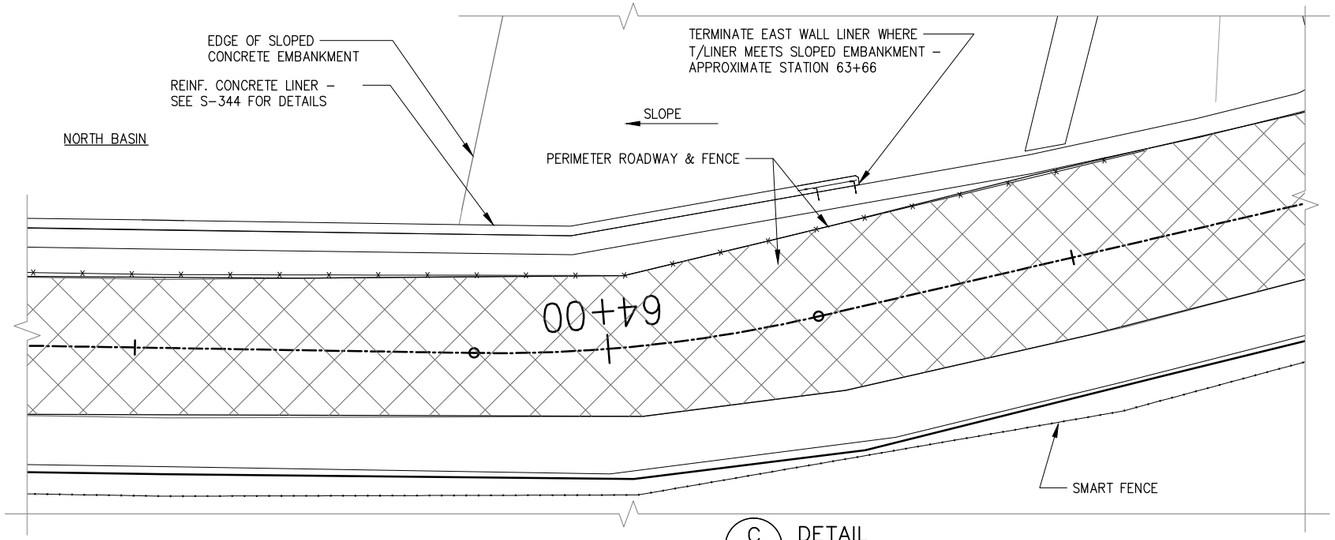
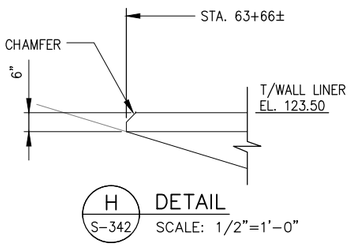
CONTRACT No: JRAQ-REH
JEROME PARK, RESERVOIR & AQUEDUCT REHABILITATION
STRUCTURAL
EAST WALL LINER
DETAIL PLAN AT GATEHOUSE 5

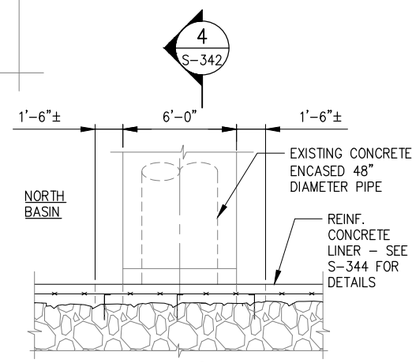
DATE: 01/27/2017
SCALE: AS NOTED
SHEET NO: 1 OF 116
DRAWING NO. S-341.00



C S–340 DETAIL
SCALE: 1/8"=1'–0"



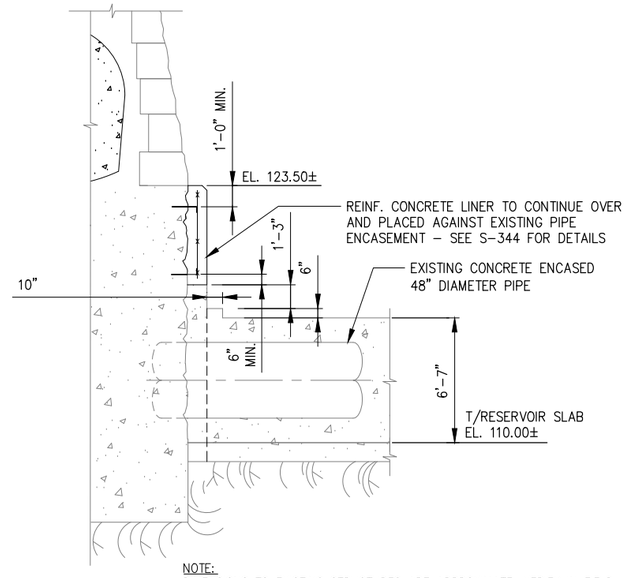
H S–342 DETAIL
SCALE: 1/2"=1'–0"



B S–340 DETAIL
SCALE: 1/4"=1'–0"

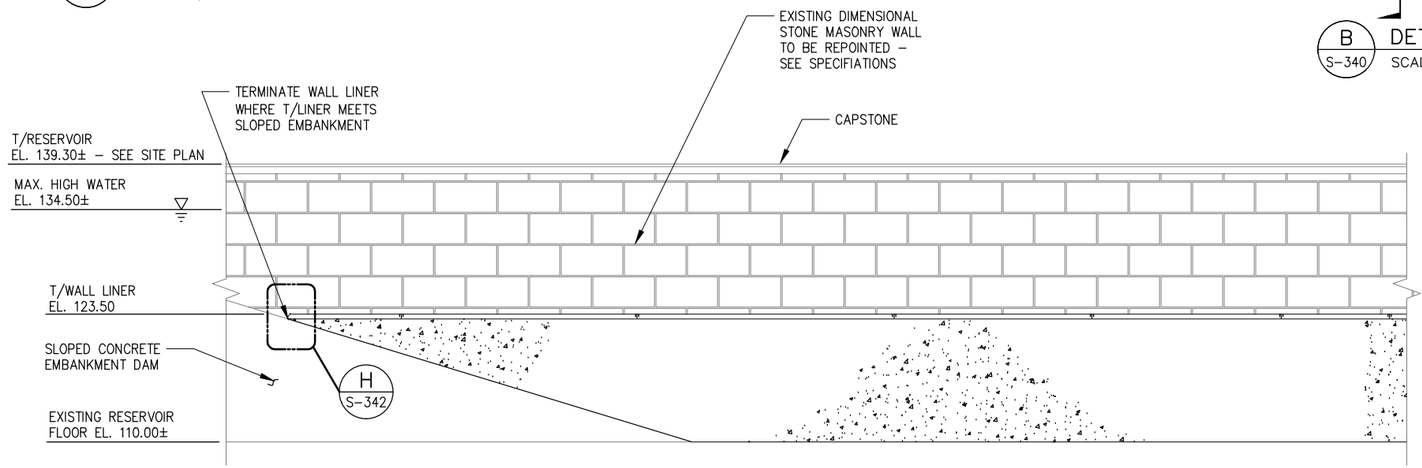
NOTES:

1. CONCRETE WALL LINER SHALL CONTINUE OVER AND PLACED AGAINST THE EXISTING CONCRETE ENCASED 48" DIAMETER PIPE. REFER TO EXISTING CONCRETE SURFACE PREPARATION AND WATERSTOP NOTES ON S–341.

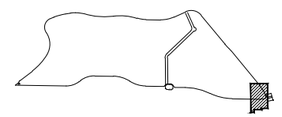


NOTE:
DIMENSIONS TO EXISTING STRUCTURES ARE APPROXIMATE, VERIFY IN FIELD.

4 S–342 SECTION
SCALE: 1/4"=1'–0"



EAST WALL LINER – ELEVATION
SCALE: 1/8"=1'–0"



KEY PLAN

1/2"=1'–0" 0 1 2 3 4 FT.
1/4"=1'–0" 0 4 8 FT.
1/8"=1'–0" 0 5 10 15 FT.

NYC Environmental Protection BEDC/HD
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SUBMITTAL DATE: 01/27/2017

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SECTION MANAGER: J. CARUSO
MOTT MACDONALD

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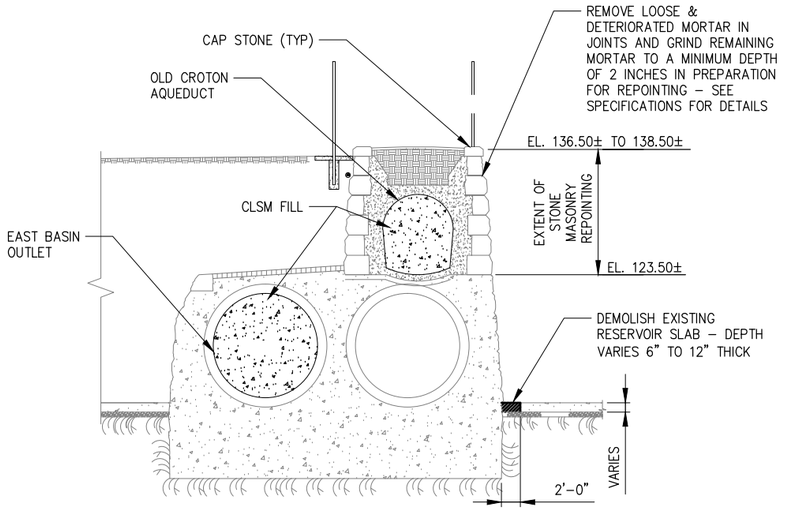
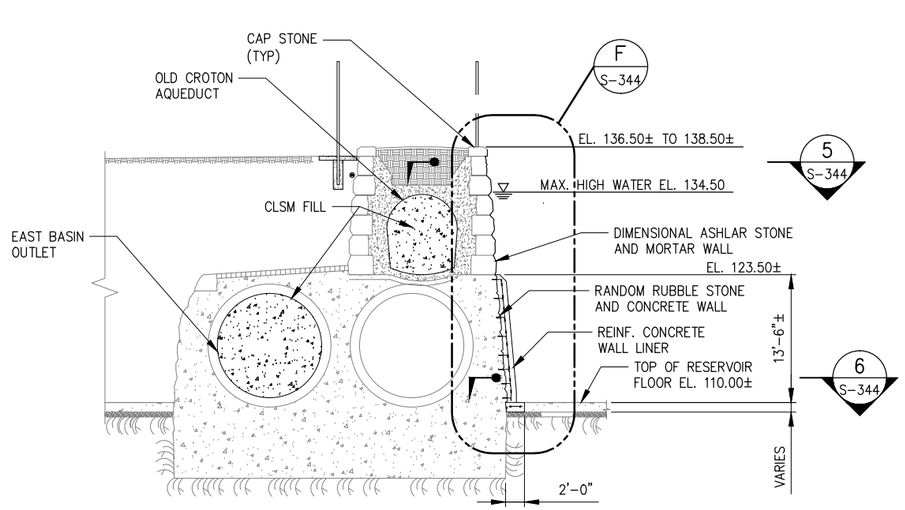
CONTRACT No: JRAQ-REH
JEROME PARK, RESERVOIR & AQUEDUCT REHABILITATION
STRUCTURAL
EAST WALL LINER
DETAIL PLAN AT GATEHOUSE 7

DATE: 01/27/2017
SCALE: AS NOTED
SHEET NO: 1 OF 116
DRAWING NO. S–342.00



1 S–340 EAST WALL LINER – DEMOLITION
SCALE: 1/8"=1'–0"

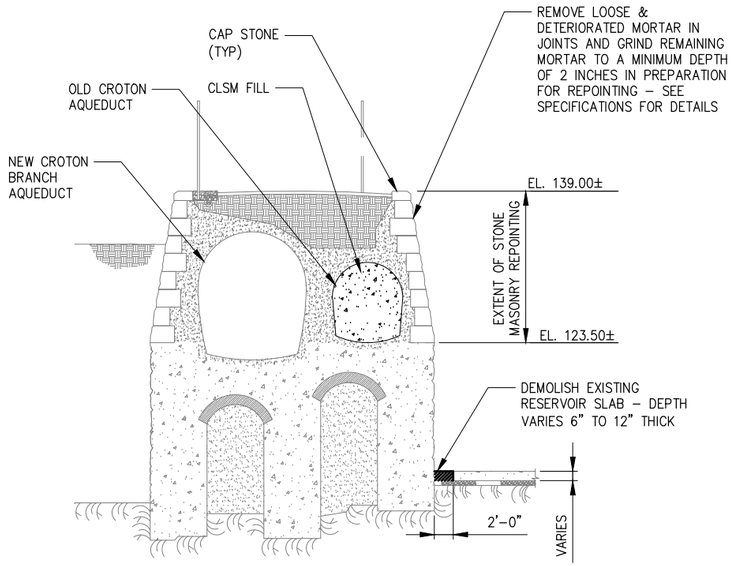


1 S–340 EAST WALL LINER – SOUTH BASIN
SCALE: 1/8"=1'–0"

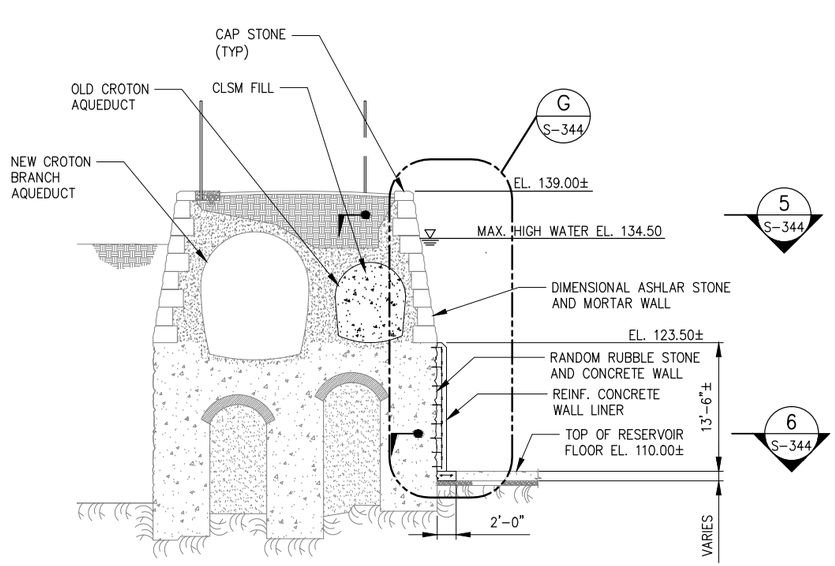
NOTES:

1. PROVIDE DEMOLITION WORK TO THE EXISTING RESERVOIR SLAB AND SUBGRADE PREPARATION AS SHOWN ON THE DRAWINGS. REFER TO S–350 FOR ADDITIONAL DEMOLITION NOTES.
2. THE UPPER PORTION OF THE EAST RESERVOIR WALL, CONSISTING OF COURSE DIMENSIONED ASHLAR STONE MASONRY, IS TO BE REPOINTED FOR THE LIMITS AS NOTED ON S–340. REFER TO TABLE FOR ESTIMATED REPOINTING QUANTITIES.
3. ESTIMATED REPOINTING QUANTITIES AND DEPTHS ARE FOR INFORMATION ONLY. ACTUAL QUANTITY OF REPOINTING SHALL BE DETERMINED BASED ON FIELD MEASUREMENTS.

	ESTIMATED QUANTITY FOR DIMENSIONAL STONE MASONRY REPOINTING (LF)	
APPROXIMATE DEPTH OF REPOINTING	NORTH BASIN	SOUTH BASIN
2+ INCHES	13,600	800
2+ INCHES TO 6 INCHES	3,700	0
6+ INCHES TO 12 INCHES	4,000	650
12+ INCHES TO 24 INCHES	3,350	250



2 S–340 EAST WALL LINER – DEMOLITION
SCALE: 1/8"=1'–0"



2 S–340 EAST WALL LINER – NORTH BASIN
SCALE: 1/8"=1'–0"

1/8"=1'–0" 0 5 10 15 FT.

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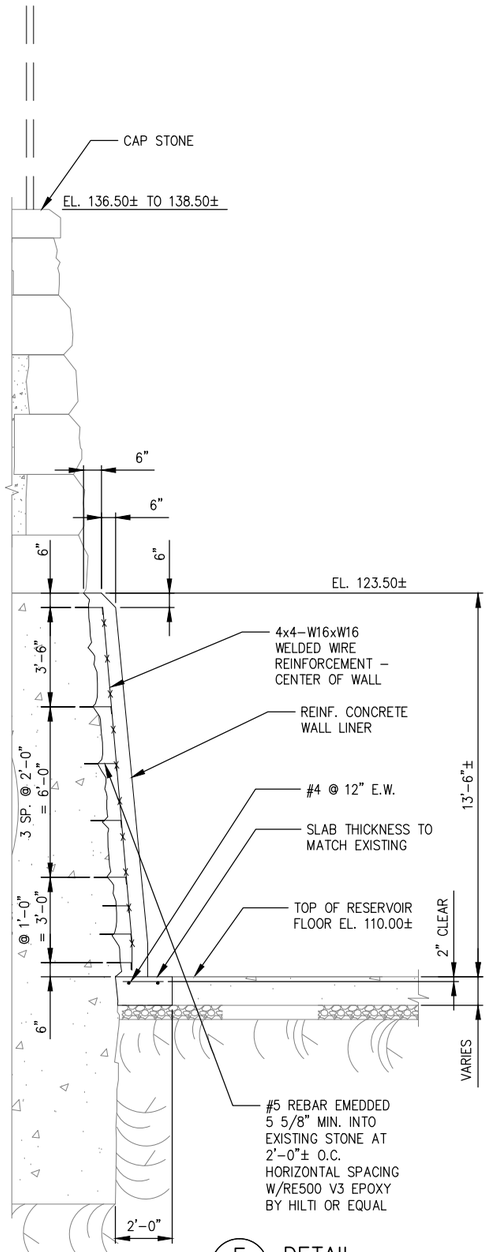
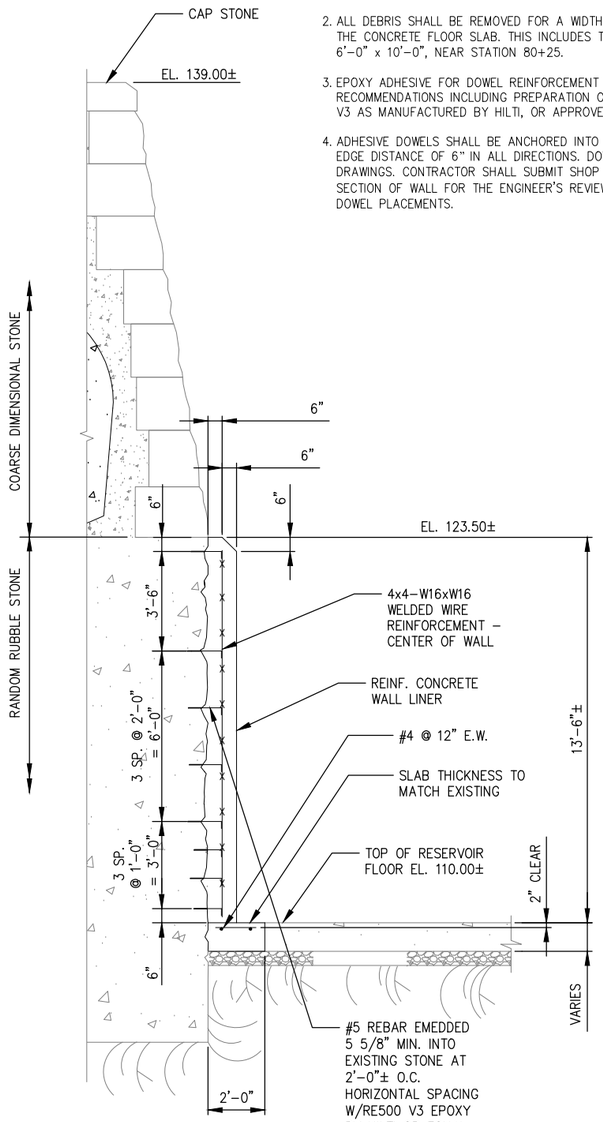
CONTRACT No: JRAQ-REH
JEROME PARK, RESERVOIR & AQUEDUCT REHABILITATION
STRUCTURAL
EAST WALL LINER
SECTIONS - SOUTH BASIN AND NORTH BASIN

DATE: 01/27/2017
SCALE: AS NOTED
SHEET NO: 1 OF 116
DRAWING NO. S–343.00



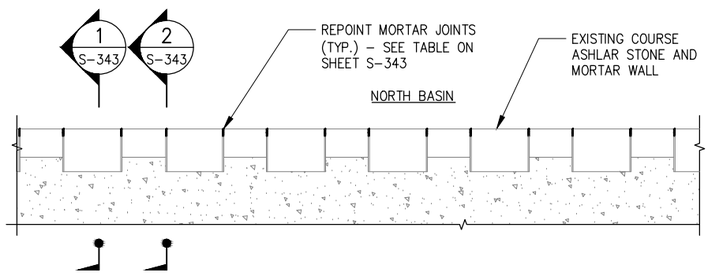
F S-343 DETAIL
SCALE: 3/8"=1'-0"



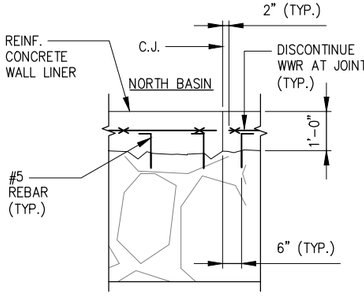
G S-343 DETAIL
SCALE: 3/8"=1'-0"

NOTES:

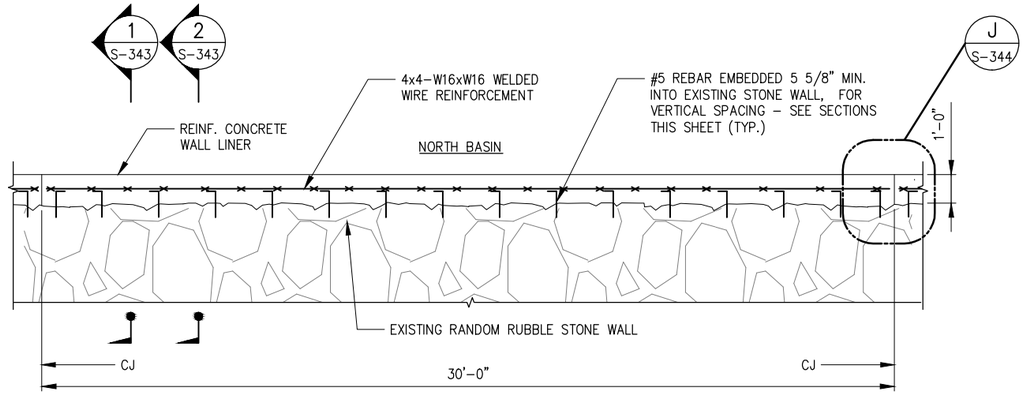
1. PRIOR TO THE PLACEMENT OF THE CONCRETE WALL LINER, THE EAST RESERVOIR WALL SHALL BE THOROUGHLY CLEANED BY WATER BLASTING AND MADE FREE OF DIRT, DEBRIS, DELAMINATED MORTAR, SAND, AND OTHER ORGANIC MATERIAL. ALL LOOSE MORTAR SHALL BE REMOVED. THE SUBSTRATE SHALL BE SATURATED SURFACE DRY WITH NO STANDING WATER PRIOR TO THE PLACEMENT OF FRESH CONCRETE.
2. ALL DEBRIS SHALL BE REMOVED FOR A WIDTH OF 4'–0" MEASURED OFF THE BASE OF THE EAST WALL TO EXPOSE THE CONCRETE FLOOR SLAB. THIS INCLUDES THE REMOVAL OF A PARTIAL MORTARED STONE WALL, APPROXIMATELY 6'–0" x 10'–0", NEAR STATION 80+25.
3. EPOXY ADHESIVE FOR DOWEL REINFORCEMENT SHALL BE INSTALLED WITH STRICT CONFORMANCE TO MANUFACTURERS RECOMMENDATIONS INCLUDING PREPARATION OF HOLE AND HOLE DIAMETER. EPOXY ADHESIVE SYSTEM SHALL BE RE500 V3 AS MANUFACTURED BY HILTI, OR APPROVED EQUAL.
4. ADHESIVE DOWELS SHALL BE ANCHORED INTO INDIVIDUAL STONES OF SUFFICIENT SIZE THAT CAN PROVIDE A MINIMUM EDGE DISTANCE OF 6" IN ALL DIRECTIONS. DOWEL PLACEMENT SHALL SEEK TO MAINTAIN SPACING PROVIDED ON DRAWINGS. CONTRACTOR SHALL SUBMIT SHOP DRAWING WITH PROPOSED DOWEL PLACEMENT LOCATIONS FOR A 30'–0" SECTION OF WALL FOR THE ENGINEER'S REVIEW AND APPROVAL TO BE USED AS A TEMPLATE FOR THE REMAINING DOWEL PLACEMENTS.
5. A GEOTECHNICAL ENGINEER SHALL BE PRESENT DURING THE PLACEMENT OF ADHESIVE ANCHORS TO ENSURE PLACEMENT INTO SUITABLE STONE. ADDITIONAL DOWELS MAY BE REQUIRED AND SHALL BE INSTALLED AS DIRECTED IN THE FIELD.
6. LOWER RUBBLE STONE WALL HAS A JAGGED, NON–UNIFORM FACE WITH SEVERAL PROTRUSIONS. A MINIMUM OF 2" OF CLEAR COVER SHALL BE MAINTAINED BETWEEN ANY INDIVIDUAL STONE FACE AND THE FACE OF WELDED WIRE REINFORCEMENT (WWR). ALL STONES THAT ENTER THIS CLEAR SPACE SHALL BE CUT BACK.
7. WHERE EXCESSIVE AMOUNTS OF MORTAR HAS BEEN REMOVED DURING CLEANING OF THE RANDOM RUBBLE STONES, REPACKING OF MORTAR SHALL BE REQUIRED. QUANTITY OF REPACKING SHALL BE SUCH THAT THE STONE IS STABLE DURING LINER WALL CASTING. ADDITIONALLY, VOIDS BETWEEN 1/4" AND 3/4" SHALL BE PACKED WHERE STABILITY MAY BE COMPROMISED. ADDITIONAL REPACKING SHALL BE AS DIRECTED IN THE FIELD.
8. LOOSE STONES LESS THAN 4" IN HEIGHT AND LENGTH MAY BE REMOVED AND REPLACED WITH MORTAR.
9. WHERE MORTAR REMOVAL IN COARSE DIMENSIONAL STONES HAS CAUSED THE STONE TO BE UNSTABLE, TEMPORARY SUPPORT SHALL BE PROVIDED TO PREVENT MOVEMENT UNTIL FULL REPOINTING HAS TAKEN PLACE.



5 S-343 REPOINTING – SECTIONAL PLAN AT EL. 134.50
SCALE: 3/8"=1'–0"



J S-344 DETAIL
SCALE: 1/2"=1'–0"



6 S-343 EAST WALL LINER – SECTIONAL PLAN AT EL. 122.00
SCALE: 3/8"=1'–0"

NOTE:
WELDED WIRE REINFORCEMENT TO BE DISCONTINOUS AT CONSTRUCTION JOINTS.

1/2"=1'–0" 0 1 2 3 4 FT.
3/8"=1'–0" 0 1 2 3 5 FT.

NYC Environmental Protection BEDC/IHD
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SUBMITTAL DATE: 01/27/2017

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CONTRACT No: JRAQ-REH
JEROME PARK, RESERVOIR & AQUEDUCT REHABILITATION
STRUCTURAL
EAST WALL LINER
DETAILS

DATE: 01/27/2017
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DRAWING NO. S–344.00

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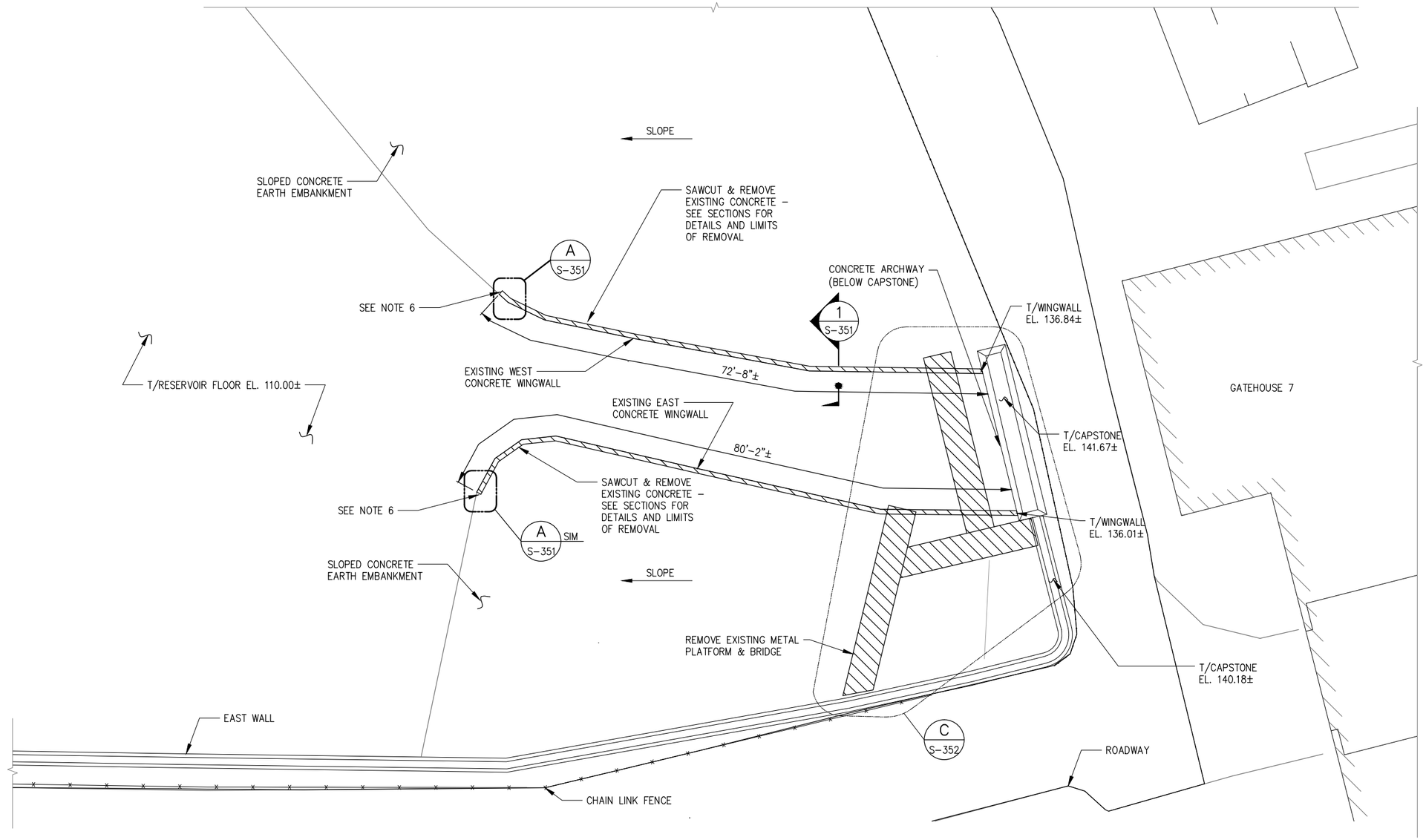
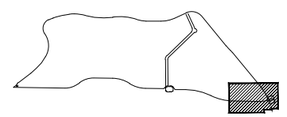


LEGEND

TO BE DEMOLISHED

NOTES:

1. PROVIDE DEMOLITION WORK AS SHOWN ON THE DRAWINGS.
2. GENERAL CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS, ELEVATION, & EXISTING CONDITIONS PRIOR TO BEGINNING DEMOLITION WORK.
3. PROTECT EXISTING STRUCTURE TO REMAIN FROM DAMAGE DURING DEMOLITION.
4. CONDUCT DEMOLITION OPERATIONS TO MINIMIZE NOISE AND THE DEVELOPMENT AND SPREAD OF DUST. CONTRACTOR SHALL DISPOSE OF DEMOLITION MATERIAL PROPERLY OFFSITE.
5. CLEAN STRUCTURES ADJACENT TO DEMOLITION OPERATIONS FROM DUST, DIRT AND DEBRIS CAUSED BY SELECTIVE DEMOLITION OPERATIONS.
6. LIMIT OF WINGWALL DEMOLITION TO EXTEND TO LOCATION THAT PROVIDES 8" MINIMUM CLEARANCE WITH EXISTING RESERVOIR FLOOR SLAB.



KEY PLAN

WINGWALL AND ARCHWAY AT GATEHOUSE 7 – DEMOLITION PLAN

SCALE: 1/8"=1'-0"

1/8"=1'-0" 0 5 10 15 FT.

90% DESIGN SUBMITTAL

SUBMITTAL DATE: 01/27/2017

GRAPHIC SCALES CHECK BEFORE USE

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REVISIONS

DESIGNED BY: M. FERRARA
DRAWN BY: C. THOMPSON
CHECKED BY: J. CARUSO
DESIGN LEAD: J. CARUSO
SECTION MANAGER: J. CARUSO

MOTT MACDONALD

Environmental Protection

ACCOUNTABLE MANAGER: ANTHONY BROWN
PORTFOLIO MANAGER: MICHAEL LOEHR, P.E.
DIRECTOR, IN HOUSE DESIGN: PATRICK O'CONNOR, P.E.

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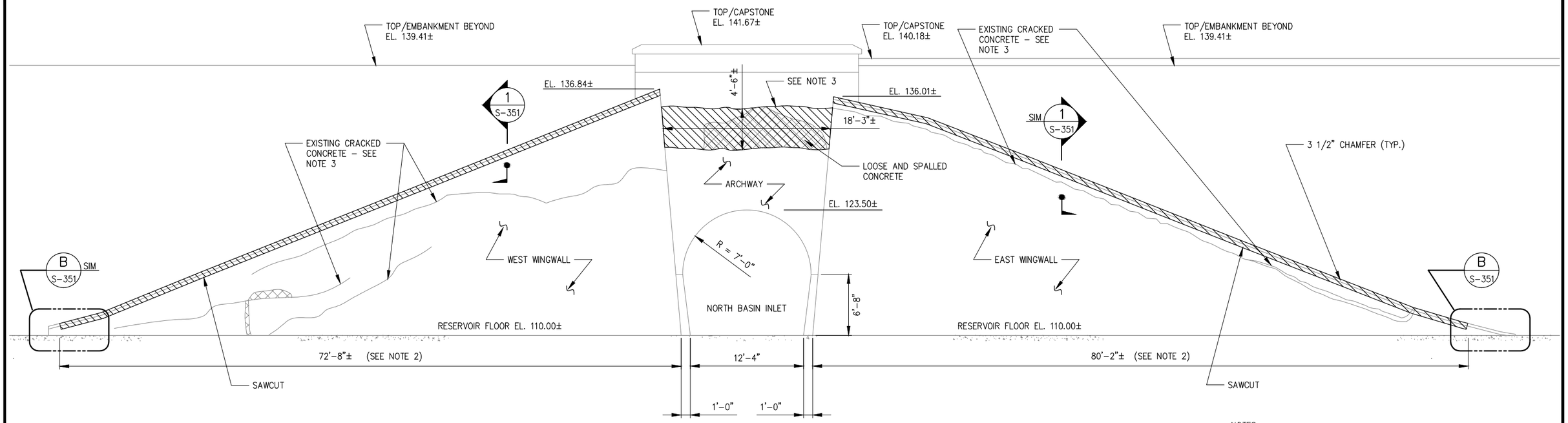
CONTRACT No: JRAQ-REH
JEROME PARK, RESERVOIR & AQUEDUCT REHABILITATION
STRUCTURAL
WINGWALL AND ARCHWAY REPAIR
DEMOLITION PLAN

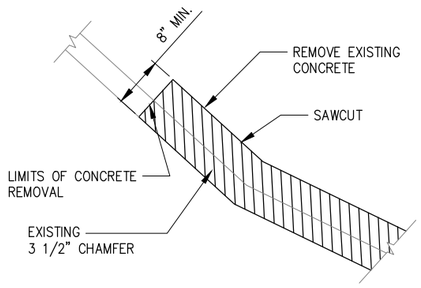
DATE: 01/27/2017
SCALE: AS NOTED
SHEET NO: 1 OF 116
DRAWING NO. S-350.00



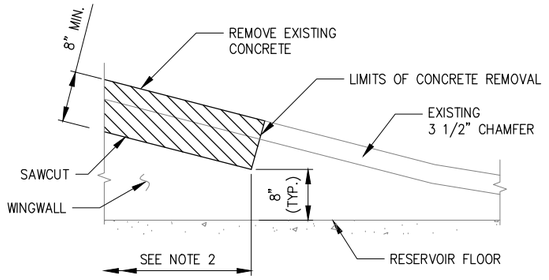
DEMOLITION EXPANDED ELEVATION

SCALE: 3/16"=1'-0"

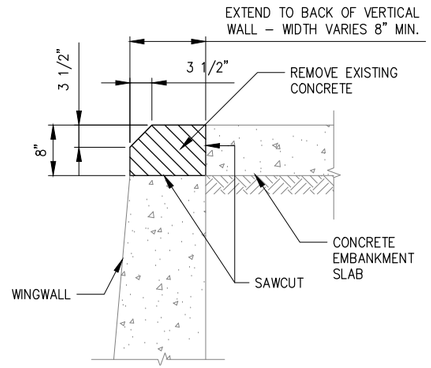
NOTE: EXISTING METAL PLATFORM AND STAIRS NOT SHOWN



A DETAIL S-350 SCALE: 1"=1'-0"



B DETAIL S-351 SCALE: 1"=1'-0"



1 SECTION S-351 SCALE: 1"=1'-0"

NOTES:

1. GENERAL CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS, ELEVATION, & EXISTING CONDITIONS PRIOR TO BEGINNING DEMOLITION WORK. CRACKED AND SPALLED CONCRETE SHOWN DOES NOT INDICATE FULL EXTENT OF CONCRETE DETERIORATION.
2. WINGWALL DEMOLITION TO EXTEND TO LOCATION THAT PROVIDES 8" MINIMUM CLEARANCE BELOW SAWCUT TO EXISTING RESERVOIR FLOOR SLAB.
3. PROVIDE DEMOLITION WORK AS SHOWN ON THE DRAWINGS. IN ADDITION TO LIMITS SHOWN, CONTRACTOR TO REMOVE LOOSE AND UNSOUND CONCRETE ALONG FACE OF ARCHWAY AND WINGWALLS BY MECHANICAL MEANS, SAND/WATER BLAST, CHIP, SCRAPE, WIRE BRUSH OR OTHERWISE CLEAN TO SOUND SUBSTRATE. ADDITIONAL REMOVAL SHALL BE AS DIRECTED IN THE FIELD.
4. REFER TO S-350 FOR ADDITIONAL DEMOLITION NOTES.

LEGEND

SPALLED CONCRETE

TO BE DEMOLISHED

1"=1'-0" 0 1 2 FT.

3/16"=1'-0" 0 5 10 FT.

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SUBMITTAL DATE: 01/27/2017

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DESIGN LEAD: J. CARUSO
SECTION MANAGER: J. CARUSO
MOTT MACDONALD

Environmental Protection

ACCOUNTABLE MANAGER
ANTHONY BROWN

PORTFOLIO MANAGER
MICHAEL LOEHR, P.E.

DIRECTOR, IN HOUSE DESIGN
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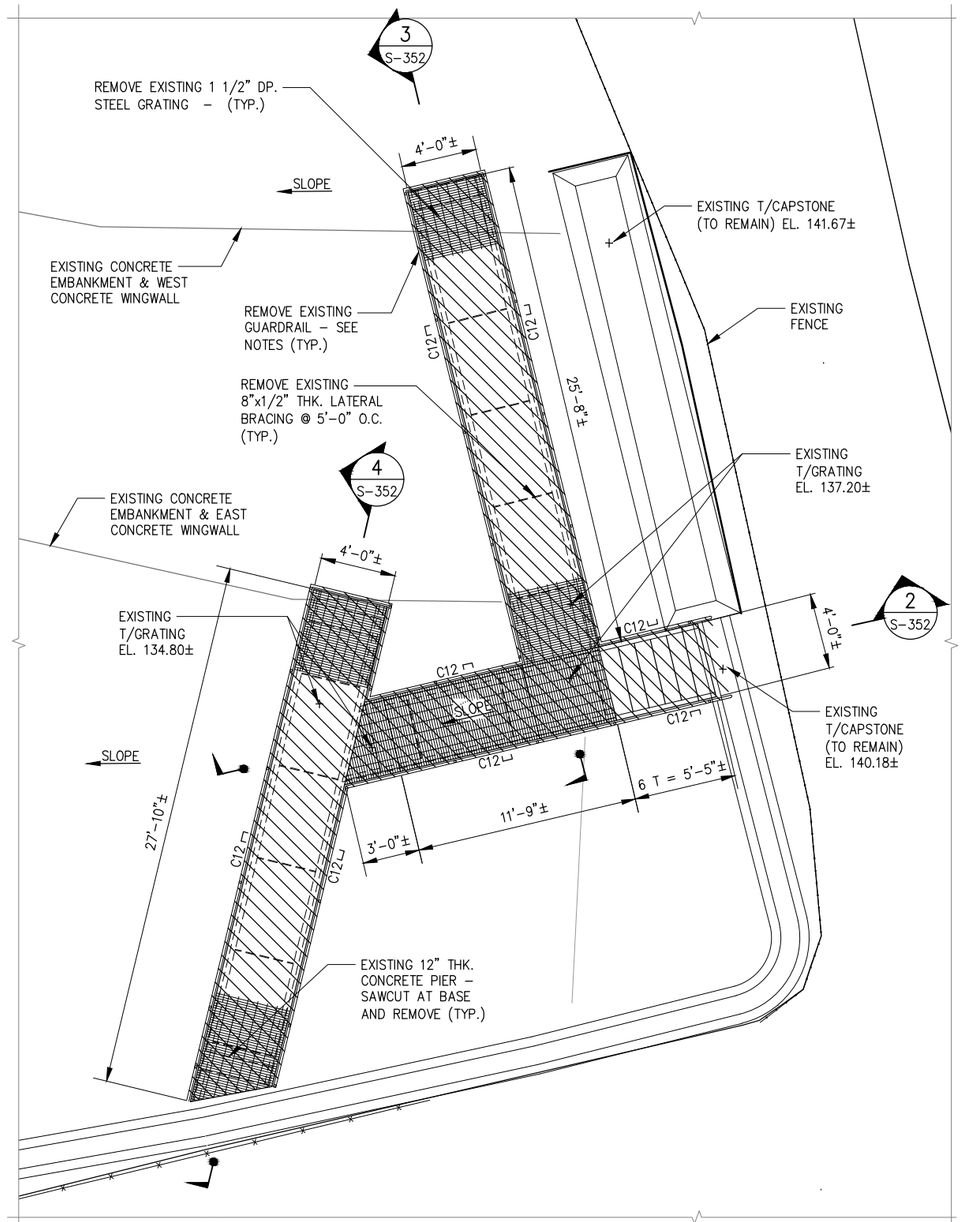
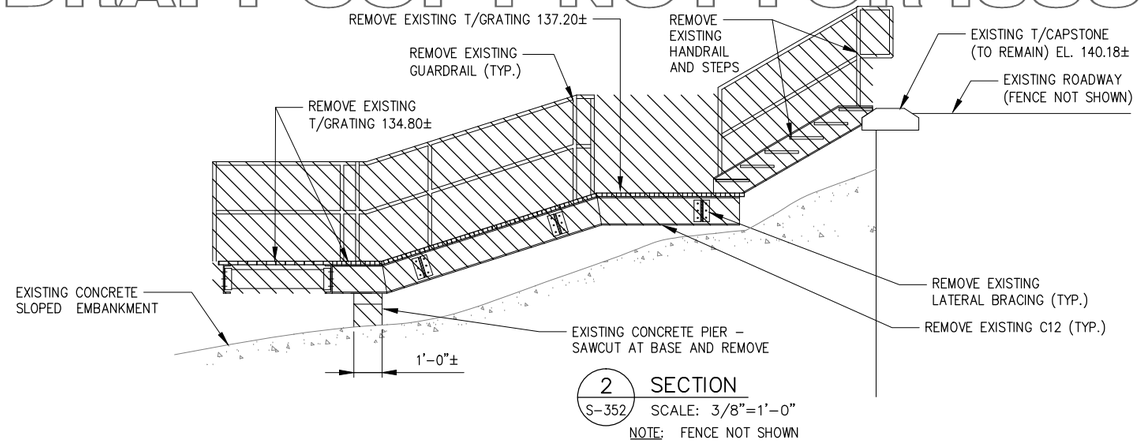
JEROME PARK, RESERVOIR & AQUEDUCT REHABILITATION
STRUCTURAL
WINGWALL AND ARCHWAY REPAIR
DEMOLITION ELEVATION AND DETAILS

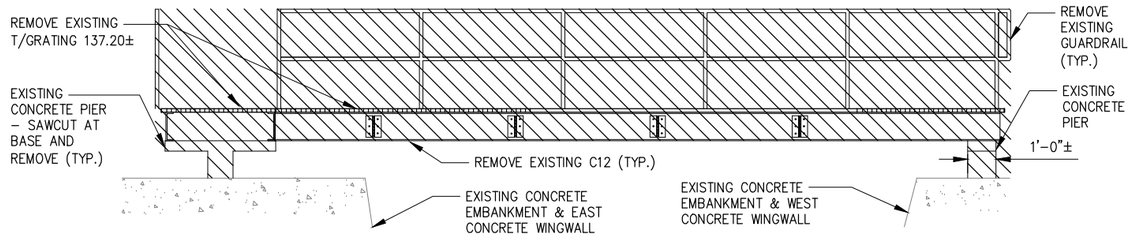
DATE: 01/27/2017
SCALE: AS NOTED
SHEET NO: 1 OF 116
DRAWING NO. S-351.00



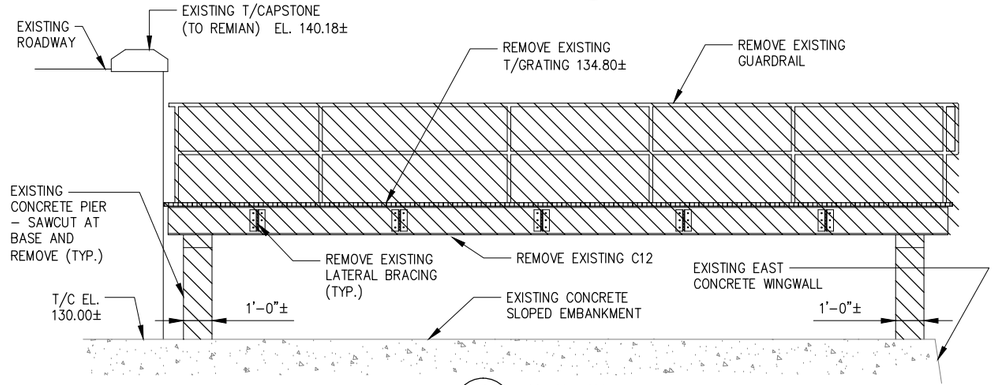
C S-350 DETAIL – PLATFORM AND STAIR DEMOLITION PLAN
SCALE: 1/4"=1'-0"



2 S-352 SECTION
SCALE: 3/8"=1'-0"
NOTE: FENCE NOT SHOWN



3 S-352 SECTION
SCALE: 3/8"=1'-0"



4 S-352 SECTION
SCALE: 3/8"=1'-0"

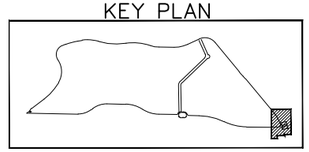
NOTES:

1. GENERAL CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS, ELEVATION, & EXISTING CONDITIONS PRIOR TO BEGINNING DEMOLITION WORK.
2. PROVIDE DEMOLITION WORK AS SHOWN ON THE DRAWINGS.
3. C12 REFERS TO C12X20.7, UNLESS OTHERWISE NOTED.
4. GUARDRAIL CONSISTS OF 2 RAILS WITHOUT TOE PLATE AND SIDE MOUNTED POSTS SPACED AT 5'–0" ON CENTER.
5. REFER TO S–350 FOR ADDITIONAL DEMOLITION NOTES.
6. PLATFORM PIERS SHALL BE CUTOFF MIN. 1/2" BELOW CONCRETE SURFACE.

LEGEND

TO BE DEMOLISHED

KEY PLAN



GRAPHIC SCALES
CHECK BEFORE USE

3/8"=1'-0" 0 1 2 3 5 FT.
1/4"=1'-0" 0 4 8 FT.

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NO.	DATE	DESCRIPTION	APPR'D.

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MOTT MACDONALD

NYC Environmental Protection

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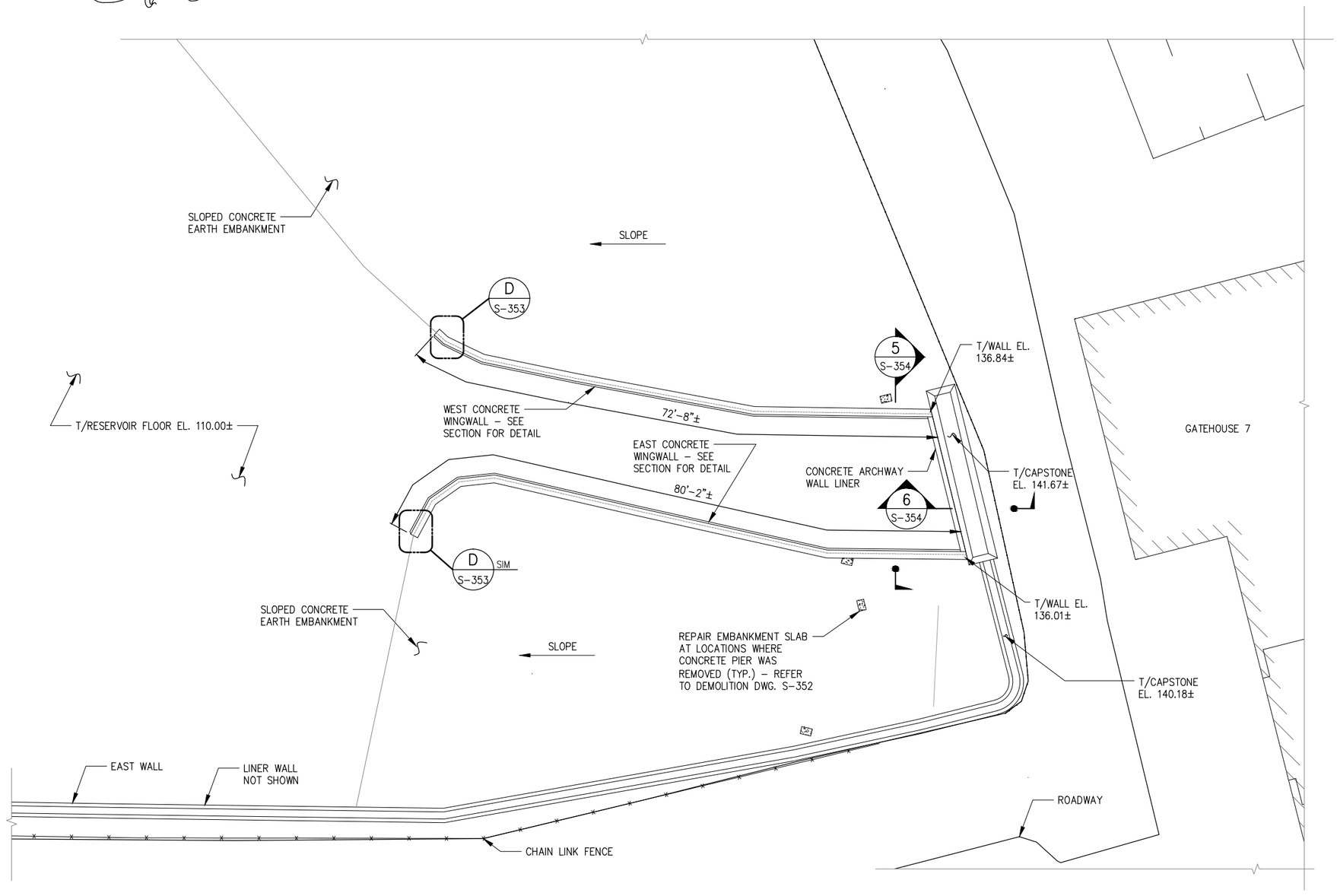
JEROME PARK, RESERVOIR & AQUEDUCT REHABILITATION
STRUCTURAL
WINGWALL AND ARCHWAY REPAIR
PLATFORM AND STAIR DEMOLITION

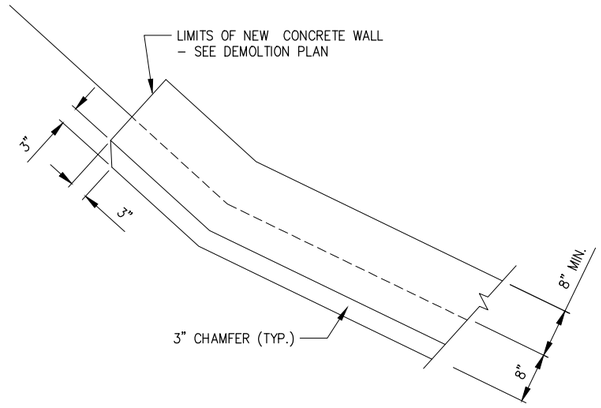
DATE: 01/27/2017
SCALE: AS NOTED
SHEET NO: 1 OF 116
DRAWING NO. S–352.00

JRAQ-REH 60% SUBMITTAL DRAFT COPY NOT FOR ISSUE



WINGWALL AND ARCHWAY AT GATEHOUSE 7 – PLAN

SCALE: 1/8"=1'-0"

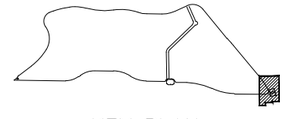


D S-353 DETAIL

SCALE: 1"=1'-0"

NOTES:

1. CONTRACTOR SHALL FIELD VERIFY AND COORDINATE FINAL DIMENSIONS AND ELEVATIONS OF EXISTING ARCHWAY AND WINGWALLS.
2. CONCRETE WALL LINER SHALL BE PLACED ALONG ARCHWAY SECTION AND ALLOWED TO FULLY CURE PRIOR TO THE CONCRETE PLACEMENT ALONG THE WINGWALLS.
3. CONCRETE ALONG EACH WING WALL SHALL BE ONE CONTINUOUS PLACEMENT WITHOUT ANY CONSTRUCTION JOINTS.
4. CUT CONCRETE AT STAIR/PLATFORM LOCATIONS SHALL HAVE ALL REBAR CUT BACK 1/2" MINIMUM & COVERED WITH A POLYMER MODIFIED CEMENTITIOUS NONSHRINK GROUT.



KEY PLAN

1"=1'-0" 0 1 2 FT.

1/8"=1'-0" 0 5 10 15 FT.

90% DESIGN SUBMITTAL

SUBMITTAL DATE: 01/27/2017

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STRUCTURAL
WINGWALL AND ARCHWAY REPAIR PLAN

DATE: 01/27/2017
SCALE: AS NOTED
SHEET NO: 1 OF 116
DRAWING NO. S-353.00

Last Saved By & Date:FER61681, Thursday, January 05, 2017 and Date Plotted:Friday, January 06, 2017
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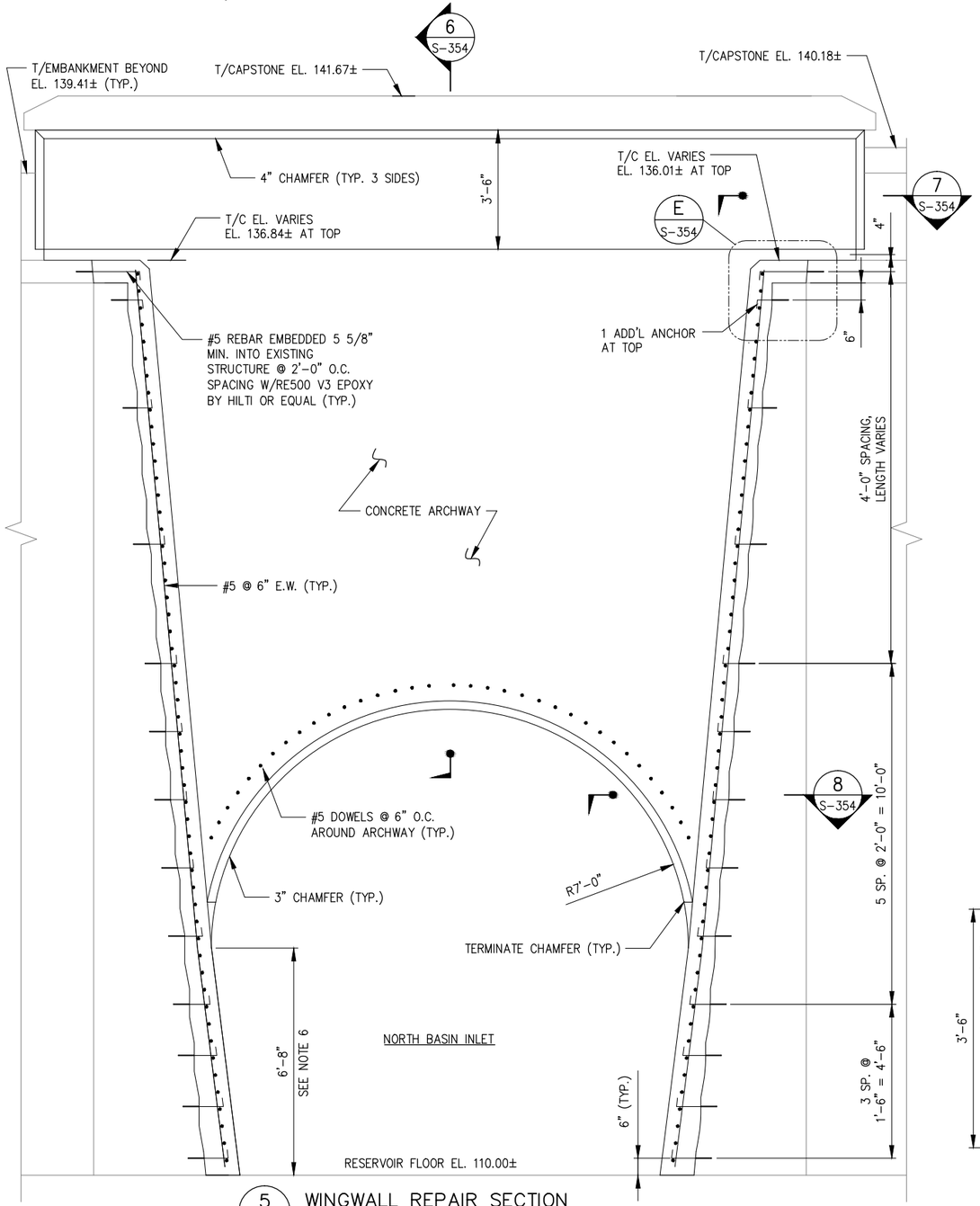
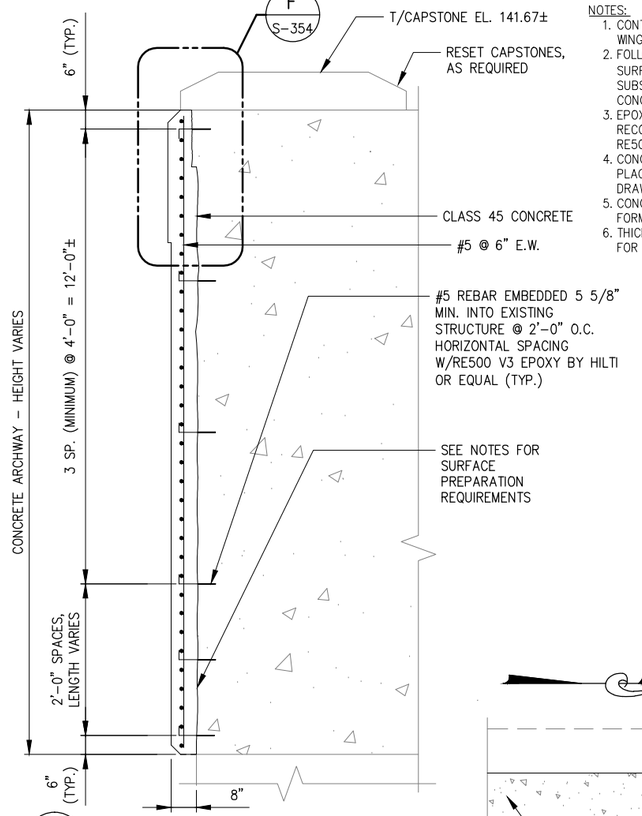
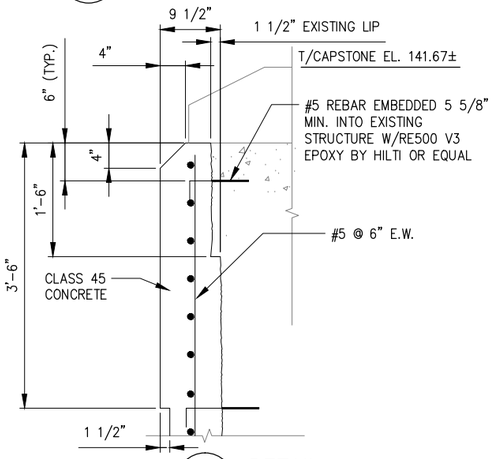


5 S-353 WINGWALL REPAIR SECTION
SCALE: 1/2"=1'-0"

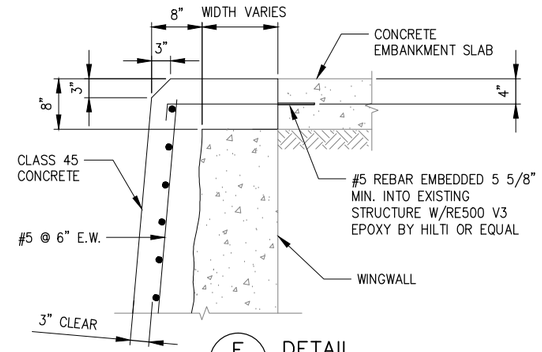


6 S-353 ARCHWAY REPAIR SECTION
SCALE: 1/2"=1'-0"

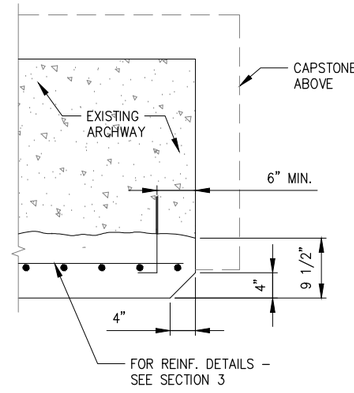


F S-354 DETAIL
SCALE: 1"=1'-0"

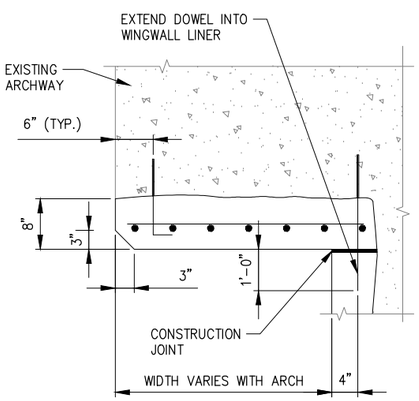
NOTES:
1. CONTRACTOR SHALL FIELD VERIFY AND COORDINATE FINAL DIMENSIONS AND ELEVATIONS OF EXISTING ARCHWAY AND WINGWALLS.
2. FOLLOWING DEMOLITION, EXISTING CONCRETE SURFACE SHALL BE WATER BLASTED AND ROUGHENED TO A CONCRETE SURFACE PROFILE (CSP) OF 4 TO 6, THOROUGHLY CLEANED AND MADE FREE OF LAITANCE AND DEBRIS. THE SUBSTRATE SHALL BE SATURATED SURFACE DRY WITH NO STANDING WATER PRIOR TO THE PLACEMENT OF NEW CONCRETE.
3. EPOXY ADHESIVE FOR DOWEL REINFORCEMENT SHALL BE INSTALLED WITH STRICT CONFORMANCE TO MANUFACTURERS RECOMMENDATIONS INCLUDING PREPARATION OF HOLE AND HOLE DIAMETER. EPOXY ADHESIVE SYSTEM SHALL BE RE500 V3 AS MANUFACTURED BY HILTI, OR APPROVED EQUAL.
4. CONCRETE LINER SHALL BE PLACED ALONG ARCHWAY SECTION AND ALLOWED TO SET PRIOR TO THE CONCRETE PLACEMENT ALONG THE WINGWALLS. A CONSTRUCTION JOINT SHALL BE PROVIDED AS SHOWN ON THE CONTRACT DRAWINGS.
5. CONCRETE ALONG EACH WING WALL SHALL BE ONE CONTINUOUS PLACEMENT WITHOUT ANY CONSTRUCTION JOINTS. FORMWORK SHALL BE DESIGNED ACCORDINGLY.
6. THICKNESS OF CONCRETE AT WINGWALLS BELOW ARCHWAY SHALL BE NO THICKER THAN EXISTING ARCHWAY WALL FOR FIRST 5FT OF WINGWALL.



E S-354 DETAIL
SCALE: 1"=1'-0"



7 S-354 SECTION
SCALE: 1"=1'-0"



8 S-354 SECTION
SCALE: 1"=1'-0"

0 1 2 FT.
1"=1'-0"

0 1 2 3 4 FT.
1/2"=1'-0"

90% DESIGN SUBMITTAL
SUBMITTAL DATE: 01/27/2017

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SECTIONS & DETAILS

DATE: 01/27/2017
SCALE: AS NOTED
SHEET NO: 1 OF 116
DRAWING NO. S-354.00

Last Saved By & Date:FER61681, Friday, January 06, 2017 and Date Plotted:Friday, January 06, 2017
Paper Size:ANSI full bleed B (11.00 x 17.00 Inches) Plot Scale:1:2_XREF Plot Style Table:BEDC_11x17_Reduced_Size.ctb
Drawing Name: & Location:C:\pwworking\hmm\water_wastewater\fer61681\d0143455\S-354.00.dwg

APPENDIX D: Memorandum of Agreement

2003 NOV 12 P

MEMORANDUM OF AGREEMENT CONCERNING THE CONTINUED OPERATION OF JEROME PARK RESERVOIR AFTER LISTING TO THE NEW YORK STATE AND NATIONAL REGISTERS OF HISTORIC PLACES

WHEREAS, the New York State Historic Preservation Officer (the "SHPO") hereby confirms that Jerome Park Reservoir was determined by the Commissioner of the New York State Office of Parks, Recreation and Historic Preservation ("NYSOPRHP") to be eligible for listing on the New York State and National Registers of Historic Places on November 4, 1994; and

WHEREAS, NYSOPRHP and SHPO brought the nomination of the area denominated as Jerome Park Reservoir (the "Reservoir") for listing on the New York and National Registers of Historic Places before the State Board for Historic Preservation (the "Board") on June 9, 2000. As of such date, the Board decided to list the Reservoir on the New York State Register of Historic Places and recommended listing of the Reservoir on the National Register of Historic Places. (see attached Exhibit A for a description of the proposed site as listed); and

WHEREAS, the City of New York (the "City") and the New York City Department of Environmental Protection (the "NYCDEP") have expressed concern over the potential impact of such listing on the ability of the City to operate and maintain the Jerome Park Reservoir, including but not limited to the reservoir, the bed of the reservoir, surrounding and dividing stone-masonry walls, the gate houses, and associated piping and appurtenances, as integral parts of the City's water supply system (see attached Exhibit B for a description of the existing functioning facilities); and

WHEREAS, NYSOPRHP and SHPO acknowledge that the Jerome Park Reservoir is an integral part of the City's water supply system and that NYCDEP must operate and maintain the Reservoir in a manner to ensure the wholesome and plentiful supply of water to New York City consumers as well as to ensure that the City's water supply system generally, and Jerome Park Reservoir specifically, be operated and maintained in a manner consistent with all applicable laws and regulations including, but not limited to the federal Safe Drinking Water Act and the New York State Sanitary Code; and

WHEREAS, NYSOPRHP and SHPO acknowledge that NYCDEP has in the past, and will, in the future, need to rehabilitate, modify, upgrade, expand and/or make additions to the Reservoir and/or its structures or appurtenances, or a part thereof, that are the subject of the listing in order to ensure they continue to function in accordance with the best engineering practice, water supply requirements, and applicable public health laws and regulations; and

WHEREAS, NYSOPRHP, SHPO and NYCDEP agree that the proposed listing is intended to recognize the historic significance of the Jerome Park Reservoir without

jeopardizing the ability of NYCDEP to operate and maintain the Reservoir as a part of the New York water supply system for the benefit of the City of New York; and

WHEREAS, title 9 of the New York Code Rules and Regulations ("NYCRR") section 428.12 provides for the designation of certain categories of undertakings as being exempt from review when it has been determined that such undertakings are not likely to change the quality of an historic resource; and

WHEREAS, NYSOPRHP, SHPO and NYCDEP agree that compliance with the stipulations set forth below in this Memorandum of Agreement (the "Agreement") will satisfy NYCDEP's obligations under Article 14 of the Parks, Recreation, and Historic Preservation Law and 9 NYCRR section 428 et seq. resulting from the determination that the Reservoir is eligible for listing, and its subsequent listing, on the New York State Register of Historic Places, and that no further actions with respect to certain rehabilitations, modifications, upgrades, expansions and/or additions which have been determined to be exempt from review under 9 NYCRR 428.12 will be required as a result of such determination and listing;

NOW, THEREFORE, NYSOPRHP, SHPO and NYCDEP agree that such rehabilitations, modifications, upgrades, expansions, and/or additions to the Reservoir shall be administered in accordance with the following Stipulations.

STIPULATIONS

I. Role of Jerome Park Reservoir within the New York Water Supply System.

The City and NYCDEP represent that the following is an accurate description of the role of Jerome Park Reservoir within the New York water supply system.

Three separate watershed systems, the Croton, Catskill, and Delaware, are each provided with separate aqueducts that convey water flow to New York City. Jerome Park Reservoir functions as a balancing reservoir to absorb the inflow from upstate reservoirs in the Croton System and meet the outflow demands primarily of the Bronx and lower Manhattan through gravity. During times of drought, utilizing a pumpage system, the Reservoir can provide up to 30% of the drinking water for all of New York City.

Water flows by gravity from upstate reservoirs of the Croton System to the City's distribution system, which includes Jerome Park Reservoir. There are controlled, steady inflows from upstate aqueducts into Jerome Park Reservoir from the Croton System and variable outflows resulting from the instantaneous demand in the water distribution systems. Imbalances between inflows and outflows are compensated for by a rise or fall in reservoir levels. Instantaneous water demands from the distribution system vary with the time of day, season, weather, and numerous other factors. The system operator at Jerome Park Reservoir reacts to the resulting water level changes by requesting an increase or decrease in the flow being withdrawn from the New Croton Reservoir upstream.

The New Croton Reservoir has a spillway at elevation 195.2 feet and the Jerome Park Reservoir, encompassing 94 acres, has a maximum water level of 134.5 feet. The system is operated based upon hourly observations of the water level at Jerome Park Reservoir, since the New Croton Aqueduct operates by gravity as an open channel. At a flow rate of 150 mgd, it takes about sixteen hours for a change made at the Croton Lake Gate House to affect the Jerome Park Reservoir. Changes in the rate of withdrawal from the New Croton Reservoir are normally made once daily based upon the observed trend of the water level at Jerome Park Reservoir, the projected demands of the Bronx and lower Manhattan, and, if required, pumpage into the Intermediate and High Level Systems of New York City for the following day.

Distribution of the flow through Jerome Park Reservoir involves a complicated system of piping, tunnels, pumps, and drains, connected by a series of gate houses. Exhibit B provides a concise description of the existing functioning facilities at Jerome Park Reservoir, which must be operated, maintained, and over time, upgraded, expanded, and/or modified in order to properly serve the water needs of New York City and comply with applicable State and Federal clean water, public health, and sanitary laws and regulations.

II. Activities which are predetermined not to require consultation with SHPO.

To the extent NYCDEP proposes to engage in activities which modify, upgrade, expand, and/or add to Jerome Park Reservoir, or a part thereof, that is listed on the State Register of Historic Places, and such activities are to be either undertaken, funded, or approved by a State Agency, as those terms are defined in Article 14 of the Parks, Recreation, Historic Preservation Law and the New York State Historic Preservation Act of 1980, such activities listed in this section of the Agreement are hereby considered not to adversely impact or change the quality of the Reservoir as an historic resource and are thus designated as undertakings exempt from review according to 9 NYCRR section 428.12 and thus require no consultation with SHPO ("Exempt Undertakings"). Notwithstanding the activities listed below, except for Exempt Undertakings pursuant to Section IIG, nothing contained in Section II shall be deemed to affect NYCDEP's obligations to consult with SHPO, and obtain SHPO review of any activity otherwise requiring such consultation and review pursuant to Section III hereof. (i.e., if, in the course of conducting an activity on a structure or facility which is an Exempt Undertaking, NYCDEP employs a method of work which results in an alteration or change to the historic character of another structure or facility where such alteration or change would not be an Exempt Undertaking, consultation and review would be required for the latter, in accordance with Section III.).

A. Purchase of equipment.
B. Public Service programs.
C. Repair, Replacement, and/or Routine Operation of the Reservoir.
    1. Resurfacing of roads where no change in width, surface material, depth of roadbed, vertical alignment or drainage is to occur.

2. Repair/replacement of underground utility lines in existing trench.
3. Repair/replacement of existing curbing or sidewalks in kind.
4. Repair/replacement of vegetation landscaping in kind.
5. Repair/replacement of existing waterworks or sewer systems, storm drainage, chemical or fuel storage where significant site features such as mature vegetation are not impacted.
6. Repair/replacement of existing passageways and/or tunnels between any and/or all of the following facilities: Gate House Nos. 2, 3, 5, 6, 7, Shafts 3, 4, 21, 33, and the Mosholu Pumping Station.
7. In kind repair of the Reservoir retaining walls, including masonry and fencing. For masonry repointing, in kind is understood to include strength and color of mortar, and width, profile, tooling and texture of joint. In performing repointing hand-held, non-power tools will be used to the greatest extent possible.
8. Repair/replacement of dividing wall separating the North and South basins of the Reservoir including masonry and seven existing intake pipes with sluice gates.
9. Repair/replacement of existing underground masonry aqueducts leading to Shafts 21 and 33 of the New Croton Aqueduct running underneath the Reservoir.
10. Repair/replacement of sluice gates connecting the New Croton Branch Aqueduct, Shaft 21, and 205th Street water main to Gate House No. 5.
11. Repair/replacement of cast iron mains secured by concrete cradles to the Reservoir bottom connecting Gate House Nos. 2 and 3 to the Reservoir and to Gate House No. 5.
12. Repair/replacement of open drain installed under Gate House No. 2 connected to sewer system leading to a combined sewer system along Broadway, west of the Reservoir serving the overflow weir.
13. Repair/replacement of overflow weir.
14. Repair/replacement of the system of Reservoir dewatering pipes.
15. Repair/replacement of reinforced concrete cylindrical pipe connecting Gate House No. 6 to the Reservoir dividing wall.
16. Repair/replacement of underground cast iron main at Reservoir Avenue serving the southeast Bronx.
17. Repair/replacement of cast iron main in Reservoir retaining wall connecting Gate House No. 6 to the Reservoir.
18. Repair/replacement of chlorination facilities and/or equipment at Gate House Nos. 5, 6, and 7.
19. Repair/replacement of the Microstrainer Building adjacent to Gate House No. 6.
20. Repair/replacement of connections between Gate House No. 7 and the Mosholu Pumping Station.
21. Repair/replacement of the three pumps at Mosholu Pumping Station underneath Gate House No. 7.
22. Repair/replacement of waterway screens.
23. Repair/replacement of valves.

24. Draining and dredging of either or both the North or South Basin of the Reservoir for inspection, cleaning, and repairs to maintain water flow and quality.
25. Raising or lowering the water level within the Reservoir as needed based on observed water needs for New York City and projected flow trends from the New Croton Aqueduct and New Croton Branch Aqueduct serving the New Croton Reservoir.
26. In kind roof repair and/or replacement of roofing material.
27. In kind repair/replacement of gutters and downspouts using colors complementing building facades.
28. Window and door repair/replacement using in kind materials and matching original details, including replacement of isolated wooden members, glazing and hardware, and replacement or addition of window screens.
29. In kind replacement of missing or broken glass.
30. Minor wood repair/replacement of structural elements and isolated trim sections provided new material matches original in material and detail.
31. Masonry repair/replacement using in kind materials and methods. For masonry repointing, in kind is understood to include strength and color of mortar, and width, profile, tooling and texture of joint. In performing repointing hand-held, non-power tools will be used to the greatest extent possible.
32. Repair/replacement of concrete floors.
33. Repair/replacement in kind of concrete block foundations, minor repairs to parget foundations to match existing, and repointing in kind of all foundations. For repointing, in kind is understood to include strength and color of mortar, and width, profile, tooling and texture of joint. In performing repointing hand-held, non-power tools will be used to the greatest extent possible.
34. Repair/replacement of signs.
35. Storm windows:
    a. Exterior: New wood or aluminum exterior storm windows provided they completely fill the window opening without the use of spacers or panels; mullions and meeting rails match those of prime window; and color matches that of prime sash and trim.
    b. Interior: Interior storms where units are installed within existing opening; match interior trim color; are reversible and do not cause damage to existing trim; and have structural elements that align with those of prime window. Windows should be installed to completely fill existing opening and with a seal so as to protect prime window from condensation.
36. Caulking and weather-stripping, utilizing a color complementary to the subject structure.
37. Wrapping of heating pipes and ducts.

Unless otherwise indicated, the term "in-kind" shall mean using materials that match the original in color, texture and detail.

NYCDEP reserves the right to present to SHPO, and the SHPO agrees to consider in good faith, alternative materials in the event that matching materials are

(i) unavailable, or

(ii) cannot fulfill the operational function in question at the Reservoir (e.g., are not sufficiently strong, durable or watertight, or cannot be used in combination with existing materials on site, or do not meet relevant federal or state requirements),

D. Modifications, upgrades, expansions, and/or additions of subsurface structures, including but not limited to:

1. Removal of the chemical feed facilities in Gate House Nos. 5, 6, and 7 and decommission of the Mosholu Pumping Station after completion of the Croton Water Treatment Plant (WTP).
2. Construction of a new shaft and tunnel from Croton WTP to the Reservoir to convey filtered and disinfected water from the Croton WTP to the distribution connections at the Reservoir and the trunk mains connected to City Water Tunnel Nos. 1 and 3.
3. Enlargement of the Reservoir storage capacity by lowering the depth of the Reservoir floor, provided that the work does not require removal or destruction of and/or alterations to the existing Reservoir retaining wall (underpinning that does not affect the integrity of the existing retaining wall shall not be deemed work requiring removal, destruction, and/or alterations to such wall).

E. Modifications, upgrades, expansions, and/or additions of above surface structures essential to maintenance of quantity and quality of New York City Water Supply.

1. Demolition of Demonstration Water Treatment Plant.
2. Demolition of Microstrainer Building.

F. Rehabilitation, modification, upgrade, expansion, and/or addition to surface structure interiors of the Gate Houses serving the Reservoir including, but not limited to, alterations and/or removals of existing cast iron floor plates and valve assemblies in Gate Houses 2, 3, 6 & 7. Alterations and/or removals of existing cast iron floor plates and valve assemblies at Gate House 5 are not included in this exclusion.

G. Any undertaking which is a necessary to prevent an immediate and imminent threat to life or property in accordance with the New York State Historic Preservation Act of 1980 (9 NYCRR section 428.11).

III. Review Procedure for Activities Involving Significant Alterations to Listed Surface Structures.

A. Except for the activities listed in Section II above, to the extent NYCDEP proposes to significantly modify, upgrade, expand, and/or add to surface structures of Jerome Park Reservoir, or a part thereof, as it is listed on the New

York State and National Registers of Historic Places, and such modifications, upgrades, expansions, and/or additions are to be either undertaken, funded, or approved by a State Agency, as those terms are defined in Article 14 of the Parks, Recreation, and Historic Preservation Law and the New York State Historic Preservation Act of 1980, NYCDEP will undertake such modifications, upgrades, expansions, and/or additions in accordance with "The Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings" (Standards).

1. NYCDEP will apply the Standards in consultation with the New York SHPO on a case-by-case basis.
2. To begin consultation with the SHPO, prior to initiating activities involving significant alterations to listed surface structures, covered by this section of the Agreement, NYCDEP will provide documentation for SHPO review which includes the following:
   a. A description of the undertaking.
   b. Original photographs, not photocopies, of the project site that completely describe existing conditions. In the case of buildings, all exterior elevations should be photographed. All photographs should be clearly labeled as to location of view, and keyed to existing condition floor/site plans.
   c. Photographs (labeled) of all architectural details, keyed to existing condition floor/site plans.
   d. Streetscape photographs taken of properties in both directions of the property affected.
   e. Architect's floor plans or sketches of both existing and proposed conditions.
   f. Specifications for proposed work to fully describe methods and materials proposed for repair or replacement.
   g. Site plan/elevation drawings where exterior changes or new construction is proposed. Drawings must fully describe existing and proposed conditions, materials, and finishes.
   h. A "Survey of Architectural Conditions" to fully describe both existing and proposed conditions, where floor plan changes or removals are to occur.
   i. Description of any building additions.
3. The SHPO will respond in accordance with Section V.

B. For those activities involving significant modifications, upgrades, expansions, and/or additions to the surface structures at the Reservoir, undertaken, funded, or approved by a State Agency, as those terms are defined in Article 14 of the Parks, Recreation, and Historic Preservation Law and the New York State Historic Preservation Act of 1980 and covered by this section of the Agreement, where the Standards cannot be met and SHPO has made an assessment that the activities will cause an adverse impact on the Reservoir in accordance with 9 NYCRR section 428.7, NYCDEP will consult with the SHPO and prior to taking any

further action, will initiate the process set forth at 9 NYCRR sections 428.8 through 428.10 to obtain SHPO's comments.

C. Documentation of the work (project files), including "before" photographs, will be retained and will be available to the SHPO.

IV. Archeology.

NYSOPRHP and SHPO acknowledge that NYCDEP has determined, through an extensive archeological survey conducted as part of the Environmental Impact Study (EIS) completed for the Croton Water Treatment Plant, that the Jerome Park Reservoir does not contain archeological resources which require further review.

V. Responsibilities of the SHPO.

Within thirty (30) days of receipt of notification of any proposed activities subject to Section III above, SHPO will review the documentation for the proposed project and may:

A. Request additional information and/or provide recommendations.

B. Provide a project effect finding in writing which may:
   1. make an assessment of no adverse impact in accordance with 9 NYCRR section 428.7, concluding the consultation process, or
   2. require continued consultation with the SHPO, or
   3. establish conditions for project approval, which may require that the SHPO be informed in writing that conditions will be incorporated into the project and that the SHPO be provided with revised documents incorporating these conditions.

VI. Amendments; Termination.

The SHPO may monitor activities carried out pursuant to this Agreement, and the SHPO will review such activities if so requested. NYCDEP will cooperate with the SHPO in carrying out their monitoring and review responsibilities.

This Agreement will continue in force for the duration of the listing of Jerome Park Reservoir on the New York State and National Registers of Historic Places. Any party to this Agreement may request that it be amended, whereupon the parties will consult to consider such amendment. No amendment shall be effective unless set out in a writing executed by all of the parties hereto.

Any party to this Agreement may terminate it by providing thirty (30) days notice to the other parties, provided that the parties will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. In the event of termination, NYCDEP will comply with 9 NYCRR sections 428.4 through

428.10 with respect to activities undertaken at the Reservoir to which such regulations are applicable.

Execution and implementation of this Agreement satisfies the responsibilities of NYCDEP, and of the State agencies undertaking, funding, or approving any project or other action, under Article 14 of the Parks, Recreation, and Historic Preservation Law and 9 NYCRR Part 428 with respect to Jerome Park Reservoir.

In the event that a federal agency undertakes a review pursuant to section 106 of the National Historic Preservation Act of 1966 with respect to Jerome Park Reservoir, SHPO will make this document available and recommend its adoption as a document which satisfies the responsibilities of NYCDEP and the state agencies undertaking, funding, or approving any undertaking listed in section II of this Agreement.

VII. Miscellaneous.

A. This Agreement may not be assigned except pursuant to written instrument executed by all of the parties hereto.

B. This Agreement shall be governed by, and construed in accordance with, the laws of the State of New York.

C. All notices required or permitted hereunder shall be in writing, and shall be delivered by hand, or by certified mail, return receipt requested, addressed as follows:

If to NYCDEP, to

New York City Department of Environmental Protection
59-17 Junction Boulevard, 19th Floor
Corona, New York 11368
Attention: General Counsel

If to NYSOPRHP or SHPO, to

Commissioner of Parks, Recreation and Historic Preservation
Attention: Historic Preservation Field Services Bureau
Agency Building 1, Empire Plaza
Albany, New York 12238

Any party may change its address for notices hereunder by providing written notice of the change to the other parties in the manner specified in this paragraph C.

D. Nothing contained herein shall be deemed to create or confer any benefit or interest in this Agreement in any third party.

E. This Agreement sets out the complete understanding between the parties with respect to the subject matter hereof, and supersedes all prior agreements or understandings with respect to such subject matter.

The New York State Office of Parks, Recreation and Historic Preservation

By: _____ Date: 11 July '00
For Bernadette Castro, Commissioner

New York State Historic Preservation Officer

By: _____ Date: 11 July '00
Deputy Commissioner for Historic Preservation

New York City Department of Environmental Protection

By: _____ Date: 7/24/00
Commissioner, Joel A. Miele Sr., P.E.