National Park Service
U.S. Department of the Interior

Blackstone River Valley National Heritage Corridor Commission
Blackstone Canal Alternative Transportation Feasibility Study
Lincoln, RI

NPS Contract No. GS-10F-0281R; VHB Project No. 33281.02
Document No.

November 2011

Prepared By: Vanasse Hangen Brustlin, Inc.

Contents

Contents i

List of Figures ii

1 Introduction: Purpose and Need....1

Introduction....1
Study Area Description....1
Purpose Of The Feasibility Study....2
Special Considerations....2

2 Recreational Access to the River and Canal....3

Existing Conditions....3
Recommendations....6

3 Canal Boat Replica Operations....11

Existing Canal Elements....11
Recommendations....14

4 Water Control Structures....15

Existing Conditions/Challenges and Constraints....16
Recommendations....20

5 Interpretive Opportunities....22

Recommendations....23

Appendix A: Concept Plans....A-1

Appendix B: Conceptual Cost Estimate....B-1

Appendix C: Public Comments Received....C-1

List of Figures

Figure No.	Description	Page
1	Blackstone Park Features	9
2	Blackstone Canal/Lonsdale Features	10

1

Introduction: Purpose and Need

INTRODUCTION

The Blackstone Canal was constructed between 1824 and 1828, stretching approximately 45 miles from Worcester, Massachusetts to Providence, Rhode Island. It provided a means of transporting crops and manufactured goods from the interior sections of Massachusetts and Rhode Island to the shipping port of Providence and was the last major transportation canal to be constructed in New England. As designed, the canal trench was generally 34 feet wide and 4 to 6 feet deep with a 10 foot wide towpath. As built, the dimensions varied somewhat depending on the existing terrain and surrounding conditions. Forty-eight locks allowed boats to navigate the 450 foot descent of the Blackstone Canal. The canal was utilized until approximately 1847 when the Providence & Worcester Railroad Company began operations and railroad transportation became quicker, less expensive and a more reliable mode of transportation. Although many historic canal features have disappeared or been altered over time, significant stretches of the canal remain largely intact. In recognition of its significance, the Blackstone Canal is listed in the National Register of Historic Places.

STUDY AREA DESCRIPTION

This report focuses on an approximately 3.5-mile segment of the Blackstone Canal located in the Town of Lincoln, Rhode Island. The limits extend from where the Blackstone Canal meets the Blackstone River, near the Ashton Dam, south to the former Lonsdale Bleachery (Figures 1 and 2, Appendix A). All of the study area is within the Blackstone River State Park, which is owned and operated by the Rhode Island Department of Environmental Management. In addition to the canal trench and towpath, the study area includes a portion of the Blackstone River Bikeway, including a spur connection from the I-295 Visitor's Center ; access points for boats; water control structures; associated engineering resources (spillways, lay-bys, dams, etc.), and natural bodies of water used to sustain the Canal's water supply.

PURPOSE OF THE FEASIBILITY STUDY

The intent of this study, as stated in the Scope of Work (SOW), is to:

- Enhance visitor access and improve connections between the Blackstone Canal (Canal), Blackstone River (River), the Blackstone River Bikeway (Bikeway), hiking trails, and water based activities, including existing River and Canal access sites. Review the existing boat put-ins/portage locations and suggest improvements. Evaluate the possibility of operating a canal boat replica within this segment of the Canal.
- Explore ways to control the flow of water between the Canal and the River, especially during flood events, which threatens the integrity of the Canal, towpath and Bikeway.
- Increase /improve interpretive opportunities.

SPECIAL CONSIDERATIONS

The Blackstone Canal is a significant historic resource, and the entire length of the canal, from Worcester, Massachusetts to Providence, Rhode Island, is listed in the National Register of Historic Places. In addition, the segment of the Canal that is the subject of this study is located within the Blackstone River State Park and implementation of the recommendations presented in this report will likely involve state and/or federal funding. Such work may also involve complex environmental permitting, with potential impacts on wildlife, the possibility of contaminated soils, and the potential for underwater archaeological resources. Therefore, a number of special considerations apply to any projects undertaken as a result of this study:

- All work must meet the Secretary of the Interior's Standards for the Treatment of Historic Properties.
- Projects must include, in the planning stages, an assessment of the potential for archaeological sensitivity as well as research regarding known archaeological sites in the vicinity of the project.
- Wildlife breeding, nesting and migration seasons must be taken into consideration in the scheduling and sequencing of construction activities, particularly if work involves de-watering the canal.

2

Recreational Access to the River and Canal

While access to the River and Canal within the Study Area is better than in many other sections of the Canal in Rhode Island, parking, docking, and put-in sites need to be evaluated for their sufficiency of use for both current and future conditions. The addition of tours via a canal boat replica, for example, could create a need for expanded facilities (see Chapter X). In addition, water-based activities in the study area are impacted by the lack of adequate flood control measures (see Chapter X).

EXISTING CONDITIONS

Bikeway

The Canal and its towpath are accessed via the Blackstone River Bikeway throughout most of the Study Area's length. This bituminous paved facility is utilized by pedestrians and cyclists and parallels the Canal and River. Lonsdale Mill Village and Lonsdale Bleachery are located, at the southern end of the study area. Also at the southern end of the study area is a bikeway connection to the Willow Way residential neighborhood, to the west of the Canal. The southern section has access to public parking for the Bikeway from Front Street in Lincoln. The Bikeway continues southerly by crossing to the easterly bank of the Blackstone River via the Pratt Dam Bikeway Bridge allowing connections to Cumberland, RI.

The northern terminus of the study area is in Ashton. The bikeway in Ashton has spur connections to parking areas located on Route 116 and I-295 as well as access from a Lower River Road residential neighborhood. The Bikeway continues northerly by crossing to the easterly bank of the Blackstone River via the Ashton Bikeway Bridge allowing connections to Cumberland, RI.

Bikeway access ramp from Martin Street

Parking

Several parking facilities exist at the northern and southern ends of the Study Area. There are three principal parking options available to the northern section at Ashton Village/Ashton Mill Complex. A parking lot off of George Washington Highway (Route 116) with 19 spaces has a spur connection to the Bikeway and Blackstone River State Park. There is a similar spur connection to the I-295 Visitors Center, with its ample parking. The third parking lot is across the Blackstone River from the park, adjacent to the former Ashton Mill; it contains 14 spaces and is connected to the park by an existing bikeway bridge. In Lonsdale, the southern end of the study area, approximately 57 general parking spaces are available off Front Street (Route 123). This lot also has a drop off/pick up area for vehicles transporting a canoe or kayak. Parking needs seem to be adequately provided for at this time, although the possible addition of a canal boat replica tour could mean that more parking is required.

Dock/Canoe Put-Ins

Within the Blackstone River State Park, there are two canoe put-in locations to the River and two put-in locations to the Canal. One of the Canal put-ins, located near the Kelly House Museum, is a makeshift stairway and railings made from 2” dimensioned lumber. The second is composed of a granite stairway and railings approximately 100 feet south of the Ashton Dam. The Blackstone River put-ins are stairways leading down to the river edge. One is approximately 100 feet south

of the Ashton Dam and made from timber, the other is approximately 100 feet south of the Ashton bikeway bridge across the Blackstone River and made from granite. The number of put-ins to the River and Canal is considered adequate, although a canal boat replica tour would require a larger dock at the Kelly House Museum location.

River access stairs near Kelly House

Canal access near Kelly House

The Canal section from Martin Street to the southern end of the study area at the former Lonsdale Bleachery is generally lined by residential property on the westerly bank. The easterly bank includes the former Canal towpath, which is now utilized by the Blackstone River Bikeway. East of the bikeway is a steep tree-lined slope to the banks of the Blackstone River. At the southern end of the study area, within the canal, there is a granite step Canoe put in/take out that provides access to the Canal. The lower granite step is partially undermined by the rise and fall of the Canal water elevation. This structure needs to be stabilized and could be improved by the addition of another step down into the canal.

At the southern end of the study area, the Blackstone River is impounded by the Pratt Dam and the river flows through four large arched culverts which were formerly controlled by gates. During flood events, the culverts cannot accommodate the total volume of water and water passes over the Pratt Dam. This area of the river is dangerous for boats and has been the site of serious accidents and a drowning, although the area currently has warning buoys. There is an area near the warning buoy system to take a canoe or kayak out of the River . From there, people can carry their boats up a ramp up to the Blackstone River Bikeway, then along the Bikeway to put-in ramps at the Blackstone Canal or into the river, downstream of Pratt Dam. It is, however, a long portage of approximately 500 feet to either site. In addition, the take out portage ramp to the Bikeway is prone to erosion damage during high water flood events as water overflows the normal River channel into the Pratt Dam impound pond.

There currently is a canoe / kayak access loop that begins in the Blackstone River at Ashton and continues downstream to Pratt Dam, although it is not widely used. At Pratt Dam, the boat must be taken -out near the Pratt Dam warning buoy and carried via a rough path and up a slope to

reach the Canal Tow Path/Bikeway and Canal. Placing the boat into the Canal, one can then paddle back upstream, against the slower water flow of the Canal, to return to Ashton.

Additional Trails/Access

Access to the Bikeway is also achieved by a 3/4-mile long spur connection between the I-295 Visitors Center and the Bikeway to the east. The connection, however, is not very well advertised, with only a small sign at the Center that notes the connection is to the rear (east).

I-295 Rest Area/Visitor's Center

Kelly House and Adjacent Tenement Interpretive Site

Within the Blackstone River State Park, there is an interpretative walk through a former mill town, with views of former vegetable gardens, orchards, tenement housing, and mill ruins. An informal bridle/cross country bicycle trail exists through the fields and wooded areas of the Park.

RECOMMENDATIONS

Parking

Parking throughout the Study Area is adequate for current uses. If recreational opportunities in the Study Area were to expand – e.g, through the operation of a canal boat replica (see Chapter 3) – it may be necessary to explore options for additional parking. Additional parking may be difficult to obtain, however, both due to costs and topographic challenges.

Dock/Canoe Put-ins

The number and location of put-ins is adequate for current use, although several require repairs or modifications. At the Canal take out near the Ashton Dam, the portage stairs and platform are being undermined by high water flow and need to be stabilized. If a new water control structure is built in this location (see "Water Control Structures" Chapter), this should be addressed. The new structure would not need to change the location of this portage but additional granite stairs would need to be added to bring the portage to the overlook elevation.

The current Canal put-in near the Kelly House Museum needs to be re-built, due to its insubstantial construction and need for better accessibility. If Canal Boat replica tours are envisioned, then this put-in should be made into a dock for loading and unloading passengers as well as overnight docking for the boat. If it remains as a canoe put-in or stop along the Canal, its appearance could be formalized with more substantial construction.

The small canal put-in at the southern end of the study area, adjacent to the Front Street Parking area, needs an additional step lower into the canal, and the foundation needs to be bolstered with the addition of new earthen fill and strategic positioning of rip-rap protection due to the previous erosion pattern.

Although the River portage at the south end at the Pratt Dam is long and somewhat arduous, we do not see any feasible alternatives. The existence of the four arched culverts which pass the river flow through the dam is very dangerous to paddlers, requiring all boats to be removed from the river. The existing downstream river topography will not allow a new put-in to the river in a better, more convenient location. The frequent erosion damage to the take out portage path, however, could be greatly reduced by providing larger rip rap stone sized to the flow velocities experienced during flood storms.

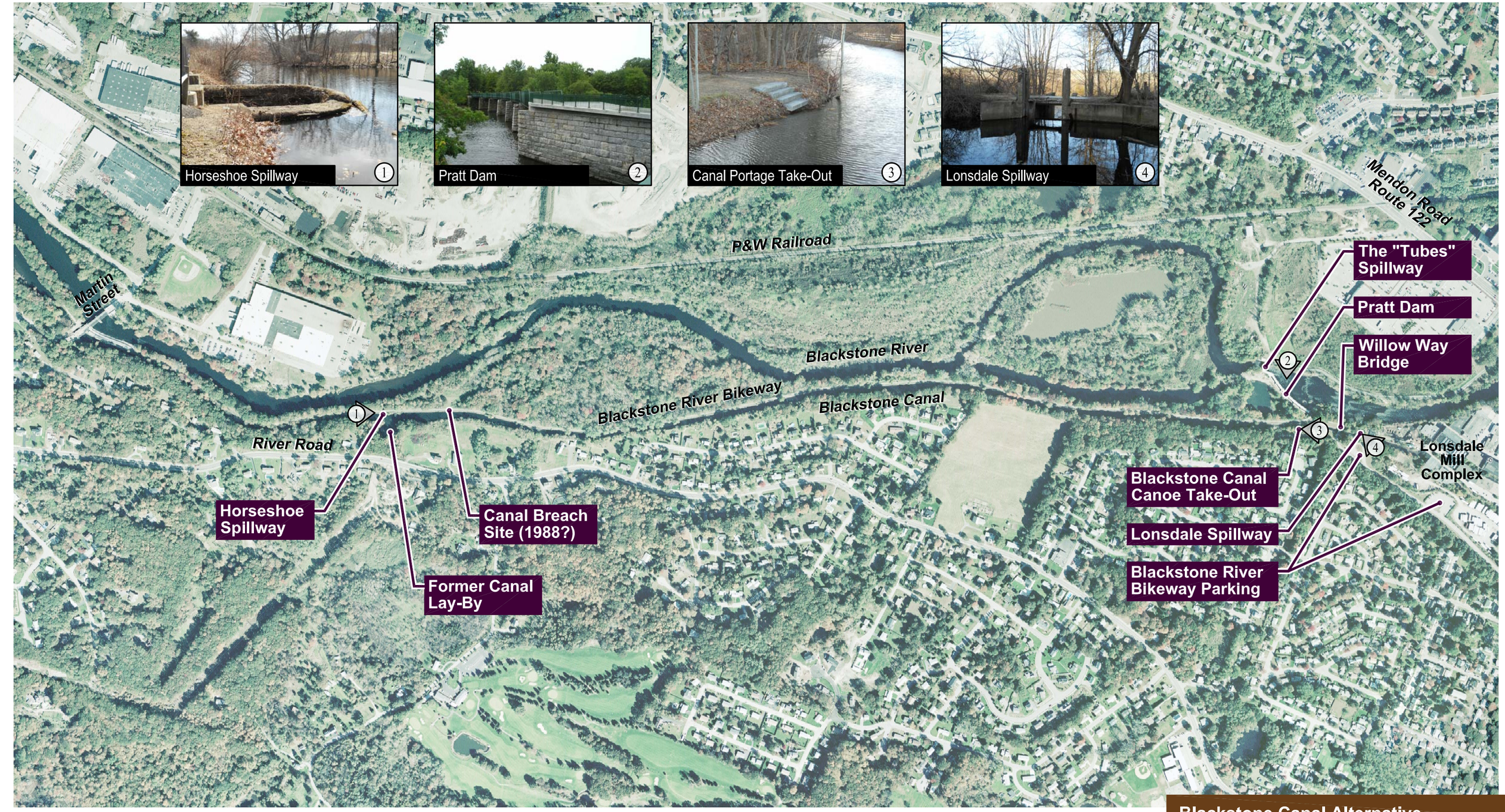
The canoe loop from Ashton Dam, down the River to Pratt Dam with a return via the Canal, could be better promoted through wider distribution of the existing brochure which provides directions, the Blackstone River & Canal Guide,. Also, a sign at the Ashton Dam could also display the route and provide simple instructions on portage. A clear connection path from the River to the Canal, which is level and easily traversed, is required before directing the public to this feature.

A potential new canal access point exists at a location on the westerly bank approximately half way between Ashton and Lonsdale. The Town of Lincoln owns an access from Old River Road to the Canal edge, which was a former driveway to a water supply well in the area. This access could be formalized into a public canoe put-in or utilized as an access for emergency use only.

It is noted that any new physical work will require proper permitting and regulatory review.

Additional Trails/Access

Access to the study area could be improved by highlighting the spur bikeway at the I-295 Visitor's Center. Signing should begin near the front entrance of the building and note that the Blackstone River State Park, Bikeway, Canal, and the Kelly House Transportation Museum are only 3/4 mile away to the east and are easily and safely connected to the Visitor's Center. A map should be provided on the front entrance sign that shows these features and how to get to them, and be scaled to indicate distance and landmark features. Beyond the Visitor's Center, signs should be placed along I-295 north and south to inform the public of the Visitor's Center and park/bikeway connection.

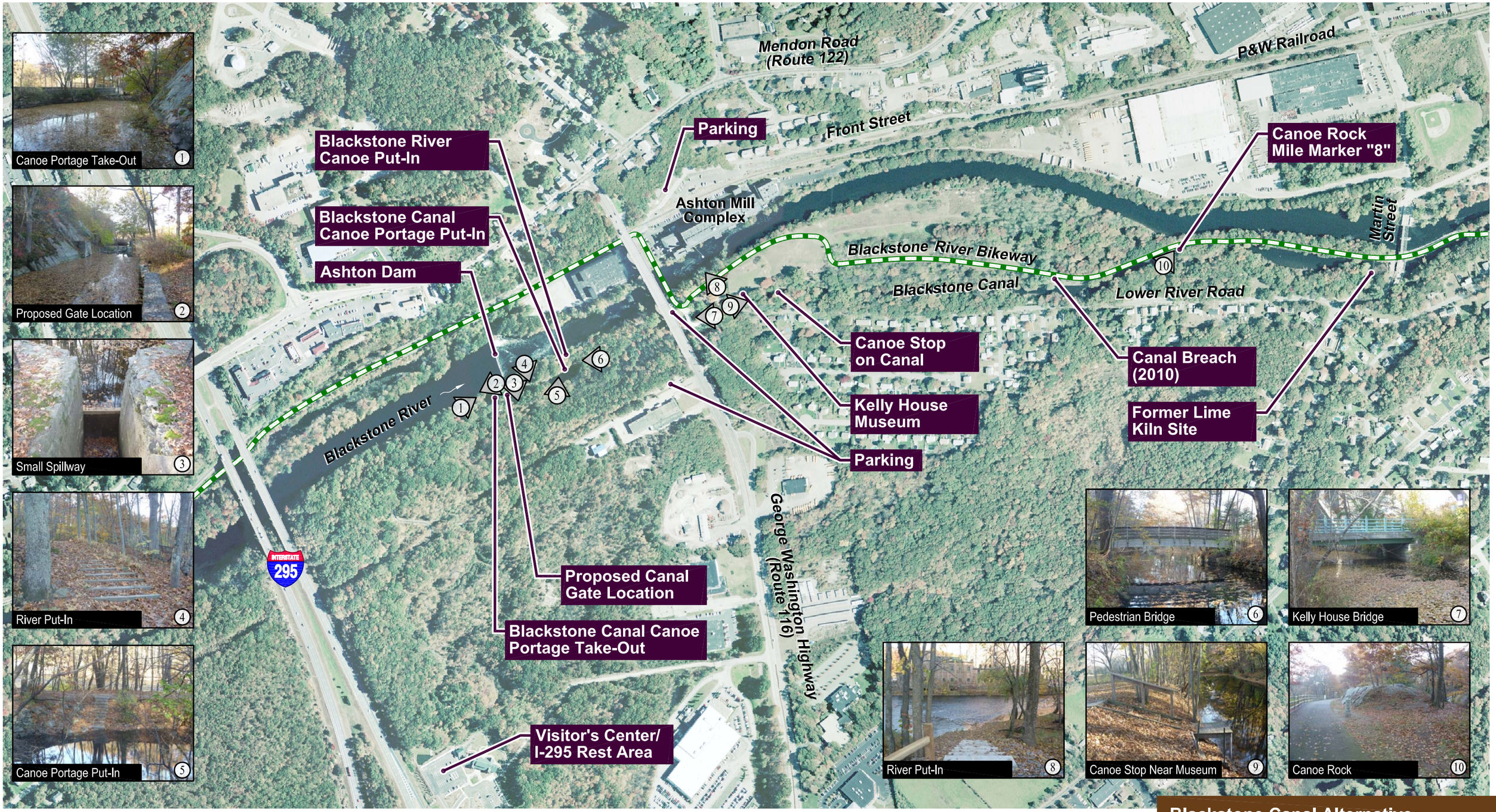


Blackstone Canal Alternative Transportation Feasibility Study

Blackstone Canal/ Lonsdale Features

National Park Service
U.S. Department of the Interior

0 300 600 Feet



Blackstone Canal Alternative Transportation Feasibility Study

National Park Service
U.S. Department of the Interior

0 250 500 Feet

Ashton/Lincoln Canal Features
Blackstone Park Features

3

Canal Boat Replica Operations

Two boats operated by the Blackstone Valley Tourism Council now ply the River in this area: the 40-passenger river boat called the *Blackstone Valley Explorer* and a 40-foot long English canal boat known as the *Samuel Slater*. This study considers whether a replica of a Blackstone Canal boat could be operated on this stretch of the Canal and River, given the constraints of the existing bridges, water depth, and docking and storage logistics.

According to the Worcester Historical Museum, the dimensions of the boats that operated on the Blackstone Canal were as follows:

Length: 45’ to 70’
Width: 9’-3”
Height: unknown
Draft: 2’ to 2’-6” (loaded)

Each boat had a crew of 3 including the captain, deck hand and one man to drive the horses that pulled the boat from the towpath. It is assumed that the replica boat would be motorized and would not utilize draft animals to pull the boat.

EXISTING CANAL ELEMENTS

Bridges

There are three bridges within the study area that present significant impediments to the operation of a Canal boat replica due to their low clearance. At the north end, a wooden pedestrian bridge crosses the canal approximately 500 feet south of the Ashton Dam. The average clearance from water level to underside of the bridge is 4 to 5 feet. The second bridge, located approximately 1,100 feet south of the Ashton Dam, is the Kelly House Bridge, which provides vehicle and bikeway access across the Canal to Blackstone River State Park. The average clearance from water level to underside of the bridge is 6 to 7 feet. At the south end is the Willow Way Bridge located approximately 300 feet north of the southern Canal terminus or

where the Canal travels under one of the former Lonsdale Bleachery buildings. The average clearance from water surface to underside of the bridge is 3 to 4 feet.

Kelly House Bridge Over The Canal

Willow Way Bridge Over The Canal

To avoid having to go under any of these bridges, a canal boat replica would need to operate from the Kelly House Bridge south to the Willow Way Bridge, a distance of approximately 3 miles (6 miles round trip).

Canal Width and Water Depth

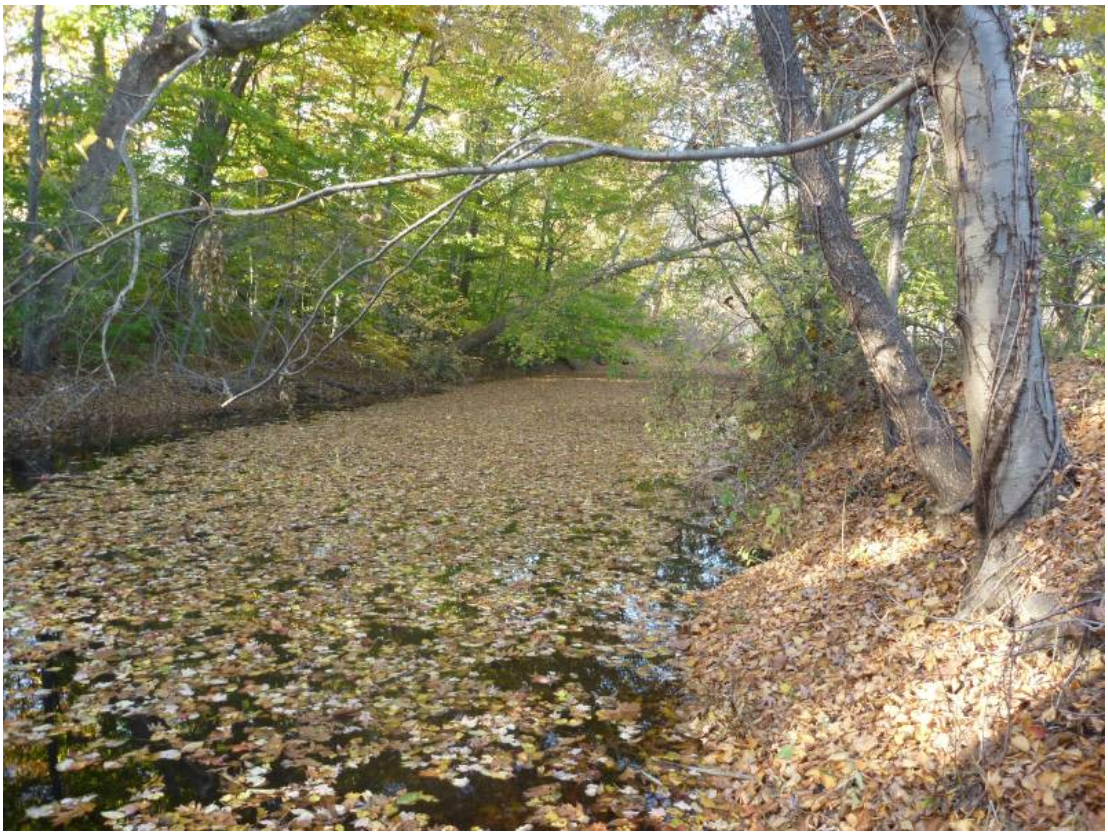
The approximately 3-mile length available for tourist boat generally has a width equal to or greater than 40 feet. However, there are three areas where the canal width narrows to approximately 27 feet: they are just north of the Willow Way Bridge, in the vicinity of the Horse Shoe Spillway, and the area around Canoe Rock. The water depth in the canal varies and is generally from 5 feet to 8 feet in depth. There are a few limited areas that have less depth, however. They are located in the vicinity of the Kelly House Bridge, the former Lincoln Well Field crossing and the Willow Way Bridge. These locations can have depths of 2 feet or less during the lowest flow periods, a depth that will not accommodate any motorized boats. Several other isolated shallow spots exist at silt plumes from roadway drainage systems and streams that outfall into the canal.

Dock Sites

Docking a canal boat for loading/unloading and off-season storage presents a host of issues to consider. The existing dock at the Kelly House Museum is a logical location for loading and unloading passengers as well as overnight storage. This location is near the northern end of the available Canal length and is within the walking route used by many visitors. The existing dock, however, is quite small and would probably have to be enlarged to accommodate additional visitors. Off-season storage would have to be somewhere other than at this dock as the canal water freezes and the boat would need to be covered.

Other Considerations

An additional consideration for operating these boats within the Canal is the presence of heavy vegetation on both banks. It is not uncommon for a large tree to fall across the Canal and limit its use. Maintenance of the Canal's unobstructed water surface will be necessary for use by boats larger than canoes or kayaks. Currently, fallen trees are removed from the Canal by volunteers; this system of clearing is not sustainable for the long term and cannot be mobilized quickly.



Vegetated Canal Banks

Solutions considered – A canal boat replica, discussed for many years as a way to bring more visitors to the Canal and surrounding area, would provide a wonderful visitor experience here due to the long length of watered canal. The logistical and financial requirements for the canal boat replica, however, are considerable and could have an adverse effect on some of the area's historic resources. The canal boat replica would need to be of a short enough length so that it could turn around at each end of the 3-mile route. Alternatively, the replica could have a motor installed at each end of the boat so that it could operate in both directions without having to be turned.

Docking operations would require a larger dock than the existing one, which may have an adverse effect on the setting of the Kelly House Museum. The boat would need to be taken away in the off-season, which has cost implications in transport and storage facility rental or purchase.

Some areas of the Canal would require dredging to provide sufficient and consistent water depth. The dredge material will likely be regulated soil requiring proper disposal.

The cost of the boat manufacture, maintenance, operating expenses and storage, as well as the cost for dredging the canal and constructing a new dock need to be weighed against the benefits of the canal boat operation.

RECOMMENDATIONS

Our recommendation is that the canal boat replica should not be pursued at this time, in light of its upfront and ongoing expenses versus the economic benefit of offering such a venture, particularly since it would be limited to operating for just half of the year. Although the canal boat replica would be of great interest to visitors, it is not feasible given the costs. We suggest review of this concept again in the future, especially with consideration of a vender operated service.

Our alternative recommendation is for enhanced canoe and kayak tours on the canal. Tours could be guided or self-guided, the latter with either a brief pamphlet explaining the history or an interpretive panel at the canoe put-in dock at the Kelly House Museum. The guided tours could be achieved either through regularly scheduled tours or by appointment.

General recreational canoe and kayak use as well as guided tours would benefit from dredging of the most severe silt plumes. A dredging project should be considered in future capital improvements of the Canal.

4

Water Control Structures

The section of the canal located in the study area has been subjected to several serious flood events in the last 15 years, a situation that threatens the canal trench, towpath and the Bikeway. Indeed, the towpath has been breached by flood waters in several locations. Historically, there was a gate at the head of the Canal – in the vicinity of the Ashton Dam – that helped regulate water flow between the canal and the river. This gate deteriorated and was removed decades ago. A rip rap berm was later placed across the canal entrance, allowing some water to enter the canal and deflecting some volume back to the river. This system has limited ability to deflect flood water from entering the Canal. Other early 20th century water control structures are located to the south, but they are in fair to poor condition and cannot by themselves regulate the water flow between the canal and river. Instead, these water control structures need to work together as a system. The three principal water control structures in the study area – the Canal Inlet Control Gate/Rip-Rap Berm, the Horse Shoe Spillway, and the Lonsdale Spillway - are discussed below. A fourth structure, an early 20th century spillway, just south of the Ashton Dam acts as a weir, is quite narrow, does not manage a significant volume of water and is not discussed.

Area of Former Structure in Canal at Ashton Dam

Because the cost of restoring the existing water control structures or building a new gate at Ashton will be high, the work needs to be prioritized with justifications for the recommended order of work. An important consideration in any recommendations for proposed work is the need to meet the Secretary of the Interior's Standards for the Treatment of Historic Properties as all of the existing water control structures are listed in the National Register of Historic Places.

EXISTING CONDITIONS/CHALLENGES AND CONSTRAINTS

Canal Inlet Control Gate, Ashton Dam

At the north end of the study area, the Canal and the River meet at a location approximately 150 feet north of the Ashton Dam. The River's westerly bank widens to accommodate the Canal entrance and diversion of a portion of the river flow into the canal mouth. As noted above, historically there was a gate structure at the Canal mouth to regulate flows into the Canal; the concrete abutments from this structure – dated 1906 – remain. This gate was removed and replaced with a large stone and voided rip rap dam upstream of the former gate location. The rip rap dam allows sufficient water to enter the Canal during low flow periods, but provides little protection during high water events which can result in the Canal breaching its banks. Breaches have occurred at two particular locations that have low freeboard in the towpath.

In 2000, the Rhode Island Department of Environmental Management (RIDEM) undertook a study for a new water control structure at this location, which recommended the installation of swing gates at the site of the 1906 concrete abutments. This design would have allowed unrestricted boating between the canal and the River during normal and low water flow periods. The gates were designed to contain baffles or panels that could be opened after the gates were closed to allow passage of some River flow into the Canal. The plans were approved by RIDEM Freshwater Wetlands Section as an Insignificant Alteration in January 2000. The permitted plans included a description of the procedure to open and close the swing gates for canal maintenance or during flood events. The open/close procedure as described in the RIDEM approved plans noted that both gates would be closed during flood events. The open/close procedure as described in a revised set of plans (2002) noted that only one gate would be closed during flood events and that the second gate should remain open. This procedure contradicts the permit and is contrary to VHB's understanding of the gate operation. It is also contrary to the belief that has been stated by numerous stakeholders that the gates would close to "shut off or limit" River flow into the canal during flood events.

Subsequent to the RIDEM permit approval, concern was raised that the water flow through the baffles in the closed swing gates could result in strong undertow currents in the canal upstream of the gates. Specifically, the concern was that if a canoe or kayak entered the canal upstream of the closed gates, the undertow current could draw the watercraft up to the closed gate structure, potentially pinning it or worst case drawing it down under the gate. A fatal accident in 2009 at the Pratt Dam exhibited a similar scenario when a 2-man canoe was pinned broadside to the upstream side of the Dam arches (commonly referred to as the "tubes"), overturned and a canoeist became entangled in debris and drowned. The incident was repeated shortly thereafter but, fortunately, the canoeists were rescued without harm.

In 2006, RIDEM hired Pare Engineering to investigate this concern. The Pare Engineering report included hydraulic calculations and analysis for various flood events (2-year up to 100-year events) with the existing riprap dam left in place and with the dam removed. The Pare report concluded that, as designed, the gate installation could generate flow velocities greater than those that advanced canoeists and competitive kayakers could be expected to negotiate.

Horse Shoe Spillway

The Horse Shoe Spillway is a concrete, U-shaped weir located approximately half way between Ashton and Lonsdale. The spillway was constructed in 1902, as noted by the date embedded within the concrete. The concrete of the spillway is in very poor condition, evidenced by efflorescence, cracking, spalling, and water leakage. The portion that extends into the Canal to maintain water elevation within it is in poorer condition than the spillway race to the Blackstone River, but the entire concrete structure requires analysis and repairs. The Blackstone River Bikeway crosses over the top of the Horse Shoe Spillway on a bridge structure that has its beam seats within the Spillway concrete.

Horse Shoe Spillway in Canal

Lonsdale Spillway

The Lonsdale Spillway, just north of the Lonsdale Bleachery Mill at the extreme south end of the Study Area, is a major component in regulating the water elevation within the Canal. The Lonsdale Spillway is the last spillway in this section of the canal that allows water to return to the Blackstone River. Some water by-passes the Lonsdale Spillway and continues to the Lonsdale Bleachery, but the flow is very limited.

Constructed as an overhead sluice gate in approximately 1905, the Lonsdale Spillway is missing its original gate and gate operator hardware. Currently it operates as a weir with batter boards and steel plates wedged against the upstream face of the spillway, allowing the canal water to spill over the top. The height of the weir batter boards is adjusted as the volume of water entering the canal varies. Unfortunately, the operator of the batter boards does not monitor the Canal and does not modify the batter board height until a canal breach is imminent. The spillway is then fully opened until the flood has passed and the canal flow has been reduced to a continuous flowing stream. The batter boards are then replaced and the canal waters impounded to normal flow elevations.

Lonsdale Spillway Structure

Portions of the Lonsdale Spillway need immediate repair. At one time, a portion of the spillway had a concrete slab roof to allow vehicle and train passage over the spillway. The roof slab has severely deteriorated such that a steel plate has been placed over the top to allow passage. The concrete columns that supported the gate operator hardware are spalled and require repair. The gate system and operations need to be replaced so that they can be operated easily and correctly during storm events.

RECOMMENDATIONS

As noted above, when the three water control structures in the study area were present and operable, they operated as a system to control water levels in the canal. The total cost of restoring such a system will be high; preliminary cost estimates for construction of a new gate at Ashton Dam, the restoration of the Lonsdale Spillway, and additional testing and analysis of the Horse Shoe Spillway, as shown in Appendix B, are estimated at over $1,567,000.00. Given the total cost, it is recommended that the projects be prioritized, as discussed below.

It is anticipated that a new control structure at the Canal entrance at Ashton, as considered by RIDEM in 2002, would not in and of itself adequately manipulate the water level in the Canal, especially during flood events. The Horse Shoe Spillway located between Ashton and Lonsdale operates as a weir and, though deteriorated, does not require immediate repair in order to operate as designed. VHB has observed that the removal of the steel plate and batter boards at the Lonsdale Spillway significantly lowers the water level in the Canal during flood events. Unfortunately, in the past, the plate removal has not occurred until after flood flow has peaked and the Canal towpath has been overtopped and damaged. We assume that the plate removal is delayed simply by the fact that its removal is a somewhat cumbersome process involving a backhoe, operator and laborer. It would appear this is a somewhat dangerous procedure, especially given its late implementation during flood events.

Of the three water control structure projects, the restoration of the Lonsdale Spillway appears to offer the best opportunity for flood protection in the short term. Of second priority would be the construction of a new water control structure in Ashton. The restoration of the Horse Shoe Spillway is of lowest priority, since it currently functions reasonably well. (Further analysis of the concrete at the Horse Shoe Spillway, however, is recommended.) Specific recommendations are described below and shown in the plans in Appendix A. Note that any projects undertaken need to meet the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Final construction drawings, specifications and cost estimates for the proposed gates and spillways should be prepared and be available for use in grant applications or other funding sources as they may arise.

Canal Inlet Control Gate at Ashton

The recommended solution at this location is to remove the existing rip-rap structure and construct two new sluice gates and one swing gate. Conceptual design plans have been prepared are included in Appendix A. Compared to the 2000 design, which proposed two swing gates, the sluice gate/swing gate arrangement would provide more ease in controlling the water level due to less hydraulic pressure on the gates. The water velocity through the three openings requires further analysis, but during the summer, at low-flow periods, the velocity would be manageable by a novice canoeist or kayaker. A cable float system should be put in place upstream of the gate structure. Ideally, the system would be deployed only during flood events. The system should also be located such that a canoeist/kayaker could be diverted to the portage landing and steps, which appear to be a sufficient distance upstream from the proposed gate installation site to

avoid any difficulties caused by water currents at the gates. The proposed sluice gates combined with the swing gate will eliminate the draw down current concern associated with the former double swing gate design.

An accurate hydraulic analysis of the existing canal which quantifies average flow , flood flows and discharge capacities of the existing weirs would provide information for operating the future gates. This analysis should be undertaken as part of the final design of the gate structure.

Horse Shoe Spillway

We recommend at a minimum that the concrete core of this structure be tested to determine the strength of the existing concrete and the extent of cracking. Given the strength, a determination can be made to repair the surface concrete facing of the structure or if total reconstruction is required. During these repairs, the Bikeway bridge that traverses the spillway would need to be removed, but it appears possible to have a temporary crossing installed across the easterly end of the spillway.

Lonsdale Spillway

We recommend at a minimum to replace the concrete roof slab, rehabilitate the gate columns, and investigate replacement of historically compatible (wood boards) gate and gate operator hardware. This would allow the structure to operate as an overhead sluice gate, as it did historically. Conceptual design plans have been prepared are included in Appendix A.

Gate operator hardware has been removed from another water control structure at the downstream end of the Lonsdale Bleachery Mill Complex and remains stockpiled on site. The hardware is privately owned but has the potential for purchase or donation, rehabilitation and re-use. Another potential source for operator hardware is located in Albion Village, where several gate operator pieces remain on another non-operating, privately owned, water control structure.

A new safe and efficient operating gate will make adjustments to the spillway easier, safer and less time consuming. Hopefully this will allow more timely adjustments during storm events.

Water Control Feature Operation and Management

Although owned by RIDEM, the Lonsdale Spillway is currently operated by the Town of Lincoln. It is envisioned that the new gate structure at Ashton would be operated by RIDEM staff. A written agreement should be executed between the parties to solidify the proposed actions to operate and control the Canal water level. We also recommend that an operation plan be developed such that operations/adjustments to the canal water control structures are directly related to River water elevations at the Thunder Mist Dam in Woonsocket. The plan should dictate the communication protocol with the continuously monitored Thunder Mist Dam and the specific operational responses. We anticipate RIDEM, as owner of these structures and the Canal, will be the organization responsible for developing and refining the operation plan.

5

Interpretive Opportunities

The study area features a superb concentration of historic resources, including the longest stretch of watered canal in Rhode Island. Some aspects of the area's history are presented at the Captain Wilbur Kelly Museum, which focuses on the evolution of transportation modes in the area. The Blackstone River Bikeway and its bicycle/pedestrian connection to the I-295 Visitors Center (at the north end of the study area) and the area's attraction to canoeists and kayakers provide optimal opportunities for additional interpretation. The stories about the area's early development, mills and their respective villages, as well as other related topics, remain to be told here.

Kelly House Museum

Solutions considered – Previous studies and reports that included the Study Area have consistently noted this area's wealth of resources and history. Suggestions for interpretive themes ranged from:

- Construction and operation of the Canal. This theme could include a display of a scale model Canal Boat for educational use.
- The Canal's incorporation into the industrial waterpower system.
- The history of the industrial enterprises that operated here, including the Smithfield Cotton and Woolen Manufactory, Lincoln's first textile mill.
- The history of the mill villages located here – Old Ashton (1810), Ashton (1867), Berkeley (1871), Lonsdale Old Village (1834), and Lonsdale New Village (1860).
- The struggle for control of the water between canal operators and the adjacent mill owners.
- The physical means of controlling water in this area and how it changed over time.
- Understanding that the Canal was a state-wide resource that incorporated both engineered and constructed trench with slackwater passages in ponds and the Blackstone and Moshassuck Rivers.
- Lime Kiln and Cart Bridge archaeological site at Martin Street.
- Gasometer archaeological site at Old Ashton Village (its location is currently represented by a series of stones depicting its location and diameter just north of the Kelly House Museum).

The 2010 *Blackstone Canal Preservation Study* additionally suggested that in addition to signage consistent with the Corridor's standards, the interpretive efforts combine signs with activities that engage people more actively and tangibly. Signage would support visitor services, but could also be interactive through a game or a quest and not just display dates and images. Scheduled activities that focus on historic and/or recreational events at the location of interpretive signage or other places along the Canal would also contribute to interpretive efforts.

RECOMMENDATIONS

Clearly there is no lack of interpretive themes that could be expanded upon in this area. To some degree, all or most of the themes should be touched upon in an overview panel and/or brochure that explain the historical development of the area. The location of the panel should be at a major entrance or central location in the area, such as at one of the parking areas at the north end, the terminus (either end) of the connecting pathway from the I-295 Visitors Center to the Bikeway, or at the Kelly House Museum. Individual interpretive themes could then be presented at more site-specific locations. Our recommendations for these themes are:

- *Historic and current means of controlling water in the Canal* should be presented near the location of the proposed new gates and sluice at the Ashton Dam. The panel could be illustrated with the 1828 Phelps drawing of the area, along with historic photographs or drawings of how the area previously looked. The current means of controlling the water could be represented in a simple graphic that explains how the gates, sluiceways, and weirs work in relation to one another.

- *Struggle over water control between canal operators and mill owners* should be presented at the southern end near the Lonsdale Bleachery site, possibly at the Lonsdale Spillway. The Lonsdale

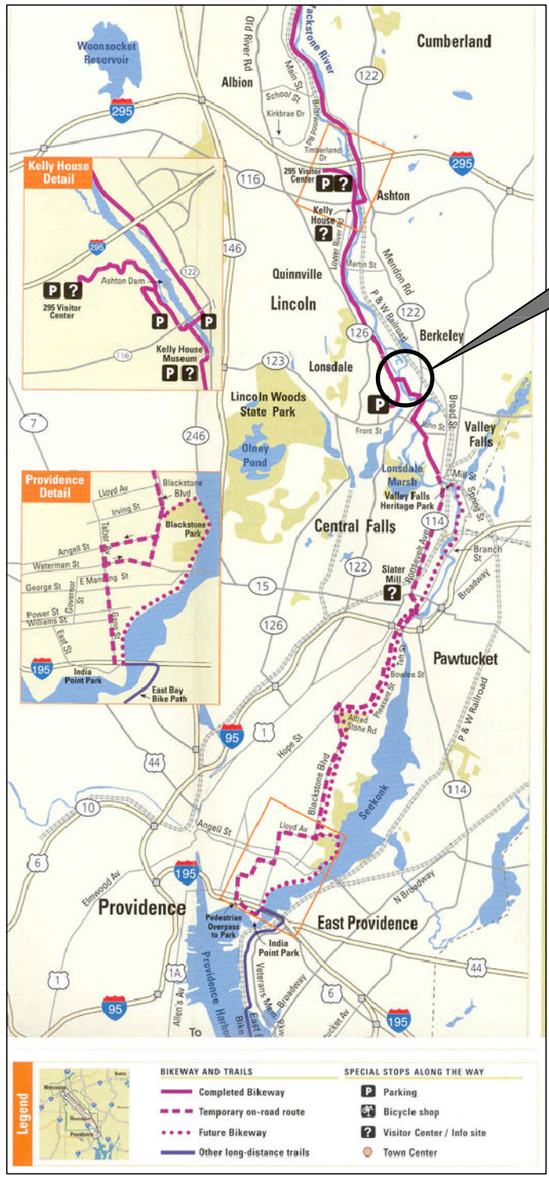
Company purchased this section of the Canal after the closure of Canal operations in 1848. The company built the Lonsdale Spillway in the early 20th century to improve the water control at this location.

- *Introduction to the Canal as a state-wide resource* –The area's strong connectivity to a variety of visitors and their modes of transportation (canoe, kayak, bicycle, or on foot) results in this area being a very good location for a panel that explains, both in words and in a graphic, where the canal ran throughout the state and how it was connected via an engineered canal trench, as well as rivers and ponds. A location near a canoe/kayak portage site and the Bikeway – either at the north or south end of the study area is suggested.

- *Staged interpretive event or activity* – Again, the nexus of visitors with proximity to parking and the Kelly House Museum could support a one-time or possible annual event to help highlight the specific history of this area.

We also recommend developing a self guided walking tour brochure for the Kelly House Museum/ Ashton Meadows. This was part of an original interpretive proposal for the Kelly House which was never implemented. The brochure could relate the information and stories provided within the museum but enable a visitor to view and experience the historic landscape firsthand.

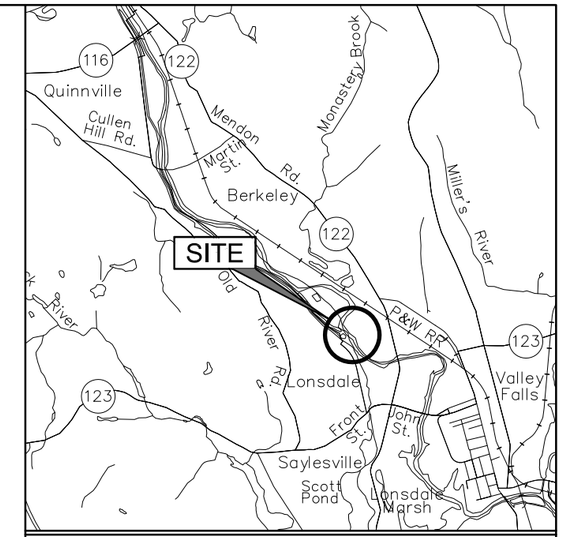
Appendix A: Concept Plans



BLACKSTONE RIVER VALLEY
NATIONAL HERITAGE CORRIDOR
(PARTIAL)

PROJECT LOCATION

BLACKSTONE CANAL ALTERNATIVE TRANSPORTATION FEASIBILITY STUDY



INDEX

SHEET	SUB SHEET	TITLE OF SHEET
1		COVER SHEET
2	S1	GENERAL NOTES
3	S2	SITE SPECIFIC NOTES
4	S3	SITE PLAN
5	S4	LONGITUDINAL SECTION
6	S5	CONCRETE SLUICEWAY REPAIR DETAILS
7	S6	DECK PLAN AND MACHINERY PLATFORM PLAN
8	S7	SLUICEWAY GATE DETAILS

GS–10–0281R
–

200 0 200 400
SCALE OF FEET

CONSTRUCTION DRAWINGS

UNITED STATES
DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE
DENVER SERVICE CENTER

TITLE OF PROJECT
LONSDALE SPILLWAY GATE
LOCATION WITHIN PARK
WEST OF PRATT DAM BRIDGE
NAME OF PARK
BLACKSTONE RIVER STATE PARK

REGION	COUNTY	STATE
NORTHEAST	PROVIDENCE	RHODE ISLAND

DRAWING NO. – –
PMIS/PKG NO. –
SHEET 1 OF 8

BASIC DATA: –

8/8/11 12:44 FISANTOS R17 \\WHB\PROJ\PROVIDENCE\33281.02\CAD\ST\PLANSET\LONSDALE SPILLWAY\ORLANDO\LONSDALE SPILLWAY\ORLANDO\RI_BIKEWAY_MAP_JPG_2009.TIFF; IMAGES: \\RIDATA\PROJECTS\33281.02\CAD\ST\PLANSET\LONSDALE SPILLWAY\ORLANDO\LONSDALE COVER.DWG

DESIGN SPECIFICATIONS

DESIGN SPECIFICATION: RHODE ISLAND STATE BUILDING CODE (IBC 2009)

LOADING: ASCE 7–05, MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES

CONCRETE: AMERICAN CONCRETE INSTITUTE (ACI) BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE (318–08)

STRUCTURAL STEEL: AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) STEEL CONSTRUCTION MANUAL 13TH EDITION

WELDING: AMERICAN WELDING SOCIETY (AWS) D1.1 –STEEL

TIMBER: NATIONAL DESIGN SPECIFICATION (NDS) FOR WOOD CONSTRUCTION – 2005

ENVIRONMENTAL LOADS

PEDESTRIAN LIVE LOAD ON WALKWAY: 40 PSF

VEHICLE LIVE LOAD ON WALKWAY: H–5

WIND: BASIC WIND SPEED 100 MPH

SNOW LOAD: 35 PSF

FLOOD CONDITION – WATER ELEVATION: +XX.XX

NORMAL CONDITION – WATER ELEVATION: +XX.XX

TEMPERATURE:
- STEEL: 0 TO 120 DEGREES FAHRENHEIT
- CONCRETE: 45 DEGREES FAHRENHEIT (RISE), 35 DEGREES FAHRENHEIT (FALL)

GENERAL NOTES

ALL ELEVATIONS ARE REFERENCED TO N.G.V.D 1929 DATUM.

COORDINATES USED ON THESE PLANS ARE BASED ON THE STATE RECTANGULAR COORDINATE SYSTEM. (NAD 83).

DIMENSIONS, STATIONS, AND ELEVATIONS ARE SHOWN TO THE NEAREST ONE–HUNDREDTH OF A FOOT OR ONE–EIGHTH OF AN INCH.

DIMENSIONS ARE BASED ON FIELD MEASUREMENTS AND SURVEY TAKEN IN JUNE 2011. THE CONTRACTOR SHALL FIELD VERIFY ALL ELEVATIONS AND DIMENSIONS PRIOR TO THE COMMENCEMENT OF WORK.

CONSTRUCTION ACCESS

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPERATION AND MAINTENANCE OF THE CONSTRUCTION SITE AND CONSTRUCTION ACCESS AREAS.

THE CONTRACTOR SHALL PLACE ALL EQUIPMENT AND MATERIAL IN HIS FIELD YARD OR AT A SITE APPROVED BY THE ENGINEER. THE EQUIPMENT AND MATERIAL SHALL BE PLACED IN A STORAGE AREA SO AS NOT TO CAUSE A SAFETY HAZARD.

THE CONTRACTOR IS REQUIRED TO THOROUGHLY INSPECT THE EXISTING GRAVEL ACCESS ROAD WHICH IS THE SOLE MEANS OF SURFACE ACCESS. THE CONTRACTOR'S CLEARING ACTIVITIES SHALL BE LIMITED TO SELECTIVE TREE/LIMB TRIMMING ALONG THE ACCESS, AT NO ADDITIONAL COST TO THE OWNER. IF THE CONTRACTOR SELECTS EQUIPMENT WHICH REQUIRES ANY VEGETATIVE CLEARING, THE CONTRACTOR, AT HIS SOLE EXPENSE, WILL BE REQUIRED TO APPLY FOR AND OBTAIN THE NECESSARY R.I.D.E.M. PERMITS. ALSO, IF THE CONTRACTOR'S EQUIPMENT DISTURBS THE GROUND COVER, THE CONTRACTOR WILL BE REQUIRED TO IMMEDIATELY COVER THE DISTURBED AREA WITH 6" CRUSHED STONE, AND UPON PROJECT COMPLETION, RESTORE THE AREAS TO THEIR ORIGINAL CONDITION.

ALL AREAS WHERE EQUIPMENT, MATERIALS AND/OR MACHINERY ARE TO BE PLACED OR STATIONED MUST FIRST BE LINED WITH 6" OF CRUSHED STONE (1–2" DIA.), UPON PROJECT COMPLETION ALL WORK AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION. THE ABOVE MEASURES ARE TO BE INCLUDED IN THE CONTRACTORS BID PRICE. NO SPECIAL PAYMENT IS TO BE PROVIDED.

EROSION AND SEDIMENT CONTROL

THE CONTRACTOR SHALL BE REQUIRED TO INSTALL TEMPORARY EROSION CONTROLS AT THE LOCATIONS INDICATED ON THE PLANS AND THE LOCATIONS WARRANTED IN ANY PERMIT STIPULATIONS. THESE CONTROLS MUST BE INSTALLED PRIOR TO ANY WORK AND SHALL BE REMOVED UPON PROJECT COMPLETION AT NO ADDITIONAL COST. ANY MATERIALS WHICH INADVERTENTLY ENTER THE WATERWAYS/WETLAND AREAS SHALL BE IMMEDIATELY AND COMPLETELY REMOVED AT THE CONTRACTOR'S EXPENSE.

SILT FENCING MUST BE PLACED SURROUNDING ALL STOCKPILES AND STATIONARY MACHINERY/EQUIPMENT LOCATIONS.

ALL DISTURBED AREA IS TO BE IMMEDIATELY REPAIRED BY THE CONTRACTOR AND TEMPORARILY STABILIZED WITH JUTE MESH OR, WHEN DEEMED APPROPRIATE BY THE ENGINEER, CRUSHED STONE

SEDIMENT REMOVED FROM EROSION CONTROL STRUCTURES SHALL BE DISPOSED OF IN A MANNER WHICH IS CONSISTENT WITH THE INTENT OF THIS PLAN. ALL HAY BALES OR SILT FENCE RETAINING SEDIMENT OVER 6" HIGH SHALL HAVE THE SEDIMENT REMOVED AND ALL DAMAGED EROSION CONTROLS REMOVED AND REPLACED.

PRIOR TO PERFORMING WORK ON THE UPSTREAM DIVERSION STRUCTURE, THE CONTRACTOR SHALL BE REQUIRED TO PLACE A 'FLOATING TURBIDITY BOOM' IMMEDIATELY DOWNSTREAM OF THE WORK AREA. THE CONTRACTOR WILL BE REQUIRED TO SUBMIT FOR APPROVAL FROM THE ENGINEER AND R.I.D.E.M. A SHOP DRAWING OF THE BOOM TO BE UTILIZED.

DEWATERING PROGRAM

THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE SITE CONDITIONS (SURFACE AND SUBSURFACE) AND HYDROLOGIC DATA AND, BASED UPON THIS INFORMATION, SHALL PREPARE A COMPLETE DEWATERING PLAN WHICH MUST ADDRESS THE METHODS AND COMPONENTS OF THE DEWATERING SYSTEM. THE CONTRACTOR'S DEWATERING PLAN SHALL BE SUBMITTED TO THE OWNER FOR APPROVAL. APPROVAL OF THIS PLAN REPRESENTS A GENERAL APPROVAL OF THE PROPOSED METHODS AND DOES NOT RELIEVE THE CONTRACTOR'S RESPONSIBILITY OF THE SYSTEM'S EFFECTIVENESS. THE DEWATERING PROCEDURES MUST MAINTAIN A SAFE AND DRY WORKING AREA.

THE DEWATERING SYSTEM WILL INCLUDE ALL NECESSARY PUMPS, EQUIPMENT, LABOR AND MATERIALS NECESSARY TO DEWATER THE WORK SITE.

THE DEWATERING SYSTEM SHALL BE OPERATED CONTINUOUSLY, 24 HOURS PER DAY, 7 DAYS PER WEEK UNTIL SUCH TIME AS ALL CONSTRUCTION WORK BELOW NORMAL WATER LEVELS IS COMPLETE.

THE SELECTION OF SIZE AND SPACING AND TYPE OF DEWATERING EQUIPMENT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

UPON COMPLETION OF THE DEWATERING WORK, THE CONTRACTOR SHALL REMOVE ALL EQUIPMENT AND LEAVE THE CONSTRUCTION AREA IN A NEAT, CLEAN AND ACCEPTABLE CONDITION.

EXTREME CARE MUST BE EXERCISED TO ENSURE NO IMPACT ON THE EXISTING RETAINING WALLS AND ALL EXISTING STRUCTURES.

MATERIALS

ALL WORK SHALL BE IN CONFORMANCE WITH THE "RHODE ISLAND DEPARTMENT OF TRANSPORTATION (RIDOT) STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" AND "RHODE ISLAND STANDARD DETAILS", STATE OF RHODE ISLAND, DEPARTMENT OF TRANSPORTATION, 2004 EDITION AND ALL SUBSEQUENT ADDITIONS, REVISIONS AND ADDENDA, UNLESS OTHERWISE NOTED.

STEEL PILES MATERIAL AND INSTALLATION SHALL CONFORM TO RIDOT SECTION 804.

CONCRETE SHALL CONFORM TO RIDOT SECTION 601 CLASS XX WITH A MINIMUM COMPRESSIVE STRENGTH (f'c) OF 5000 PSI.

REINFORCING STEEL SHALL CONFORM TO RIDOT SECTION 810. REINFORCING STEEL SHALL BE ZINC COATED (GALVANIZED) IN ACCORDANCE WITH ASTM A767.

STRUCTURAL STEEL SHALL CONFORM TO RIDOT SECTION 824 AND ASTM A709 GRADE 50.

TIMBER SHALL CONFORM TO REQUIREMENTS OF THE SOUTHERN PINE INSPECTION BUREAU INSPECTION RULES, LATEST EDITION, OR THE REQUIREMENTS OF THE WEST COAST BUREAU OF LUMBER GRADE AND INSPECTION FOR SOUTHERN YELLOW PINE NO.1 GRADE, SR WITH MINIMUM ALLOWABLE BENDING STRESS (Fb) OF 1,300 PSI. TIMBER MEMBERS WITH DIMENSIONS 5"X 5" OR LARGER SHALL CONFORM TO SOUTHERN YELLOW PINE, SELECT STRUCTURAL GRADE, SR WITH MINIMUM ALLOWABLE TENSION STRESS OF (Ft) of 1,000 PSI.

MAINTENANCE OF PUBLIC ACCESS

THE CONTRACTOR SHALL KEEP ALL WALKWAYS UNOBSTRUCTED. IF, IN THE OPINION OF THE OWNER, THE INTEREST OF ABUTTERS AND THE PUBLIC REQUIRES IT, THE CONTRACTOR SHALL PROVIDE SUCH TEMPORARY MEANS OF CROSSING OR GUARDING ACCEPTABLE TO THE OWNER. THIS DOES NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY OF PROTECTING THE PROJECTS WORKERS, VEHICULAR TRAFFIC AND PEDESTRIAN TRAFFIC IN AND ADJACENT TO THE LIMITS OF WORK.

ANTICPATED OPERATION PROCEDURE

GATE FUNCTION:
- THE PURPOSE OF THE PROPOSED, GATE IS TO REPLACE THE CANAL'S ORIGINAL VERTICAL SLIDE GATE WHICH OFFERED TWO (2) CRITICAL 'FUNCTIONS:'
  - MAINTENANCE: OPEN DURING LOW–FLOW CONDITIONS TO ALLOW FOR MAINTENANCE OF THE CANAL, INCLUDING SLOPE STABILIZATION, WALL REPAIR, SEDIMENT REMOVAL, CHANNEL STABILIZATION, ETC.
  - FLOOD PROTECTION: OPEN DURING HIGH–FLOW CONDITIONS TO PREVENT THE UPSTREAM OVERTOPPING OF THE CANAL'S BANKS WHICH COULD POTENITALLY RESULT IN SIGNIFICANT BANK EROSION AND A COMPLETE BREECH BETWEEN THE CANAL AND THE BLACKSTONE RIVER.

AGENCY COORDINATION:
- R.I.D.E.M. SHALL ESTABLISH A LINE OF COMMUNICATION BETWEEN THE LINCOLN POLICE AND FIRE DEPARTMENTS, THE R.I.D.E.M. DAMS SECTION AND THE R.I.D.E.M. DIVISION OF PLANNING AND DEVELOPMENT TO CREATE A SLUICE GATE OPENING PLAN BASED ON FLOW RATES AND WATER LEVELS IN THE BLACKSTONE RIVER. PERIODICALLY REVIEW AND ADJUSTMENT OF THIS PLAN WILL BE CONDUCTED.

- NO CLOSURE/OPENING IS TO OCCUR WITHOUT ADVANCED NOTIFICATION TO THE ABOVE PARTIES.

MAINTENANCE INSPECTIONS:

- ON AN ANNUAL BASIS, R.I.D.E.M. ENGINEERS SHALL PERFORM A STRUCTURAL INSPECTION OF THE GATE STRUCTURE, INCLUDING ALL SYSTEM COMPONENTS, WALKWAY, ETC. AND IDENTIFY POTENTIAL DEFICIENCIES. THE STRUCTURAL ENGINEER SHALL SUBMIT A CHECKLIST TO THE CHIEF OF R.I.D.E.M. DIVISION OF PLANNING AND DEVELOPMENT OF ALL SYSTEM COMPONENTS AND IDENTIFY THE COMPONENT CONDITION, NEED FOR ACTION AND APPROPRIATE MITIGATION/REPAIR.
- ON A ROUTINE BASIS, PARTICULARLY FOLLOWING A HIGHER THAN NORMAL FLOW EVENT, R.I.D.E.M. ENGINEERS SHALL PERFORM AN INSPECTION OF THE GATE STRUCTURE, INCLUDING ALL SYSTEM COMPONENTS, WALKWAY, ETC. FOR DEBRIS CAUGHT ON THE STRUCTURE. THE ENGINEER SHALL CREATE AND EXECUTE A PLAN TO REMOVE THE DEBRIS AND RETURN THE GATE TO NORMAL OPERATION.

DESIGNED: AD	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CADD FIS	S1	LONSDALE SPILLWAY GATE GENERAL NOTES	———
TECH. REVIEW:			PMIS/PKG NO.
DATE: 8/2011		BLACKSTONE RIVER STATE PARK	SHEET 2 OF 8

8/12/11 13:08 FISANTOS R17 \\VHB\PROJ\PROVIDENCE\33281.02\CAD\ST\PLANSET\LONSDALE SPILLWAY\ORLANDO\LONSDALE S1.DWG

GENERAL REPAIR NOTES

ALL DIMENSIONS SHALL BE FIELD VERIFIED.

ALL REPAIRS SHALL PRESERVE THE HISTORIC APPEARANCE, CHARACTURE, AND OPERATIONS OF THE COMPONENTS.

EXCEPT WHERE NOTED, WHEREVER POSSIBLE, EXISTING MATERIALS SHALL BE REPAIRED AND REHABILITATED TO THE ORIGINAL DESIGN AND WORKING CONDITION.

WHERE THE DETERIORATION OF COMPONENTS IS SO SEVERE AS TO ELIMINATE REPAIR AS AN OPTION, THE ORIGINAL COMPONENTS SHALL BE REPLACED WITH MATCHING AND HISTORICALLY ACCURATE MATERIALS.

VERIFY THE ALIGNMENT OF ALL COMPONENTS ON THE GATE MACHINERY AND GATE TO ENSURE PROPER WORKING CONDITION AND OPERATION.

INSTALL WEATHER RESISTANT LOCKS AND CHAINS TO SECURE THE GATE OPERATOR.

SITE WORK

THE CONTRACTOR SHALL DO ALL SITE WORK AS REQUIRED TO COMPLETE THE WORK AS SHOWN ON THE DRAWINGS.

TO THE BEST KNOWLEDGE OF THE ENGINEER AND ACCORDING TO ALL READILY AVAILABLE INFORMATION, THE SITE PLAN INDICATES ALL PHYSICAL OBSTACLES, BOTH ABOVE AND BELOW GRADE. HOWEVER, THE ENGINEER DOES NOT IN ANY WAY GUARANTEE THE COMPLETENESS NOR CORRECTNESS OF THE SITE PLAN INSOFAR AS THE UNDETECTED OBSTACLES TO THE PROPOSED CONSTRUCTION IS CONCERNED.

THE CONTRACTOR MUST RELY ON HIS OWN JUDGEMENTS AND DETERMINATION IN ESTIMATING THE AMOUNT OF WORK INVOLVED IN PREPARING THE SITE FOR CONSTRUCTION.

IN ADDITION TO PROJECT AND SITE SPECIFIC SPECIFICATIONS, ALL WORK MUST BE IN CONFORMANCE WITH THE "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" AND THE "RHODE ISLAND STANDARD DETAILS," STATE OF RHODE ISLAND, DEPARTMENT OF TRANSPORTATION, 2010 EDITION AND ALL SUBSEQUENT ADDITIONS, REVISIONS AND ADDENDA.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COORDINATION WITH UTILITY COMPANIES.

IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY ALL ELEVATIONS, DIMENSIONS, DETAILS, ANGLES, STRUCTURAL MEMBER SIZES, AND LAYOUTS AS SHOWN ON THESE PLANS. THIS PRIOR FIELD VERIFICATION IS ESPECIALLY PERTINENT FOR PRE–FABRICATED STRUCTURAL ITEMS AND WORK IN THE VICINITY OF UTILITIES.

THE CONTRACTOR SHALL TAKE THE PROPER PRECAUTION TO ENSURE THE STABILITY OF ALL STRUCTURAL ELEMENTS DURING ALL PHASED CONSTRUCTION UNTIL THE TOTAL STRUCTURE IS IN PLACE.

CONTRACTOR SHALL CALL DIG SAFE AT LEAST 72 HOURS PRIOR TO STARTING THE WORK TO VERIFY LOCATIONS OF EXISTING UTILITIES.

IT IS THE CONTRACTOR'S RESPONSIBILITY TO AVOID ANY DAMAGE TO THE UTILITIES, DRAINAGE, AND GATE MACHINERY.

EXISTING UTILITIES

THE CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES WITHIN THE PROJECT LIMITS AND EXERCISE CAUTION NOT TO DISTURB EXISTING UTILITIES UNLESS NOTED OTHERWISE. ANY DAMAGE TO EXISTING UTILITY LINES SHALL BE REPAIRED AS DIRECTED BY THE CONTRACTOR AT NO EXPENSE TO THE OWNER.

BACKFILLING

AFTER COMPLETING THE NECESSARY WORK, EXCAVATED AREAS SHALL BE COMPACTED PRIOR TO BACKFILLING. BACKFILLED AREAS SHALL BE COMPACTED IN A MAXIMUM OF 8" LIFTS BY AN APPROPRIATE MECHANICAL TAMPER TO ACHIEVE NOT LESS THAN 95% MAXIMUM DENSITY (MODIFIED METHOD). NO BACKFILL SHALL BE PLACED UPON A SURFACE OF FROZEN MATERIAL, NOR SHALL SNOW, ICE OR FROZEN MATERIAL BY INCORPORATED INTO ANY FILL.

GRAVEL BORROW

WHERE SHOWN ON THE DRAWINGS, GRAVEL BORROW SHALL CONFORM TO TABLE 1 IN SUBSECTION M.01.09 AND PARAGRAPH M.01.02 GRAVEL BORROW OF THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.

SLAB, STONE, AND UNSUITABLE MATERIAL REMOVAL

ALL SLABS, STONE, BOULDERS, ORIGINAL SILL AND RETAINING WALL REMNANTS, SOIL AND OTHER ITEMS ENCOUNTERED REQUIRING REMOVAL TO DO THE WORK SHALL BE DEPOSITED OFF SITE OR AS DIRECTED BY THE OWNER. UNSUITABLE MATERIAL ALSO INCLUDES SOD, MUCK, ORGANIC SILT, PEAT, ORGANICS, LOOSE ROCK OR OTHER ITEMS DETRIMENTAL TO THE WORK.

COMMON BORROW

COMMON BORROW SHALL CONFORM TO DIVISION III, SECTION M.01.01 OF THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.

REMEDIAL WORK DUE TO CRACKING

CRACKING OF CONCRETE WORK UNDER THIS SECTION DUE TO SETTLEMENT OF FILLED AREAS, RESULTING IN DIFFERENTIAL SETTLEMENT OF SLAB, POOR WORKMANSHIP, EXCESSIVELY WET CONCRETE OR OTHER CAUSES, SHALL BE EVALUATED BY THE ENGINEER.

IF IN HIS OPINION, CRACKS ARE CAUSED BY POOR WORKMANSHIP, FAILURE TO ADHERE TO SPECIFICATIONS OR IMPROPER USE OF SLABS AFTER PLACING, THE CONTRACTOR SHALL SATISFACTORILY REPAIR SUCH CRACKS, USING METHODS REVIEWED BY THE ENGINEER. IN GENERAL, REMOVAL/REPLACEMENT, EPOXY ADHESIVES OR EPOXY MORTORS WILL BE REQUIRED, RATHER THAN CEMENTIOUS MATERIALS.

CONCRETE NOTES

THE CONTRACTOR SHALL FURNISH, DELIVER, AND INSTALL ALL LABOR AND MATERIALS, TOOLS, AND EQUIPMENT AS REQUIRED TO COMPLETE ALL CONCRETE WORK AS SHOWN ON THE DRAWINGS AND SPECIFIED HEREIN:

A. CONCRETE COLUMNS
B. CONCRETE SLABS AND PLATFORMS
C. CONCRETE REPAIR

CLASSES OF CONCRETE SHALL BE XX AS DESCRIBED IN THE LATEST REVISION OF TABLES (1) AND (2) UNDER SECTION 601 "PORTLAND CEMENT CONCRETE" OF THE RHODE ISLAND STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION AND THE SPECIAL PROVISIONS OF THE SPECIFICATIONS.

ALL PORTLAND CEMENT CONCRETE SHALL BE AIR–ENTRAINED.

REINFORCING STEEL SHALL CONFORM TO AASHTO DESIGNATION M 31 (ASTM DESIGNATION A 615) GRADE 60. ALL WIRE TIES AND MISCELLANEOUS HARDWARE USED FOR PLACEMENT OF GALVANIZED REINFORCING SHALL BE NON–METALIC.

REINFORCING STEEL SHALL BE GALVANIZED PER ASTM A767 CLASS 1 (GALVANIZED STEEL).

WELDED WIRE FABRIC FOR REINFORCING SHALL CONFORM TO AASHTO DESIGNATION M 55 (ASTM DESIGNATION A 185) GRADE 60.

UNLESS OTHERWISE SPECIFIED ALL REINFORCING BARS SHALL HAVE THE FOLLOWING MINIMUM COVER:

		MINIMUM COVER
CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH (FOOTINGS, ABUTMENT AND WALL FACES, BACKWALLS)		3"
STIRRUPS, TIES AND SPIRALS		$1\frac{1}{2}$"
DECK SLABS	TOP	3" ($+\frac{1}{4}$", –0")
	BOTTOM	1" ($+\frac{1}{8}$", –0")
CONCRETE DIRECTLY EXPOSED TO SALT OR BRACKISH WATER		4"
ALL OTHER BARS		2"

UNLESS OTHERWISE NOTED, ANCHOR BOLTS SHALL BE ASTM DESIGNATION A 307, AND SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO DESIGNATION M 232 (ASTM DESIGNATION A 153), OR METALIZED IN A MANNER APPROVED BY THE ENGINEER. SUCH APPROVAL DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY TO PREVENT CONCRETE STAINS OR DISCOLORATIONS. SWEDGED RODS SHALL BE AASHTO DESIGNATION M 270 (ASTM DESIGNATION A 709) GRADE 36 AND SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO DESIGNATION M 232 (ASTM DESIGNATION A 153).

ALL ANCHOR BOLTS SHALL BE SET PRIOR TO PLACEMENT OF CONCRETE UNLESS OTHERWISE AUTHORIZED BY THE ENGINEER.

HORIZONTAL CONSTRUCTION JOINTS OTHER THAN THOSE SHOWN ON PLANS WILL NOT BE PERMITTED WITHOUT A WRITTEN REQUEST BY THE CONTRACTOR AND PRIOR AUTHORIZATION BY THE ENGINEER.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREVENTING CONCRETE STAINS OR DISCOLORATIONS DURING CONSTRUCTION UNTIL SUCH TIME AS THE SURFACES ARE APPROVED AND ACCEPTED BY THE ENGINEER. ANY CONCRETE STAINS OR DISCOLORATION OCCURRING PRIOR TO ACCEPTANCE OF THE SURFACES SHALL BE REMOVED BY THE CONTRACTOR AT HIS OWN EXPENSE.

UNLESS OTHERWISE NOTED ON THE PLANS JOINT FILLER IS TO BE PREFORMED, NON–EXPANSIVE, NON–EXTRUDING TYPE IN ACCORDANCE WITH SECTION M.02.11.1 OF THE RHODE ISLAND STATE STANDARD SPECIFICATIONS.

IN ACCORDANCE WITH THE RHODE ISLAND STANDARD SPECIFICATIONS, ALL METAL TIES OR ANCHORAGES WHICH ARE REQUIRED FOR CONCRETE FORMWORK SHALL BE SO CONSTRUCTED THAT THEY CAN BE REMOVED TO AT LEAST TWO INCHES FROM THE EXPOSED SURFACE OF THE CONCRETE WITHOUT CAUSING DAMAGE TO THE CONCRETE SURFACE. SNAP TIES MAY BE USED ONLY IF APPROVED BY THE ENGINEER. IF THE CONTRACTOR PROPOSES TO USE THEM HE MUST SUBMIT A CATALOG CUT AND OTHER NECESSARY INFORMATION TO THE ENGINEER TO DEMONSTRATE THAT THE TIES WILL SNAP–OFF FAR ENOUGH INTO THE CONCRETE TO ALLOW FOR PROPER PATCHING. SNAP TIES MUST PROVIDE ADEQUATE STRENGTH TO SUPPORT THE FORMS. ALL CAVITIES SHALL BE FILLED WITH AN APPROVED CEMENT MORTAR TO THE SATISFACTION OF THE ENGINEER.

REINFORCEMENT NOTE

THE CONTRACTOR'S BAR FABRICATOR SHALL VERIFY THE CORRECTNESS IN PREPARING HIS ORDER LISTS AND BENDING DIAGRAMS. ANY EXPENSE INCIDENT TO REVISION OF MATERIAL AS SHOWN ON THE ORDER LISTS AND BENDING DIAGRAMS IN ORDER TO MAKE IT COMPLY WITH THE DESIGN DRAWINGS SHALL BE BORNE BY THE CONTRACTOR. SHOP DRAWINGS FOR ALL REINFORCEMENT DETAILS AND SCHEDULE SHALL BE SUBMITTED TO THE ENGINEER IN SUFFICIENT TIME TO PERMIT CAREFUL CHECKING.

THE CONTRACTOR SHALL LOCATE AND SET ALL REINFORCING BARS, ETC., IN ACCORDANCE WITH THE APPROVED SHOP DRAWINGS.

COLD WEATHER REQUIREMENTS

AFTER THE FIRST FROST AND UNTIL THE MEAN DAILY TEMPERATURE AT THE SITE FALLS BELOW 40 DEGREES (F) FOR MORE THAN ONE DAY, PROTECT CONCRETE FROM FREEZING FOR NOT LESS THAN THE FIRST 48 HOURS AFTER IT IS PLACED.

WHEN THE MEAN DAILY TEMPERATURE IS BELOW 40 DEGREES (F) FOR MORE THAN ONE DAY, CONCRETE SHALL THEREAFTER BE PLACED AT A TEMPERATURE NOT LOWER THAN 55 DEGREES (F) AND NOT HIGHER THAN 70 DEGREES (F) AND SHALL BE MAINTAINED NOT LOWER THAN 55 DEGREES (F) FOR AT LEAST THE FIRST THREE DAYS. DURING THE NEXT THREE DAYS, PROTECT IT FROM FREEZING.

WHEN THE MEAN DAILY TEMPERATURE RISES ABOVE 40 DEGREES (F) FOR MORE THAN THREE SUCCESSIVE DAYS, PROTECT THE CONCRETE FROM FREEZING FOR NOT LESS THAN 40 HOURS AFTER PLACING. AVOID RAPID DRY OUT OF CONCRETE DUE TO OVERHEATING AND AVOID THERMAL SHOCK DUE TO SUDDEN HEATING AND COOLING.

JOINT SEALANT

ALL JOINT SEALANT SHALL BE POLYURETHANE BASE UNLESS OTHERWISE DESIGNATED ON THE PLANS. THE COLOR OF THE JOINT SEALANT, WHERE EXPOSED, SHALL BE NEUTRAL (LIGHT GRAY OR TAN). THE COLOR OF THE SEALANT, WHERE NOT EXPOSED, WILL BE AT THE DISCRETION OF THE CONTRACTOR.

SEALS SHALL BE ON NON–SAG CONSISTENCY FOR VERTICAL JOINTS AND SHALL BE APPLIED BY GUN OR SPATULA. PRIMERS SHALL BE USED WHEN RECOMMENDED BY THE MANUFACTURER.

ALL SURFACES TO WHICH SEALANTS ARE TO BE APPLIED SHALL BE THOROUGHLY CLEANED TO REMOVE ALL LOOSE CONCRETE, DIRT, OIL, GREASE, PAINT, LACQUER, RUST, SCALES, BITUMINOUS OR OTHER FOREIGN MATERIALS. PROJECTIONS OF CONCRETE INTO JOINT SPACES SHALL BE REMOVED. LOOSE PARTICLES OR DIRT SHALL BE REMOVED AND THE JOINT SHALL BE DRY BEFORE APPLICATION OF PRIMER AND/OR SEALER.

DRILL AND GROUT REINFORCING BARS

THE WORK UNDER THIS ITEM INVOLVES THE SETTING OF REINFORCING BAR DOWELS IN EXISTING CONCRETE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER.

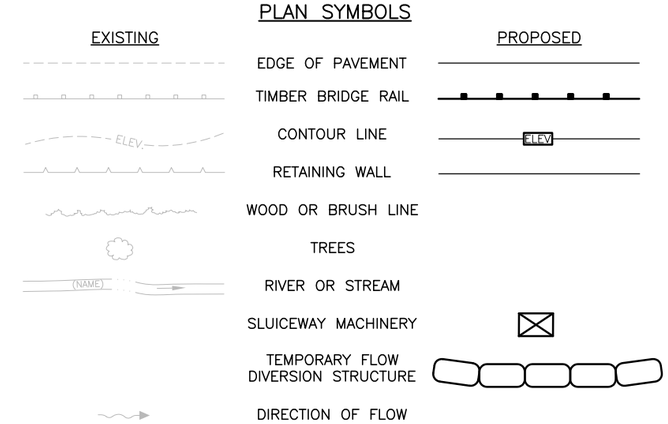
ALL REINFORCING DOWEL BARS SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION A–615, GRADE 60.

THE HOLES FOR THE BARS SHALL BE DRILLED AT THE DESIGNATED LOCATIONS. THE MINIMUM DIAMETER OF THE HOLES AND THE REQUIRED EMBEDMENT SHALL BE AS SHOWN BELOW:

A. #4 BARS – PROVIDE A HOLE DIAMETER OF 1.25 INCHES WITH 8 INCHES OF EMBEDMENT LENGTH
B. #5 BARS – PROVIDE A HOLE DIAMETER OF 1.375 INCHES WITH 10 INCHES OF EMBEDMENT LENGTH
C. #6 BARS – PROVIDE A HOLE DIAMETER OF 1.50 INCHES WITH 12 INCHES OF EMBEDMENT LENGTH

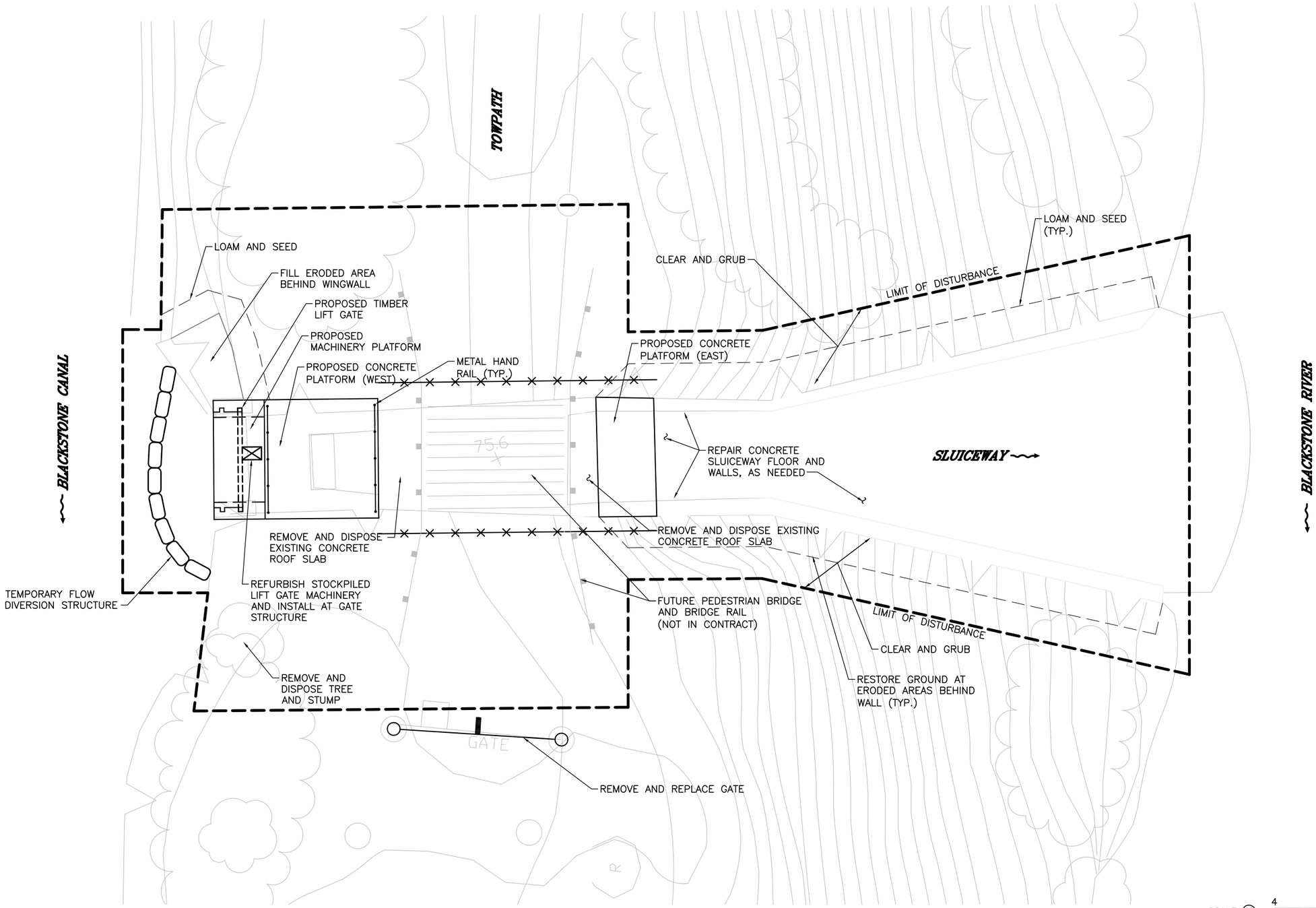
THE HIGH STRENGTH, NON–SHRINK GROUT SHALL BE SUITABLE FOR OUTDOOR USE, AND IT SHALL HAVE A MINIMUM COMPRESSION STRENGTH OF 8,000 PSI AFTER 28 DAYS AS DETERMINED BY TESTING UNDER ASTM DESIGNATION C109. IT SHALL NOT EXHIBIT ANY MEASURABLE DECREASE IN VOLUME AFTER CURING. ALL GROUT MATERIALS MUST BE ON THE RIDOT APPROVED MATERIAL LIST.

PLAN SYMBOLS



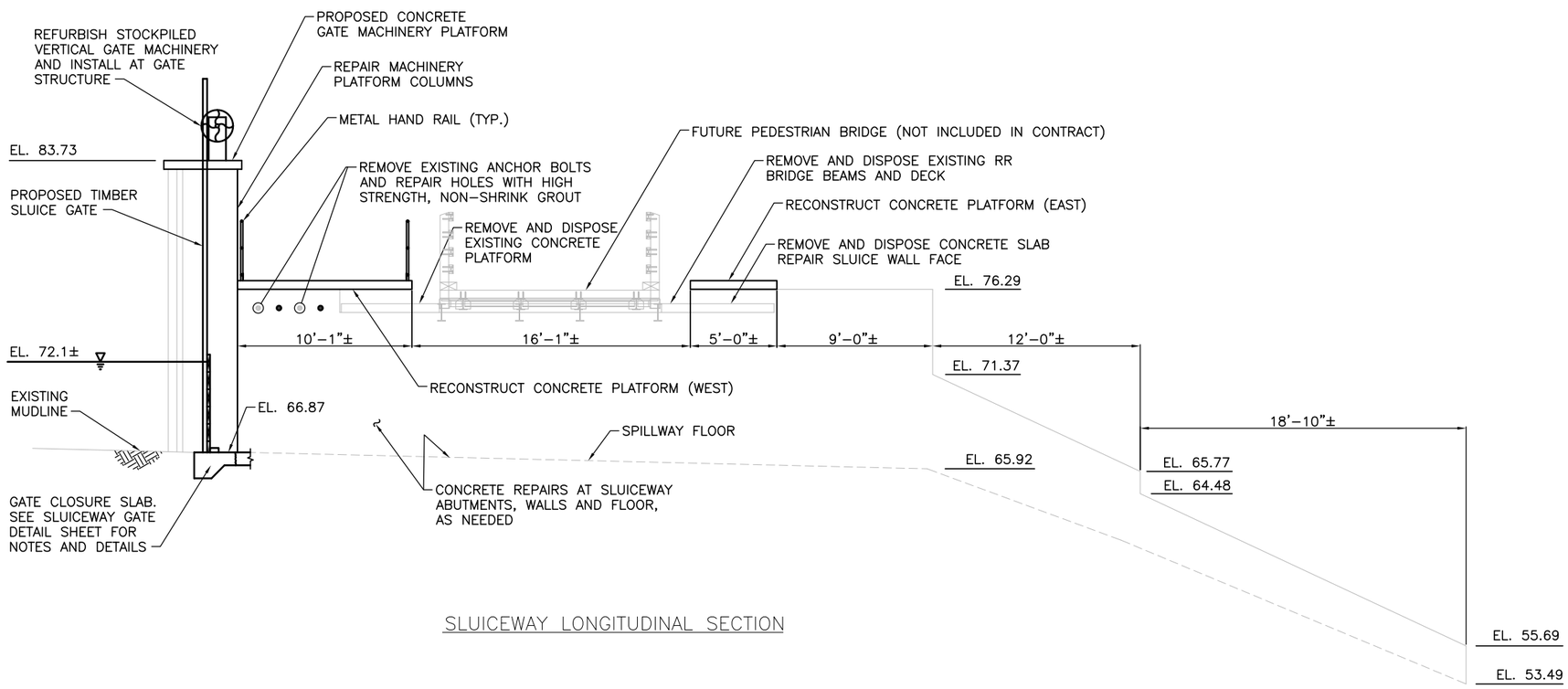
DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
AD CADD FIS TECH. REVIEW: DATE: 8/2011	S2	LONSDALE SPILLWAY GATE SITE SPECIFIC NOTES BLACKSTONE RIVER STATE PARK	—— PMIS/PKG NO. SHEET 3 OF 8

8/12/11 13:08 FISANTOS R17 \\VHB\PROJ\PROVIDENCE\33281.02\CAD\ST\PLANSET\LONSDALE SPILLWAY\ORLANDO\LONSDALE S2.DWG



DESIGNED: AD	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CADD FIS	S3	LONSDALE SPILLWAY GATE SITE PLAN	PMIS/PKG NO.
TECH. REVIEW:		BLACKSTONE RIVER STATE PARK	SHEET 4 OF 8
DATE: 8/2011			

8/12/11 12:36 FISANTOS R17 \\VHB\PROJ\PROVIDENCE\33281.02\CAD\ST\PLANSET\LONSDALE SPILLWAY\ORLANDO\LONSDALE S3.DWG

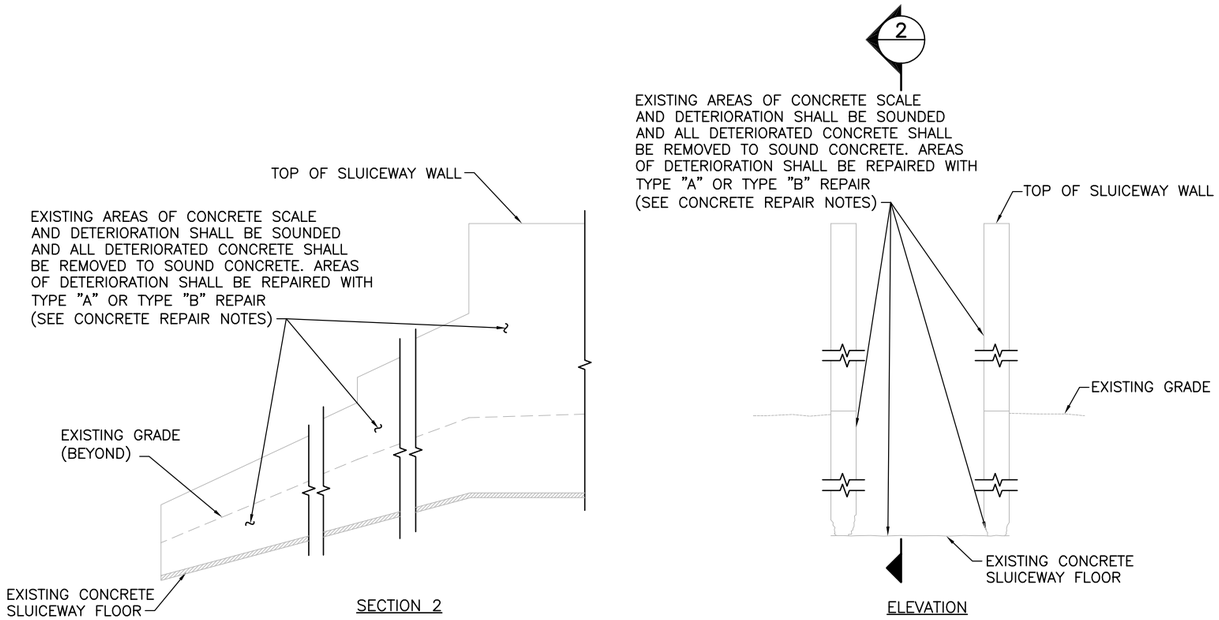


SLUICEWAY LONGITUDINAL SECTION

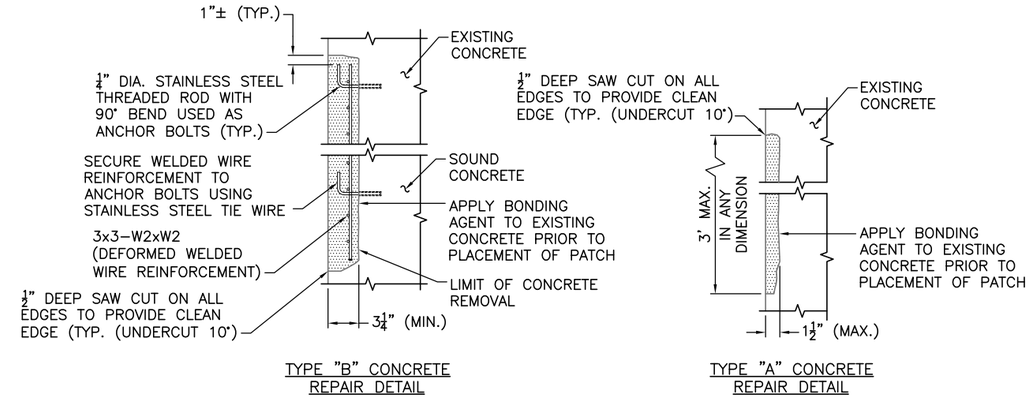
4 0 4 8
SCALE OF FEET

DESIGNED: AD	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CADD FIS	S4	LONSDALE SPILLWAY GATE LONGITUDINAL SECTION	PMIS/PKG NO.
TECH. REVIEW:		BLACKSTONE RIVER STATE PARK	SHEET 5 OF 8
DATE: 8/2011			

8/12/11 12:42 FISANTOS R17 \\VHB\PROJ\PROVIDENCE\33281.02\CAD\ST\PLANSET\LONSDALE SPILLWAY\ORLANDO\LONSDALE S4.DWG



1 SLUICEWAY FLOOR AND WALL REPAIR
NO SCALE



2 CONCRETE REPAIR
SCALE B

CONCRETE REPAIR NOTES

ALL EXPOSED CONCRETE SURFACES SHALL BE SOUNDED IN ORDER TO DETERMINE THE LOCATION OF DETERIORATED CONCRETE.

UNSOUND CONCRETE SHALL BE REMOVED ONLY TO THE DEPTH NECESSARY TO EXPOSE A BONDING SURFACE OF SOUND CONCRETE MATERIAL, BUT NOT LESS THAN 1" DEEP.

WHEN REMOVAL OF UNSOUND CONCRETE EXPOSES MORE THAN HALF OF THE SURFACE OF THE EXISTING REINFORCING, THE REMOVAL SHALL EXTEND TO 1" BEYOND THE EXPOSED REINFORCING.

ALL DETERIORATED AREAS TO BE REPAIRED SHALL BE MARKED AND IDENTIFIED BY THE CONTRACTOR.

ALL DETERIORATED AREAS TO BE REPAIRED SHALL BE OUTLINED WITH ½" (MAX.) DEEP SAW–CUTS ON A RECTANGULAR SHAPE AROUND THE PERIPHERY OF THE DEFECT.

THE CONTRACTOR SHALL CAREFULLY REMOVE SPALLED, LOOSE AND HOLLOW CONCRETE FROM WITHIN THE SAWCUT LIMITS. POWER TOOLS SHALL BE LIMITED TO PNEUMATIC HAMMERS OF NO MORE THAN 15 POUND CLASS. ANY OVERBREAKAGE OR DAMAGE BEYOND THE LIMITS OF THE APPROVED REPAIR SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE STATE.

DURING REMOVAL OF DETERIORATED CONCRETE, IF THE CONTRACTOR'S OPERATIONS CAUSE ANY DAMAGE TO THE EXISTING STRUCTURE TO REMAIN, HE SHALL BE REQUIRED TO REPAIR THE AREA TO THE SATISFACTION OF THE ENGINEER AT NO ADDITIONAL COST TO THE STATE.

THE CONTRACTOR SHALL LOCATE EXISTING REINFORCING STEEL (BY PACHOMETER OR OTHER SUITABLE MEANS) PRIOR TO DEMOLITION OF REPAIR AREA. THE EXISTING REINFORCING SHALL NOT BE DAMAGED. THE COST OF LOCATING EXISTING REINFORCING SHALL BE INCLUDED IN THE COST OF REPAIRS.

ALL CORRODED REINFORCING BARS SHALL BE THOROUGHLY CLEANED TO REMOVE ALL RUST.

ALL REPAIRS SHALL RESTORE THE SURFACE TO ORIGINAL CONTOUR.

TYPE "A" CONCRETE REPAIR DETAIL SHALL BE USED FOR PATCHES THAT MEET THE FOLLOWING PARAMETERS:
- THE AREA OF THE PATCH IS LESS THAN 3 SQ. FT
- THE PATCH DOES NOT EXCEED 3 FT IN ANY DIRECTION
- THE DEPTH OF THE PATCH IS LESS THAN 1½"

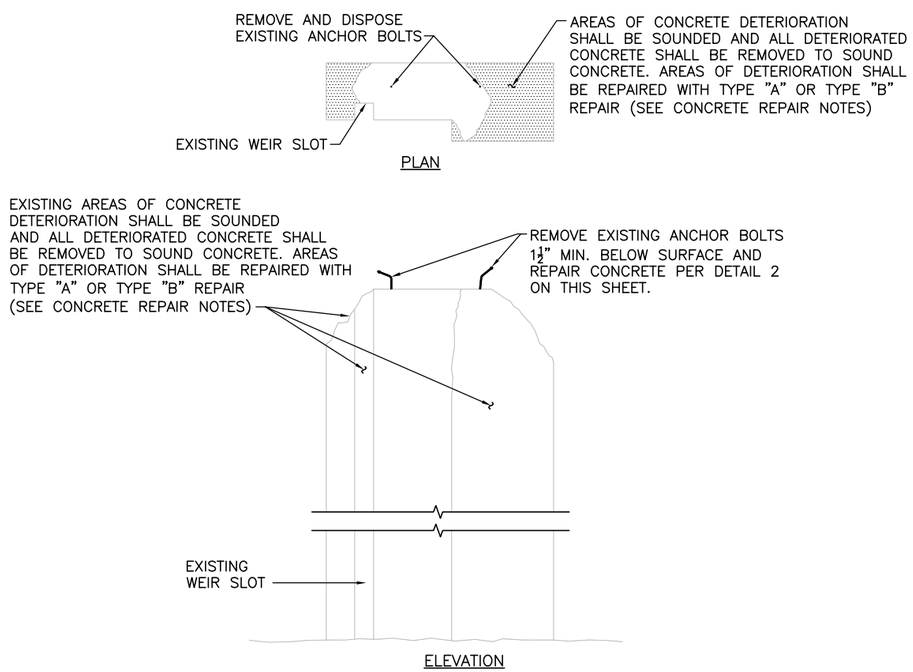
TYPE "B" CONCRETE REPAIR DETAIL SHALL BE USED FOR PATCHES THAT MEET THE FOLLOWING PARAMETERS:
- THE AREA OF THE PATCH IS GREATER THAN 3 SQ. FT
- THE PATCH EXCEEDS 3 FT IN ANY DIRECTION
- 20% OR MORE OF THE PATCH IS GREATER THAN 1½"

REMOVE CONCRETE IN TYPE "B" REPAIR, INCLUDING SOUND CONCRETE, TO A DEPTH OF 3¼" MINIMUM.

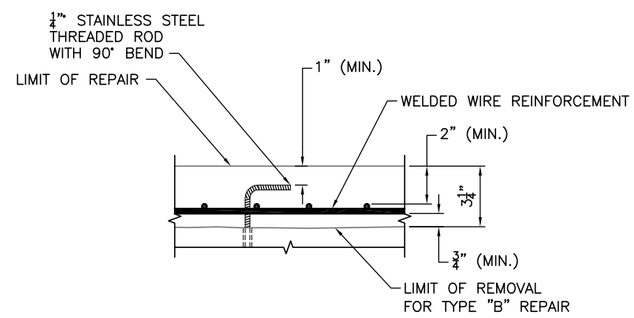
WELDED WIRE REINFORCEMENT SHALL BE 3x3–W2xW2.
SPLICES IN WELDED WIRE SHALL BE IN ACCORDANCE WITH THE MANUAL OF STANDARD PRACTICE FOR STRUCTURAL WELDED WIRE REINFORCEMENT PUBLISHED BY THE WIRE REINFORCEMENT INSTITUTE.

¼" DIAMETER STAINLESS STEEL THREADED RODS SHALL BE USED AS ANCHORS TO SECURE THE WELDED WIRE REINFORCEMENT TO THE CONCRETE. THE THREADED RODS SHALL BE EMBEDDED 3" MINIMUM INTO SOUND CONCRETE AND SECURED WITH HILTI HIT RE–500 EPOXY ADHESIVE OR APPROVED EQUAL.

ANCHORS FOR TYPE "B" REPAIRS SHALL BE SPACED SUCH THAT THE MAXIMUM DISTANCE BETWEEN EACH ANCHOR IS 18". A MINIMUM OF (2) ANCHORS SHALL BE USED FOR EACH TYPE "B" REPAIR.



3 MACHINERY PLATFORM COLUMN
SCALE C

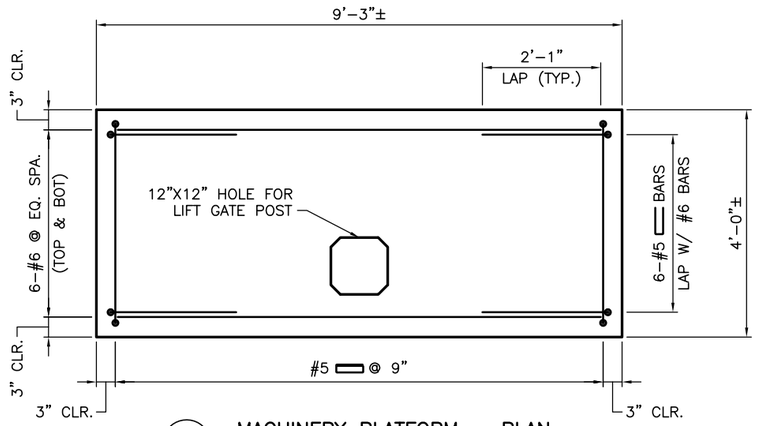


4 CONCRETE ANCHOR DETAIL
SCALE A

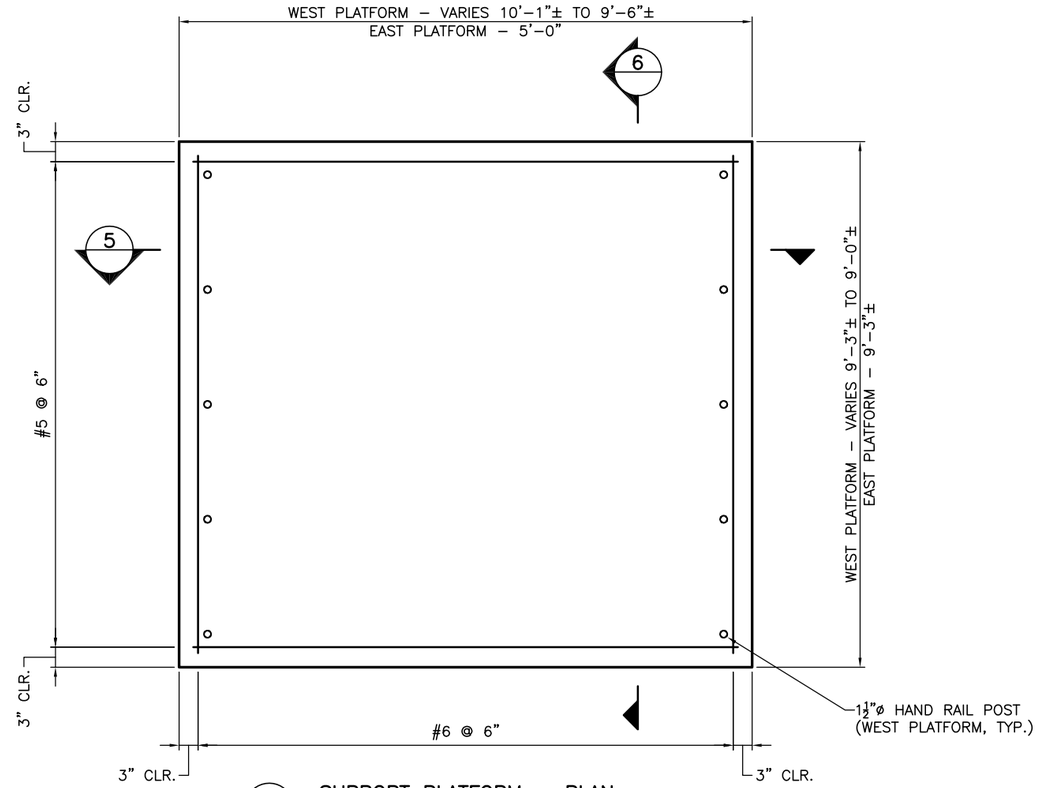
SCALE C — 1 0 1 2 3 — SCALE OF FEET
SCALE B — 12 6 0 12 — SCALE OF INCHES
SCALE A — 6 3 0 6 — SCALE OF INCHES

DESIGNED: AD	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CADD FIS	S5	LONSDALE SPILLWAY GATE CONCRETE SLUICEWAY REPAIR DETAILS	PMIS/PKG NO.
TECH. REVIEW:		BLACKSTONE RIVER STATE PARK	SHEET 6 OF 8
DATE: 8/2011			

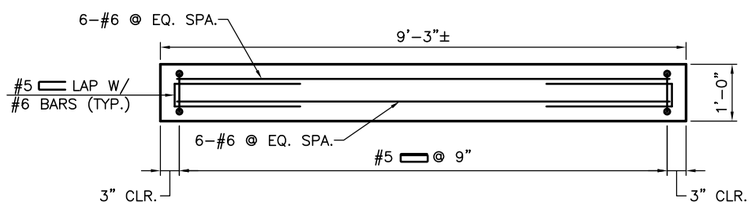
8/12/11 12:42 FISANTOS R17 \\WHB\PROJ\PROVIDENCE\33281.02\CAD\ST\PLANSET\LONSDALE SPILLWAY\ORLANDO\LONSDALE S5.DWG



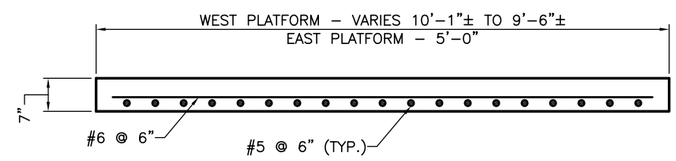
1 MACHINERY PLATFORM – PLAN
SCALE (A)



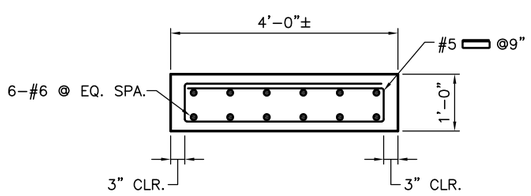
4 SUPPORT PLATFORM – PLAN
SCALE (A)



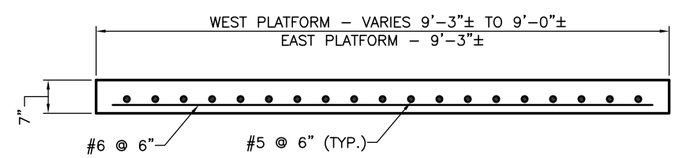
2 MACHINERY PLATFORM – ELEVATION
SCALE (A)



5 SUPPORT PLATFORM – SECTION A
SCALE (A)



3 MACHINERY PLATFORM – SECTION
SCALE (A)



6 SUPPORT PLATFORM – SECTION B
SCALE (A)

NOTE

FINAL MACHINERY PLATFORM SIZES TO BE DETERMINED BASED ON REQUIREMENTS OF REFURBISHED LIFT GATE MACHINERY.

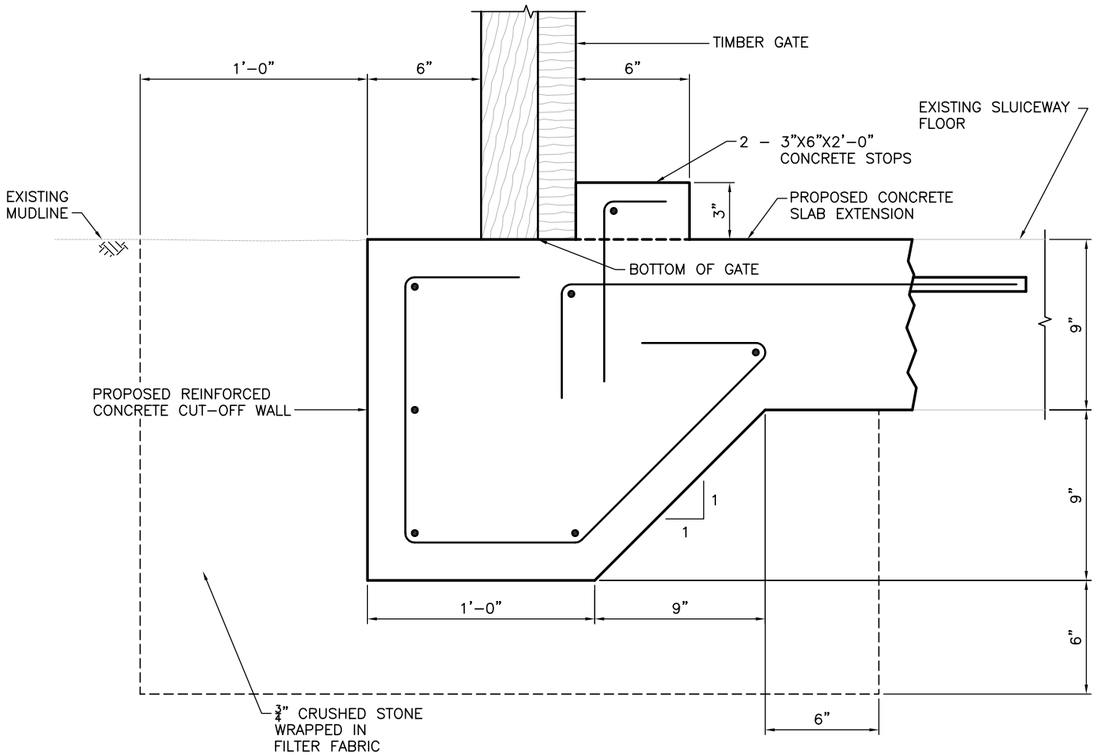
SCALE (C) 1 0 1 2 3
SCALE OF FEET

SCALE (B) 12 6 0 12
SCALE OF INCHES

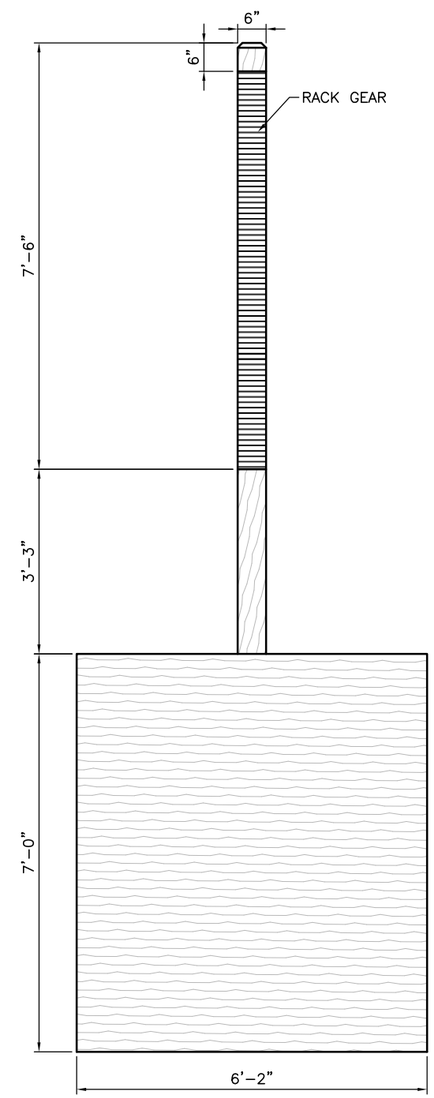
SCALE (A) 6 3 0 6
SCALE OF INCHES

DESIGNED: AD	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CADD FIS	S6	LONSDALE SPILLWAY GATE MACHINERY AND SUPPORT PLATFORM PLAN AND DETAILS BLACKSTONE RIVER STATE PARK	PMIS/PKG NO.
TECH. REVIEW:			SHEET 7 OF 8
DATE: 8/2011			

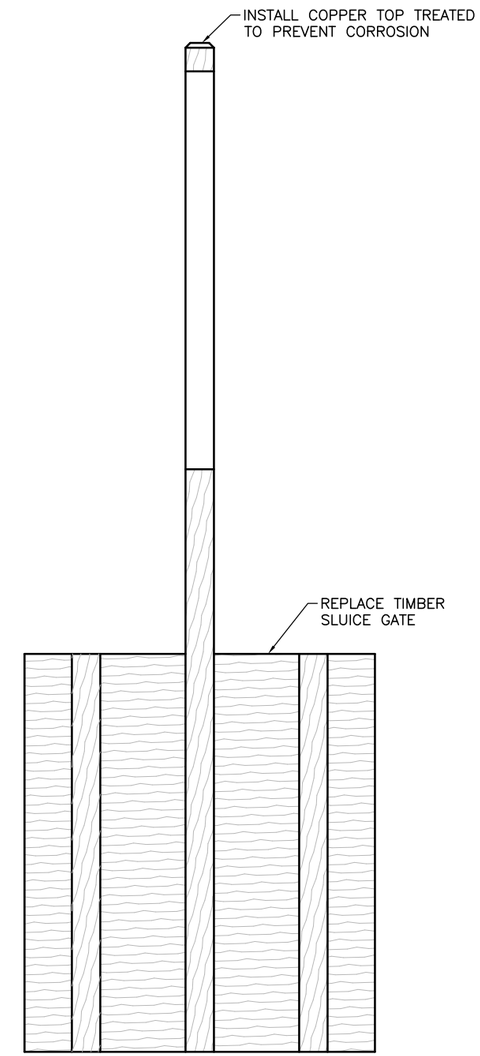
8/12/11 12:41 FISANTOS R17 \\VHB\PROJ\PROVIDENCE\33281.02\CAD\ST\PLANSET\LONSDALE SPILLWAY\ORLANDO\LONSDALE S6.DWG



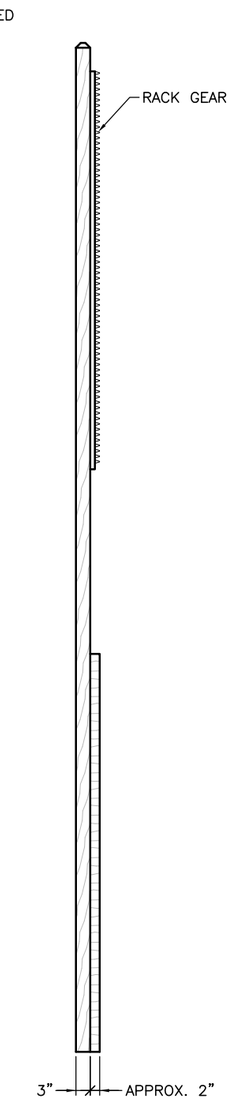
1 GATE CLOSURE DETAIL
SCALE (A)



DOWNSTREAM ELEVATION



UPSTREAM ELEVATION



SIDE ELEVATION

2 TIMBER SLUICE GATE
SCALE (B)

SCALE (B) 1 0 1 2 3
SCALE OF FEET

SCALE (A) 6 3 0 6
SCALE OF INCHES

TIMBER SLUICE GATES

ALL EXISTING TIMBERS ARE TO BE REPLACED WITH WHITE OAK.

METAL COMPONENTS

BROKEN OR MISSING COMPONENTS NOTED ON THIS SHEET ARE TO BE REPLACED WITH HISTORICALLY ACCURATE CAST REPRODUCTIONS.

ADDITIONAL COMPONENTS IDENTIFIED AS HAVING DETERIORATION AND/OR DAMAGE SEVERE ENOUGH TO INHIBIT THEIR PROPER WORKING CONDITION ARE TO BE REPLACED WITH HISTORICALLY ACCURATE CAST REPRODUCTIONS.

ALL METAL COMPONENTS ARE TO BE REMOVED TO AN OFF–SITE LOCATION AND COMPLETELY DISASSEMBLED, CLEANED (REMOVE ALL PAINT, DIRT, AND CORROSION), AND INSPECTED FOR DETERIORATION AND/OR DAMAGE THAT MAY INHIBIT THEIR PROPER WORKING CONDITION.

ANY COMPONENTS DAMAGED DURING DISASSEMBLY ARE TO BE REPLACED WITH HISTORICALLY ACCURATE CAST REPRODUCTIONS.

SURFACES OF COMPONENTS THAT WILL NOT BE IN CONTACT WITH MOVING PARTS ARE TO BE PRIMED AND PAINTED BLACK USING HISTORICALLY ACCURATE MATERIALS.

GATE OPERATIONS ARE TO BE LUBRICATED, REASSEMBLED, AND BENCH TESTED TO VERIFY PROPER WORKING CONDITION. UPON INSTALLATION, THE GATE OPERATOR SHALL BE FIELD TESTED TO VERIFY OPERABILITY.

NOTES

FINAL GATE DIMENSIONS AND MEMBER SIZES TO BE DETERMINED BASED ON REQUIREMENTS OF REFURBISHED LIFT GATE MACHINERY.

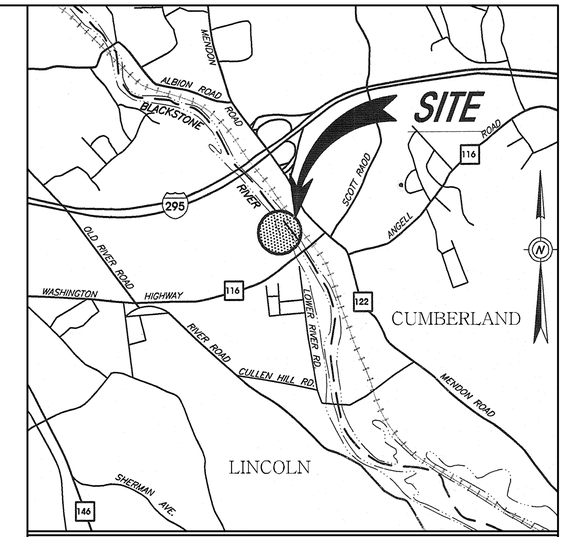
DESIGNED: AD CADD FIS TECH. REVIEW: DATE: 8/2011	SUB SHEET NO. S7	TITLE OF SHEET LONSDALE SPILLWAY GATE SLUICEWAY GATE DETAILS BLACKSTONE RIVER STATE PARK	DRAWING NO. PMIS/PKG NO. SHEET 8 OF 8

8/12/11 12:40 FISANTOS R17 \\VHB\PROJ\PROVIDENCE\33281.02\CAD\ST\PLANSET\LONSDALE SPILLWAY\ORLANDO\LONSDALE S7.DWG

PROJECT LOCATION

BLACKSTONE RIVER VALLEY
NATIONAL HERITAGE CORRIDOR
(PARTIAL)

BLACKSTONE CANAL ALTERNATIVE TRANSPORTATION FEASIBILITY STUDY



LINCOLN
RHODE ISLAND

NOT TO SCALE

INDEX

SHEET	SUB SHEET	TITLE OF SHEET
1		COVER SHEET
2	S1	GENERAL NOTES
3	S2	SITE PLAN
4	S3	GATE STRUCTURE PLAN AND ELEVATION
5	S4	SWING GATE DETAIL PLAN
6	S5	BATTER BOARD AND SLUICE GATE DETAIL PLAN
7	S6	HINGE PLATE PINTLE DETAIL PLAN
8	S7	FOUNDATION PLAN AND DETAILS
9	S8	ABUTMENT PLAN AND DETAILS
10	S9	PIER PLAN AND SLUICE GATE WALL DETAILS
11	S10	DECK PLAN AND MACHINERY PLATFORM PLAN

GS–10–0281R
–

1.0 0 0.5 1.0
SCALE OF MILES

CONSTRUCTION DRAWINGS

UNITED STATES
DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE
DENVER SERVICE CENTER

TITLE OF PROJECT
ASHTON DAM CANAL INLET CONTROL GATE
LOCATION WITHIN PARK
LOWER RIVER ROAD
NAME OF PARK
BLACKSTONE RIVER STATE PARK

REGION	COUNTY	STATE
NORTHEAST	PROVIDENCE	RHODE ISLAND

DRAWING NO. – –
PMIS/PKG NO. –
SHEET 1 OF 11

8/11/11 08:06 VDOLEZAL R17 \\RIDATA\PROJECTS\33281.02\CAD\ST\PLANSET\ASHTON GATE\IMAGES\01.TIFF; \\RIDATA\PROJECTS\33281.02\CAD\ST\PLANSET\ASHTON GATE\RI_BIKEWAY_MAP_JPG_2009.TIFF;
IMAGES: \\RIDATA\PROJECTS\33281.02\CAD\ST\PLANSET\ASHTON GATE\ASHTONG COVER.DWG

BASIC DATA: –

DESIGN SPECIFICATIONS

DESIGN SPECIFICATION: RHODE ISLAND STATE BUILDING CODE (IBC 2009)

LOADING: ASCE 7–05, MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES

CONCRETE: AMERICAN CONCRETE INSTITUTE (ACI) BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE (318–08)

STRUCTURAL STEEL: AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) STEEL CONSTRUCTION MANUAL 13TH EDITION

WELDING: AMERICAN WELDING SOCIETY (AWS) D1.1 –STEEL

TIMBER: NATIONAL DESIGN SPECIFICATION (NDS) FOR WOOD CONSTRUCTION – 2005

ENVIRONMENTAL LOADS

PEDESTRIAN LIVE LOAD ON WALKWAY: 40 PSF

VEHICLE LIVE LOAD ON WALKWAY: H–5

WIND: BASIC WIND SPEED 100 MPH

SNOW LOAD: 35 PSF

FLOOD CONDITION – WATER ELEVATION: +83.00 UPSTREAM, +76.0 DOWNSTREAM

NORMAL CONDITION – WATER ELEVATION: +76.00 UPSTREAM, +76.0 DOWNSTREAM

TEMPERATURE:
- STEEL: 0 TO 120 DEGREES FARENHEIT
- CONCRETE: 45 DEGREES FARENHEIT (RISE), 35 DEGREES FARENHEIT (FALL)

GENERAL NOTES

ALL ELEVATIONS ARE REFERENCED TO N.G.V.D 1929 DATUM.

COORDINATES USED ON THESE PLANS ARE BASED ON THE STATE RECTANGULAR COORDINATE SYSTEM. (NAD 83).

DIMENSIONS, STATIONS, AND ELEVATIONS ARE SHOWN TO THE NEAREST ONE–HUNDREDTH OF A FOOT OR ONE–EIGHTH OF AN INCH.

DIMENSIONS ARE BASED ON FIELD MEASUREMENTS AND SURVEY TAKEN IN JUNE 2011. THE CONTRACTOR SHALL FIELD VERIFY ALL ELEVATIONS AND DIMENSIONS PRIOR TO THE COMMENCEMENT OF WORK.

CONSTRUCTION ACCESS

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OPERATION AND MAINTENANCE OF THE CONSTRUCTION SITE AND CONSTRUCTION ACCESS AREAS.

THE CONTRACTOR SHALL PLACE ALL EQUIPMENT AND MATERIAL IN HIS FIELD YARD OR AT A SITE APPROVED BY THE ENGINEER. THE EQUIPMENT AND MATERIAL SHALL BE PLACED IN A STORAGE AREA SO AS NOT TO CAUSE A SAFETY HAZARD.

THE CONTRACTOR IS REQUIRED TO THOROUGHLY INSPECT THE EXISTING GRAVEL ACCESS ROAD WHICH IS THE SOLE MEANS OF SURFACE ACCESS. THE CONTRACTOR'S CLEARING ACTIVITIES SHALL BE LIMITED TO SELECTIVE TREE/LIMB TRIMMING ALONG THE ACCESS, AT NO ADDITIONAL COST TO THE OWNER. IF THE CONTRACTOR SELECTS EQUIPMENT WHICH REQUIRES ANY VEGETATIVE CLEARING, THE CONTRACTOR, AT HIS SOLE EXPENSE, WILL BE REQUIRED TO APPLY FOR AND OBTAIN THE NECESSARY R.I.D.E.M. PERMITS. ALSO, IF THE CONTRACTOR'S EQUIPMENT DISTURBS THE GROUND COVER, THE CONTRACTOR WILL BE REQUIRED TO IMMEDIATELY COVER THE DISTURBED AREA WITH 6" CRUSHED STONE, AND UPON PROJECT COMPLETION, RESTORE THE AREAS TO THEIR ORIGINAL CONDITION.

ALL AREAS WHERE EQUIPMENT, MATERIALS AND/OR MACHINERY ARE TO BE PLACED OR STATIONED MUST FIRST BE LINED WITH 6" OF CRUSHED STONE (1–2" DIA.), UPON PROJECT COMPLETION ALL WORK AREAS SHALL BE RESTORED TO THEIR ORIGINAL CONDITION. THE ABOVE MEASURES ARE TO BE INCLUDED IN THE CONTRACTORS BID PRICE. NO SPECIAL PAYMENT IS TO BE PROVIDED.

EROSION AND SEDIMENT CONTROL

THE CONTRACTOR SHALL BE REQUIRED TO INSTALL TEMPORARY EROSION CONTROLS AT THE LOCATIONS INDICATED ON THE PLANS AND THE LOCATIONS WARRANTED IN ANY PERMIT STIPULATIONS. THESE CONTROLS MUST BE INSTALLED PRIOR TO ANY WORK AND SHALL BE REMOVED UPON PROJECT COMPLETION AT NO ADDITIONAL COST. ANY MATERIALS WHICH INADVERTENTLY ENTER THE WATERWAYS/WETLAND AREAS SHALL BE IMMEDIATELY AND COMPLETELY REMOVED AT THE CONTRACTOR'S EXPENSE.

SILT FENCING MUST BE PLACED SURROUNDING ALL STOCKPILES AND STATIONARY MACHINERY/EQUIPMENT LOCATIONS.

ALL DISTURBED AREA IS TO BE IMMEDIATELY REPAIRED BY THE CONTRACTOR AND TEMPORARILY STABILIZED WITH JUTE MESH OR, WHEN DEEMED APPROPRIATE BY THE ENGINEER, CRUSHED STONE.

SEDIMENT REMOVED FROM EROSION CONTROL STRUCTURES SHALL BE DISPOSED OF IN A MANNER WHICH IS CONSISTENT WITH THE INTENT OF THIS PLAN. ALL HAY BALES OR SILT FENCE RETAINING SEDIMENT OVER 6" HIGH SHALL HAVE THE SEDIMENT REMOVED AND ALL DAMAGED EROSION CONTROLS REMOVED AND REPLACED.

PRIOR TO PERFORMING WORK ON THE UPSTREAM OR DOWNSTREAM DIVERSION STRUCTURE, THE CONTRACTOR SHALL BE REQUIRED TO PLACE A 'FLOATING TURBIDITY BOOM' IMMEDIATELY DOWNSTREAM OF THE WORK AREA. THE CONTRACTOR WILL BE REQUIRED TO SUBMIT FOR APPROVAL FROM THE ENGINEER AND R.I.D.E.M. A SHOP DRAWING OF THE BOOM TO BE UTILIZED.

DEWATERING PROGRAM

THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE SITE CONDITIONS (SURFACE AND SUBSURFACE) AND HYDROLOGIC DATA AND, BASED UPON THIS INFORMATION, SHALL PREPARE A COMPLETE DEWATERING PLAN WHICH MUST ADDRESS THE METHODS AND COMPONENTS OF THE DEWATERING SYSTEM. THE CONTRACTOR'S DEWATERING PLAN SHALL BE SUBMITTED TO THE OWNER FOR APPROVAL. APPROVAL OF THIS PLAN REPRESENTS A GENERAL APPROVAL OF THE PROPOSED METHODS AND DOES NOT RELIEVE THE CONTRACTOR'S RESPONSIBILITY OF THE SYSTEM'S EFFECTIVENESS. THE DEWATERING PROCEDURES MUST MAINTAIN A SAFE AND DRY WORKING AREA.

THE DEWATERING SYSTEM WILL INCLUDE ALL NECESSARY PUMPS, EQUIPMENT, LABOR AND MATERIALS NECESSARY TO DEWATER THE WORK SITE.

THE DEWATERING SYSTEM SHALL BE OPERATED CONTINUOUSLY, 24 HOURS PER DAY, 7 DAYS PER WEEK UNTIL SUCH TIME AS ALL CONSTRUCTION WORK BELOW NORMAL WATER LEVELS IS COMPLETE.

THE SELECTION OF SIZE AND SPACING AND TYPE OF DEWATERING EQUIPMENT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

UPON COMPLETION OF THE DEWATERING WORK, THE CONTRACTOR SHALL REMOVE ALL EQUIPMENT AND LEAVE THE CONSTRUCTION AREA IN A NEAT, CLEAN AND ACCEPTABLE CONDITION.

EXTREME CARE MUST BE EXERCISED TO ENSURE NO IMPACT ON THE EXISTING RETAINING WALLS AND ALL EXISTING STRUCTURES.

GENERAL PROCEDURE:

THE CONTRACTOR IS TO PROCEED IN THE FOLLOWING SEQUENCE:
- REINFORCE EXISTING UPSTREAM TEMPORARY FLOW DIVERSION STRUCTURE.
- CONSTRUCT DOWNSTREAM TEMPORARY FLOW DIVERSION STRUCTURE.
- FOR INITIAL DEWATERING OF THE WORK SITE, CANAL WATERS WITHIN THE WORK SITE MAY BE DISCHARGED OVER THE DOWNSTREAM DIVERSION STRUCTURE DIRECTLY INTO THE CANAL. WHEN THE WATER LEVEL IN THE WORK AREA LOWERS TO A DEPTH OF 2' ABOVE THE RIVER BOTTOM, OR WHEN THE DEWATER DISCHARGE EXHIBITS TURBIDITY ABOVE THE EXISTING RIVER WATER TURBIDITY LEVEL, ALL DISCHARGE MUST BE DEPOSITED INTO THE DEWATERING BASIN WITHIN THE DOWNSTREAM DIVERSION STRUCTURE.

AREA TO BE DEWATERED: THE DEWATERING ACTIVITIES ARE LIMITED TO THE EXISTING CANAL BETWEEN THE UPSTREAM AND DOWNSTREAM DIVERSION STRUCTURES.

TEMPORARY WATER DIVERSION STRUCTURE REMOVAL: WATER DIVERSION STRUCTURE REMOVAL SHALL BE PERFORMED FROM EQUIPMENT STATIONED ON THE EXISTING ACCESS ROAD. THE DOWNSTREAM WATER DIVERSION STRUCTURE IS TO BE REMOVED COMPLETELY PRIOR TO REMOVING THE UPSTREAM WATER DIVERSION STRUCTURE AND EXISTING ROCK FILLED DAM.

CANAL WATER LEVEL MAINTENANCE

IF THE CANAL WATER LEVEL DOWNSTREAM OF THE WORK AREA DROPS BELOW ELEVATION 72.4, THE CONTRACTOR WILL BE REQUIRED TO PUMP WATER FROM THE UPSTREAM DIVERSION STRUCTURE TO THE CANAL. THE RATE, FREQUENCY AND DURATION OF PUMPING WILL VARY DEPENDING UPON ENVIRONMENTAL FACTORS. BYPASS PUMPING RATES ARE ANTICIPATED TO RANGE UP TO 100 gpm. IF DOWNSTREAM LEVELS CONTINUE TO DECREASE, THE CONTRACTOR MUST INCREASE THE BYPASS PUMPING RATE UNTIL A STABLE WATER LEVEL RESULTS. THE ABOVE WATER LEVEL MITIGATION WILL NOT BE APPLICABLE IF THE WATER LEVEL DECREASE IS CAUSED BY DOWNSTREAM STRUCTURAL ALTERATIONS WHICH ARE INDEPENDENT OF THE GATE PROJECT.

MATERIALS

ALL WORK SHALL BE IN CONFORMANCE WITH THE "RHODE ISLAND DEPARTMENT OF TRANSPORTATION (RIDOT) STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" AND "RHODE ISLAND STANDARD DETAILS", STATE OF RHODE ISLAND, DEPARTMENT OF TRANSPORTATION, 2004 EDITION AND ALL SUBSEQUENT ADDITIONS, REVISIONS AND ADDENDA, UNLESS OTHERWISE NOTED.

STEEL PILES MATERIAL AND INSTALLATION SHALL CONFORM TO RIDOT SECTION 804.

CONCRETE SHALL CONFORM TO RIDOT SECTION 601 CLASS XX WITH A MINIMUM COMPRESSIVE STRENGTH (f'c) OF 5000 PSI.

REINFORCING STEEL SHALL CONFORM TO RIDOT SECTION 810. REINFORCING STEEL SHALL BE ZINC COATED (GALVANIZED) IN ACCORDANCE WITH ASTM A767.

STRUCTURAL STEEL SHALL CONFORM TO RIDOT SECTION 824 AND ASTM A709 GRADE 50.

TIMBER SHALL CONFORM TO REQUIREMENTS OF THE SOUTHERN PINE INSPECTION BUREAU INSPECTION RULES, LATEST EDITION, OR THE REQUIREMENTS OF THE WEST COAST BUREAU OF LUMBER GRADE AND INSPECTION FOR SOUTHERN YELLOW PINE NO.1 GRADE, SR WITH MINIMUM ALLOWABLE BENDING STRESS (Fb) OF 1,300 PSI. TIMBER MEMBERS WITH DIMENSIONS 5"X 5" OR LARGER SHALL CONFORM TO SOUTHERN YELLOW PINE, SELECT STRUCTURAL GRADE, SR WITH MINIMUM ALLOWABLE TENSION STRESS OF (Ft) of 1,000 PSI.

MAINTENANCE OF PUBLIC ACCESS

THE CONTRACTOR SHALL KEEP ALL WALKWAYS UNOBSTRUCTED. IF, IN THE OPINION OF THE OWNER, THE INTEREST OF ABUTTERS AND THE PUBLIC REQUIRES IT, THE CONTRACTOR SHALL PROVIDE SUCH TEMPORARY MEANS OF CROSSING OR GUARDING ACCEPTABLE TO THE OWNER. THIS DOES NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY OF PROTECTING THE PROJECTS WORKERS, VEHICULAR TRAFFIC AND PEDESTRIAN TRAFFIC IN AND ADJACENT TO THE LIMITS OF WORK.

ANTICPATED OPERATION PROCEDURE

GATE FUNCTION:
- THE PURPOSE OF THE PROPOSED, GATE IS TO REPLACE THE CANAL'S ORIGINAL VERTICAL SLIDE GATE WHICH OFFERED TWO (2) CRITICAL 'FUNCTIONS:'
  - MAINTENANCE: CLOSURE DURING LOW–FLOW CONDITIONS TO ALLOW FOR MAINTENANCE OF THE CANAL, INCLUDING SLOPE STABILIZATION, WALL REPAIR, SEDIMENT REMOVAL, CHANNEL STABILIZATION, ETC.
  - FLOOD PROTECTION: CLOSURE DURING HIGH–FLOW CONDITIONS TO PREVENT THE DOWNSTREAM OVERTOPPING OF THE CANAL'S BANKS WHICH COULD POTENITALLY RESULT IN SIGNIFICANT BANK EROSION AND A COMPLETE BREECH BETWEEN THE CANAL AND THE BLACKSTONE RIVER.

NORMAL CONDITION:
- THE SWING GATE IS TO BE SECURED IN ITS OPEN POSITION. THE BATTER BOARD ASSEMBLIES ARE TO REMAIN IN THE LOWEST CLOSED POSITION.

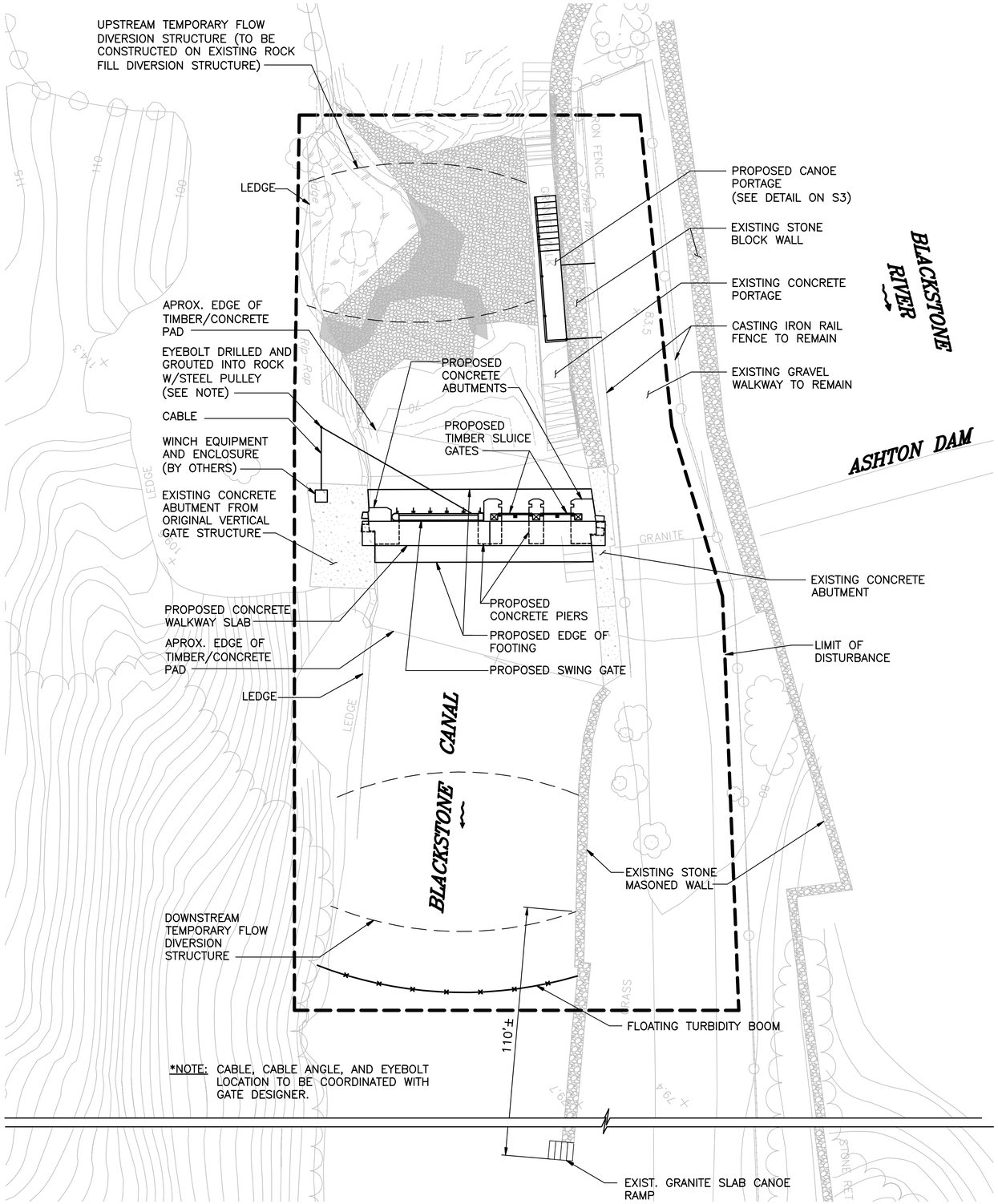
SWING GATE CLOSURE:
- WHEN A POTENTIAL EMERGENCY IS IDENTIFIED BY THE CHIEF OF THE R.I.D.E.M. DIVISION OF PLANNING & DEVELOPMENT
  - THE BATTER BOARD ASSEMBLIES ARE TO BE OPENED TO CLOSE THE GATE
  - ONCE THE GATE IS CLOSED, THE BATTER BOARDS ARE TO MOVE INTO THE CLOSED POSITION

GATE OPENING:
- THE SWING GATE WAS DESIGNED TO ONLY REOPEN UNDER THE FOLLOWING CONDITIONS:
  - THE BATTER BOARD ASSEMBLIES ARE FULLY OPEN.
  - THE UPSTREAM CANAL AND RIVER LEVELS HAVE RECEDED TO NORMAL RIVER LEVELS (APPROXIMATELY 76.0).
  - THE BATTER BOARD ASSEMBLIES ARE CLOSED ONCE THE GATE IS SECURED IN THE OPEN POSITION
- THE SLUICE GATES SHALL BE OPENED ONE AT A TIME BASED ON A PROCEDURE DEVELOPED BY THE R.I.D.E.M. DAM SECTION AND THE R.I.D.E.M. DIVISION OF PLANNING AND DEVELOPMENT.

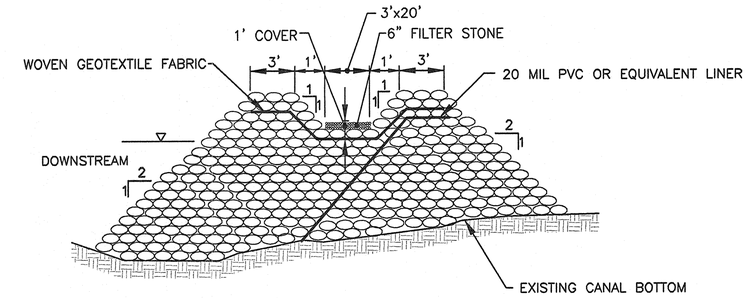
AGENCY COORDINATION:
- R.I.D.E.M. SHALL ESTABLISH A LINE OF COMMUNICATION BETWEEN THE LINCOLN POLICE AND FIRE DEPARTMENTS, THE R.I.D.E.M. DAMS SECTION AND THE R.I.D.E.M. DIVISION OF PLANNING AND DEVELOPMENT TO CREATE A SWING GATE CLOSURE PLAN AND A SLUICE GATE OPENING PLAN BASED ON FLOW RATES AND WATER LEVELS IN THE BLACKSTONE RIVER. PERIODICALLY REVIEW AND ADJUSTMENT OF THIS PLAN WILL BE CONDUCTED.
- NO CLOSURE/OPENING IS TO OCCUR WITHOUT ADVANCED NOTIFICATION TO THE ABOVE PARTIES.

MAINTENANCE INSPECTIONS:
- ON AN ANNUAL BASIS, R.I.D.E.M. ENGINEERS SHALL PERFORM A STRUCTURAL INSPECTION OF THE GATE STRUCTURE, INCLUDING ALL SYSTEM COMPONENTS, ABUTMENTS, PIERS, WALKWAY, ETC. AND IDENTIFY POTENTIAL DEFICIENCIES. THE STRUCTURAL ENGINEER SHALL SUBMIT A CHECKLIST TO THE CHIEF OF R.I.D.E.M. DIVISION OF PLANNING AND DEVELOPMENT OF ALL SYSTEM COMPONENTS AND IDENTIFY THE COMPONENT CONDITION, NEED FOR ACTION AND APPROPRIATE MITIGATION/REPAIR.
- ON A ROUTINE BASIS, PARTICULARLY FOLLOWING A HIGHER THAN NORMAL FLOW EVENT, R.I.D.E.M. ENGINEERS SHALL PERFORM AN INSPECTION OF THE GATE STRUCTURE, INCLUDING ALL SYSTEM COMPONENTS, ABUTMENTS, PIERS, WALKWAY, ETC. FOR DEBRIS CAUGHT ON THE STRUCTURE. THE ENGINEER SHALL CREATE AND EXECUTE A PLAN TO REMOVE THE DEBRIS AND RETURN THE GATE TO NORMAL OPERATION.

DESIGNED: KP	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CADD VLD	S1	BLACKSTONE CANAL MITER GATE GENERAL NOTES	———
TECH. REVIEW:			PMIS/PKG NO.
DATE: 7/2011		BLACKSTONE RIVER STATE PARK	SHEET 2 OF 11

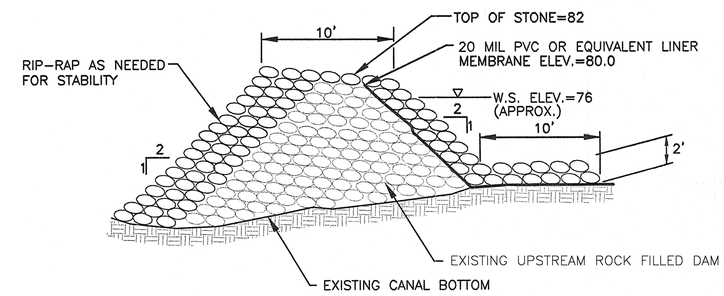


*NOTE: CABLE, CABLE ANGLE, AND EYEBOLT LOCATION TO BE COORDINATED WITH GATE DESIGNER.



DOWNSTREAM TEMPORARY FLOW DIVERSION STRUCTURE WITH DEWATERING BASIN

NOT TO SCALE



UPSTREAM TEMPORARY FLOW DIVERSION STRUCTURE

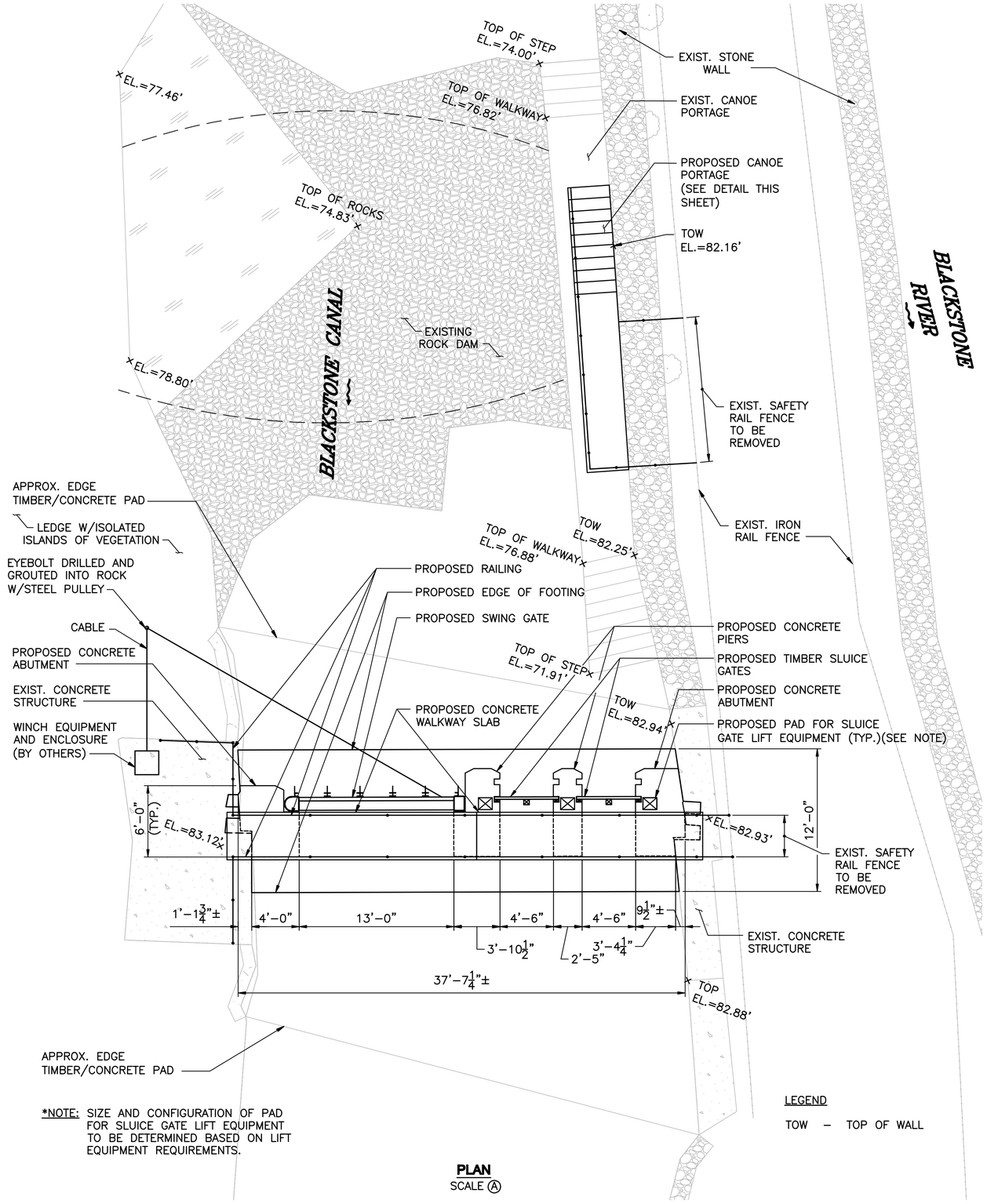
NOT TO SCALE

NOTE: ALL STONE FILL FOR FLOW DIVERSION STRUCTURES, INCLUDING EXISTING RIP-RAP UPSTREAM, TO BE REMOVED TO THE CANAL BOTTOM ELEVATION AT COMPLETION OF THE PROJECT.

10 0 10 20

SCALE OF FEET

DESIGNED: KP	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CADD VLD	S2	ASHTON DAM CANAL INLET CONTROL GATE	———
TECH. REVIEW:		SITE PLAN	PMIS/PKG NO.
DATE: 7/2011		BLACKSTONE RIVER STATE PARK	SHEET 3 OF 11

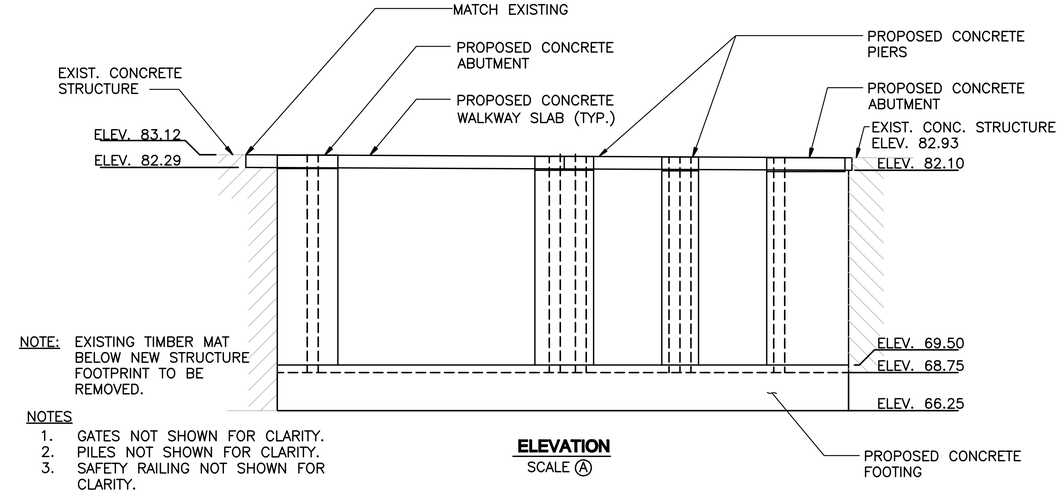


*NOTE: SIZE AND CONFIGURATION OF PAD FOR SLUICE GATE LIFT EQUIPMENT TO BE DETERMINED BASED ON LIFT EQUIPMENT REQUIREMENTS.

LEGEND

TOW – TOP OF WALL

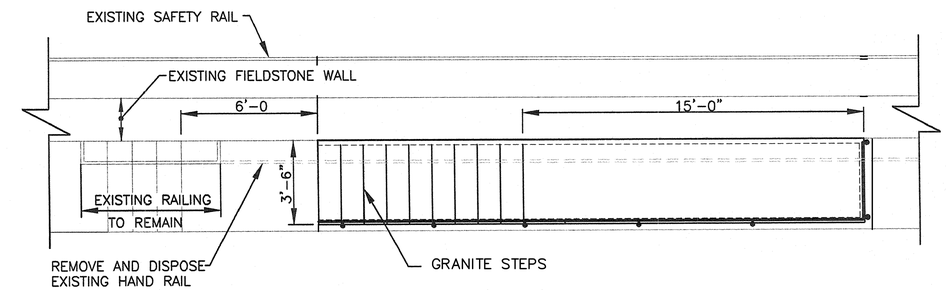
PLAN
SCALE (A)



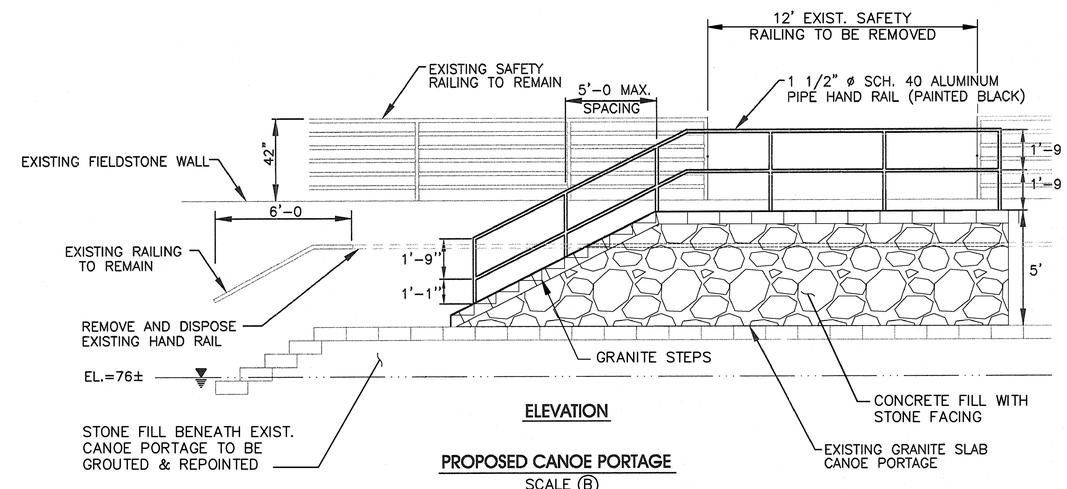
NOTE: EXISTING TIMBER MAT BELOW NEW STRUCTURE FOOTPRINT TO BE REMOVED.

NOTES
1. GATES NOT SHOWN FOR CLARITY.
2. PILES NOT SHOWN FOR CLARITY.
3. SAFETY RAILING NOT SHOWN FOR CLARITY.

ELEVATION
SCALE (A)



PLAN



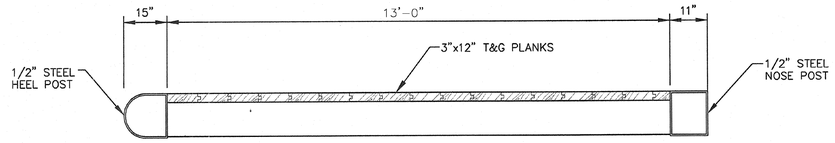
ELEVATION

PROPOSED CANOE PORTAGE
SCALE (B)

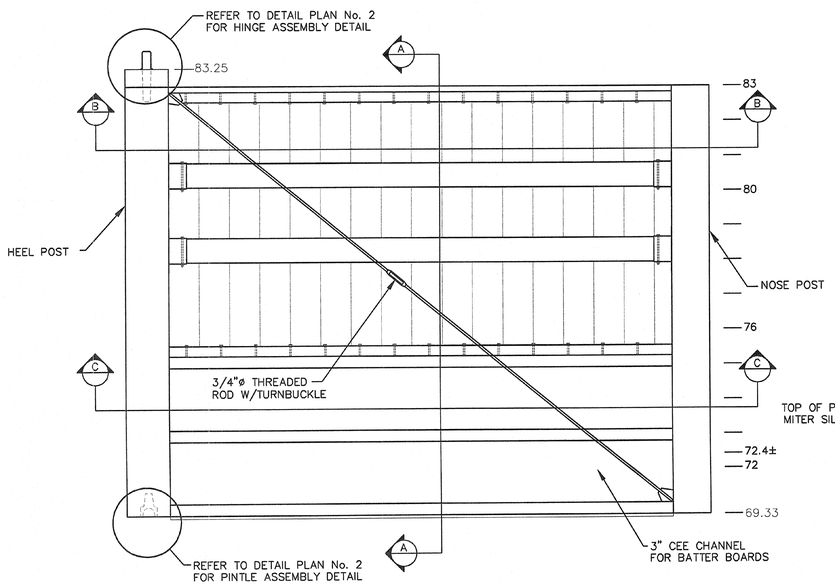
SCALE (A) 5 0 5 10
SCALE OF FEET

SCALE (B) 5 2.5 0 5
SCALE OF INCHES

DESIGNED: KP	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CADD VLD	S3	ASHTON DAM CANAL INLET CONTROL GATE GATE STRUCTURE PLAN & ELEVATION BLACKSTONE RIVER STATE PARK	PMIS/PKG NO.
TECH. REVIEW:			SHEET 4 OF 11
DATE: 7/2011			

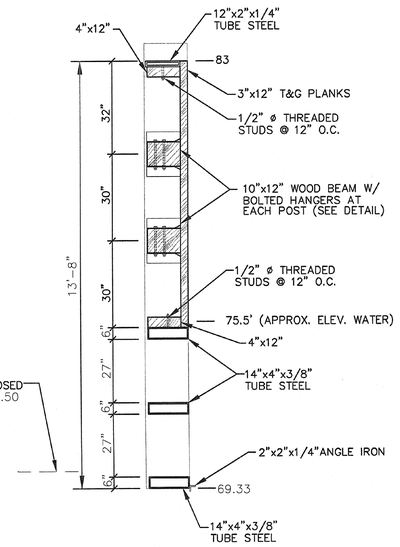


SECTION B S3|S3

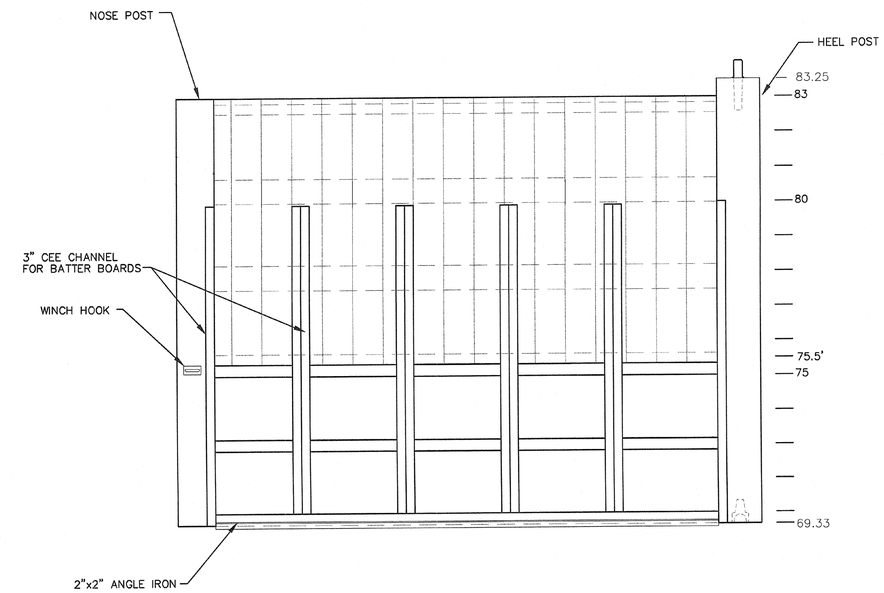


WEST GATE ELEVATION (DOWNSTREAM SIDE

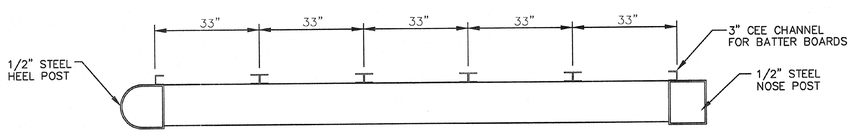
NOTE:
ALL WOOD TO BE SOUTHERN YELLOW PINE.
WOOD SHALL NOT BE PRESSURE TREATED.



SECTION A S3|S3



WEST GATE ELEVATION (UPSTREAM SIDE

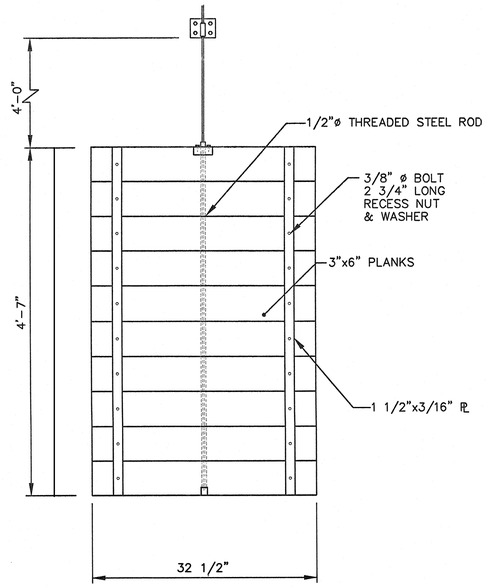


SECTION C S3|S3

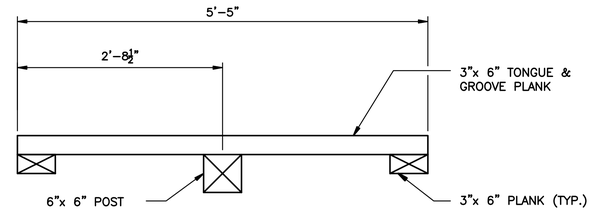
NOTE:
SWING GATE DETAILS SHOWN ARE CONCEPTUAL, FINAL DESIGN BY OTHERS.

2 0 2 4
SCALE OF FEET

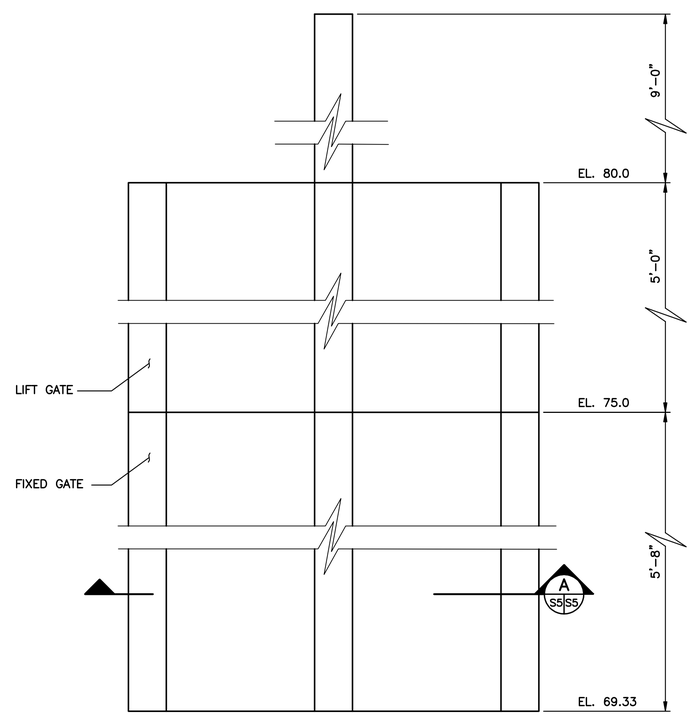
DESIGNED: KP CADD VLD TECH. REVIEW: DATE: 7/2011	SUB SHEET NO. S4	TITLE OF SHEET ASHTON DAM CANAL INLET CONTROL GATE SWING GATE DETAIL PLAN BLACKSTONE RIVER STATE PARK	DRAWING NO. —— PMIS/PKG NO. SHEET 5 OF 11



BATTER BOARD DETAIL



SECTION A S5/S5



SLUICE GATE DETAIL

NOTE:

SWING GATE DETAILS SHOWN ARE CONCEPTUAL, FINAL DESIGN BY OTHERS.

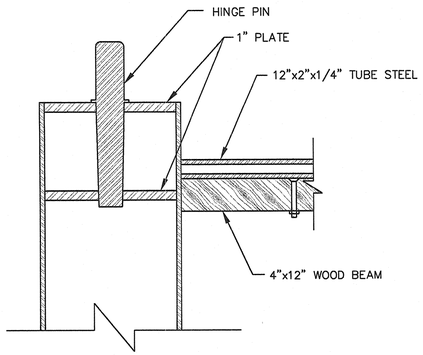
1 0 1 2

SCALE OF FEET

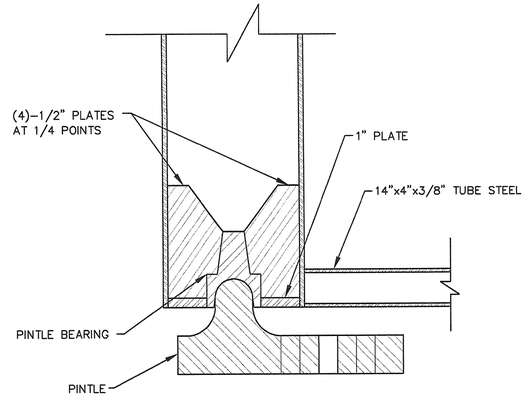
NOTES

1. SLUICE GATE LIFTING HARDWARE NOT SHOWN (BY OTHERS).
2. GATE CONFIGURATION MAY BE MODIFIED BASED ON LIFT EQUIPMENT REQUIREMENTS.

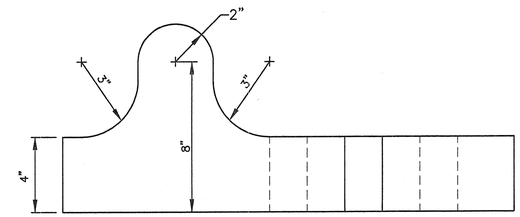
DESIGNED: KP CADD VLD TECH. REVIEW: DATE: 7/2011	SUB SHEET NO. S5	TITLE OF SHEET ASHTON DAM CANAL INLET CONTROL GATE BATTER BOARD & SLUICE GATE DETAIL PLAN BLACKSTONE RIVER STATE PARK	DRAWING NO. PMIS/PKG NO. SHEET 6 OF 11



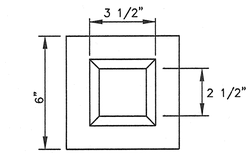
HINGE PIN ASSEMBLY DETAIL
SCALE Ⓐ



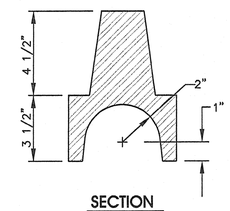
PINTLE ASSEMBLY DETAIL
SCALE Ⓐ



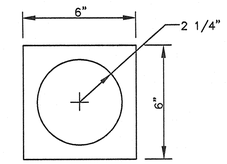
PINTLE SECTION



TOP

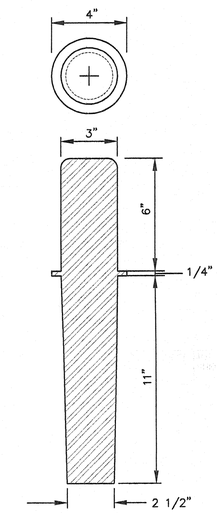


SECTION

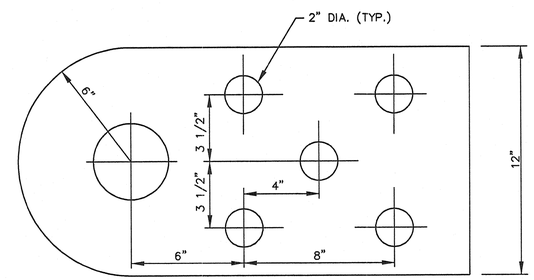


BOTTOM

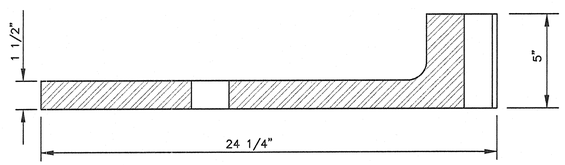
PINTLE BEARING
SCALE Ⓑ



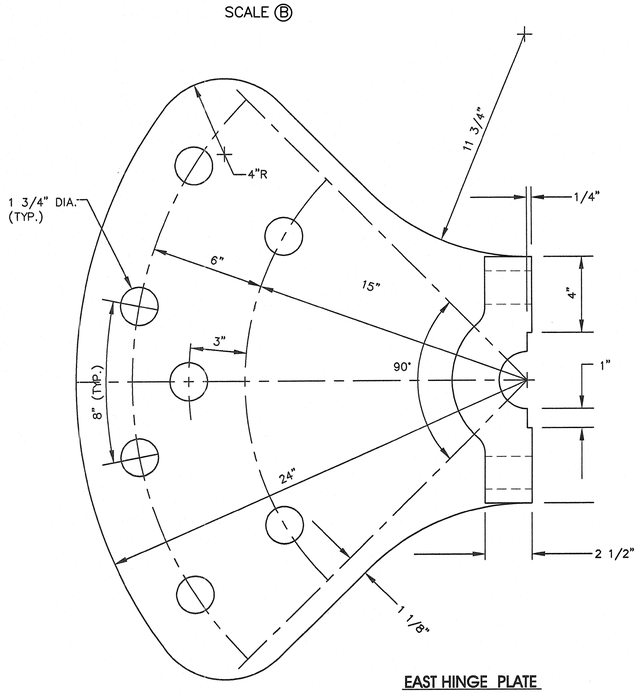
HINGE PIN SECTION
SCALE Ⓑ



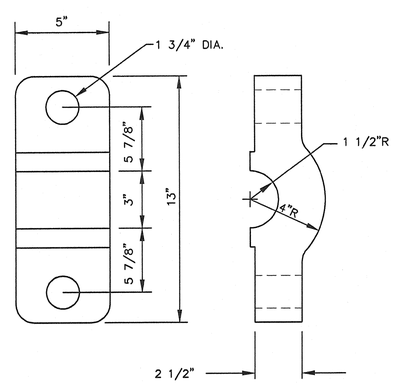
PINTLE PLAN
SCALE Ⓑ



HINGE PLATE SECTION
SCALE Ⓑ



EAST HINGE PLATE



END CAP

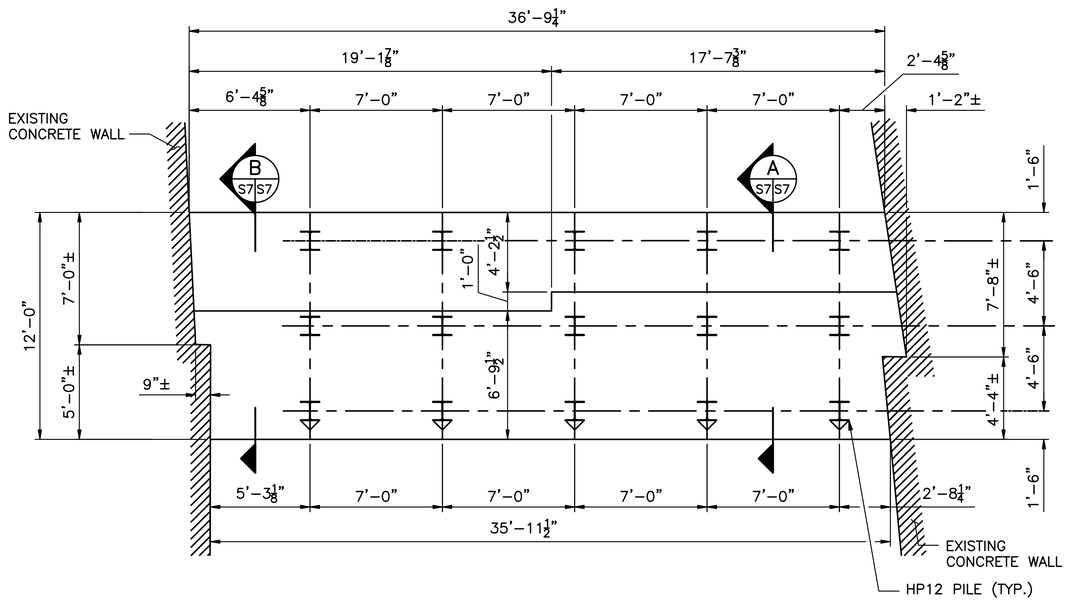
HINGE PLATE DETAIL
SCALE Ⓑ

NOTE:
SWING GATE DETAILS SHOWN ARE CONCEPTUAL, FINAL DESIGN BY OTHERS.

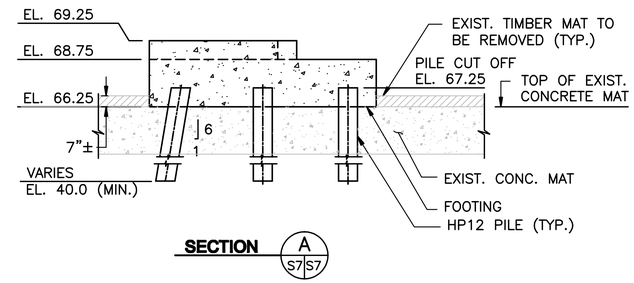
SCALE Ⓐ 12 6 0 12
SCALE OF INCHES

SCALE Ⓑ 6 3 0 6
SCALE OF INCHES

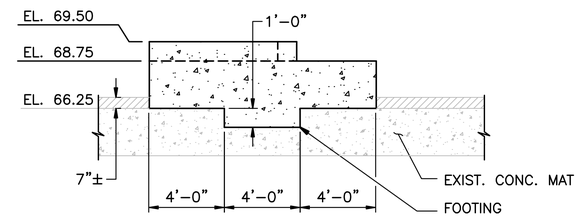
DESIGNED: KP CADD VLD TECH. REVIEW: DATE: 7/2011	SUB SHEET NO. S6	TITLE OF SHEET ASHTON DAM CANAL INLET CONTROL GATE HINGE PLATE PINTLE DETAIL PLAN BLACKSTONE RIVER STATE PARK	DRAWING NO. —— PMIS/PKG NO. SHEET 7 OF 11



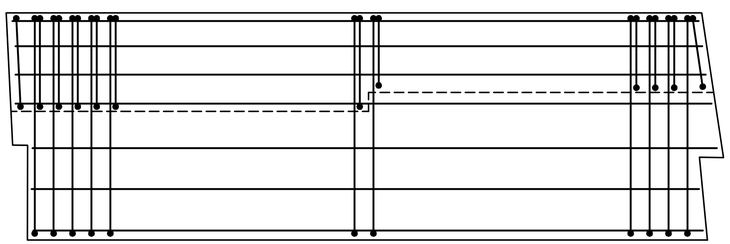
PILE PLAN



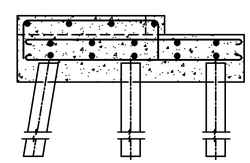
SECTION A S7 S7



SECTION B S7 S7



REINFORCEMENT PLAN



REINFORCEMENT SECTION

LEGEND

HP12 PILE (VERTICAL)

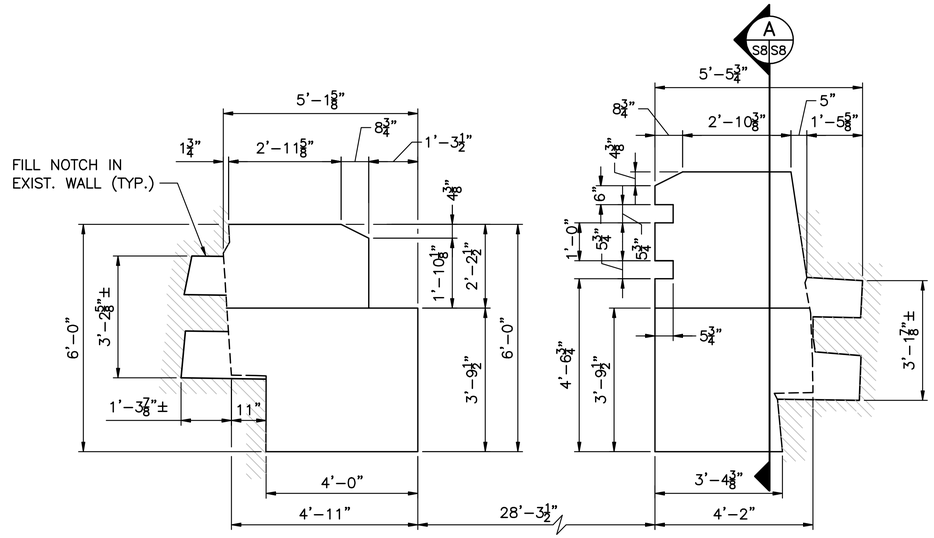
HP12 PILE (BATTER PILE)

NOTES

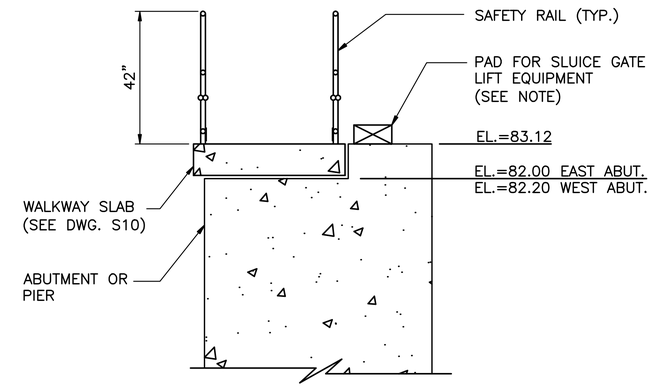
1. CONTRACTOR TO REMOVE EXISTING TIMBER MAT WHERE CONCRETE FOUNDATION TO BE PLACED.
2. CONTRACTOR TO CORE THROUGH EXISTING CONCRETE MAT TO INSTALL PILES.

4 0 4 8
SCALE OF FEET

DESIGNED: KP	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CADD VLD	S7	ASHTON DAM CANAL INLET CONTROL GATE	———
TECH. REVIEW:		FOUNDATION PLAN AND DETAILS	PMIS/PKG NO.
DATE: 7/2011		BLACKSTONE RIVER STATE PARK	SHEET 8 OF 11

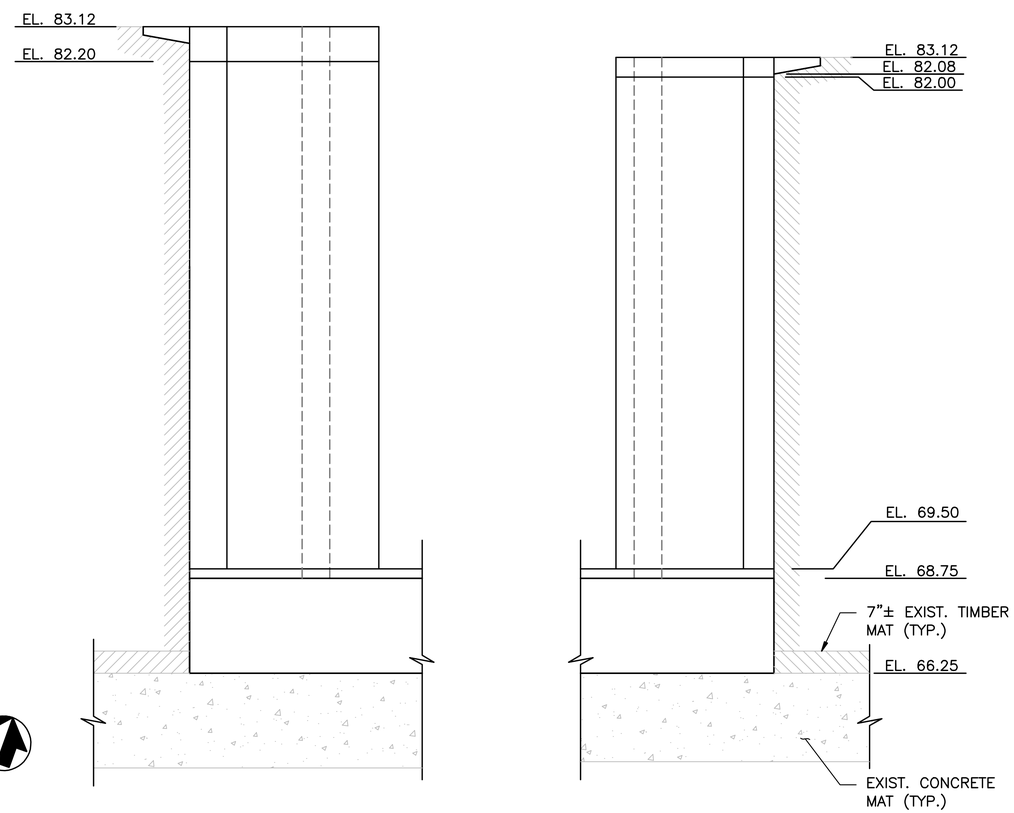


ABUTMENT PLAN



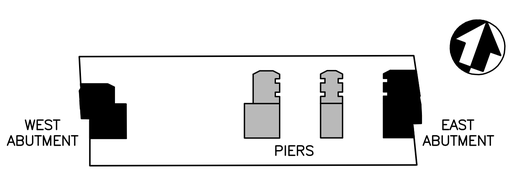
SECTION A S8 S8

NOTE:
SIZE AND CONFIGURATION OF PAD FOR SLUICE GATE LIFT EQUIPMENT TO BE BASED ON LIFT EQUIPMENT REQUIREMENTS.



ABUTMENT ELEVATION

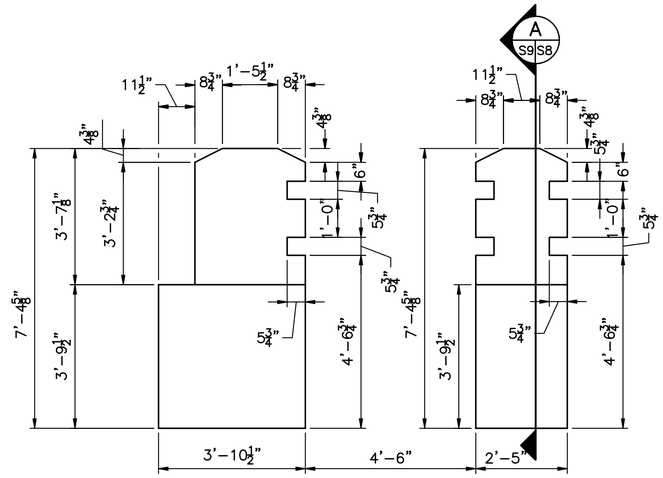
NOTE: PILES NOT SHOWN FOR CLARITY.



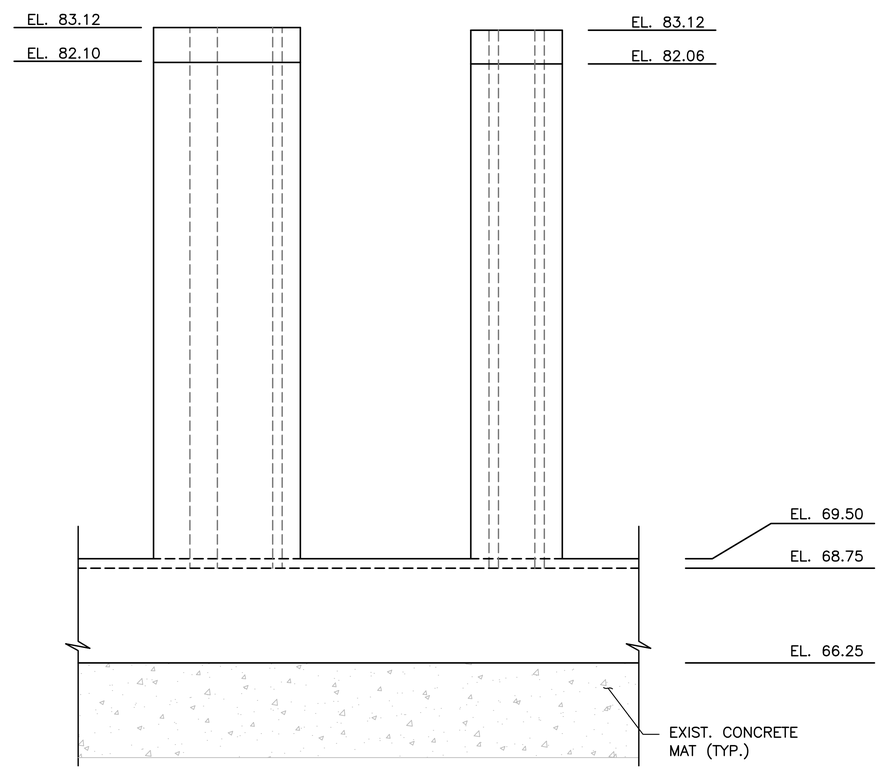
KEY PLAN

2 0 2 4
SCALE OF FEET

DESIGNED: KP CADD VLD TECH. REVIEW: DATE: 7/2011	SUB SHEET NO. S8	TITLE OF SHEET ASHTON DAM CANAL INLET CONTROL GATE PIER PLAN AND SLUICE GATE WALL DETAILS BLACKSTONE RIVER STATE PARK	DRAWING NO. PMIS/PKG NO. SHEET 9 OF 11

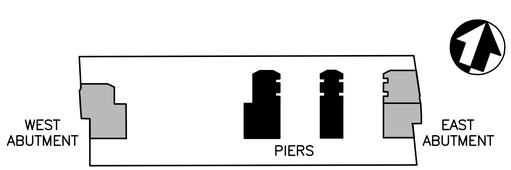


PIERS PLAN



PIERS ELEVATION

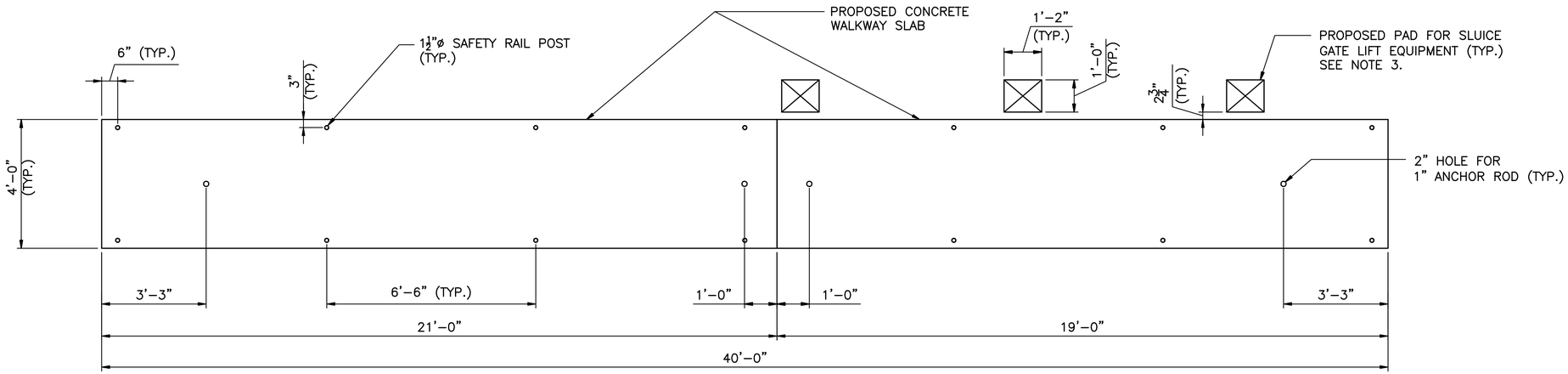
NOTE: PILES NOT SHOWN FOR CLARITY.



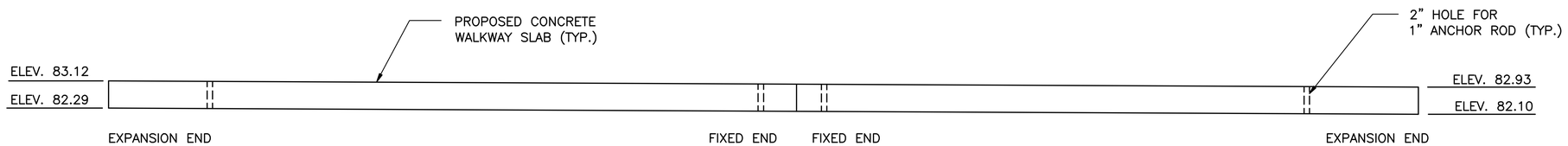
KEY PLAN

2 0 2 4
SCALE OF FEET

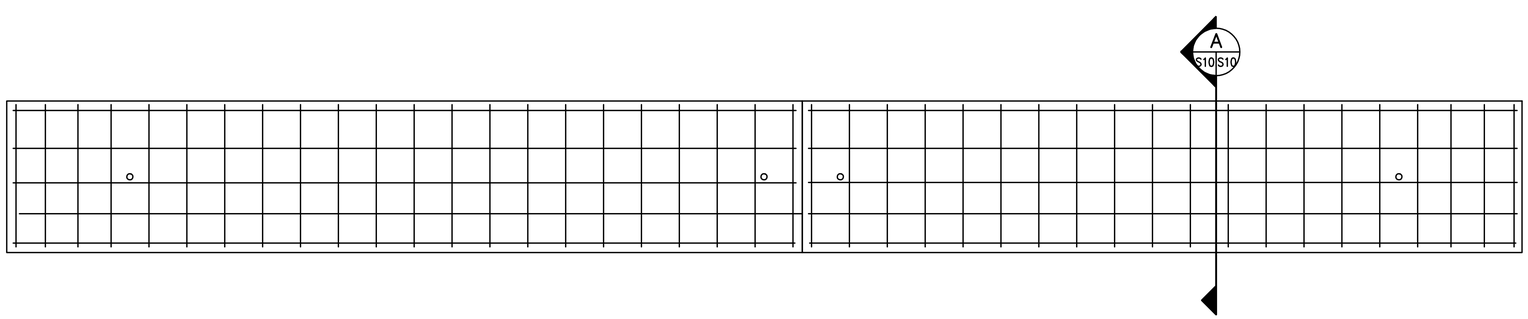
DESIGNED: KP CADD VLD TECH. REVIEW: DATE: 7/2011	SUB SHEET NO. S9	TITLE OF SHEET ASTON DAM CANAL INLET CONTROL GATE PIER PLAN AND SLUICE GATE WALL DETAILS BLACKSTONE RIVER STATE PARK	DRAWING NO. PMIS/PKG NO. SHEET 10 OF 11



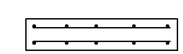
PLAN



ELEVATION



REINFORCEMENT PLAN



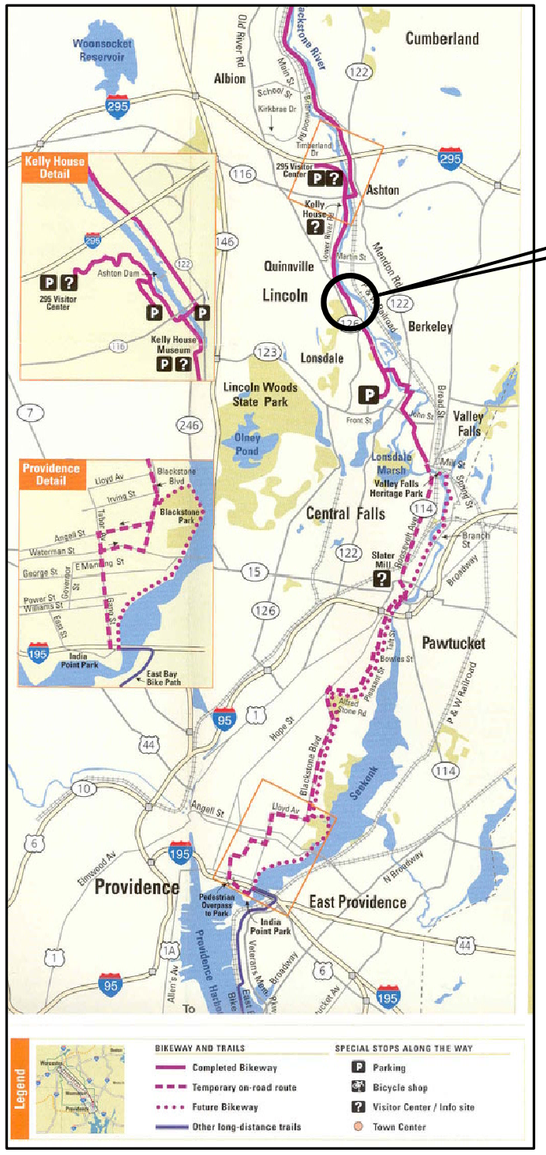
SECTION A S10 S10

NOTES

1. FIXED END DOWEL HOLE TO BE FILLED W/CONCRETE BASED GROUT MATERIAL.
2. EXPANSION END DOWEL HOLE TO BE FILLED W/ASPHALT FILLER OR ELASTOMERIC POLYMER.
3. SIZE AND LOCATION OF PAD FOR SLUICE GATE LIFT EQUIPMENT TO BE DETERMINED BASED ON LIFT EQUIPMENT REQUIREMENTS.

3 1.5 0 3
SCALE OF INCHES

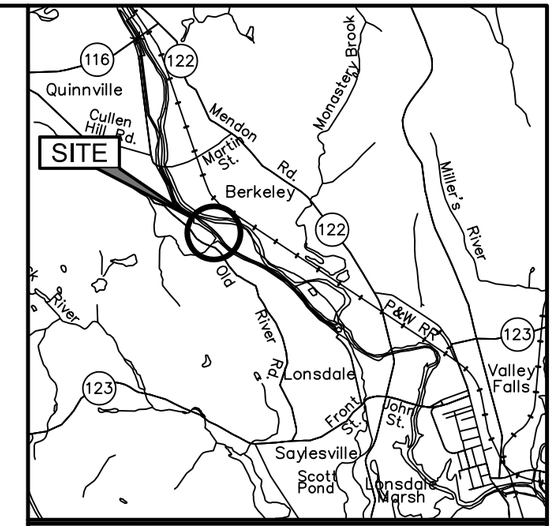
DESIGNED: KP	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CADD VLD	S10	ASHTON DAM CANAL INLET CONTROL GATE	———
TECH. REVIEW:		DECK & MACHINERY PLATFORM PLAN	PMIS/PKG NO.
DATE: 7/2011		BLACKSTONE RIVER STATE PARK	SHEET 11 OF 11



PROJECT LOCATION

BLACKSTONE RIVER VALLEY
NATIONAL HERITAGE CORRIDOR
(PARTIAL)

BLACKSTONE CANAL ALTERNATIVE TRANSPORTATION FEASIBILITY STUDY



LINCOLN
RHODE ISLAND

NOT TO SCALE

OWNER:
RHODE ISLAND DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
DIVISION OF PARKS AND RECREATION
235 PROMENADE STREET
PROVIDENCE, RI 02908-5767

ASSESSOR'S PLOT: 23
LOT: 180

PROPERTY LOCATION:
OFF RIVER ROAD, LINCOLN, RI

INDEX

SHEET	SUB SHEET	TITLE OF SHEET
1		COVER SHEET
2	S1	PLAN SHEET 1

GS-10-0281R

NOVEMBER 11, 2011

200 0 200 400
SCALE OF FEET

CONSTRUCTION DRAWINGS

UNITED STATES
DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE
DENVER SERVICE CENTER

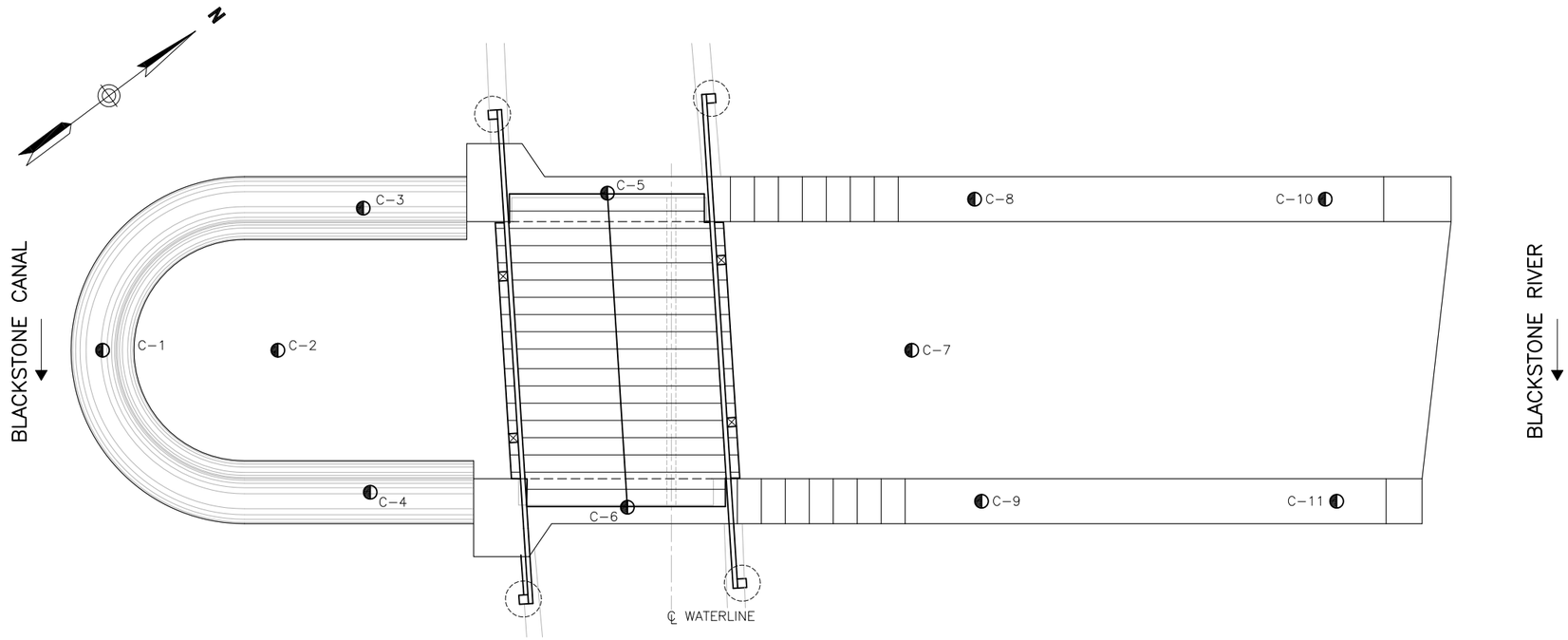
TITLE OF PROJECT
HORSE SHOW SPILLWAY
LOCATION WITHIN PARK
SOUTH OF MARTIN STREET BRIDGE
NAME OF PARK
BLACKSTONE RIVER STATE PARK

REGION	COUNTY	STATE
NORTHEAST	PROVIDENCE	RHODE ISLAND

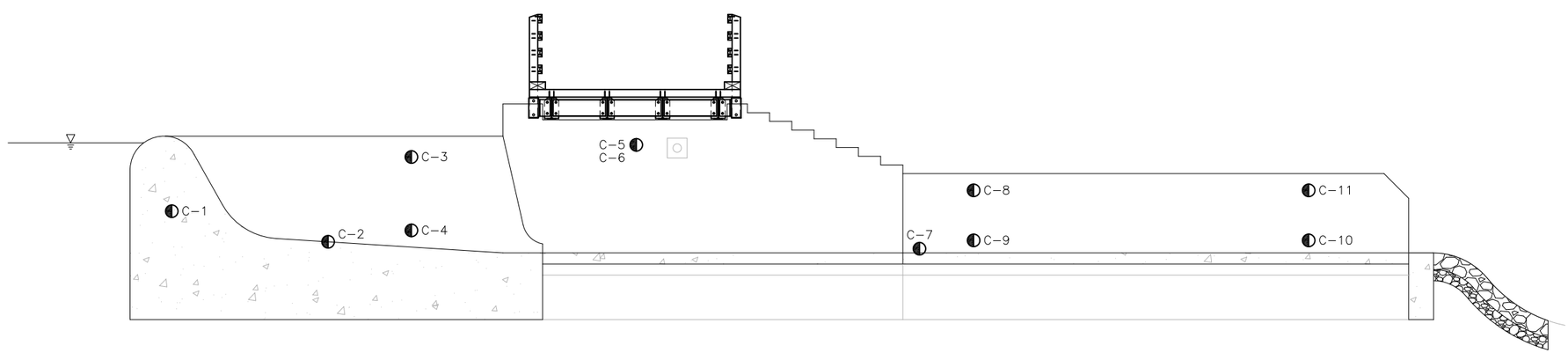
DRAWING NO. –
PMIS/PKG NO. –
SHEET 1 OF 2

BASIC DATA: –

8/8/11 12:44 FSNATOS R17 \\WBS\PROJ\PROVIDENCE\33281.02\CAD\ST\PLANSET\LONSDALE SPILLWAY\ORLANDO\LONSDALE COVERLONG IMAGES: \\RIDATA\PROJECTS\33281.02\CAD\ST\PLANSET\LONSDALE SPILLWAY\ORLANDO\RI_BIKEWAY_MAP_JPG_2009.TIFF;



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



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

LEGEND

◐ – CONCRETE CORE SAMPLE

DESIGNED: KP	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CADD VLD	S1	HORSE SHOE SPILLWAY	PMIS/PKG NO.
TECH. REVIEW:			SHEET 2 OF 2
DATE: 9/2011			

Appendix B: Conceptual Cost Estimate

Project: Blackstone Canal Alternative Transportation Feasibility Study

Park: Blackstone State Park

NPS Contract: GS-10F-0281R

Estimate By: Vanasse Hangen Brustlin, Inc
10 Dorrance Street
Providence, RI 02903

Date: 5-Nov-11

Water Control Structures, Lincoln, RI
Estimate Summary

	QUANTITY	UNIT	ITEM DESCRIPTION	UNIT PRICE	TOTAL
	1	EA	Lonsdale Spillway		$304,000.00
	1	EA	Canal Inlet Control Gate		$1,240,000.00
	1	EA	Horse Shoe Spillway Testing		$23,000.00
			Total Water Control Structure Costs		$1,567,000.00

Project: Blackstone Canal Alternative Transportation Feasibility Study

Park: Blackstone State Park

NPS Contract: GS-10F-0281R

Estimate By: Vanasse Hangen Brustlin, Inc
10 Dorrance Street
Providence, RI 02903

Date: 5-Nov-11

Lonsdale Spillway, Lincoln, RI
Estimate Summary

	QUANTITY	UNIT	ITEM DESCRIPTION	UNIT PRICE	TOTAL
	1	LS	**Install and Remove Water Diversion Dam**	$ 16,400.00	$16,400.00
	300	SF	**Dewatering Basin**	$ 15.00	$4,500.00
	180	SY	**Clearing & Grubbing**	$ 15.00	$2,700.00
	200	LF	**Erosion Control (Hay bales/Silt Fence)**	$ 6.00	$1,200.00
	9	CY	**Common Borrow**	$ 20.00	$180.00
	19	SY	**Remove and Dispose Concrete**	$ 100.00	$1,900.00
	48	CF	**Repair Concrete - Patching Mortar**	$ 290.00	$13,920.00
	48	CF	**Repair Concrete - Form and Cast in Place**	$ 520.00	$24,960.00
	2000	SF	**Welded Wire Fabric**	$ 4.00	$8,000.00
	42	EA	**Drill and Grout Reinforcing Bars**	$ 34.00	$1,428.00
	5.5	CY	**New Concrete Deck/Platform (Class XX)**	$ 700.00	$3,850.00
	1100	LB	**New Steel Reinforcing**	$ 1.25	$1,375.00
			Gate Control Mechanism		
			Obtain stockpiled gate control mechanism and refurbish. Clean and paint		
	1	LS	mechanism. Gate stem hardware included.	$ 20,000.00	$20,000.00
	1	LS	**Timber Deck Pedestrian Bridge (optional)**	$ -	$0.00
	150	SY	**Loam and Seed**	$ 5.00	$750.00
	20	LF	**Deck Railing**	$ 75.00	$1,500.00
	60	LF	**Chain Link Fence and Gate**	$ 45.00	$2,700.00
	1	LS	**Mobilization**	$ 10,300.00	$10,300.00
			Subtotal Direct Construction Cost		**$102,663.00**
			Remoteness Factor (1%)		$1,026.63
			State & Local Taxes (7%)		$7,186.41
			Design Contingency (30%)		$30,798.90
			Total Direct Construction Costs		**$141,674.94**
			Standard General Conditions (15%)		$21,251.24
			Government General Conditions (5%)		$7,083.75
			Historic Preservation Factor (5%)		$7,083.75
			Total Indirect Construction Costs		**$35,418.74**
			Subtotal NET Construction Costs		**$177,093.68**
			Bonds and Permits (2%)		$3,541.87
			Contracting Method Adjustment (10%)		$17,709.37
			Inflation Escalation (24 months @ 4% per year)		$14,167.49
			Total Estimated NET Cost of Construction		**$212,512.41**
			Construction Contingency (10% of Net Construction Costs)		$21,251.24
			Construction Management (8% of Net Construction Costs)		$17,000.99
			Estimated Total Gross Cost of Construction		**$250,764.64**
			Design Cost (17%)		$42,629.99
			Archaeology Survey, Site Mapping and Permitting (4%)		$10,030.59
			Preliminary Spillway Repair Cost		**$303,425.22**
			Say		**$304,000.00**

Project: Blackstone Canal Alternative Transportation Feasibility Study

Park: Blackstone State Park

NPS Contract: GS-10F-0281R

Estimate By: Vanasse Hangen Brustlin, Inc
10 Dorrance Street
Providence, RI 02903

Date: 5-Nov-11

Canal Inlet Control Gate, Ashton,RI
Estimate Summary

QUANTITY	UNIT	ITEM DESCRIPTION	UNIT PRICE	TOTAL
1	LS	Temporary Portage Platform Repairs	$ 21,500.00	$ 21,500.00
1	LS	Warning Buoy System	$ 2,500.00	$ 2,500.00
860	CY	Install Water Diversion Dams	$ 45.00	$ 38,700.00
600	SF	Dewatering Basin	$ 15.00	$ 9,000.00
1	LS	Structure Excavation and Removal	$ 2,500.00	$ 2,500.00
410	FT	Piles and Pile Driving	$ 235.00	$ 96,350.00
48	CY	Concrete Footings	$ 500.00	$ 24,000.00
50	CY	Concrete Superstructure (abutment and piers)	$ 1,000.00	$ 50,000.00
1	LS	Swing Gate and Installation	$ 55,000.00	$ 55,000.00
2	EA	New Sluice Gate Installation	$ 4,000.00	$ 8,000.00
160	SF	Concrete Slab/Operating Mechanism Platform	$ 60.00	$ 9,600.00
1	LS	Gate Control Mechanism	$ 40,000.00	$ 40,000.00
120	LF	Railings	$ 75.00	$ 9,000.00
860	CY	Remove Water Diversion Dams	$ 30.00	$ 25,800.00
240	CY	Remove Existing Rip Rap Dam	$ 30.00	$ 7,200.00
	LS	Mobilization		$ 20,000.00
		Subtotal Direct Construction Cost		**$419,150.00**
		Remoteness Factor (1%)		$4,191.50
		State & Local Taxes (7%)		$29,340.50
		Design Contingency (30%)		$125,745.00
		Total Direct Construction Costs		**$578,427.00**
		Standard General Conditions (15%)		$86,764.05
		Government General Conditions (5%)		$28,921.35
		Historic Preservation Factor (5%)		$28,921.35
		Total Indirect Construction Costs		**$144,606.75**
		Subtotal NET Construction Costs		**$723,033.75**
		Bonds and Permits (2%)		$14,460.68
		Contracting Method Adjustment (10%)		$72,303.38
		Inflation Escalation (24 months @ 4% per year)		$57,842.70
		Total Estimated NET Cost of Construction		**$867,640.50**
		Construction Contingency (10% of Net Construction Costs)		$86,764.05
		Construction Management (8% of Net Construction Costs)		$69,411.24
		Estimated Total Gross Cost of Construction		**$1,023,815.79**
		Design Cost (17%)		$174,048.68
		Archaeology Survey, Site Mapping and Permitting (4%)		$40,952.63
		Preliminary Inlet Control Gate Cost		**$1,238,817.11**
		Say		**$1,240,000.00**

Project: Blackstone Canal Alternative Transportation Feasibility Study

Park: Blackstone State Park

NPS Contract: GS-10F-0281R

Estimate By: Vanasse Hangen Brustlin, Inc
10 Dorrance Street
Providence, RI 02903

Date: 5-Nov-11

Horse Shoe Spillway Testing
Estimate Summary

	QUANTITY	UNIT	ITEM DESCRIPTION	UNIT PRICE	TOTAL
			Concrete Cores and Testing	Lump Sum	$8,000.00
			Subtotal Direct Construction Cost		**$8,000.00**
			Remoteness Factor (1%)		$80.00
			State & Local Taxes (7%)		$560.00
			Design Contingency (30%)		$2,400.00
			Total Direct Construction Costs		**$11,040.00**
			Standard General Conditions (15%)		$1,656.00
			Government General Conditions (5%)		$552.00
			Historic Preservation Factor (2%)		$220.80
			Total Indirect Construction Costs		**$2,428.80**
			Subtotal NET Construction Costs		**$13,468.80**
			Bonds and Permits (2%)		$269.38
			Contracting Method Adjustment (10%)		$1,346.88
			Inflation Escalation (24 months @ 4% per year)		$1,077.50
			Total Estimated NET Cost of Construction		**$16,162.56**
			Construction Contingency (10% of Net Construction Costs)		$1,616.26
			Construction Management (8% of Net Construction Costs)		$1,293.00
			Estimated Total Gross Cost of Construction		**$19,071.82**
			Design Cost (17%)		$3,242.21
			Archaeology Survey, Site Mapping and Permitting (2%)		$381.44
			Preliminary Water Control Testing Cost		**$22,695.47**
			Say		**$23,000.00**

Conceptual Cost Estimate Calculations

Vanasse Hangen Brustlin, Inc Date: 5-Nov-11
10 Dorrance Street
Providence, RI 02903
Canal Inlet Control Gate, Ashton,RI

Backup Reference Information

		units	quantity		item	unit price	total	
portage	granite	sf	80	6" thick	NYSDOT 11560.2022	$ 65.00	$ 5,200.00	
portage	railing	ft	30		RIDOT 830.0111	$ 60.00	$ 1,800.00	
portage	fill	cy	13		RIDOT 808.0502	$ 400.00	$ 5,200.00	
portage	stone	tn	60		RIDOT 912.0103	$ 30.00	$ 1,800.00	
portage	pointing	lf	250		RIDOT 807.0350	$ 30.00	$ 7,500.00	$ 21,500.00
Buoy		ea	1		11/4/10 Danville, VA Dam 6 (	$ 2,500.00	$ 2,500.00	
water diversion	stone	cy	860		RIDOT 920.0040	$ 45.00	$ 38,700.00	$ 38,700.00
water diversion	dewatering	sf	600		RIDOT 208.0100	$ 15.00	$ 9,000.00	$ 9,000.00
removal	concrete removal	cy	1		RIDOT 803.9901	$ 1,200.00	$ 1,200.00	
removal	timber removal	cy	10		RIDOT 203.0400	$ 100.00	$ 1,000.00	$ 2,500.00
piles	pile driving equip	ea	1		RIDOT 804.2000/ assumed	$ 10,000.00	$ 10,000.00	
piles	piles	ft	410		RIDOT 804.1220	$ 155.00	$ 63,550.00	
piles	coring	ea	15		RIDOT 804.0100	$ 1,500.00	$ 22,500.00	$ 96,350.00
concrete	footing	cy	48		RIDOT 808.0502 (+ reinf)	$ 500.00	$ 24,000.00	$ 24,000.00
concrete	abutment	cy	28		RIDOT 808.0505/ 0506 / 0507	$ 1,000.00	$ 28,000.00	
concrete	piers	cy	22		RIDOT 808.0505/ 0506 / 0507	$ 1,000.00	$ 22,000.00	$ 50,000.00
swing gate	timber	bd ft	410		NYSDOT 594.01	$ 7.00	$ 2,870.00	
swing gate	steel	lb	5200		RIDOT 824.0423	$ 10.00	$ 52,000.00	$ 55,000.00
sluice gate	timber	bd ft	665		NYSDOT 594.01	$ 7.00	$ 4,655.00	$ 5,000.00
concrete	walkway	sf	160		RIDOT 809.9014	$ 60.00	$ 9,600.00	$ 9,600.00
	railing	ft	120		RIDOT 830.0110	$ 60.00	$ 7,200.00	$ 7,200.00
water diversion	stone removal	cy	860		RIDOT 202.0300	$ 30.00	$ 25,800.00	$ 25,800.00
water diversion	riprap removal	cy	240		RIDOT 202.0300	$ 30.00	$ 7,200.00	$ 7,200.00
							$ 42,500.00	$ 42,500.00
	moblization (5%)						$ 19,788.75	$ 19,700.00
							$ 415,563.75	$ 414,050.00

The cost data used is from RIDOT weighted average bid prices for recent projects. Prices have been adjusted for quantity.
RIDOT Prices acccount for regional cost differences in the construction market.
RIDOT projects utilize Federal Wage Rates and include Overhead and Profit in the pricing
All RIDOT projects allow for a mobilization item that generally varies from 5% - 10% of the project cost. This is part of OH & P on a given projec
Archaeological Survey, Site Mapping and Permitting factor is low since mapping and permit submission have been completed
Gate Control Mechanism cost will vary from donation to fabrication of new historically accurate replica (estimate two new replicas

Vanasse Hangen Brustlin, Inc Date: 5-Nov-11
10 Dorrance Street
Providence, RI 02903
Lonsdale Spillway, Lincoln, RI

Backup Reference Information

units	quantity	item	unit price	total
CY	315	RIDOT AWUP 202.0800	$22.00	$6,930.00
CY	315	RIDOT AWUP 202.0300	$30.00	$9,450.00
				$16,380.00
SF	300	RIDOT AWUP 208.0100	$ 15.00	$4,500.00
SY	180	RIDOT AWUP 201.0321	$ 15.00	$2,700.00
LF	200	206.0201 & 206.0208	$ 6.00	$1,200.00
CY	9	202.0700/203.0700	$ 20.00	$180.00
SY	19	RIDOT AWUP 201.0420	$ 100.00	$1,900.00
CF	48	RIDOT AWUP 817.2110	$ 290.00	$13,920.00
CF	48	RIDOT AWUP 817.2140	$ 520.00	$24,960.00
SF	2,000	RIDOT AWUP 810.0702	$ 4.00	$8,000.00
EA	42	RIDOT AWUP 819.0800	$ 34.00	$1,428.00
CY	6	RIDOT AWUP 601.0200	$ 700.00	$3,850.00
LB	1,100	RIDOT AWUP 810.0200	$ 1.25	$1,375.00
LS	1	N/A		
SY	150	L01.0104 & L02.0101	$ 5.00	$750.00
LF	20	RIDOT AWUP 830.0110	$ 75.00	$1,500.00
LF	60	903.0206 & 903.0227	$ 45.00	$2,700.00
LS	1	10% Mob (small proj)		

The cost data used is from RIDOT weighted average bid prices for recent projects. Prices have been adjusted for quantity.
RIDOT Prices acccount for regional cost differences in the construction market.
RIDOT projects utilize Federal Wage Rates and include Overhead and Profit in the pricing.
All RIDOT projects allow for a mobilization item that generally varies from 5% - 10% of the project cost. This is part of OH & P on a given project
Archaeological Survey, Site Mapping and Permitting factor is low since mapping and permit submission have been completed.
Gate Control Mechanism cost will vary from donation to fabrication of new historically accurate replica (estimate new replica)

Vanasse Hangen Brustlin, I Date: 5-Nov-11
10 Dorrance Street
Providence, RI 02903
Horse Shoe Spillway Testing

Backup Reference Information

11 concete cores, 11 concrete tests, core repairs (some cores will be in wet) say $700.00 ea for core,test and repair

Item Id	Description	UM	/AUP Awarde	WAUP All	Avg. Qty.	# of Bidders	of Contract
201.0301	CUTTING AND DISPOSING ISOLATED TREES A	EACH	$364.88	$440.52	14.00	33	6
201.0302	CUTTING AND DISPOSING ISOLATED TREES A	EACH	$1,675.00	$1,400.00	1.00	16	4
201.0305	COMPLETE REMOVAL AND DISPOSAL OF ISOL	EACH	$1,000.00	$431.25	1.00	4	1
201.0306	COMPLETE REMOVAL AND DISPOSAL OF ISOL	EACH	$350.00	$500.00	1.00	4	1
201.0310	REMOVE AND DISPOSE SHRUBS	EACH	$19.77	$46.53	17.75	21	4
201.0320	CLEARING AND GRUBBING	ACRE	$393.59	$1,211.83	9.67	20	3
201.0321	CLEARING AND GRUBBING	SY	$3.82	$7.96	564.30	48	10
201.0401	REMOVE AND DISPOSE GRANITE CURB	LF	$5.13	$5.76	239.80	47	10
201.0402	REMOVE AND DISPOSE CONCRETE CURB	LF	$3.67	$3.94	1545.73	71	15
201.0403	REMOVE AND DISPOSE SIDEWALKS	SY	$8.70	$7.74	575.35	93	20
201.0407	REMOVE AND DISPOSE PAVEMENT AND RIGID	SY	$10.89	$12.66	400.60	21	5
201.0408	REMOVE AND DISPOSE RIGID PAVEMENT	SY	$.21	$3.84	1954.38	21	4
201.0409	REMOVE AND DISPOSE FLEXIBLE PAVEMENT	SY	$3.14	$3.66	5159.41	146	29
201.0410	REMOVE AND DISPOSE CATCH BASINS	EACH	$230.31	$247.47	7.38	44	8
201.0411	REMOVE AND DISPOSE CATCH BASIN AND GU	EACH	$200.00	$420.00	3.00	5	1
201.0412	REMOVE AND DISPOSE MANHOLE	EACH	$110.30	$253.44	2.50	22	4
201.0414	REMOVE AND DISPOSE PIPE - ALL SIZES	LF	$4.40	$7.29	561.06	91	16
201.0415	REMOVE AND DISPOSE GUARDRAIL AND POS	LF	$.61	$1.72	4772.31	86	16
201.0419	REMOVE AND DISPOSE FENCE	LF	$5.51	$5.32	265.00	30	6
201.0420	REMOVE AND DISPOSE CONCRETE SLAB	SY	$60.00	$93.33	2.00	6	1
201.0421	REMOVE AND DISPOSE BITUMINOUS CURB	LF	$.26	$.92	1972.22	43	9
201.0422	REMOVE AND DISPOSE DROP INLET	EACH	$233.33	$243.75	1.50	11	2
201.0423	REMOVE AND DISPOSE HANDHOLE	EACH	$187.50	$185.72	4.00	20	3
201.0424	REMOVE AND DISPOSE RETAINING WALL	CY	$56.78	$73.83	50.00	11	2
201.0425	REMOVE AND DISPOSE FLARED END SECTION	EACH	$243.75	$189.11	2.67	18	3
201.0426	REMOVE AND DISPOSE PRIVATE SIGN	EACH	$375.00	$360.22	1.00	9	2
201.0427	REMOVE AND DISPOSE CONCRETE CAR STOP	EACH	$60.00	$33.93	7.00	5	1
201.0428	REMOVE AND DISPOSE FRAME AND GRATE O	EACH	$55.57	$61.38	14.57	99	21
201.0429	REMOVE AND DISPOSE CURB STOP BOX	EACH	$200.00	$96.36	2.00	5	1
201.0430	REMOVE AND DISPOSE CONCRETE MEDIAN B	LF	$7.87	$9.33	172.50	17	4
201.0431	REMOVE AND DISPOSE CONCRETE MEDIAN M	SY	$8.58	$8.70	1722.67	13	3
201.0432	REMOVE AND DISPOSE HEADWALL	EACH	$257.58	$240.49	3.44	44	9
201.0434	REMOVE AND DISPOSE MONITORING/OBSERV	EACH	$425.00	$445.83	2.67	15	3
201.0440	REMOVE AND DISPOSE ASBESTOS CEMENT P	LF	$1.00	$52.20	430.00	5	1
201.0450	REMOVE AND STOCKPILE ON SITE GRANITE C	LF	$10.00	$10.40	238.00	5	1
201.0455	REMOVE AND STOCKPILE ON SITE SIGN PANE	EACH	$50.00	$115.00	8.00	5	1
201.0601	REMOVE AND DISPOSE GROUND MOUNTED S	EACH	$56.48	$96.87	18.00	18	3
201.0602	REMOVE AND STOCKPILE GROUND MOUNTED	EACH	$200.00	$191.00	4.00	5	1
201.0604	REMOVE AND DISPOSE GROUND MOUNTED S	EACH	$57.61	$99.72	11.50	22	4
201.0605	REMOVE AND DISPOSE GROUND MOUNTED S	EACH	$72.22	$176.50	15.00	18	3
201.0609	REMOVE AND SALVAGE DIRECTIONAL REGUL	EACH	$1.00	$203.71	2.00	7	1
201.0610	REMOVE AND DISPOSE DIRECTIONAL, WARNI	EACH	$15.19	$20.22	54.65	99	20
201.0613	REMOVE AND STOCKPILE LIGHT STANDARDS	EACH	$150.00	$147.78	1.00	9	1
201.0615	REMOVE AND STOCKPILE LUMINAIRE	EACH	$80.00	$78.67	1.00	9	1
201.0616	REMOVE AND DISPOSE LIGHT STANDARD FO	EACH	$600.00	$280.56	1.00	9	1
201.0617	REMOVE AND DISPOSE CONDUIT - ALL SIZES	LF	$3.00	$6.81	618.00	9	1
201.0619	REMOVE AND SALVAGE TRAFFIC SIGNAL SYS	EACH	$2,500.00	$2,850.00	1.00	4	1
201.0623	REMOVE AND DISPOSE OVERHEAD SIGN STR	EACH	$3,500.00	$3,675.00	1.00	4	1
202.0100	EARTH EXCAVATION	CY	$5.09	$8.56	2796.50	147	30
202.0200	ROCK EXCAVATION COMMON	CY	$10.15	$63.16	174.00	12	2
202.0201	ROCK EXCAVATION MECHANICAL	CY	$250.00	$312.50	1.00	4	1
202.0300	UNCLASSIFIED EXCAVATION	CY	$15.00	$11.00	1000.00	6	1
202.0400	MUCK EXCAVATION	CY	$30.00	$28.00	50.00	11	2
202.0700	COMMON BORROW	CY	$.74	$2.40	7018.00	53	11
202.0800	GRAVEL BORROW	CY	$21.38	$22.39	372.11	42	9
203.0100	STRUCTURAL EXCAVATION EARTH	CY	$18.73	$18.82	908.14	40	7
203.0220	STRUCTURAL EXCAVATION ROCK MECHANIC	CY	$85.00	$83.02	30.00	5	1
203.0310	STRUCUTRAL EXCAVATION MASONRY	CY	$80.00	$100.33	196.00	6	1
203.0400	STRUCTURAL EXCAVATION UNCLASSIFIED	CY	$42.06	$46.58	77.67	13	3
203.0530	DEWATERING	LS	$1,833.67	$4,294.29	1.00	17	3
203.0600	FILL GRAVEL BORROW UNDER STRUCTURES	CY	$70.00	$55.00	20.00	4	1
203.0650	CRUSHED STONE FILL UNDER STRUCTURES	CY	$40.00	$56.67	92.00	6	1
203.0700	PERVIOUS FILL	CY	$24.40	$29.64	279.75	40	8

204.0100	TRIMMING AND FINE GRADING	SY	$1.12	$1.32	17502.14	141	28
205.0240	TRENCH ROCK EXCAVATION (0-7')	CY	$1.00	$40.33	400.00	6	1
205.0270	TRENCH ROCK EXCAVATION-MECHANICAL (0-	CY	$1.00	$35.12	335.00	9	2
206.0201	BALED HAY EROSION CHECK STANDARD 9.1.(	LF	$3.20	$3.53	4698.20	54	10
206.0208	REMOVAL OF BALED HAY EROSION CHECKS	LF	$1.53	$1.28	3596.00	84	16
206.0220	SILT FENCE STANDARD 9.2.0	LF	$4.74	$5.45	115.00	16	4
206.0230	BALED HAY EROSION CHECK AND SILT FENCE	LF	$5.92	$6.11	1152.24	87	17
207.0202	BALED HAY DITCH EROSION CHECK STANDAF	LF	$4.03	$4.69	594.00	26	4
207.0206	SAND BAG EROSION DIKE STANDARD 9.6.0	PBAG	$16.95	$13.90	66.67	15	3
207.0210	STONE CHECK DAMS	CF	$2.84	$3.99	816.00	13	2
208.0100	DEWATERING BASIN STANDARD 9.7.0	SF	$7.72	$9.93	464.00	20	3
209.0100	SANDBAG GUTTER INLET SEDIMENT BARRIEF	PBAG	$1.00	$7.80	616.00	5	1
209.0110	BALED HAY CATCH BASIN INLET PROTECTION	LF	$3.72	$4.96	424.63	45	8
211.0100	CONSTRUCTION ACCESSES STANDARD 9.9.0	SY	$4.62	$7.13	800.00	11	2
212.2000	CLEANING AND MAINTENANCE OF EROSION C	LS	$4,906.65	$5,720.70	1.00	115	23
213.0100	PLACEMENT OF MILLINGS BENEATH GUARDR	LF	$1.83	$2.56	6275.67	63	12
301.0300	CRUSHED STONE OR CRUSHED GRAVEL BAS	CY	$40.00	$31.33	114.00	6	1
302.0100	GRAVEL BORROW SUBBASE COURSE	CY	$12.25	$15.79	1694.89	130	26
303.0100	SPECIAL GRADED AGGREGATE FOR SHAPING	CY	$45.04	$61.35	19.86	33	7
304.0100	SELECT LEVELING AND FILLER AGGREGATE	CY	$28.00	$22.00	500.00	4	1
401.0100	BITUMINOUS BASE COURSE	TON	$75.24	$77.12	1184.33	79	15
401.0200	BITUMINOUS SURFACE COURSE TYPE I-1	TON	$81.20	$81.95	1166.06	105	22
401.0300	BITUMINOUS SURFACE COURSE TYPE I-2	TON	$152.02	$139.63	227.72	46	10
401.0400	BRIDGE BINDER	TON	$145.71	$163.51	14.00	10	2
402.0870	DENSE FRICTION COURSE	TON	$80.00	$116.67	70.00	3	1
402.0871	DENSE FRICTION COURSE WITH MATERIAL TF	TON	$85.06	$87.81	16778.33	10	3
402.0880	RAMP FRICTION COURSE	TON	$80.00	$89.00	1495.00	4	1
403.0300	ASPHALT EMULSION TACK COAT	SY	$.07	$.19	51813.74	150	31
408.0100	CLEANING AND SEALING CRACKS IN BITUMIN	LF	$.28	$.33	365611.11	29	9
408.0200	CLEANING AND SEALING CRACKS IN BITUMIN	LF	$.05	$.11	46732.00	29	9
410.1000	TEMPORARY PATCHING MATERIAL/TRENCHES	TON	$81.24	$125.11	105.77	66	13
411.0100	PAVER PLACED ELASTOMERIC SURFACE TRE	SY	$6.49	$8.70	180197.00	5	1
412.0100	RUBBERIZED ASPHALT CHIP SEALING	SY	$4.20	$4.48	118836.00	13	4
502.1000	FULL DEPTH CLEANING AND SEALING OF JOIN	LF	$5.00	$3.78	14000.00	5	1
503.1010	REPAIRING DETERIORATED/DAMAGED JOINTS	CF	$.01	$72.40	6000.00	5	1
601.0120	CLASS HP PORTLAND CEMENT CONCRETE	CY	$1,500.00	$1,120.00	2.00	5	1
601.0200	CLASS XX PORTLAND CEMENT CONCRETE	CY	$131.92	$153.54	36.05	61	13
601.0300	CLASS A PORTLAND CEMENT CONCRETE	CY	$112.94	$117.21	108.16	52	11
603.1000	CONTROLLED LOW STRENGTH MATERIAL	CY	$118.44	$106.83	136.33	16	3
701.0412	REINFORCED CONCRETE PIPE M 170 CLASS I	LF	$33.00	$32.84	929.63	39	8
701.0415	REINFORCED CONCRETE PIPE M 170 CLASS I	LF	$42.77	$36.65	130.67	17	3
701.0418	REINFORCED CONCRETE PIPE M 170 CLASS I	LF	$54.72	$43.36	1813.67	17	3
701.0424	REINFORCED CONCRETE PIPE M 170 CLASS I	LF	$40.83	$50.24	137.67	16	3
701.0512	REINFORCED CONCRETE PIPE M 170 CLASS I	LF	$55.00	$66.60	348.00	5	1
701.0536	REINFORCED CONCRETE PIPE M 170 CLASS I	LF	$265.00	$139.56	20.00	9	1
701.0612	REINFORCED CONCRETE PIPE M 170 CLASS \	LF	$56.00	$51.95	99.80	28	5
701.0615	REINFORCED CONCRETE PIPE M 170 CLASS \	LF	$39.01	$43.73	73.00	11	2
701.0618	REINFORCED CONCRETE PIPE M 170 CLASS \	LF	$43.14	$44.10	74.00	11	2
701.0630	REINFORCED CONCRETE PIPE M 170 CLASS \	LF	$85.00	$115.83	60.00	6	1
701.4312	12 INCH SMOOTH INTERIOR CORRUGATED PC	LF	$52.79	$79.75	700.50	13	2
701.5308	8 INCH DUCTILE IRON WATER PIPE CLASS 52,	LF	$110.00	$98.60	25.00	5	1
701.5312	12 INCH DUCTILE IRON WATER PIPE CLASS 52	LF	$73.55	$82.46	525.00	11	2
701.5314	14 INCH DUCTILE IRON WATER PIPE CLASS 52	LF	$130.00	$130.00	30.00	6	1
701.5316	16 INCH DUCTILE IRON WATER PIPE CLASS 52	LF	$64.61	$64.56	2917.33	16	3
701.5416	16 INCH DUCTILE IRON WATER PIPE CLASS 52	LF	$270.00	$290.10	300.00	5	1
701.6008	8 INCH DUCTILE IRON SEWER SAFE PIPE CLA	LF	$50.00	$57.00	282.00	4	1
701.6010	10 INCH DUCTILE IRON SEWER SAFE PIPE CL/	LF	$75.00	$105.00	347.00	5	1
701.6012	12 INCH DUCTILE IRON SEWER SAFE PIPE CL/	LF	$80.28	$82.57	576.50	8	2
701.6018	18 INCH DUCTILE IRON SEWER SAFE PIPE CL/	LF	$105.00	$115.00	205.00	4	1
701.7412	12 INCH BCCMCP M 190 TYPE A END SECTION	EACH	$300.00	$430.83	1.00	12	2
701.7712	12 INCH REINFORCED CONCRETE PIPE END S	EACH	$718.36	$703.57	3.50	40	8
701.7715	15 INCH REINFORCED CONCRETE PIPE END S	EACH	$1,300.00	$933.33	1.00	3	1
701.7718	18 INCH REINFORCED CONCRETE PIPE END S	EACH	$619.00	$738.45	4.00	11	2
701.7724	24 INCH REINFORCED CONCRETE PIPE END S	EACH	$1,100.00	$986.25	1.50	11	2

701.7736	36 INCH REINFORCED CONCRETE PIPE END S	EACH	$1,325.00	$1,436.11	1.00	9	1
701.8003	PIPE BEDDING CLASS C	CY	$26.75	$24.32	79.80	26	5
701.8100	FURNISH AND INSTALL DUCTILE IRON FITTING	LBS	$4.67	$4.38	4890.75	21	4
701.8116	16 INCH GATE VALVE AND BOX	EACH	$6,021.83	$5,262.39	4.00	17	3
701.8150	TYPE K COPPER SERVICE PIPE	LF	$50.00	$62.80	75.00	5	1
701.8151	CURB STOP BOX	EACH	$191.58	$179.59	6.33	16	3
701.8163	POST TYPE HYDRANT	EACH	$3,000.00	$4,015.00	7.00	5	1
701.9001	CONDUCT LEAKAGE TEST	EACH	$2,250.00	$2,509.07	1.00	10	2
701.9002	STERILIZATION OF WATER MAINS	LS	$2,500.00	$2,739.63	1.00	10	2
702.0204	4' MANHOLE BLOCK STANDARD 3.2.0	EACH	$2,975.00	$3,168.75	1.00	8	2
702.0209	6' MANHOLE BRICK STANDARD 3.2.1	EACH	$2,800.00	$3,950.00	1.00	4	1
702.0210	SOLID BLOCK SHALLOW 4'-0" ROUND MANHOI	EACH	$2,106.67	$1,912.44	3.75	21	4
702.0510	HEAVY-DUTY SQUARE FRAME AND ROUND C(	EACH	$783.33	$786.07	1.00	14	3
702.0511	FRAME AND COVER STANDARD 6.1.0	EACH	$551.55	$581.38	9.67	15	3
702.0513	FRAME AND GRATE STANDARD 6.3.1	EACH	$682.41	$651.81	13.50	18	4
702.0514	FRAME AND GRATE STANDARD 6.4.0	EACH	$678.70	$645.96	4.60	26	5
702.0515	FRAME AND GRATE HIGH CAPACITY STANDAF	EACH	$1,200.00	$900.00	1.00	3	1
702.0516	FRAME AND GRATE, HIGH CAPACITY, STANDA	EACH	$675.45	$711.30	8.00	32	7
702.0517	FRAME AND GRATE, STANDARD 6.3.2	EACH	$591.08	$588.44	14.69	81	16
702.0521	FRAME AND COVER STANDARD 6.2.0	EACH	$664.68	$613.68	2.75	39	8
702.0522	FRAME AND COVER STANDARD 6.2.1	EACH	$799.03	$736.37	11.54	70	13
702.0530	PRECAST CONCRETE INLET STONE 5' STAND/	EACH	$211.39	$227.94	6.00	14	3
702.0531	PRECAST CONCRETE INLET STONE 38" STAN	EACH	$205.35	$212.50	14.25	19	4
702.0532	PRECAST CONCRETE APRON STONE 5' STANI	EACH	$198.33	$245.92	1.50	8	2
702.0533	PRECAST CONCRETE APRON STONE 38" STA	EACH	$211.30	$207.35	7.67	16	3
702.0540	GRANITE INLET STONE 5 FOOT STANDARD 7.3	EACH	$352.50	$434.15	10.00	10	2
702.0541	GRANITE INLET STONE 38" STANDARD 7.3.6	EACH	$454.55	$434.62	5.50	7	2
702.0542	GRANITE APRON STONE 5FT. STANDARD 7.3.7	EACH	$337.41	$400.90	4.25	22	4
702.0543	GRANITE APRON STONE 38" STANDARD 7.3.8	EACH	$303.67	$305.56	24.80	27	5
702.0605	PRECAST CATCH BASIN 4' DIAMETER STANDA	EACH	$1,659.85	$1,788.95	28.50	33	6
702.0610	PRECAST CATCH BASIN 5' DIAMETER STANDA	EACH	$2,488.89	$2,576.53	3.00	16	3
702.0615	PRECAST CATCH BASIN 6' DIAMETER STANDA	EACH	$2,500.00	$4,258.33	1.00	6	1
702.0630	PRECAST MANHOLE 4' DIAMETER STANDARD	EACH	$1,770.59	$2,192.77	3.40	27	5
702.0635	PRECAST MANHOLE 5' DIAMETER STANDARD	EACH	$3,350.00	$3,165.45	5.00	11	2
702.0640	PRECAST MANHOLE 6' DIAMETER STANDARD	EACH	$4,200.00	$4,077.78	1.00	9	1
702.0645	PRECAST MANHOLE 4' SQUARE STANDARD 4.	EACH	$3,200.00	$3,550.00	4.00	4	1
702.0650	PRECAST MANHOLE 6' SQUARE STANDARD 4.	EACH	$3,700.00	$5,425.00	1.00	4	1
702.0701	CATCH BASIN TYPE 'D' ROUND STANDARD 3.4	EACH	$4,000.00	$2,600.00	2.00	5	1
702.0705	CATCH BASIN W/GUTTER INLET STANDARD 3.	EACH	$1,600.00	$2,744.00	6.00	5	1
702.0709	CATCH BASIN 6' DIAMETER STANDARD 3.4.5	EACH	$3,900.00	$3,716.67	1.00	6	1
702.0711	DROP INLET BRICK STANDARD 3.6.0	EACH	$800.00	$802.60	2.00	5	1
702.0712	PRECAST CONCRETE DROP INLET STANDARD	EACH	$948.46	$1,091.62	3.25	20	4
702.0713	PRECAST CONCRETE DROP INLET WITH APR(	EACH	$1,095.42	$1,205.35	7.50	29	6
702.0714	PRECAST CONCRETE DROP INLET WITH APR(	EACH	$1,250.00	$1,505.00	1.00	5	1
702.0722	SOLID BLOCK SHALLOW TYPE "F" SQUARE CA	EACH	$2,995.00	$3,431.00	3.33	16	3
702.0723	SOLID BLOCK SHALLOW 5'-0" SQUARE CATCH	EACH	$3,000.00	$3,223.33	5.00	6	1
702.0724	SOLID BLOCK SHALLOW 6'-0" SQUARE CATCH	EACH	$3,500.00	$4,116.67	2.50	10	2
702.0726	SOLID BLOCK SHALLOW DOUBLE GRATE CAT	EACH	$3,433.33	$3,433.85	1.00	13	3
702.0727	SOLID BLOCK SHALLOW DOUBLE GRATE CAT	EACH	$3,450.00	$2,619.09	2.00	11	2
702.0750	MANHOLES, CATCH BASINS & INLETS DEPTHS	VLF	$750.00	$383.33	14.00	3	1
702.0800	CONCRETE COVER SHALLOW 4'-0" ROUND MA	EACH	$515.00	$546.55	7.00	11	2
702.0810	CONCRETE COVER SHALLOW 5'-0" ROUND MA	EACH	$640.00	$645.00	1.00	11	2
702.0820	TOP COVER 4'-0" SQUARE CATCH BASINS AN	EACH	$890.00	$425.00	4.00	4	1
702.0825	TOP COVER 6'-0" SQUARE CATCH BASINS AN	EACH	$2,000.00	$1,462.00	1.00	5	1
702.0840	ALTERNATE TOP COVER ROUND PRECAST M/	EACH	$400.00	$495.45	13.00	11	2
702.0850	CONCRETE COVER SHALLOW TYPE "F" SQUA	EACH	$1,035.15	$941.53	5.00	21	4
702.0860	CONCRETE COVER SHALLOW DOUBLE GRATE	EACH	$1,250.00	$665.00	1.00	4	1
702.0870	CONCRETE COVER SHALLOW DOUBLE GRATE	EACH	$1,000.00	$690.83	1.00	6	1
702.0880	CONCRETE COVER SHALLOW 5'-0" SQUARE C	EACH	$1,200.00	$884.17	6.00	6	1
702.0890	CONCRETE COVER SHALLOW 6'-0" SQUARE C	EACH	$1,240.00	$897.92	2.50	10	2
703.0012	12" PERFORATED CONCRETE PIPE M175 WITH	LF	$40.00	$58.08	118.00	6	1
703.0608	8" PERFORATED CORRUGATED POLYETHLYN	LF	$34.00	$45.75	200.00	6	1
704.0100	RECONSTRUCT CATCH BASIN/CORBEL CONE	EACH	$311.82	$716.78	10.00	52	11
704.0200	RECONSTRUCT MANHOLE/CORBEL CONES	EACH	$286.62	$715.36	5.20	26	5

704.0300	RECONSTRUCT CATCH BASIN/VERTICAL WAL	VLF	$37.25	$145.47	73.83	27	6
704.0400	RECONSTRUCT MANHOLE/VERTICAL WALLS	VLF	$53.64	$174.48	15.50	21	4
705.1300	RECONSTRUCT CB TYPE 'D' TO CATCH BASIN	EACH	$236.74	$716.92	12.25	18	4
706.9000	PLUG AND CAP PIPE ALL SIZES	EACH	$109.05	$191.26	9.25	22	4
707.0900	ADJUST MANHOLES TO GRADE	EACH	$167.26	$169.23	12.19	73	16
707.0950	ADJUST TELEPHONE MANHOLE TO GRADE	EACH	$140.03	$307.14	6.67	54	12
707.0955	ADJUST ELECTRICAL MANHOLE TO GRADE	EACH	$213.59	$347.47	7.67	30	6
707.1000	ADJUST SANITARY MANHOLE	EACH	$163.20	$143.54	25.45	54	11
707.1100	ADJUST CATCH BASINS	EACH	$137.31	$187.48	11.38	61	13
707.1200	ADJUST CATCH BASIN TO MANHOLE	EACH	$468.75	$426.33	2.00	8	2
707.1900	ADJUST FRAME & COVER TO GRADE	EACH	$142.36	$70.61	11.25	38	8
707.2000	ADJUST FRAME AND GRATE TO GRADE	EACH	$212.21	$109.79	45.38	60	13
708.9040	CLEANING AND FLUSHING PIPE ALL SIZES	LF	$1.37	$1.55	5510.74	94	19
708.9041	CLEANING CATCH BASINS ALL TYPES AND SIZ	EACH	$66.50	$78.50	41.48	103	21
708.9042	CLEANING MANHOLES ALL TYPES AND SIZES	EACH	$70.16	$82.55	5.57	69	14
709.0100	CONCRETE CONNECTING COLLAR STANDARD	CY	$625.00	$465.58	2.00	23	4
709.0200	CONCRETE HEADWALLS FOR PIPE CULVERTS	CY	$1,526.54	$1,312.71	4.33	29	6
709.8103	FURNISH & INSTALL CEMENT CONCRETE CLA	CY	$223.50	$180.30	29.25	21	4
711.0110	3" PAVED WATERWAY CLASS I-1 STANDARD 8	SY	$30.38	$44.71	262.71	38	7
711.0111	2" PAVED WATERWAY CLASS I-1 STANDARD 8	SY	$200.00	$111.67	6.00	3	1
711.0200	BITUMINOUS CONCRETE DITCH STANDARD 8.	SY	$34.00	$51.17	170.00	6	1
711.0300	SEEDED DITCH STANDARD 8.1.0	SY	$3.18	$2.18	809.60	24	5
712.0100	WATER GATE BOX	EACH	$280.56	$250.73	6.55	54	11
712.0200	GAS GATE BOX	EACH	$314.24	$256.79	6.09	55	11
713.8268	ADJUST CURB STOP BOX TO GRADE	EACH	$28.79	$38.32	37.88	36	8
713.8269	ADJUST WATER GATE BOXES TO GRADE	EACH	$77.29	$66.40	22.05	86	20
713.8300	ADJUST GAS GATE BOXES TO GRADE	EACH	$92.57	$77.56	13.50	70	16
714.8266	REMOVE AND SALVAGE POST TYPE FIRE HYD	EACH	$200.00	$824.00	7.00	5	1
803.0000	REMOVAL OF EXISTING BRIDGES	LS	$300,000.00	$435,833.33	1.00	6	1
803.0200	REMOVE AND DISPOSE EXISTING SUBSTRUC	LS	$15,000.00	$18,500.00	1.00	3	1
803.0300	PARTIAL REMOVAL AND DISPOSAL OF EXISTII	CY	$100.00	$806.67	5.00	6	1
803.0500	TEMPORARY DECK UNDERSIDE AND SIDE PR	SF	$6.00	$10.80	7000.00	5	1
804.1210	H PILES FURNISH AND DRIVE 14 INCH 117 LB/I	LF	$100.00	$130.83	1200.00	6	1
804.2000	MOBILIZATION & DEMOBILIZATION OF PILE DF	LS	$10,000.00	$21,833.33	1.00	6	1
804.2100	PILE POINTS FOR H PILES 14 INCH X 117 LB/F	EACH	$100.00	$142.50	30.00	6	1
805.0100	PERMANENT SHEET PILING STEEL FURNISH A	SF	$100.00	$118.33	320.00	6	1
807.0350	POINTING & GROUTING MASONRY	LF	$42.00	$27.17	757.00	6	1
808.0321	CONCRETE SUBSTRUCTURE CLASS HP 3/4" W	CY	$1,278.26	$1,466.46	15.33	16	3
808.0322	CONCRETE SUBSTRUCTURE CLASS HP 3/4" E	CY	$1,621.95	$1,975.76	13.67	17	3
808.0324	CONCRETE SUBSTRUCTURE CLASS HP 3/4" B	CY	$600.00	$915.00	4.00	5	1
808.0502	CONCRETE SUBSTRUCTURE CLASS XX 3/4" A	CY	$570.00	$443.33	72.00	6	1
808.0504	CONCRETE SUBSTRUCTURE CLASS XX 3/4" W	CY	$568.70	$637.45	34.50	12	2
808.0505	CONCRETE SUBSTRUCTURE CLASS HP 3/4" W	CY	$1,078.45	$1,040.12	60.33	17	3
808.0506	CONCRETE SUBSTRUCTURE CLASS HP 3/4" A	CY	$897.69	$854.05	116.33	17	3
808.0508	CONCRETE SUBSTRUCTURE CLASS XX 3/4" A	CY	$262.35	$396.29	57.10	25	5
808.0601	CONCRETE SUBSTRUCTURE CLASS HP 3/4" P	CY	$1,300.00	$1,335.00	35.00	5	1
808.0602	CONCRETE SUBSTRUCTURE CLASS HP 3/4" B	CY	$1,496.81	$1,525.86	15.67	30	6
808.0800	CONCRETE RETAINING WALL CLASS HP 3/4" S	CY	$421.47	$476.18	890.00	11	2
808.1501	CONCRETE SUPERSTRUCTURE CLASS HP 3/4	CY	$595.16	$802.53	92.00	11	2
808.1502	CONCRETE SUPERSTRUCTURE CLASS HP 3/4	CY	$576.74	$704.96	55.25	19	4
808.1503	CONCRETE SUPERSTRUCTURE CLASS HP 3/4	CY	$1,100.00	$1,525.00	8.00	6	1
808.1640	PREFORMED POLYETHYLENE FOAM JOINT FII	SF	$1.00	$3.00	250.00	3	1
808.1642	PREFORMED POLYETHYLENE FOAM JOINT FII	SF	$4.33	$4.65	322.10	23	5
808.1651	MASTIC JOINT SEALER	CI	$.89	$1.12	4680.00	13	3
808.1670	POLYURETHANE JOINT SEALANT	CI	$1.78	$2.50	620.75	19	4
808.1675	POLYURETHANE ELASTOMERIC JOINT SEALA	CI	$1.42	$1.56	1400.00	9	2
808.1810	CONCRETE SURFACE FINISHING RUBBED RE	SF	$6.50	$4.71	3199.33	17	3
809.0914	PRESTRESSED CONCRETE BOX BEAM B1-48 F	SF	$100.00	$100.21	300.00	5	1
809.0923	PRESTRESSED CONCRETE BOX BEAM TYPE E	SF	$120.00	$129.00	3263.00	5	1
809.1145	PRESTRESSED CONCRETE VOIDED SLABS 18	SF	$50.00	$52.15	12600.00	3	1
809.1146	PRESTRESSED CONCRETE VOIDED SLABS 21	SF	$80.00	$76.72	1720.00	5	1
810.0200	STANDARD BARS GRADE 60	LBS	$1.25	$2.85	5385.00	4	1
810.0300	EPOXY COATED BARS GRADE 60	LBS	$1.13	$1.38	21771.00	31	7
810.0702	WELDED WIRE FABRIC (GALVANIZED)	SF	$4.00	$3.05	35.00	5	1

811.0101	WEEP HOLES 4 INCH DIAMETER	LF	$60.00	$47.33	15.00	6	1
811.2100	WALL DRAINS 6" BITUMINOUS COATED CORR	LF	$45.00	$52.50	25.00	6	1
811.2200	WALL DRAINS 8" BITUMINOUS COATED CORR	LF	$40.00	$31.83	189.00	6	1
813.0400	RUBBERIZED ASPHALT LIQUID MEMBRANE (W	SY	$32.00	$32.33	850.00	3	1
817.2100	REPAIRS TO STRUCTURAL CONCRETE MASO	CF	$400.00	$435.00	21.00	4	1
817.2110	REPAIRS TO STRUCTURAL CONCRETE MASO	CF	$250.00	$253.50	1040.00	4	1
817.2140	REPAIRS TO STRUCTURAL CONCRETE MASO	CF	$445.00	$423.00	210.00	6	1
819.0800	DRILL AND GROUT REINFORCING DOWELS	EACH	$34.02	$39.29	811.80	25	5
820.0110	CONCRETE SURFACE TREATMENT (PROTECT	SF	$1.87	$2.33	19028.63	34	8
820.0200	HIGH PRESSURE WATER CLEANING OF CONC	SF	$.21	$.25	53767.00	7	2
821.1690	SAW & SEALING JOINTS IN BITUMINOUS CON(	LF	$14.35	$24.53	184.00	8	2
822.1695	SILICONE HIGHWAY JOINT SEALER	LF	$.75	$7.55	400.00	5	1
823.1750	ASPHALTIC EXPANSION JOINT SYSTEM	LF	$147.98	$163.95	230.67	12	3
823.1760	STRIP SEAL EXPANSION JOINT ASSEMBLIES	LF	$400.00	$379.17	41.00	6	1
828.0301	ELASTOMERIC BEARINGS PLAIN	EACH	$130.00	$136.69	22.00	5	1
828.0303	ELASTOMERIC BEARINGS LAMINATED	EACH	$163.41	$217.45	123.00	8	2
830.0110	ALUMINUM BRIDGE RAIL 1 BAR ORNAMENTAL	LF	$70.00	$70.00	50.00	1	1
830.0111	ALUMINUM BRIDGE RAIL 1 BAR STRUCTURAL	LF	$91.94	$128.38	67.00	7	2
830.0210	STEEL BRIDGE RAIL 1 BAR STRUCTURAL	LF	$70.00	$70.00	50.00	1	1
830.0220	STEEL BRIDGE RAIL 2 BAR CRASH TESTED	LF	$254.87	$253.86	182.00	12	3
830.0240	STEEL BRIDGE RAIL 4 BAR COMBINATION	LF	$291.76	$297.11	340.00	4	2
830.0250	BALDWIN 4 BAR ORNAMENTAL RAIL	LF	$478.02	$587.03	116.00	5	2
831.0110	PEDESTRIAN CHAIN LINK FENCE	LF	$363.00	$321.00	180.00	6	1
831.0130	RAILROAD PROTECTIVE BARRIER RAILING	LF	$643.00	$608.67	130.00	6	1
833.0400	GRANITE IDENTIFICATION TABLETS	EACH	$485.71	$669.26	4.67	14	3
834.0131	VERTICAL FACE GRANITE CURB STRAIGHT 7"	LF	$49.74	$53.97	142.50	10	2
836.0100	STRUCTURAL CONCRETE CRACK REPAIR BY	LF	$70.00	$76.25	705.00	4	1
838.0100	SAW CUT IN EXISTING CONCRETE WALL	LF	$80.00	$33.83	110.00	6	1
901.0101	GUARDRAIL STEEL BEAM SINGLE FACE EART	LF	$20.31	$21.20	5319.20	47	10
901.0102	GUARDRAIL STEEL BEAM SINGLE FACE WITH	LF	$24.00	$24.00	1000.00	1	1
901.0111	GUARDRAIL STEEL BEAM DOUBLE FACE EAR	LF	$215.00	$190.71	39.00	7	1
901.0112	GUARDRAIL STEEL BEAM DOUBLE FACE WITH	LF	$26.00	$26.00	500.00	1	1
901.0151	TERMINAL END SECTION SINGLE FACE STAND	EACH	$63.88	$87.33	12.67	38	9
901.0160	REFLECTORIZED TRIANGULAR DELINEATORS	EACH	$3.76	$3.91	1050.00	4	2
901.0161	GUARDRAIL STEEL BEAM POST (IN EARTH AN	EACH	$175.00	$182.00	6.00	5	1
901.0165	STEEL BEAM GUARDRAIL SECTION (12.5 FT. B	EACH	$240.52	$250.87	203.00	7	2
901.0166	STEEL BEAM RUB RAIL 6 X 12 SECTION	EACH	$98.84	$249.64	21.50	6	2
901.0182	GUARDRAIL STEEL BEAM TREATMENT AT BRI	EACH	$2,900.00	$3,050.00	1.00	6	1
901.0183	STEEL BEAM BRIDGE CONNECTION APPROAC	EACH	$1,080.00	$1,788.89	5.00	6	2
901.0184	STEEL BEAM BRIDGE CONNECTION TRAILING	EACH	$1,100.00	$1,838.46	4.50	6	2
901.0190	GUARDRAIL STEEL BEAM ANCHORAGE APPR	EACH	$2,750.00	$2,789.06	1.50	22	4
901.0191	GUARDRAIL STEEL BEAM ANCHORAGE TRAIL	EACH	$868.54	$1,048.31	6.00	19	4
901.0193	GUARDRAIL STEEL BEAM SINGLE FACE STAN	LF	$22.19	$22.92	708.00	36	7
901.0194	GUARDRAIL CONNECTION TO BARRIER - APPI	EACH	$2,900.00	$2,900.00	1.00	11	2
901.0195	GUARDRAIL CONNECTION TO BARRIER - TRAI	EACH	$3,000.00	$3,000.00	2.00	11	2
901.0196	GUARDRAIL CONNECTION TO EXISTING ENDF	EACH	$2,832.50	$2,940.59	2.67	14	3
901.0197	GUARDRAIL CONNECTION TO EXISTING ENDF	EACH	$2,750.00	$2,750.00	2.00	11	2
901.0901	REMOVE AND RESET GUARDRAIL ALL TYPES	LF	$13.41	$29.31	149.00	15	4
902.0100	STEEL BACKED TIMBER GUARDRAIL STANDAI	LF	$80.00	$94.25	80.00	6	2
903.0110	WOVEN WIRE RIGHT-OF-WAY FENCE STANDA	LF	$6.70	$8.15	1000.00	2	1
903.0204	CHAIN LINK FENCE 4' STANDARD 31.1.0	LF	$10.39	$12.85	517.50	5	2
903.0205	CHAIN LINK FENCE 5' STD 31.2.0	LF	$21.87	$22.53	1732.50	19	4
903.0206	CHAIN LINK FENCE 6' STD 31.2.0	LF	$23.13	$22.24	2055.25	41	8
903.0207	CHAIN LINK FENCE 5' INTERMEDIATE POST ST	LF	$160.00	$160.00	8.00	11	2
903.0227	GATE, CHAIN LINK 6' STANDARD 31.2.0	EACH	$1,402.00	$1,532.80	2.50	12	2
903.0230	DOUBLE GATE, CHAIN LINK 5' STANDARD 31.2	EACH	$1,000.00	$1,000.00	4.00	11	2
904.0101	REMOVE AND RESET FENCE AND/OR RAILING	LF	$23.00	$21.39	25.00	6	2
904.0200	FENCE POSTS REPLACED	EACH	$300.00	$275.00	4.00	4	1
905.0110	PORTLAND CEMENT SIDEWALK MONOLITHIC	CY	$312.36	$344.27	109.12	84	17
905.0115	PORTLAND CEMENT CONCRETE DRIVEWAY S	CY	$283.15	$330.96	97.50	39	8
905.0122	BITUMINOUS SIDEWALK TYPE I-2 STANDARD	TON	$123.19	$123.97	90.14	31	7
906.0100	SLOPE FACED GRANITE CURB - QUARRY SPL	LF	$40.30	$44.25	98.50	21	4
906.0101	SLOPE FACED GRANITE CURB - QUARRY SPL	LF	$53.32	$59.36	45.50	21	4
906.0102	SLOPE FACED GRANITE TRANSITION CURB S	EACH	$350.00	$435.00	4.00	5	1

906.0110	GRANITE CURB, QUARRY SPLIT STRAIGHT, ST	LF	$27.11	$28.54	3046.00	48	10
906.0111	GRANITE CURB, QUARRY SPLIT CIRCULAR, ST	LF	$36.70	$39.84	274.57	37	7
906.0118	6' GRANITE TRANSITION CURB, QUARRY SPLIT	EACH	$234.94	$265.50	33.20	27	5
906.0119	3' GRANITE TRANSITION CURB STANDARD 7.3	EACH	$180.83	$239.65	28.20	27	5
906.0120	GRANITE WHEELCHAIR RAMP CURB STANDAR	EACH	$476.03	$516.67	12.43	38	7
906.0210	CEMENT CONCRETE CURB PRECAST STRAIG	LF	$23.14	$23.57	1133.00	51	11
906.0211	CEMENT CONCRETE CURB PRECAST CIRCUL	LF	$25.98	$27.36	460.14	31	7
906.0212	CEMENT CONCRETE CURB PRECAST 2' CORN	EACH	$175.00	$167.63	1.67	15	3
906.0221	6' PRECAST CONCRETE TRANSITION CURB ST	EACH	$211.25	$214.81	10.50	35	8
906.0230	CEMENT CONCRETE SLOPE FACE CURB PRE	LF	$20.95	$24.31	553.00	18	4
906.0231	CEMENT CONCRETE SLOPE FACE CURB PRE	LF	$24.50	$28.52	235.33	14	3
906.0245	PRECAST CAR STOPS, STD. 7.2.4	EACH	$124.50	$145.13	10.00	9	2
906.0250	PRECAST CONCRETE WHEELCHAIR RAMP CU	EACH	$402.10	$403.55	8.86	32	7
906.0270	PRECAST CONCRETE TRANSITION CURB STA	EACH	$199.00	$207.67	2.50	9	2
906.0271	PRECAST CONCRETE SLOPE FACE TRANSITI	EACH	$200.00	$206.50	8.00	4	1
906.0280	3' PRECAST CONCRETE TRANSITION CURB ST	EACH	$198.62	$179.88	15.67	27	6
906.0600	BITUMINOUS CURBING STANDARD 7.5.0	LF	$8.76	$8.05	212.00	20	4
906.0602	BITUMINOUS BERM STANDARD 7.5.1	LF	$2.80	$1.61	6064.13	80	16
906.0700	REMOVE, HANDLE, HAUL TRIM RESET CURB E	LF	$15.10	$18.64	488.23	63	13
906.0720	RESET STOCKPILE CURB STRAIGHT CIRCULA	LF	$24.00	$27.30	238.00	5	1
907.0100	WATER FOR DUST CONTROL	MGAL	$14.46	$15.47	107.78	115	23
907.0200	CALCIUM CHLORIDE FOR DUST CONTROL (PR	TON	$233.34	$252.34	47.00	50	9
909.3010	PRECAST MEDIAN BARRIER DOUBLE-FACED S	LF	$175.00	$175.00	50.00	1	1
909.3020	PRECAST MEDIAN BARRIER SINGLE-FACED S	LF	$64.58	$60.66	283.33	12	3
909.3021	PRECAST MEDIAN BARRIER SINGLE-FACED S	LF	$148.75	$169.00	20.00	3	2
911.3200	REMOVE AND RESET WET STONE MASONRY	CY	$450.00	$750.00	3.00	6	1
914.5010	FLAGPERSONS	MHRS	$39.41	$40.44	2063.95	178	44
914.5020	FLAGPERSONS - OVERTIME	MHRS	$47.71	$49.25	475.95	178	44
915.0100	HIGHWAY BOUND GRANITE STANDARD 14.2.0	EACH	$450.00	$415.04	7.00	5	1
915.0200	HIGHWAY BOUNDS REINFORCED CONCRETE	EACH	$372.73	$363.18	5.50	10	2
915.0240	REMOVE AND RESET HIGHWAY BOUNDS (ALL	EACH	$460.00	$470.00	2.00	6	1
916.0600	SHOCK ABSORBING BARRIER MODULES	GRP	$2,228.00	$3,046.09	3.57	29	7
916.0650	REMOVE, RELOCATE AND RESET SHOCK ABS	GRP	$792.00	$958.85	5.00	19	4
917.0105	REMOVE AND REPLACE RURAL MAILBOX POS	EACH	$290.60	$298.64	34.89	43	9
917.0106	REMOVE AND REPLACE MULTIPLE MAILBOX M	EACH	$731.20	$747.55	7.50	28	6
918.0100	RURAL MAILBOXES	EACH	$178.95	$187.36	33.83	31	6
919.0101	TEST PITS	EACH	$109.46	$173.23	21.40	76	15
920.0040	DUMPED STONE RIPRAP R-3, R-4, R-5 STANDA	SY	$38.12	$41.99	288.43	37	7
920.0050	PLACED STONE RIPRAP R-1, R-2 STANDARD 8	SY	$20.01	$23.23	1039.00	10	2
920.0055	PLACED STONE RIPRAP R-3, R-4, R-5 STANDA	SY	$43.98	$46.71	382.00	39	8
920.0060	PLACED STONE RIPRAP R-6, R-7, R-8	SY	$75.00	$59.00	15.00	6	1
920.0085	PLACED STONE RIPRAP R-3, R-4, R-5 STANDA	CY	$20.00	$94.67	125.00	9	1
920.0130	BEDDING FOR RIPRAP FS-1 STANDARD 8.3.0	SY	$15.86	$18.95	158.00	19	4
920.0135	BEDDING FOR RIPRAP FS-2 STANDARD 8.3.0	SY	$13.02	$16.57	553.17	63	12
920.0140	BEDDING FOR RIPRAP FS-3 STANDARD 8.3.0	SY	$26.09	$34.96	88.33	17	3
920.0150	BEDDING FOR RIPRAP FS-2 STANDARD 8.3.0	CY	$20.00	$56.00	85.00	9	1
920.0200	FILTER FABRIC FOR RIP-RAP	SY	$3.64	$3.27	538.25	43	8
922.0100	TEMPORARY CONSTRUCTION SIGNS STANDA	SF	$13.46	$14.82	653.04	175	41
923.0105	DRUM BARRICADE STANDARD 26.2.0	BDAY	$.24	$.24	13172.47	134	30
923.0120	PLASTIC PIPE BARRICADE STANDARD 26.3.0	EACH	$78.18	$111.58	9.00	71	14
923.0125	PLASTIC PIPE TYPE III BARRICADE STANDARD	EACH	$33.35	$61.02	22.00	37	8
923.0200	FLUORESCENT TRAFFIC CONES STANDARD 2	EACH	$4.68	$9.94	307.18	163	38
924.0113	ADVANCE WARNING ARROW PANEL	PDAY	$11.17	$12.20	226.95	94	22
925.0112	PORTABLE CHANGEABLE MESSAGE SIGN	PDAY	$22.06	$22.75	283.62	64	13
926.0100	UNANCHORED PRECAST CONCRETE BARRIER	LF	$6.86	$17.70	8866.67	18	3
926.0120	ANCHORED PRECAST CONCRETE BARRIER F	LF	$43.00	$60.33	3530.00	6	1
926.0130	PRECAST MEDIAN BARRIER FOR TEMPORARY	LF	$32.82	$30.25	335.45	48	11
926.0140	REFLECTIVE DELINEATORS FOR TEMPORARY	EACH	$3.94	$5.94	172.25	19	4
928.0800	TRUCK MOUNTED ATTENUATOR WITH TRUCK	PDAY	$431.53	$457.38	103.22	72	18
929.0100	FIELD OFFICES 240 SQUARE FOOT MINIMUM	PMO	$1,537.66	$1,873.01	14.97	141	34
929.0200	MATERIALS LAB 240 SQUARE FOOT MINIMUM	PMO	$800.00	$1,633.33	27.00	6	1
929.0300	CHAMP MANAGEMENT SYSTEM	EACH	$1.00	$1.00	5000.00	11	2
931.0110	CLEANING AND SWEEPING PAVEMENT	HSY	$1.84	$3.23	1353.15	143	35
932.0100	CUTTING AND MATCHING ASPHALT	LF	$1.70	$1.81	1269.48	133	27

932.0101	CUTTING AND MATCHING CONCRETE	LF	$4.20	$7.60	25.00	4	1
932.0110	TRANSVERSE PAVEMENT CUT AND MATCH S	LF	$1.92	$1.19	348.33	16	3
932.0200	FULL-DEPTH SAWCUT OF BITUMINOUS PAVEM	LF	$.74	$.95	3123.85	132	26
932.0210	FULL DEPTH SAWCUT OF BITUMINOUS PAVEM	LF	$3.12	$2.69	2178.75	35	8
932.0220	FULL DEPTH SAWCUT OF BITUMINOUS SIDEW	LF	$.55	$.86	654.91	53	11
932.0230	FULL DEPTH SAWCUT OF PORTLAND CEMENT	LF	$1.63	$1.52	670.71	68	14
934.1000	SURVEY PARTY	PDAY	$222.49	$767.27	23.71	37	7
935.0500	REMOVING BITUMINOUS SURFACE - COLD PL	SY	$2.26	$2.34	19209.14	101	21
936.0110	MOBILIZATION	LS	$143,852.95	$185,458.14	1.00	172	38
937.0200	MAINTENANCE AND MOVEMENT TRAFFIC PRC	LS	$72,102.91	$82,015.15	1.00	156	34
939.0300	STONE WALLS IN HISTORIC, SCENIC OR RURA	CY	$450.00	$641.30	10.00	5	1
939.0400	STONE WALLS IN HISTORIC, SCENIC OR RURA	LF	$85.00	$115.00	150.00	3	1
942.0100	DETECTABLE WARNING SYSTEMS STANDARD	SF	$30.28	$30.66	105.07	73	15
943.0100	TRAINEE MAN-HOURS	MNHR	$6.00	$5.93	1354.17	119	24
L01.0102	LOAM BORROW 4 INCHES DEEP	SY	$3.28	$3.73	8298.15	97	20
L01.0104	PLANTABLE SOIL 4 INCHES DEEP	SY	$2.06	$2.80	12874.00	50	11
L02.0101	GENERAL HIGHWAY SEEDING (TYPE 1)	SY	$.88	$1.02	14920.40	67	15
L02.0102	RESIDENTIAL SEEDING (TYPE 2)	SY	$1.30	$1.37	4431.82	84	17
L02.0103	TEMPORARY SEEDING (TYPE 3)	SY	$1.00	$.83	11380.00	20	3
L02.0105	WETLAND SEED MIX (TYPE 5)	SY	$.93	$1.49	2240.00	6	1
L02.0106	WILDFLOWER SEED MIX (TYPE 6)	SY	$1.55	$3.10	524.50	6	2
L04.0514	FERTILIZATION OF SEEDED AND GRASSED AF	ACRE	$814.29	$907.44	2.33	19	3
L05.0505	EROSION CONTROL BLANKET	SY	$3.58	$3.80	1238.00	13	3
L05.0506	JUTE MESH	SY	$3.02	$3.06	1459.67	14	3
L05.0508	STRAW MULCH	ACRE	$3,800.00	$1,461.00	4.00	5	1
L06.0513	WOOD CHIPS FURNISH AND SPREAD 4" DEPT	SY	$6.11	$6.44	71.50	9	2
L07.0100	EXTENDED ESTABLISHMENT PERIOD	PMO	$475.00	$576.01	21.50	6	2
L08.0109	TREE TRIMMING	MHRS	$81.58	$85.14	38.00	9	2
L09.0106	SELECTIVE CLEARING	ACRE	$3,423.20	$3,438.39	1.25	16	4
L10.0101	MECHANICAL TREE AND SHRUB ROOT PRUNI	LF	$5.84	$6.44	3111.50	9	2
L11.0102	TREE PLANT PROTECTION DEVICE STANDARI	EACH	$130.29	$149.00	20.44	42	9
L11.0103	SHRUB PLANT PROTECTION DEVICE STANDA	LF	$5.11	$5.29	293.29	34	7
L11.0104	DRIP-LINE TREE PROTECTION DEVICE STAND	LF	$5.69	$6.18	637.50	12	2
T04.5001	6 AWG SINGLE CONDUCTOR CABLE 600V INSU	LF	$1.19	$1.09	4722.88	37	8
T04.5302	14 AWG 2 CONDUCTOR TWISTED SHIELDED C	LF	$.82	$.88	2627.71	29	7
T04.5303	14 AWG 3 CONDUCTOR CABLE	LF	$.85	$.93	2787.71	31	7
T04.5305	14 AWG 5 CONDUCTOR CABLE	LF	$1.09	$1.08	3953.14	31	7
T04.5307	14 AWG 7 CONDUCTOR CABLE	LF	$1.21	$1.31	452.86	31	7
T04.5312	14 AWG 12 CONDUCTOR CABLE	LF	$1.78	$1.84	517.50	9	2
T04.5315	14 AWG 15 CONDUCTOR CABLE	LF	$1.85	$1.94	120.00	5	1
T04.6902	'2' STRANDED COPPER CONDUCTOR 600V INS	LF	$1.70	$1.76	28217.25	25	4
T04.6906	'6' STRANDED COPPER CONDUCTOR 600V INS	LF	$.97	$1.02	2577.67	20	3
T04.6910	'10' STRANDED COPPER CONDUCTOR 600V IN	LF	$1.90	$1.91	50.00	6	1
T04.7300	IN-LINE FUSED DISCONNECT DEVICE WITH FU	EACH	$34.34	$37.50	60.67	16	3
T04.7400	IN-LINE UNFUSED DISCONNECT DEVICE	EACH	$32.67	$34.90	60.67	16	3
T04.7502	TWO WAY SPLICE	EACH	$36.00	$39.27	56.00	11	2
T04.7503	SEMI-PERMANENT 3-WAY SPLICE	EACH	$40.50	$43.55	125.00	11	2
T05.0100	PRECAST TYPE A HANDHOLE STANDARD 18.2	EACH	$918.26	$905.33	17.18	55	11
T05.0200	PRECAST TYPE H HEAVY DUTY HANDHOLE S	EACH	$1,680.00	$1,754.25	3.33	16	3
T05.0301	PRECAST TYPE B PULL BOX STANDARD 18.2.2	EACH	$3,500.00	$2,953.36	4.00	5	1
T05.0302	PULL BOX ON STRUCTURE - TYPE W	EACH	$1,850.00	$1,706.82	22.00	11	2
T05.0400	BREAK INTO EXISTING HANDHOLE	EACH	$292.92	$247.42	4.80	23	5
T05.1030	ADJUST HANDHOLE TO GRADE	EACH	$207.27	$223.03	5.50	11	2
T06.1020	2 IN. RIGID STEEL CONDUIT - UNDERGROUND	LF	$25.05	$28.26	132.17	27	6
T06.1030	3 IN. RIGID STEEL CONDUIT-UNDERGROUND	LF	$27.10	$27.64	49.00	10	2
T06.2015	1-1/2 IN. RIGID STEEL CONDUIT-OVERHEAD	LF	$16.00	$15.50	20.00	6	1
T06.2020	2 IN. RIGID STEEL CONDUIT-OVERHEAD	LF	$31.51	$26.63	317.78	43	9
T06.2030	3 IN. RIGID STEEL CONDUIT-OVERHEAD	LF	$20.18	$19.79	37.50	11	2
T06.3020	2 IN. RIGID STEEL CONDUIT-UNDER EXISTING	LF	$47.35	$60.10	283.00	14	3
T06.5015	1-1/2 INCH POLYVINYL CHLORIDE PLASTIC CC	LF	$13.00	$13.42	500.00	5	1
T06.5020	2 INCH POLYVINYL CHLORIDE PLASTIC COND	LF	$25.00	$17.60	345.00	5	1
T06.5030	3 INCH POLYVINYL CHLORIDE PLASTIC COND	LF	$18.52	$18.35	35.50	9	2
T06.5110	1 INCH SCHEDULE 40 POLYVINYL CHLORIDE F	LF	$35.00	$20.83	600.00	3	1
T06.5120	2 INCH SCHEDULE 40 POLYVINYL CHLORIDE F	LF	$13.19	$11.33	2199.33	20	3

T06.5130	3 INCH SCHEDULE 40 POLYVINYL CHLORIDE F	LF	$10.39	$11.58	2139.38	37	8
T06.5140	4 INCH SCHEDULE 40 POLYVINYL CHLORIDE F	LF	$23.60	$32.92	21.50	8	2
T06.5220	2 INCH SCHEDULE 80 POLYVINYL CHLORIDE F	LF	$60.00	$33.00	150.00	3	1
T06.5230	3 INCH SCHEDULE 80 POLYVINYL CHLORIDE F	LF	$14.89	$15.27	397.50	20	4
T06.5320	2 INCH SCHEDULE 40 POLYVINYL CHLORIDE F	LF	$39.50	$57.84	200.00	4	1
T06.5330	3 INCH SCHEDULE 40 POLYVINYL CHLORIDE F	LF	$34.97	$48.65	202.50	9	2
T06.5340	4 INCH SCHEDULE 40 POLYVINYL CHLORIDE F	LF	$41.00	$69.75	30.00	4	1
T06.5420	2 INCH SCHEDULE 80 POLYVINYL CHLORIDE F	LF	$13.50	$22.79	850.00	5	1
T06.5430	3 INCH SCHEDULE 80 POLYVINYL CHLORIDE F	LF	$27.08	$31.03	552.60	22	5
T06.6020	2 INCH POLYVINYL CHLORIDE PLASTIC COND	LF	$3.28	$3.98	119.29	32	7
T06.6030	3 INCH POLYVINYL CHLORIDE PLASTIC COND	LF	$7.60	$7.93	25.00	4	1
T07.1250	FURNISH AND INSTALL 250 WATT HIGH PRESS	EACH	$242.75	$263.39	26.67	20	3
T08.0100	LIGHT STANDARD FOUNDATION WITH ANCHO	EACH	$1,430.55	$1,359.46	20.50	26	4
T08.0250	LUMINAIRE SUPPORT UNDER STRUCTURE	EACH	$506.00	$746.73	22.00	11	2
T08.2031	ALUMINUM LIGHTING STD. 30 FT. W/ SINGLE D	EACH	$1,560.00	$1,725.00	2.00	9	1
T08.2041	ALUMINUM LIGHTING STD. 40 FT. W/ SINGLE D	EACH	$1,422.50	$1,423.18	39.00	11	2
T09.1000	SERVICE PEDESTAL STANDARD 18.4.0	EACH	$14,180.00	$13,510.91	2.00	11	2
T11.0130	TRAFFIC SIGNAL STANDARD, WOOD, 30 FT. C	EACH	$995.00	$1,148.33	2.00	11	2
T11.1020	20 FOOT GAL STEEL MAST ARM TRAFFIC SIGN	EACH	$7,500.00	$7,865.93	1.00	10	2
T11.1025	25 FOOT GAL STEEL MAST ARM TRAFFIC SIGN	EACH	$6,150.00	$8,541.81	2.00	8	2
T11.1030	30 FOOT GAL STEEL MAST ARM TRAFFIC SIGN	EACH	$6,500.00	$9,068.74	3.00	5	1
T11.1035	35 FOOT GAL STEEL MAST ARM TRAFFIC SIGN	EACH	$7,000.00	$9,573.80	1.00	5	1
T11.1040	40 FOOT GAL STEEL MAST ARM TRAFFIC SIGN	EACH	$10,966.67	$12,375.64	1.50	8	2
T11.1045	45 FOOT GAL STEEL MAST ARM TRAFFIC SIGN	EACH	$11,750.00	$13,164.13	1.00	8	2
T11.2008	TRAFFIC SIGNAL STANDARD,8 FOOT,STD 19.4	EACH	$1,492.82	$1,778.92	6.50	27	6
T11.2010	TRAFFIC SIGNAL STANDARD,10 FT, STD 19.4.0	EACH	$1,400.00	$1,669.00	4.00	4	1
T11.6005	TETHER WIRE 5/16	LF	$3.50	$4.30	100.00	5	1
T11.6006	SPAN AND MESSENGER WIRES 6/16	LF	$3.50	$4.30	100.00	5	1
T12.0004	ACTUATED CONTROLLER TS-2, TYPE 1 W/4 PH	EACH	$8,724.00	$9,881.00	14.00	4	1
T12.0018	ACTUATED CONTROLLER TS-2, TYPE 1 W/8 PH	EACH	$13,221.82	$14,942.88	1.83	26	6
T12.9150	METER SOCKET W/MANUAL BY-PASS	EACH	$207.50	$219.70	6.67	26	6
T13.1000	TRAFFIC DETECTORS-LOOP, STANDARD 19.6.	LF	$5.99	$6.51	2872.10	44	10
T13.1002	TRAFFIC DETECTOR RELAY-LOOP 2 CHANNEL	EACH	$250.00	$253.60	3.00	5	1
T13.1004	TRAFFIC DETECTOR RELAY-LOOP 4 CHANNEL	EACH	$302.47	$313.09	14.83	26	6
T13.8200	PEDESTRIAN DETECTOR-PUSHBUTTON W/SIG	EACH	$270.55	$304.04	11.00	9	2
T14.3413	1 WAY 3 SECTION SPAN MOUNTED SIGNAL HE	EACH	$975.00	$1,020.00	3.00	5	1
T14.3433	3 WAY 3 SECTION SPAN MOUNTED SIGNAL HE	EACH	$2,250.00	$2,463.33	1.00	9	2
T14.3443	4 WAY 3 SECTION SPAN MOUNTED SIGNAL HE	EACH	$3,300.00	$3,452.00	1.00	5	1
T14.3513	1 WAY 3 SECTION MAST ARM MOUNTED SIGN	EACH	$1,152.14	$1,189.86	12.25	18	4
T14.3516	1 WAY 4 SECTION MAST ARM MOUNTED SIGN	EACH	$1,690.00	$1,920.00	2.00	3	1
T14.3613	1 WAY 3 SECTION BRACKET MOUNTED SIGNA	EACH	$630.00	$851.25	1.00	4	1
T14.3615	1 WAY 4 SECTION BRACKET MOUNTED SIGNA	EACH	$1,660.00	$1,890.00	1.00	3	1
T14.3713	1 WAY 3 SECTION PEDESTAL MOUNTED SIGN	EACH	$1,140.00	$1,191.25	4.00	4	1
T14.3911	1 WAY PEDESTAL MOUNTED L.E.D. PEDESTRI	EACH	$540.00	$591.75	5.00	4	1
T14.3912	2 WAY PEDESTAL MOUNTED L.E.D. PEDESTRI	EACH	$1,126.67	$1,205.71	3.00	9	2
T14.3913	1 WAY BRACKET MOUNTED L.E.D. PEDESTRIA	EACH	$600.00	$649.25	3.00	4	1
T15.0100	DIRECTIONAL REGULATORY AND WARNING S	SF	$23.81	$26.18	338.09	116	24
T15.0110	GUIDE SIGNS STANDARD 29.2.0	SF	$29.29	$29.19	119.42	24	5
T15.0200	REMOVE AND RELOCATE DIRECTIONAL REGU	EACH	$127.17	$143.97	2.09	47	11
T15.1000	STREET SIGN ASSEMBLY STD. 24.6.1	EACH	$175.77	$193.49	8.87	71	15
T15.1100	STREET SIGN - OVERHEAD MOUNTED	EACH	$380.77	$393.33	4.33	13	3
T15.2000	PARKING SIGNS	SF	$65.59	$70.78	39.00	54	11
T16.0100	GROUND MOUNTED PRIMARY DIRECTIONAL S	SF	$15.78	$16.01	808.00	18	3
T16.0200	REMOVE AND RELOCATE GROUND MOUNTED	EACH	$175.00	$652.50	1.00	4	1
T16.0300	GROUND MOUNTED PRIMARY DIRECTIONAL S	EACH	$1,745.24	$1,424.78	28.00	18	3
T17.0100	OVERHEAD SIGN PANELS	SF	$20.43	$19.09	202.00	18	3
T17.0213	OVERHEAD SIGN STRUCTURE 76-80 FOOT SP	EACH	$59,000.00	$55,450.00	1.00	4	1
T20.0004	4 INCH WHITE FAST - DRYING WATERBORNE I	LF	$.16	$.15	32300.91	46	11
T20.0006	6 INCH WHITE FAST - DRYING WATERBORNE I	LF	$.14	$.15	30536.56	72	16
T20.0008	8 INCH WHITE FAST - DRYING WATERBORNE I	LF	$.65	$.68	1280.00	5	1
T20.0012	12 INCH WHITE FAST - DRYING WATERBORNE	LF	$.56	$.65	3561.50	64	14
T20.0104	4 INCH YELLOW FAST - DRYING WATERBORNI	LF	$.15	$.14	29444.83	75	18
T20.0106	6 INCH YELLOW FAST - DRYING WATERBORNI	LF	$.12	$.12	37153.20	23	5
T20.0108	8 INCH YELLOW FAST - DRYING WATERBORNI	LF	$.75	$.66	1290.00	5	1

T20.0606	TEMPORARY PAVEMENT MARKING (TAPE) YE	LF	$1.50	$1.50	13500.00	3	1
T20.0820	FAST DRYING WATERBONE PAVEMENT ARRO	EACH	$38.38	$37.64	14.50	35	8
T20.0822	FAST DRYING WATERBONE PAVEMENT MARK	EACH	$73.00	$69.50	5.00	7	2
T20.0900	BI-DIRECTIONAL CONTROL DEVICE STANDAR	EACH	$700.00	$700.00	7.00	3	1
T20.1000	REMOVE EXISTING PAVEMENT MARKINGS	LF	$.40	$.39	36286.89	84	18
T20.2004	4 INCH EPOXY RESIN PAVEMENT MARKINGS \	LF	$.26	$.29	10440.25	19	4
T20.2006	6 INCH EPOXY RESIN PAVEMENT MARKINGS \	LF	$.34	$.36	21239.89	84	19
T20.2008	8 INCH EPOXY RESIN PAVEMENT MARKINGS \	LF	$2.25	$2.40	3584.00	5	1
T20.2012	12 INCH EPOXY RESIN PAVEMENT MARKINGS	LF	$1.89	$2.20	2150.53	72	15
T20.2014	4 INCH EPOXY RESIN PAVEMENT MARKINGS \	LF	$.29	$.30	9663.60	68	15
T20.2016	6 INCH EPOXY RESIN PAVEMENT MARKINGS \	LF	$.35	$.36	46103.20	23	5
T20.2018	8 INCH EPOXY RESIN PAVEMENT MARKINGS \	LF	$2.25	$1.95	520.50	10	2
T20.2020	EPOXY RESIN PAVEMENT ARROW - STRAIGHT	EACH	$61.83	$61.09	174.00	31	8
T20.2022	EPOXY RESIN PAVEMENT MARKING WORD "O	EACH	$100.69	$102.05	184.25	16	4
T20.2024	EPOXY RESIN PAVEMENT MARKING WORD "S	EACH	$200.00	$190.00	2.00	5	1

Appendix C: Public Comments Received

Sign in Sheet

Meeting: **Blackstone Canal Alternative Transportation Feasibility Study**
Date: June 16, 2011, 7:00 PM
Location: JH Chafee Blackstone River Valley Heritage Corridor Commission, Woonsocket, RI

PLEASE PRINT CLEARLY

Name	**Address** (Street, Town, Zip)	**Phone/email**
SCOTT DAMELIO - VHB	10 DORRANCE ST. PROVIDENCE, RI	272-8100 SDAMELIO@VHB.COM
ALICE CLEMENTE	BOX 7771, CUMBERLAND 02864	aclemente156@cox.net
DAVE [illegible]	24 Lonesome Pine RD. Cumberland RI	965-0898 DAVIDJ1957@Cox.net
MICHAEL M. SCALZI III	10 TALLEYHO RD CUMBERLAND 02864	333-5358 MSCALZI@COX.NET
ROLAND C. GAUVIN	2208 MENDON Rd. CUMBERLAND, RI 02864	401-333-6075 RJTREEMAN@COX.NET
Victoria J. Carter	567 Tremont St., Rehoboth, MA 02769	(508)-222-7163 Vicki0531@aol.com
JOE PAILTHORPE	56 Old W. Wrentham Rd Cumb RI 02864	401 658-1766 JOPAIL@COX.NET
John Marsland	6 Valley Stream DR Cumb RI	401 644-3215 canocman60@yahoo
Billington	175 MAIN ST Pawtucket	401 724 2200 BURI@AOL
David Barber	16 Ballou Rd, Hopedale MA 01747	508-478-4918 dgbarber@cs.com
RAYMOND PADO	314 High St. Cumb RI 02864	401-965-1052
Brad Fesmire	68 S. Main St. Woonsocket	767-2100
Judith Hill	PROJO	277-7381
Phyllis Gilbert	7 DuCarl Dr. Lincoln	(401) 333 4449 psgilbert@cox.net
Barry GILBERT	7 DuCARL DR. LINCOLN	333-4449 bgilbert@RIC.EDU
John Flynn	23 Holiday D. " 02865	334-2519 jflynn30@cox.net
Lambri Zervas	~~RIDOT~~ - 21 Woodcrest Dr. Cumb RI	475-9583

----- Forwarded by Chuck Arning/BLAC/NPS on 06/17/2011 01:22 PM -----

DGBarber@cs.com

06/17/2011 09:30 AM

To Chuck_Arning@nps.gov

cc

Subject Canal in Lincoln RI

Chuck

After last night's meeting on the canal in Lincoln, I want to repeat, add, and expand on some of my thoughts.

1) A dam at Ashton and Kelly Pond above it were part of the transportation canal. Kelly Pond was at the same elevation as Scott Pond. After the canal was converted to a power canal, the elevation of Scott Pond was lowered and a drop and mill privilege established at the south edge of the Lonsdale mill complex. Thus, there was no lock at the Ashton Dam, but probably a guard gate of which there are remains above the present dam. Something needs to be built at the Ashton Dam, other than the present rock pile, to regulate water into the canal and guard against floods. The present rocks are too high for low flows conditions and offer no control during floods. A lock and control gates would be ideal.

2) At the north edge of the Lonsdale mill yard are the outlet works. The consultants are recommending changes there which sound wise. But part of the issue is lack of manpower to operate them. I am attaching a photo of a spillway used at several locations on the Delaware & Raritan Canal Feeder in New Jersey. This canal is fully watered, used as a drinking water supply as well as a park, and has suffered much less damage in recent floods than the Delaware Canal just on the opposite side of the Delaware River. I believe that part of that difference is due to these overflows that require no human intervention. As the water in the canal begins to rise during a storm, it spills over the long lip into a long concrete trench and is then conveyed through culverts under the towpath (bikeway). The long spillway discharges a lot of water with a small rise, but the length prevents a few pieces of debris from plugging the works. Of course, occasional debris removal is required. The horseshoe spillway near Martin Street operates similarly, but may be more subject to plugging by debris.

3) Mention was made of the control structure at the south end of the Lonsdale Mill Yard, just north of Front Street, that controls flows into Scotts Pond. I'm not sure why there is any mystery about it as it is clear on aerials or a site visit. But, it is definitely part of the water control system of the canal. It should be regarded as such. If ownership is unclear, maybe it should be acquired by the state and repaired.

4) Silting of the canal was mentioned. Silt doesn't fall from the sky. It either comes from roads or from private property. To work on either requires a state permit, a plan, and silt barriers. Where silt has washed into the canal, it is easy to trace back to its source. Silting can be mitigated by silt traps. If silt is continuing to wash into the canal, a complaint by any citizen recks an investigation by the appropriate state investigators. The resulting fines are not to be ignored.

5) Mention was made of the fencing along the bikeway. I have always thought it was over fenced. Of course, a large drop off on the outside of the towpath should be protected. But, I see no need for a fence between the bikeway and a shallow, water filled prism. In the photo I attached, you will see a fence on the inside of the towpath at the overflow and opposite it on the outside. But, the canal ahead has none on either side. Of the many canals I am aware of with developed bikeways on the towpath, the Blackstone in Lincoln is the only one so heavily fenced.

6) Mention was also made of other maintenance issues, especially of trees over the water. I think that the ownership of the two canal parks by the states is both a blessing and a curse. It is a curse because in this era of declining budgets, the needed maintenance forces have vanished and are unlikely to be restored soon. The reliance on state forces means that no one "owns" the canal.

The two best maintained canal parks in the US are Camillus, NY (just west of Syracuse) and Delphi, IN. Both of these are town owned parks that are operated by a volunteer committee. At Camillus, every Saturday, year round, is a volunteer work day. At Delphi, the Monday, Wednesday, Friday group of retired volunteers can and does built and maintain everything needed on a year round basis. These people decide what needs to be done and do it without a lot of red tape. If the weather is bad, they work inside.
Occasionally, town forces provide a backhoe of some other specialized help.

I think that both of these Blackstone Canal parks need an organized group of volunteers with permission to on a regular weekly basis attack the backlog of maintenance issues. Such groups could proceed to more ambitious issues such as a canal boat, but they will need a home and tool shed (at least after a while). I was very impressed with the turn out a few years ago in Lincoln after the repair of the first canal breach. Perhaps the moribund, but still existing Blackstone Canal Conservancy could serve as a vehicle.

Dave Barber
(See attached file: DR overflow south Lambertville.jpg)

----- Forwarded by Chuck Arning/BLAC/NPS on 06/17/2011 01:19 PM -----

BVRI@aol.com

06/17/2011 10:01 AM

To Chuck Arning@nps.gov

cc

Subject Chuck

Comments from the Blackstone Valley Tourism Council on the 2011 VHB Blackstone River and Canal feasibility study:

The Tourism Council's Samuel Slater Canal Boat, could possibly be used in the Blackstone Canal for public tours.

Address silting of the Blackstone Canal in Quinnville.

If a canal boat of any kind is used in the Canal, dredging to its original depth will be required.

Consider not putting the control gates at Ashton. Consider putting flood control at a more northerly location.

Re-build the canal wall at Ashton and re-water the canal to it's northern-most point. Possibly a more cost- effective flood control could be installed at that northerly location.

Install signage on I-295 N and S to inform travelers of the I-295N Visitor Center's entrance to the Blackstone Bikeway.

Build a structure out of metal framing that would resemble the exact dimensions of a canal boat. Install this framing with a deck added, in the field next to the Kelly House.

Do to vandalism, consider not installing wooden rail posts along the bikeway in the future. Consider removing the existing rails fence posts where practical.

Thank you.

Robert Billington, Commissioner

----- Forwarded by Chuck Arning/BLAC/NPS on 06/24/2011 02:59 PM -----

"John Flynn" <jflynn3@cox.net>		
		To
06/18/2011 02:41 PM	<chuck_arning@nps.gov>	cc
		Subject
	Blackstone Canal	

I have been using the bike path for several years.

The deterioration and lack of maintenance is quite evident. The fence is falling down in many spots, the park benches have no seats, the asphalt is being uprooted, there are trees across the canal blocking passage, and of serious concern has to be the erosion on the side of the canal; which is causing the bike path to begin to cave in.

Canoes and kayaks canot use the canal. The water level is too low and there is too much debris restricting passage.

Another concern of mine is the draining of Scott's Pond that takes place as the water flows back to the canal.

I hope these problems can be addressed soon.

Thank you
John W Flynn

Lonsdale Resident

Hi Chuck:

Please forgive the late response. I have been meaning to complete my comments and get them to you (as promised) before the deadline. Now I realize that my timing was off by a few days. I appreciate the opportunity to provide my personal comments concerning the canal. There are two comment packages 1) generally commenting on the handouts and on elements of the VHB presentation; 2) a few detailed comments targeting specific areas along the canal where I have some familiarity, and note several concerns. With respect to some of the larger projects identified herein, I realize that some may not be the exact focus of this feasibility study. Nonetheless, I thought it was necessary to point these out. There may be opportunities to work with partners or engage the State in reviewing and implementing phased efforts to meet new storm water regulations; each providing a significant step towards improved water quality and enhanced enjoyment on the canal.

One additional thought which I believe I heard someone mention at the meeting, is to have an automated call center set up for responding to citizen observations, issues, complaints for the river and bikeway. I think that is a good idea and one that will allow for a more rapid response, and better control of over the park elements.

Let me know if you have any thoughts or questions. Again, my thanks go out to you, VHB, and the staff at the JHCBRVNHC for pushing these studies along and taking the appropriate steps to improve our river. Good luck with this project.

Sincerely,

David Newton
Cell: 401-965-0898

Delivered by email on July 17, 2011

Dear Chuck:

Please forgive my tardiness in providing you with comments on the recent presentation given by VHB concerning the improvements along the Blackstone River Canal. As you may know, with vacations, work, and summertime obligations, it has been a challenge to simply meet certain commitments. Your fine work in promoting and visualizing park improvement projects, such as with the Canal, deserve public attention and a response to your call for comments. I applaud these efforts. And thank you for providing an open forum such as this so that the public can comment on such an important project as this.

Before I go any further, please let me inform you that any comments which I provide here are solely my own, acting as an individual, and as an informed and interested citizen of town of Cumberland. In no way do any of these comments, provided herein, reflect upon, or otherwise involve, in any manner, the US Environmental Protection Agency, or in the performance of any duties as an employee or representative of this Agency for the purpose of reviewing these public materials which were provided to me in a public setting. Finally, any appearance of these comments aligning, any way, with those of the BRWC/FOB, is merely conjecture.

General Comments:

My comments generally follow the presentation and handout provided by VHB.

Under Objectives: I agree with the objectives outlined in the handout with the following exceptions:

a) I do not concur with any further elaboration under this feasibility study concerning the operation of, or designing, a replica canal boat for the purpose of evaluating such use in this segment of the canal. My reasoning follows that the current condition of the canal has deteriorated greatly from when canal boats were first operating many decades ago; siltation, woody vegetation along its banks, and even potentially bank subsidence, erosion and other anthropogenic activities along the canal bank have all acted in a way that has reduced the water volume that can safely flow through the canal to a critical minimum given the change in habitat conditions. As such, I believe the NPS is on the right track to evaluate the canal's potential as a more passive canoe and kayak recreation trail. No motorized boats should be allowed to operate in the canal due to its narrow width, shallow conditions, wooded and overhanging terraces, and the preferred promotion of more passive boat traffic (boats/kayaks).

b) Preserving the Canal and Towpath by addressing dilapidated water control structures and improving/maintaining the water volume and flow are critical steps. Moreover, I would strongly recommend the feasibility study include options for continued partnering (with local watershed advocates, State and towns (including those entities owning or

operating), and the abutting citizens), to promote improved water quality and to protect aquatic life support within the canal. To do this, steps must also be evaluated to pull resources (staff and budgets) with partners, to forge meaningful agreements, and to undertake targeted projects that get to the root of the water quality/water flow issues. Once projects are underway or complete, the staff and budget to operate and maintain these improvements must also be considered in this plan. (See my comments below).

Visitor Access and Connections:

a) It is my understanding that the Town of Lincoln (and its Water Commission) own/operate a piece of land which connects River Road to the canal, across from Dexter Quarry Brook Road. This strip of land used to be the access road to the Quinnville Wellfield which is no longer able to be used for that purpose. The feasibility study could evaluate this, and other potential access points, for off road parking and access to mid canal landing sites. This location may be critical for River Rescue access on the canal. Recommend further considerations are given, in this feasibility study, as to the deployment of response and maintenance teams in the mid canal reach.

b) I believe it was mentioned that the granite stairs which access the canal at the south end (near Pratt Dam) were poorly located and installed. During low water conditions, it can be seen that the stairs are at a height not convenient for canoe or kayak landings and the last step is even being undermined when flow is rapidly increased near by (Lonsdale flow control structure boards are rapidly pulled during heavy storm events increasing turbulent flow conditions in this segment of the canal and erosion/scour of the canal floor is evident.)

Under Visitor Access and Connections –Recommendations

a) Recommend the feasibility study consider mid-canal access points for rapid deployment of first responders and maintenance crews. This consideration is not clearly illustrated in the handouts provided.

b) Under "Improve the River to Canal Canoe/Kayak Loop Trail", the feasibility study needs to consider portage improvements at the Pratt Dam. This critical portage area is highly vulnerable to erosion during spring flows. The materials used at this portage are seriously under sized and under engineered. The portage must be re-engineered to conform to expected flow velocities which occur at least during every spring season. The continued replacement of pea gravel and melon-sized rip rap is not going to cut it. Each year, this material is simply washed into the spillway and over the dam, effectively filling the spillway and plunge pool of the dam. Recommend the feasibility study outlines engineering alternatives which will alleviate these constant repairs. Alternatives could include, but not be limited to, large, well placed tabular boulders link-locked with smaller rock fragments, set at a shallow angle for ease of access up the slope (essentially a boulder groin as built on coastlines), a reinforced cement ramp, abandonment of the portage to another location all together such as on the Cumberland side, as an example (may not be feasible due to prevailing currents).

c) The feasibility study needs to consider that some localized areas of the canal will require some limited dredging to provide unrestricted boating and for enhanced enjoyment of the canal. The handling and use/disposal of these dredge materials would also need to addressed.

Water Control Structures (repair of)

I concur that the Lonsdale Water Control Structure is in need of immediate attention and repair. During times of high water, the boards are pulled and water passes into this control structure from both up stream and down stream (from the area of Lonsdale Mill) of this location. This situation places some question as to the hydraulic connection of the southern canal segment south of the control structure. Recommend that a water budget/hydraulic study be performed to determine the balance from both up stream and down stream flows at critical spillway heights at Lonsdale (and at other spillway locations). Moreover, I recommend that the feasibility study consider performing a detailed topographic survey of the Blackstone Canal which would in turn provide information to support calculations for optimum water height and flow conditions within the canal, from each respective control structure, and would identify potential areas where canal banks may be critically low (topographically) due to subsidence or erosion, or vulnerable to overtopping (at critical bank full conditions). A survey of the canal bottom will inform us as to the areas where critical siltation and filled channel bottoms are located for targeted dredging (only where necessary). Ideally, these tasks would be incorporated into the described "Canal Water Management Plan"?

Water Control Structures (management of)

Lastly, I saw no mention of an Operations and Management Plan and associated budget and source of funds for supporting this plan. Plainly put, once some of these feasibility options are selected and acted upon, resources (staff and funds) for operation and maintenance of the canal become critical components. I will assume that at least some of the operations and maintenance tasks will require structured partnerships with others to fulfill these needs.

Please also consider some more detailed comments concerned with canal improvements and water quality issues. These additional comments are meant to be used as informative recommendations and may require efforts that could be outside of the bounds of this feasibility study. Nevertheless, I find these observations to be meaningful and connected to the long term protection and maintenance of the canal as a recreational resource. (see enclosure)

VHB's Presentation
Blackstone Canal Alternative Feasibility Study
Project Report
Ashton, Rhode Island

Detailed Canal Observations and Comments

For these Notations, please see Figure #1:

NOTE #1: Outfall Pipe -transite (asbestos-containing). Area of outfall from unnamed stream into Canal. At least one of the outfall pipes includes one broken (potential) transite (asbestos-containing) conduit. Outfall should be improved to meet current Rhode Island Phase 2 storm water standards and broken pipes should be removed and properly disposed. Included with storm water mitigation improvements herein, a stream bank restoration project should be considered west of Lower River Road to improve flow conditions and minimize erosion and sedimentation issues up stream of any planned outfall improvements. Together these improvements will maximize water quality to the canal while greatly reducing sedimentation within the canal.

NOTE #2: This area is highly susceptible to storm water erosion and deposition due to lack of erosion control at confluence of unnamed stream. Infilling of sediments restrict recreational use of canal; reduces flow in canal; increases channel fill; impacts water quality. Restriction here may be root cause of recent canal bank failure and washout of bikeway immediately above (see Note #3). A storm water control structure on stream confluence is required. New culvert design and construction allowing for sediment control and run of river solutions are needed. Moreover, dredging of deposited materials at this location is necessary in order to deepen the channel allowing for recreational use and passage up and down stream.

NOTE #3: Repaired Canal Bank and Bikeway. Area of recent canal breach (2010). Repair may not have taken into account appropriate "bank full" canal conditions during storm conditions. Recent repairs appear to have been made at a lower elevation then previously constructed thus potentially limiting optimum flow height in canal without concern for future overtopping during heavy rain events.

NOTE #4: Heavy erosion and storm water deposits/No controls. Line depicts excessive storm water related runoff. Silt, sand, debris, and stone flow down slope, onto road and eventually into canal. No abatement controls present. Thus, sedimentation of canal is increased due to this condition. Appropriately engineered storm water control structures would mitigate this situation. Minor dredging along this reach would improve water quality, flow and recreational use along the Kelly House reach of the canal.

FIGURE 1 Along Lower River Road

For these Notations, please see Figure #2:

NOTE #5: Storm Surge Spillway Improvement Area. In this area, during heavy rains/flood conditions, the canal waters breach the newly constructed Martin Street Bridge and Bikeway complex, NOT only at the engineered (armored) overflow bypass, but further upstream where armoring has not been established. This observation has been made during flood conditions in 2005 and 2010. A future breach of the canal at the marked location is anticipated unless further improvements are made. Such improvements include, but are not limited to, height adjustment (lowering) of established engineered armored overflow bypass corridor at bridge, and/or further armament applied to canal banks (west and east) at the upstream location. The suspect cause of this observed overflow condition is the restriction caused by the construction of the west bridge abutment on the west bank of the canal. Further, it is likely that storm water surge (from Cullen Hill Road storm water infrastructure, and overland flows) were not appropriately accounted for (in the design of the approach to the bridge-Lincoln side) as additional volume entering into the canal immediately upstream of the bridge.

Moreover, a storm water improvement project, meeting the requirements under Storm Water Phase 2, at the Cullen Hill storm water collection basins along Lower River Road, is necessary (see below).

NOTE #6: At this location, the confluence of street runoff down Cullen Hill Road and meeting Lower River Road enters into storm water basins which daylight and channels through the riparian buffer, spilling into the canal and adding sedimentation while continually incising into and eroding the buffer. A storm water improvement project is needed here to protect the buffer and lessen the amount of silt and roadway debris from entering into the canal; thus improving water quality.

NOTE #7: At this location, while not as severe, it is noted that there is a storm water discharge that enters into the canal which should also be retrofitted.

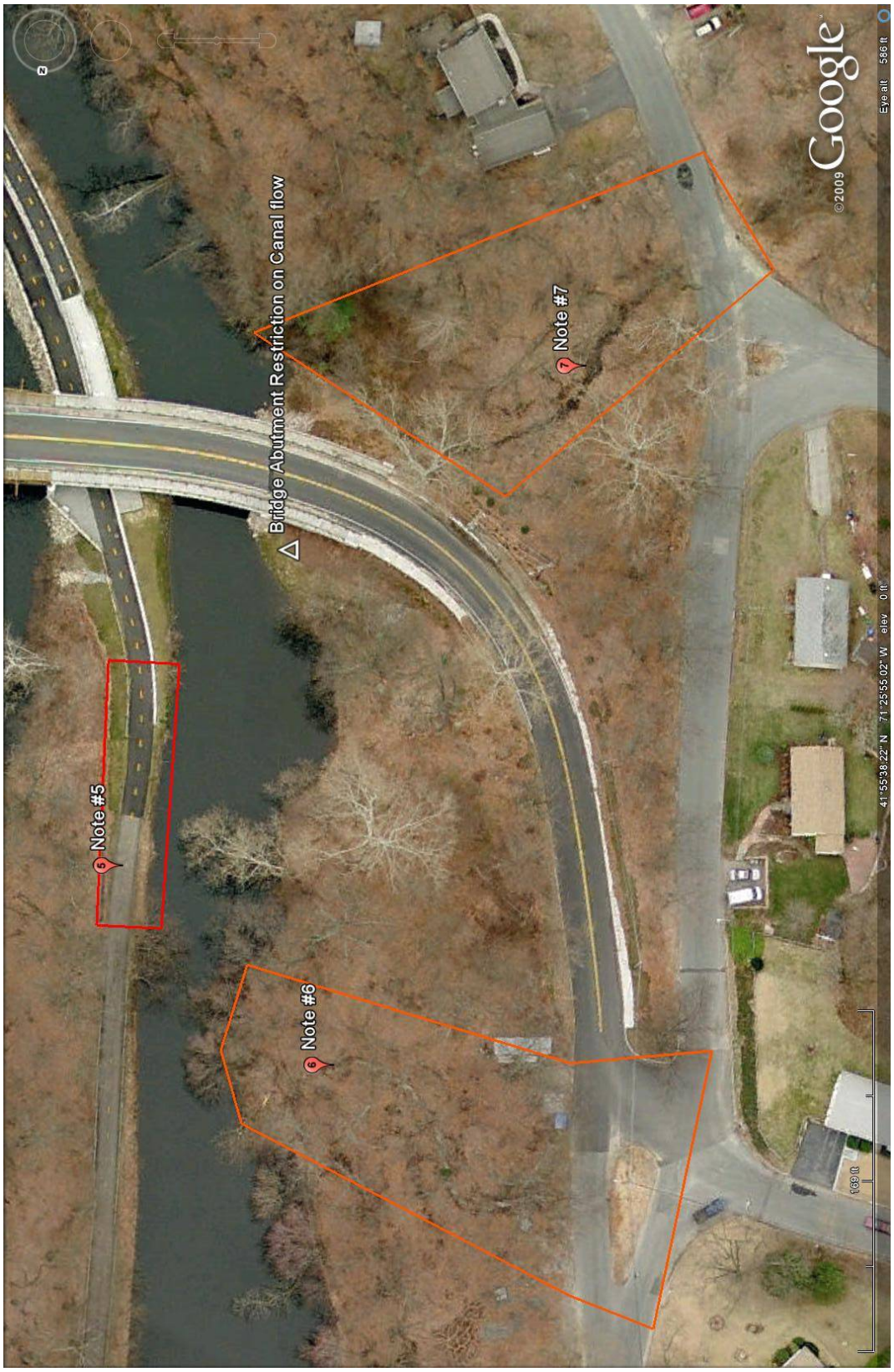


FIGURE 2 At Martin Street Bridge

For this Notation, please see Figure 3:

NOTE #8; It is observed that one residence may have lowered (breached) the west canal bank to allow for intermittent flooding and creation of a shallow seasonal pond. This also appears to provide canoe access to the canal. If the canal control structures were repaired and water levels were set to the proper heights to allow for full season recreational canoe and kayak use, some review of the canal bank modification here, and possibly at other locations, may be in order.

FIGURE 3 Ashley Drive, Lincoln RI.

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

U.S. Government Printing Office
March 2011

Document No. 609/100159
PMIS No. 143301

United States Department of the Interior – National Park Service