Stratton Lock and Dam Life Extension Reconnaissance Study

Summary Report, Prepared for the Illinois Department of Natural Resources,
Office of Water Resources - June 2005

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HNTB

TABLE OF CONTENTS

	Page
Executive Summary	1
1. Introduction	3
2. Site Visit and Condition Assessment of Existing Facilities	6
3. Alternatives for Life Extension of Specific Structures	11
4. Cost Estimate Summaries for Various Project Features	17
5. Summary and Conclusions	19
Appendices	20
Exhibits	A1
Lock Traffic Data	A15
Detailed Features Cost Estimates	A27

EXECUTIVE SUMMARY

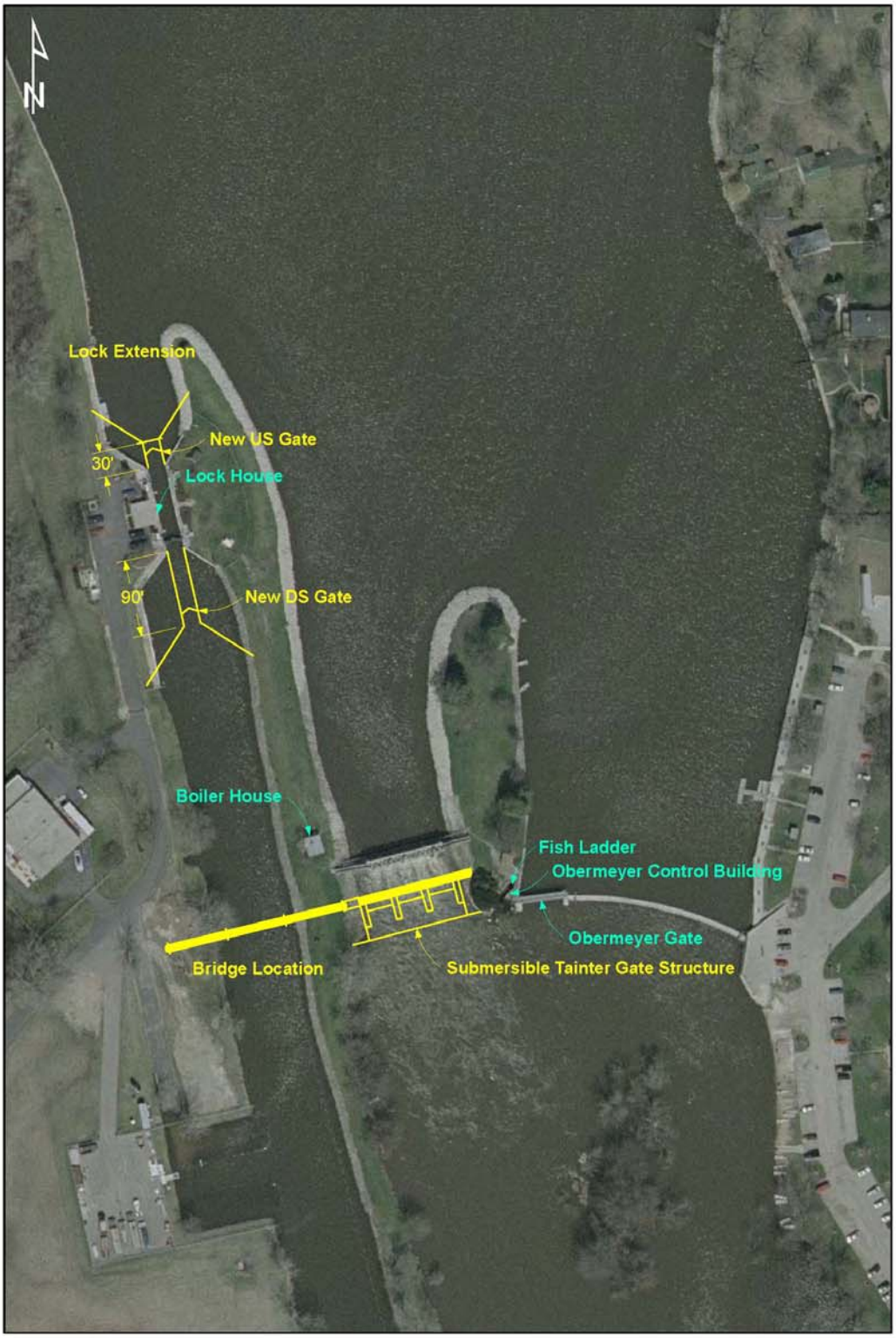
HNTB was retained to perform a reconnaissance study of life extension or reconstruction of facilities at the Stratton Lock and Dam. Services consisted of :

1. Civil, structural, electrical and mechanical engineers from HNTB reviewed record drawings and O&M records provided by IDNR and performed an inspection of the facilities. The inspection is documented herein and includes annotated photographs.
2. A reconnaissance level estimate of life extension actions and cost was made to extend the life of the facilities for another 50 years. The reconnaissance level cost estimates utilized professional judgment, unit prices for complete features (such as $/LF of overflow dam) from past construction, and contingencies of 30%.
3. A reconnaissance level layout and cost estimate was made for totally reconstructed facilities needing replacement.
4. A reconnaissance level layout and cost estimate was made for an extended lock (as a better alternative than a second lock) and alternative mechanical means of passing recreational craft around the dam.
5. This brief report summarizes the reconnaissance study and conclusions.

The conclusions are:

1. The vertical sluice gate structure should be replaced with an equivalent discharge capacity submersible Tainter gate structure.
2. Vehicular access should be provided from the service center on the west side of the river to the submersible Tainter gate structure (and thereby the east side of the lock).
3. The existing lock should be extended in length by 120’ to ease navigation congestion at the lock.
4. These facilities should be designed for a life of approximately 50 years.
5. The cost for the implementation of the above project is approximately $10.8M and the location of the modified, reconstructed, or newly constructed facilities is as shown in yellow on the next page.

Recommended Reconstructed Facilities



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1. INTRODUCTION

1.1. History of Dams at McHenry

The following is an account of the history and ownership from the "Operation of Stratton and Algonquin Dams", Fox River, Lake and McHenry Counties, IL, IDNR, January 2000.

> *McHenry County was established on January 16, 1836. The government plat for Township 44 North, Range 8 East was signed December 17, 1839, and no dam at McHenry was indicated on this survey. Early in the 1900's, a group of property owners and others organized the Fox River Navigable Waterway Association. In 1907, this association secured a Federal Permit and constructed a wooden dam across the Fox River to improve navigation for recreation in the Chain-O-Lakes. This dam deteriorated, and prior to 1915, it was replaced with a three foot steel sheet piling structure equipped with three foot high flash boards. This dam was constructed with a lock at the east end, on the opposite side of the present lock. This dam was indicated on a 1923 map prepared by the Division of Waterways and was similar to the 1915-16 River and Lakes Commission maps, covering the Fox River.*
>
> *In 1923-24, the titles, rights and interest in the dam, lock and adjacent properties were conveyed to the State of Illinois. The State continued to operate and maintain the dam. A November 9, 1936 survey of the dam site showed the crest length to be 210.7 feet. The dam crest was at elevation 733.6 with the top of the three foot flash boards at 735.6. On the date of the survey the pool elevation was 736.07 and the tailwater elevation was 732.50. Major damage occurred to the structure from the floods of November 1937 and July 1938.*
>
> *In 1939, the State of Illinois Department of Public Works and Buildings, Division of Waterways (predecessor to the Office of Water Resources), under contract FR-14, constructed the present dam and gate control structure (Department of Public Works, 1938). Also in 1939, the State of Illinois made the initial land acquisition of 15 acres for McHenry Dam State Park, which became a part of Moraine Hills State Park, which is located on the east side of the Fox River.*
>
> *The present boat lock was constructed in 1958-60 under Department of Public Works and Buildings contracts FR-109 and FR-113. The lock was opened for public use on June 1, 1960. A number of other contracts have been awarded and completed since 1939 to repair and maintain the existing dam, buildings and site area. None of these contracts has changed the hydraulic characteristics of the outlet works.*
>
> *In 1999, the United States Army Corps of Engineers installed a hinged-crest gate at Stratton Dam. Flood events in the Chain-of-Lakes are lessened because of the operation of this gate.*

The Illinois Department of Natural Resources, Office of Water Resources, wishes to extend the life of the existing facilities or reconstruct similar facilities with improvements to navigation. The purpose of this reconnaissance study is to identify the likely configuration and cost of implementation of such a life extension or improvement project.

1.2. Description of Existing Facilities

Dam

The dam consists of an overflow section of masonry capped concrete on timber piles, which is approximately 215' long; a pneumatically actuated hinge leaf gate, 50' wide by 5' high; and a vertical sluice

gate structure with 5 gates, each 13.75' wide by 8' high and electrically operated by a 1 HP, 115/220 volt, single phase motor and gear reducer.

Lock

The lock is 22' wide by approximately 62' long enclosed by two (2) mitre gates. The upstream gate is 14.5 feet high, and the downstream gate is 18.5' high. The lock walls are constructed of vertical sheet piling with tie-backs, and the gate bays are constructed of reinforced mass concrete. The normal upstream water level is at elevation 737.0, and the normal tailwater elevation is at 731.5. Therefore, the water level differential is 5.5'.

The gate actuators are electric motor operated with a double turnbuckle upper pivot system. Each motor is rated 1/2 HP, 115 volts, single phase.

During the summer season, it was reported that the lock is capable of handling up to 27 lockages in 4 hours. The normal gate open/close cycle is approximately 8-11 minutes.

Filling and emptying culverts are controlled by four (4) 24" electric motor operated sluice gates.

A bubbler system is provided for each miter gate, to prevent freezing during cold weather periods. The system consists of a 2" perforated submerged galvanized steel pipe adjacent to each gate, which terminates at a fixed connection at the side of the lock. When required, a flexible hose is routed to the fixed end connection from the compressed air supply, which is located in a utility room in the Lock House.

A 110-volt convenience outlet is located on the side of the lock to supply power to the lock winter recirculation pumps. A 220-volt outlet is also located on the side of the lock and used to power lock dewatering pumps and welding equipment.

Electrical

The existing facilities receive power from Commonwealth Edison through a 50 KVA, 120/240-volts single phase, pole-mounted transformer. A 70 KW standby generator provides backup power. An automatic transfer switch selects the power source and directs the power to a 400 Ampere main distribution panel that distributes power to the Lock House, the Service Building, the Boiler House, and Obermeyer Control Building. It is noted that three-phase power is not available in the area.

Power Utility 50 KVA Pole-Mounted Transformer

70 KW Standby Generator

The Lock House receives power through a 225 Ampere, 2-pole circuit breaker. Electrical loads fed from the power distribution panel at this location include two (2) mitre gate actuators, four (4) sluice gate actuators, site lighting, bubbler air compressor, and other ancillary equipment. The estimated connected load is 35 Kilowatts or 150 Amperes.

The Boiler House receives power through a 100 Ampere, 2-pole circuit breaker. Electrical loads fed from the power distribution panel at this location include five (5) vertical sluice gate actuators, boiler support equipment, lighting, and other ancillary equipment. The Obermeyer Control Building receives power through a 100 ampere, 2-pole circuit breaker. Electrical loads fed from the power distribution panel inside the building include the Obermeyer gate air compressor, the gate control panel, a hydraulic power unit for the bulkhead gate system, abutment heaters, lighting, space heaters, exhaust fans, and receptacles.

2. SITE VISIT AND CONDITION ASSESSMENT OF EXISTING FACILITIES

2.1. Lock and Ancillary Facilities

Since the original installation of the lock facility in 1960, limited rehabilitation and equipment replacement have occurred. The gates and original actuators were rehabilitated in 1989. Rehabilitation work included replacement of the gear actuator stand, painting of the gates, and improvements to the gate bearing lubrication system. The bottom bearings were inspected and determined to be adequate at that time. Replacement galvanized steel handrail, plate decking, and grating were also included. Most recently, the gate actuator drive chains were replaced this year. At that time, it was reported that the sprockets were adequate.

Lock - Upstream Miter Gates

During the site visit, a small leak at the northwest hinge was reported. Typically this can be corrected with a turnbuckle adjustment. In addition, a small hole (approximately ½" in size) through the 3/8" steel skin plate of the west leaf of the north (upstream) mitre gate was observed approximately one foot above tailwater level. The vertical sheet piling in the lock has experienced some leakage in the past, which has been corrected by welding the piling seams.

Small hole through the 3/8" steel skin plate

Several operation and maintenance concerns were discussed. Installation of stop logs to isolate and dewater the lock for inspection and maintenance currently requires the use of a leased portable crane. A

more convenient method is preferred. The gate leaf 8-inch horizontal wide flanges occasionally trap fish on the web during lock dewatering. Some means to prevent this occurrence is desired. Also, it was reported that the gates experience a sudden pop when the vacuum breaks on the underside of the horizontal 8-inch wide flange during dewatering. The original design provided two (2) 3/4-inch diameter drain holes in the web of each beam. Consideration should be made for providing additional holes.

The original 24-inch filling and emptying culvert sluice gates currently remain in service. Approximately four years ago, the actuators were replaced. Motor and bearing problems were experienced with the replacement actuators which required field modification of failed components.

Existing galvanized conduits are corroded, and seals for exterior junction boxes have deteriorated along the sides of the lock. This has resulted in wiring failures and failure of the horn and light fixtures on the south lock gate pole.

Electrical and Controls

The electrical and control equipment for each mitre gate consists of two, motor-operated gates: the nearside gate and the farside gate. Each gate is driven by a ½ HP single phase motor. Knife gate valves are located at each corner of the lock to control the amount of water entering and exiting the lock. Each valve is driven by a 1 HP single phase motor actuator.

Each mitre gate has two control stations: the nearside control station and the farside control station. Each control station houses reversing contactors for the associated gate and valve, and parallel controls for both the nearside and the farside gates and valves.

Mitre Gate Control Station

Reversing Contactors below the Mitre Gate Control Station

Hard-wired interlocks are provided so that only one mitre gate is allowed to open at any one time, and it is allowed to open only when the other gate and all knife gate valves are fully closed.

2.2. Vertical (sluice) Gate Spillway Structure (including steam boiler facilities)

The gate section of this structure has significant concrete deterioration. The tops of the walls along the access steps on both the east and west sides have heavy spalling and loss of concrete. The upper walkway

surface repair topping is heavily cracked and spalled. It was reported that the concrete on the piers has recently been repaired.

Sluice (Wheel) Gate Structure

Hoists

The steel gates are heavily corroded with visible steel delamination on the downstream side of the gates. It was reported that during a recent dewatering, the upstream side of the exposed gates were found to be heavily corroded in certain areas.

The boiler system in the boiler house is operated with diesel fuel, which has been very expensive. Recent plans have been made to convert to gas fuel to reduce energy costs. Concurrently, additional improvements will include a new steam service line, electrical modifications, new roofing, and other minor building improvements.

Electrical and Controls

Each gate is driven by a 1 HP single phase motor. A reversing starter with an integral "Raise – Off – Lower" selector switch is installed adjacent to each motor. The starter receives power from a distribution panel in the boiler house. A parallel control station is located at each gate to allow full observation of the gate movement during operation. No other remote control and monitoring are available.

Sluice Gate Reversing Starter adjacent to each Actuator Motor

Parallel Control Station at each Gate

2.3. Obermeyer Gate Spillway Structure

The pneumatically operated hinge leaf gate was commissioned in 2002 and is in good condition. A wire rope actuated bulkhead gate was also provided, which allows emergency shut-off of water in the event of hinge leaf gate failure. Only minor modification of the structure and gate is needed.

Pneumatically Operated Hinge Leaf Gate (Obermeyer)

Electrical and Controls

The Obermeyer gate is controlled from a control panel located in the Obermeyer Control Building, by adjusting and maintaining the bladder air pressure. The control panel receives air from a 5 HP air compressor with an 80 gallon storage tank. No other remote control and monitoring are available.

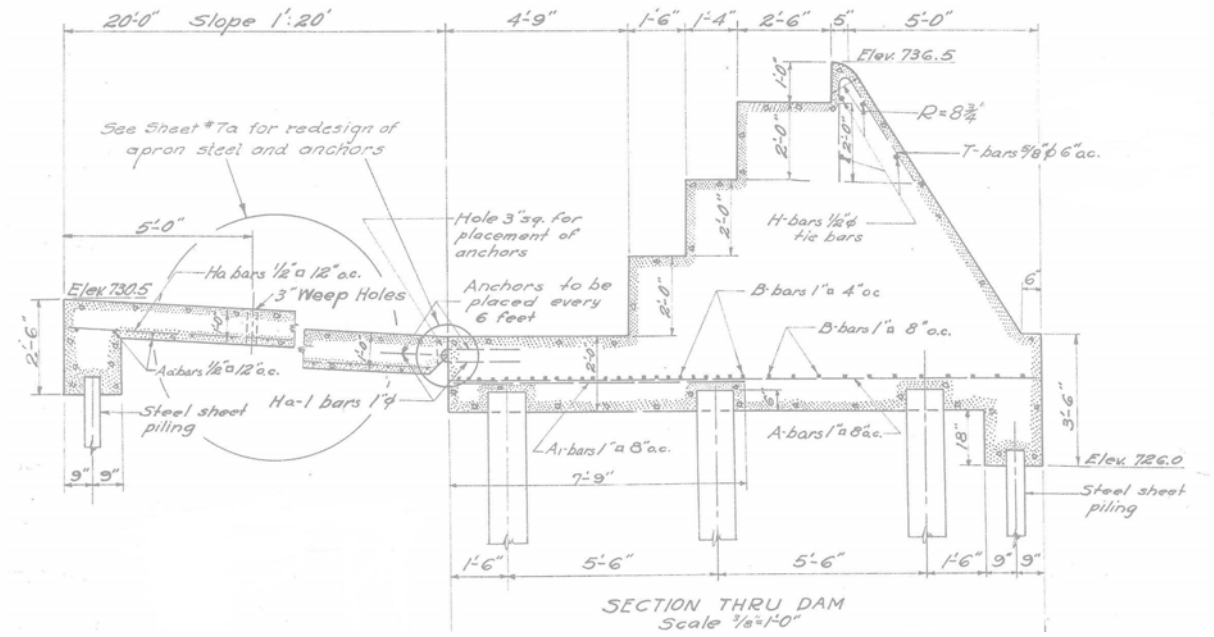
Obermeyer Gate Control Panel in the Obermeyer Control Building

Obermeyer Gate Air Compressor in the Obermeyer Control Building

Electric abutment heaters are provided to prevent freezing of the gate during winter. A hydraulic power unit provides power to operate the bulkhead gate system.

2.4. Masonry Capped Concrete Gravity Overflow Spillway

The masonry capped concrete overflow spillway is reported to be in good condition. It can be expected to need minor rehabilitation periodically because of winter exposure and freeze-thaw deterioration. The robust cross section and low head combine to make this section very stable and long lived.



Concrete Section of the Masonry Capped Concrete Overflow Spillway

2.5 Fish Ladder

The fish ladder is currently under rehabilitation / modification design to improve its performance. Further improvements beyond implementation of this design are not anticipated at this time.

Existing Fish Ladder

3. ALTERNATIVES FOR LIFE EXTENSION OF SPECIFIC STRUCTURES

3.1. Lock and Ancillary Facilities

3.1.1.Minor Upgrades in Filling / Emptying Capacity

The lock is 45 years old and has undergone rehabilitation in 1989. It is believed that it could be operated in its present condition for another 10 years with only normal maintenance. Present demand on the lock is very high, with reported wait times of 4-hours to lock through on weekends at mid-day. The original lock design was for 9 – small boats per lockage. Current demand consists of much larger boats and as a result, only 4 boats (approximately) per lockage are now passed.

Lockage records provided by Mr. Terry Burke for 2000 through 2004 (see Appendices, Lock Traffic Data) indicate continuing increase in demand, except for last year when the river was closed to power boat navigation because of flooding upstream of the lock and dam. Lockage time depends upon filling and emptying time for the lock and ingress and egress times for the boats. At peak demand time, 22 lockages per 4-hour period were reported, passing 132 boats (and 27 lockages for 47 boats).

For high traffic volumes, boat ingress and egress takes approximately 3 minutes. For low traffic volumes, boat ingress and egress can be accomplished in approximately 1 minute. Current filling and emptying time are 8 minutes for water and 1-3 minutes for boat ingress or egress, for a total of approximately 10 minutes per lockage. This could be reduced to 6 minutes per lockage, resulting in a maximum lockage rate of 34 per 4-hour period or 200 boats, by reducing the water filling and emptying time to 4 minutes instead of the current 8 minutes. This could be accomplished by pumping, in addition to the existing culverts, in order to speed the last foot of water level equalization.

The pumping system would be four 14" diameter, 20 Hp, 7000 gpm pumps (2 upstream discharging toward each other and 2 downstream), 15" diameter piping, and associated pedestals, supports, hangers, minor excavation and structural modifications, and electrical work including:

- Power distribution panel and feed to the upstream pumps
- Power distribution panel and feed to the downstream pumps
- Control stations for the pumps

Detailed layouts have not been made and are beyond the scope of this study. An order of magnitude cost for this improvement is $525,000, with details summarized in the next section and appendix.

3.1.2.Lock Extension

A preliminary layout of an extended lock was made (see Appendices, Exhibit 1). Consideration was given to a parallel lock of similar configuration and extending the existing lock length by the addition of new miter gates upstream and downstream of the existing gates and connecting walls, similar to the existing tied back sheet pile walls. The lock extension was determined to be more cost effective with respect to life cycle cost (in particular having to operate two locks simultaneously) and an extension length of 120' selected for capacity reasons. New miter gates may be hydraulically operated as that is the cost effective current technology. The lock gates will be controlled to allow operation in the following combinations depending upon capacity needs:

- New upstream gate and new downstream gate – high capacity, L=180'
- Existing upstream gate and new downstream gate – medium high capacity, L=150'
- New upstream gate and existing downstream gate – medium low capacity, L=90'
- Existing upstream and downstream gates – low (existing) capacity, L=60'

The area in an extended lock upstream of the existing upstream gate will have to be used with caution as the low water clearance over the gate sill will only be 3', and as a result large boats would need to be placed downstream of the existing upstream miter gate during lockage. Existing gate filling and emptying culverts will be increased in size, and the new gates will have culverts with at least 3 times the capacity of the existing culverts.

Electrical Work

Electrical work to support the lock extension will include the following:

- Power feed to the lake side gates and control valves
- New local power distribution panel for the new lake side electrical loads
- Nearside and farside control stations for the lake side gates and control valves
- Site lighting, navigational signal lights and safety beacons for the lake side extension
- Power feed to the lock side gates and control valves
- New local power distribution panel for the new lock side electrical loads
- Nearside and farside control stations for the lock side gates and control valves
- Site lighting, navigational signal lights and safety beacons for the lock side extension
- Central control and monitoring system to support the new operation
- Central video monitoring system

Since interlocks will be required to prevent simultaneous operation of the gates and valves, the existing electrical system may be able to support the additional loads without major modifications. The approximate cost for a 120' lock extension is estimated to be $4,939,000, with details summarized in the next section and appendix.

3.1.3.Monorail Hoist Boat Lift

A monorail hoist boat lift is a possibility for small increases in boat passage capacity. A schematic layout is presented in Exhibits 2 and 3. Such a facility would have a capacity of approximately 12 boats per hour. This type of facility is often used as a self serve type operation for private clubs or lake owners associations. The state would probably require the addition of an operator to reduce the risk of injury or damage. An example of a small version of such a facility is shown on the next page and is owned by the Long Lake Property Owners Association, giving them access to Fox Lake.

Monorail Hoist Boat Lift at Long Lake

Electrical Work

Electrical work to support the monorail hoist boat lift will include the following:

- Power feed to the hoist system
- New local power distribution panel
- Site lighting, navigational signal lights and safety beacons

New power feed will have to be brought in from the 400 Ampere main distribution panel. The hoist system may require 3-phase power; if so, a phase converter has to be added. The approximate cost is estimated to be $1,276,000.

3.1.4.Boat Conveyor

Boat conveyors are used regularly in amusement parks for water rides and are gaining in popularity in open water settings for kayak and canoe recreational facilities. Phone conversations with an experienced manufacturer of boat conveyors indicated conveyor cost for the length and lift range at Stratton of less than $300,000 (supply and install in owner furnished structures) for a conveyor. Two would be needed, one in each direction. A schematic layout of such a facility is shown in Exhibits 4 and 5. The capacity of such a facility would be approximately 30 boats per hour. Construction materials and methods were assumed to be similar to the lock structure, relying for the most part on tied back sheet pile walls.

Disadvantages of this type of facility are primarily concerned with the different geometry of boats and power plants. The conveyor shown could only be used by single engine craft without out board instruments, such as velocity meters and depth sounders or sonar, unless these instruments are protected. Also, staff monitoring of such a facility may be required to provide emergency help or shut-off.

Electrical Work

Electrical work to support the boat conveyor will include the following:

- New local power distribution panel
- Power feed to the downstream conveyor system

- Power feed to the upstream conveyor system
- Site lighting, navigational signal lights and safety beacons

New power feed will have to be brought in from the 400 Ampere main distribution panel. The boat conveyors may require 3-phase power; if so, a phase converter has to be added. The approximate cost is estimated to be $1,814,000.

3.2. Vertical (sluice) Gate Spillway Structure Rehab or Replacement

3.2.1.Total Rehabilitation

The vertical sluice (wheel) gate structure and equipment is in severely deteriorated condition. The staff is doing excellent work keeping the facility in operation. A total rehabilitation or replacement is required soon. Rehabilitation, while possible, would leave the DNR with an outdated structure, which is difficult to operate in winter, requiring extensive deicing operations. The rehabilitation option is not recommended, and costs for such have not been estimated.

3.2.2.Replacement with Hinge Leaf (Obermeyer) Gate of Equal Capacity

The replacement of the sluice gate structure with a pneumatically operated hinge leaf gate would provide a gate easily operable in winter, similar to others in the DNR inventory. A conceptual layout is shown in Exhibits 6 and 7. An access bridge over the gates is provided for maintenance. Gate pier and abutment seal plates would be heated with immersion heaters in glycol filled embedded pipe or channels. The gate skin plate would be kept ice free by the continuous flow of water.

Electrical Work

Electrical work to support the new Obermeyer gate spillway structure will include the following:

- New local power distribution panel
- Power for new air compressor and control panel
- Automatic remote control and monitoring system
- Power for new hydraulic power system for new maintenance gates
- Power for new abutment heaters
- Site lighting, navigational signal lights and safety beacons
- Remote video monitoring system

The approximate cost is estimated to be $4,159,000.

3.2.3.Replacement with Submersible Tainter (radial) Gate Spillway Structure

The replacement of the sluice gate structure with a submersible Tainter gate would also provide a gate easily operable in winter. However, this gate type would be the first in the DNR inventory. A conceptual layout is shown in Exhibits 8 and 9. An access bridge over the gates is provided for maintenance. Gate pier and abutment seal plates would be heated with immersion heaters in glycol filled embedded pipe or channels. The gate skin plate would be kept ice free by the continuous flow of water. This type of gate is shown because it offers slightly finer control of upstream water levels, which are important to the Chain-O-Lakes.

The gate actuators can be either motor driven wire rope or chains, or hydraulics. The nearest gates of this type are owned by the USACE at Marseilles L&D.

Electrical Work

Electrical work to support the new submersible tainter gate will include the following:

- Power for the new tainter gate actuator
- Automatic remote control and monitoring system
- Power for new abutment heaters
- Site lighting, navigational signal lights and safety beacons
- Remote video monitoring system

New power feed will have to be brought in from the 400 Ampere main distribution panel. The tainter gate actuator will require 3-phase power. A phase converter is required. The approximate cost is estimated to be $5,208,000.

3.2.4.Replacement with Labyrinth Spillway and Small Obermeyer Gate Spillway Structure

A labyrinth spillway was laid out in an attempt to find a passive / fixed crest spillway to satisfy the required range of head and discharge. In order to satisfy those requirements, a spillway length of over 1600' would be required. It was felt that a structure of this size would be too environmentally disruptive, and therefore a shorter labyrinth and gate structure was laid out instead. Exhibits 10 and 11 show a conceptual layout and section for this alternative. This structure has the disadvantage of also requiring the space of the existing masonry capped concrete overflow structure, which is a perfectly good structure with an anticipated long remaining life. The approximate cost is estimated to be $5,891,000.

3.3. Existing Obermeyer Gate Spillway Structure

The existing Obermeyer gate structure was commissioned in 2002. The structure is sound, and we anticipate a long remaining life with only minor modifications.

Instrumentation and Control Work

Recommended improvements to the system include the following:

- Automatic remote control and monitoring system
- Remote video monitoring system

3.4. Masonry Capped Concrete Gravity Overflow Spillway

As stated in the section related to the Labyrinth replacement of the vertical sluice structure, we believe the masonry capped overflow structure is in good condition and should have a long remaining life. Minor rehabilitation may be required from time to time.

3.5. Improved Access to East Side of the Lock and Island

Currently there is no truck access to the east side of the lock and vertical sluice structure. Such access is possible while maintaining navigation clearance downstream of the lock even if the existing project features and configuration are maintained. If the vertical sluice structure is replaced, as we believe it should be, an access bridge to the new structure would be appropriate. Exhibits 12 and 13 show a possible location and elevation of an access bridge for the existing project configuration. The location of a bridge to a new gated spillway structure would differ slightly. The bridge is envisioned to be a three (3) span pre-engineered structure, fabricated in a factory or shop, then delivered and installed on site on piers and abutments constructed there.

Electrical work to support improved access to east side of the lock and island will include the following:

- Site lighting, navigational signal lights and safety beacons

The approximate cost is estimated to be $498,000.

4. COST ESTIMATE SUMMARIES FOR VARIOUS PROJECT FEATURES

4.1. Enhanced Filling and Emptying System for Existing Lock

Item	Price
Civil / Structural	$100,000
Electrical & Mechanical	$250,000
Contingency (30%)	$105,000
Subtotal	$455,000
Engineering (15%)	$70,000
Grand Total	$525,000

4.2. Lock Extension

Item	Price
Civil	$1,410,000
Electrical & Mechanical	$1,893,000
Contingency (30%)	$991,000
Subtotal	$4,294,000
Engineering (15%)	$645,000
Grand Total	$4,939,000

4.3. New Monorail Boat Hoist

Item	Price
Civil	$708,000
Electrical & Mechanical	$145,000
Contingency (30%)	$256,000
Subtotal	$1,109,000
Engineering (15%)	$167,000
Grand Total	$1,276,000

4.4. Boat Conveyors

Item	Price
Civil	$501,000
Electrical & Mechanical	$712,000
Contingency (30%)	$364,000
Subtotal	$1,577,000
Engineering (15%)	$237,000
Grand Total	$1,814,000

4.5. New Hinge Leaf (Obermeyer) Gate Spillway Structure

Item	Price
Civil	$2,148,000
Electrical & Mechanical	$633,000
Contingency (30%)	$835,000
Subtotal	$3,616,000
Engineering (15%)	$543,000
Grand Total	$4,159,000

4.6. New Submersible Tainter Gate Spillway Structure

Item	Price
Civil	$2,265,000
Electrical & Mechanical	$1,218,000
Contingency (30%)	$1,045,000
Subtotal	$4,528,000
Engineering (15%)	$680,000
Grand Total	$5,208,000

4.7. New Labyrinth Overflow Spillway and Small Obermeyer Gate Strucure

Item	Price
Civil	$2,174,000
Electrical & Mechanical	$1,766,000
Contingency (30%)	$1,182,000
Subtotal	$5,122,000
Engineering (15%)	$769,000
Grand Total	$5,891,000

4.8. Cost of Improved Access to East Side of the Lock and Gated Spillway Structure

Item	Price
Civil	$333,000
Electrical & Mechanical	$0
Contingency (30%)	$100,000
Subtotal	$433,000
Engineering (15%)	$65,000
Grand Total	$498,000

5. SUMMARY AND CONCLUSIONS

After reviewing the layouts and cost estimates for the various project features the recommended project configuration for a reconstructed Stratton Lock and Dam is as follows and as shown on Exhibit 14:

1. Replace the existing vertical sluice Gate Structure with a Submersible Tainter Gate structure consisting of three (3) – 30' wide gates, 6' high, as illustrated in Exhibit 9. The gate will have the ability to lower its crest by 2' for winter drawdown and permit water to flow over the rear skin plate, keeping it ice free.
2. Provide access to the spillway structure access bridge via a three span pre-engineered bridge. The elevation of is similar to that shown on Exhibit 13, except that the east span (right most) will connect to the spillway access bridge on its west end at elevation 746.5 instead of an approach roadway fill at 744.0.
3. Extend the existing lock upstream by 30' and downstream and 90' downstream by adding gate bays, gates, and tied back sheet pile walls upstream and downstream similar in configuration to the existing upstream and downstream gate bays, gates, and walls. The resulting lock facility can be operated at a length of either: 60', 90', 150', or 180' in length, depending upon the traffic demand.

Project operation during construction will be modified to account for reduced project discharge capacity when the vertical sluice gates are taken out of service

The cost for such improvements is as follows and as detailed further in the appendix, Detailed Cost Estimates.

Item	Price
Civil	$4,008,000
Electrical & Mechanical	$3,111,000
Dam Safety System	$100,000
Contingency (30%)	$2,166,000
Subtotal	$9,385,000
Engineering (15%)	$1,408,000
Grand Total	$10,793,000

APPENDICES

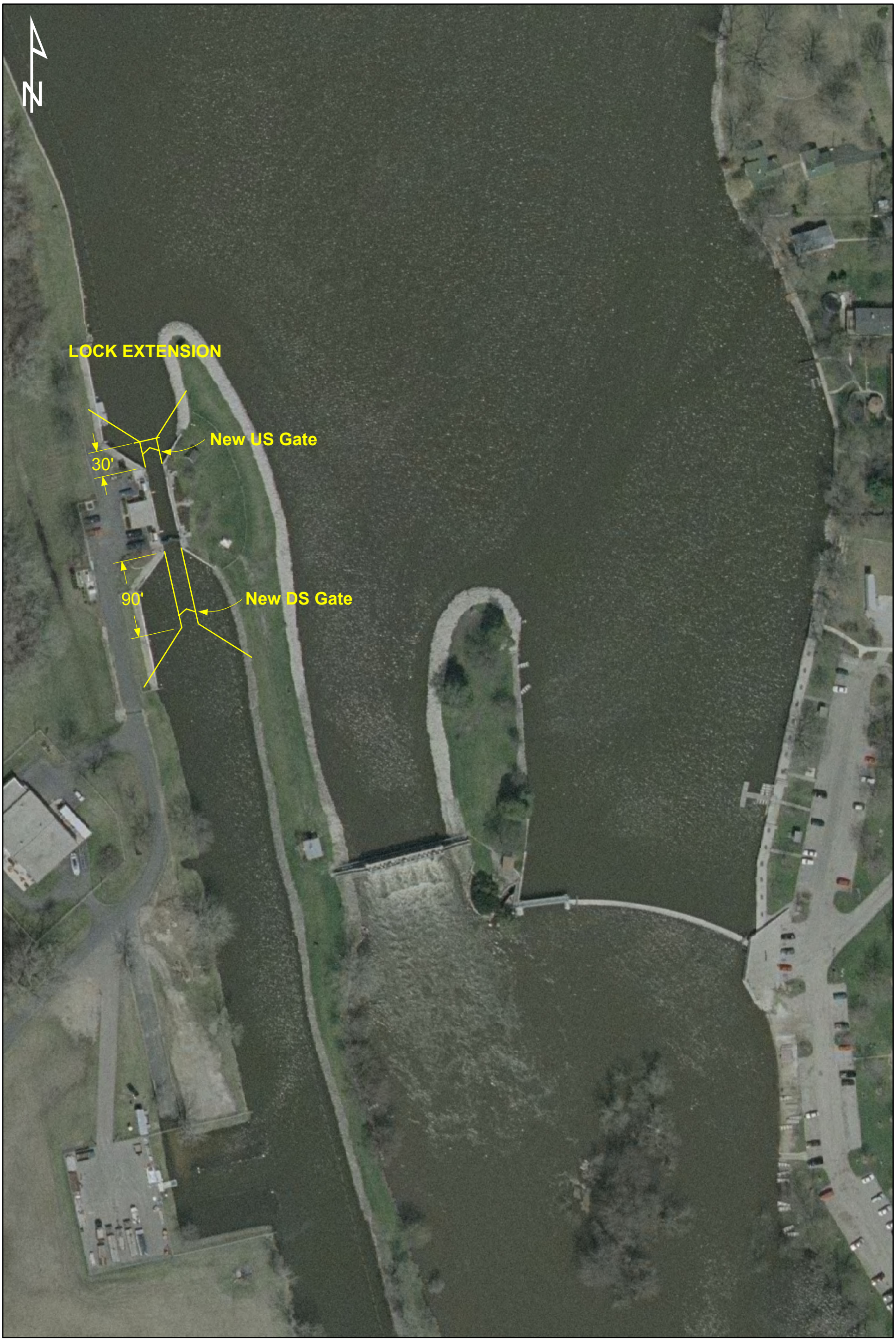
Exhibits

1. Lock Extension Location
2. Monorail Boat Hoist Concept Location
3. Monorail Boat Hoist Concept Plan and Section
4. Boat Conveyor Concept Location
5. Boat Conveyor Concept Plan and Section
6. Hinge Leaf (Obermeyer) Gates Location
7. Hinge Leaf (Obermeyer) Gate Section
8. Submersible Tainter Gate Location
9. Submersible Tainter Gate Section
10. Labyrinth Spillway
11. Labyrinth Spillway Section
12. Access Bridge Location
13. Access Bridge Elevation
14. Recommended Project Features

Lock Traffic Data

Detailed Cost Estimates

Exhibit #1 - Lock Extension



0 100 200 300

Feet

Scale: 1 inch = 100 feet

HNTB

Exhibit #2 - Monorail Hoist

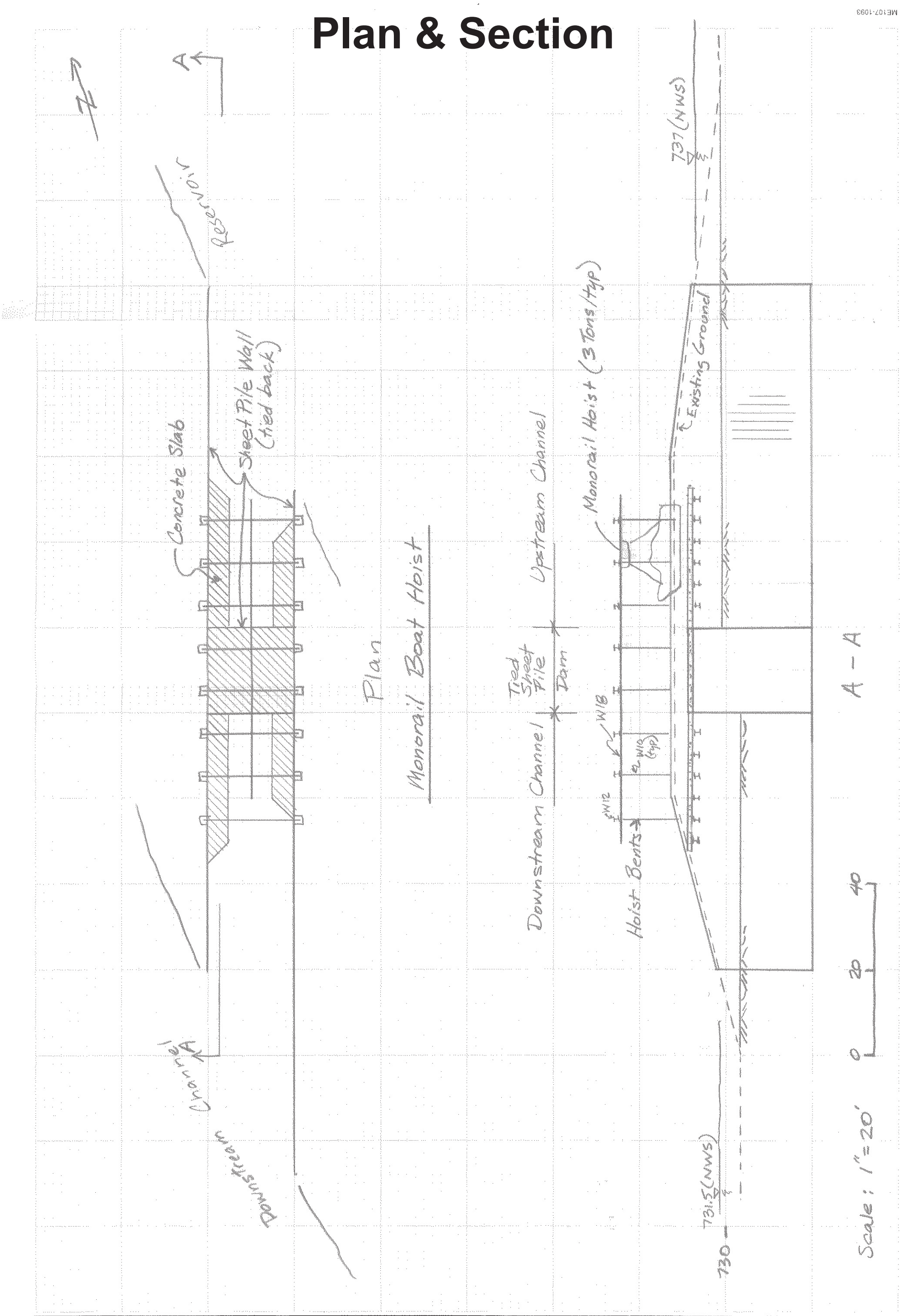
0 100 200 300

Feet

Scale: 1 inch = 100 feet

HNTB

Exhibit #3 - Monorail Hoist Plan & Section



For Monorail Boat Hoist	Made by WRI	Date 6/24/05	Job Number 42180 PL
The HNTB Companies	Check by	Date	Sheet Number
	Backchecked by	Date	

Exhibit #4 - Boat Conveyor

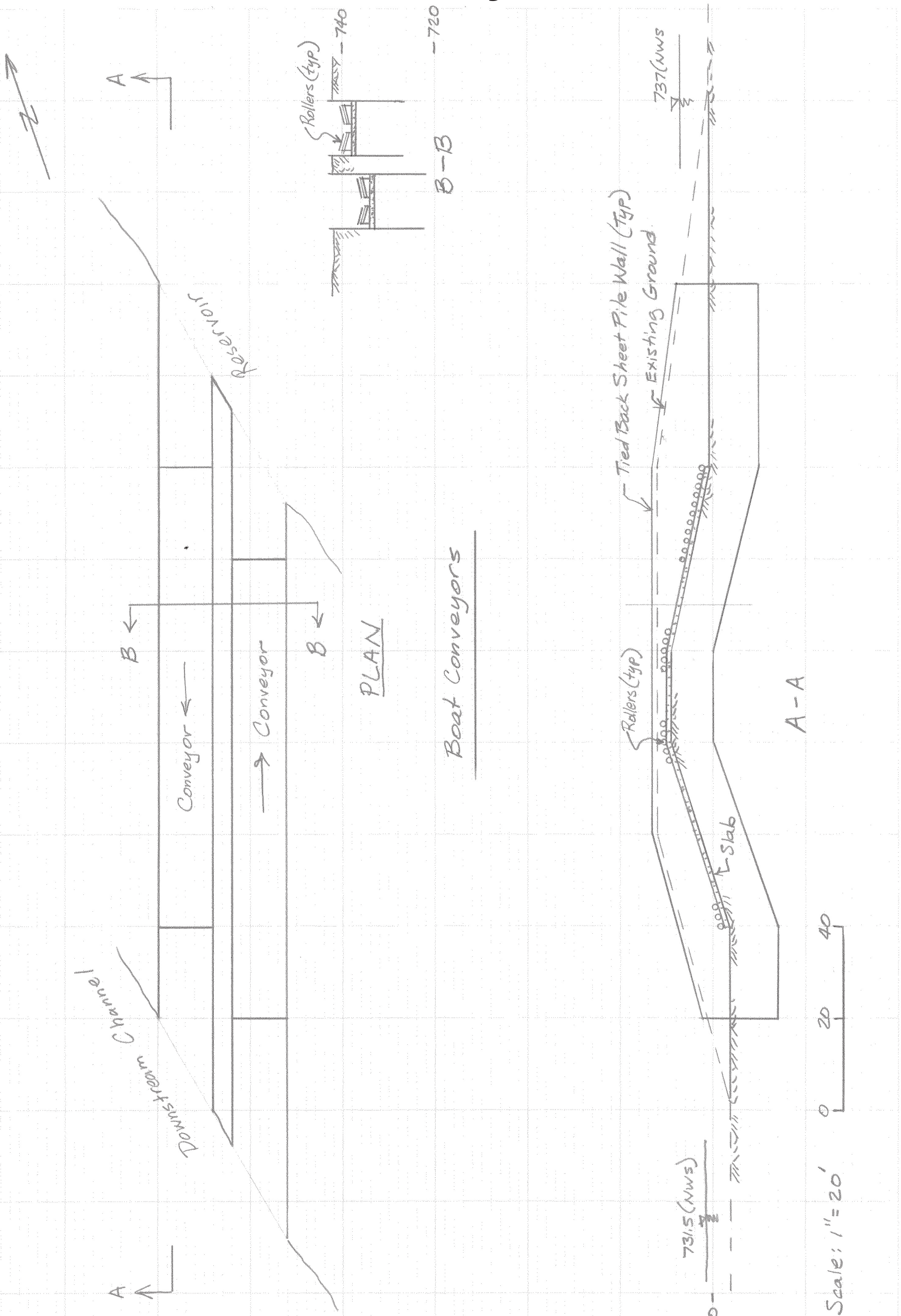
0 100 200 300

Feet

Scale: 1 inch = 100 feet

HNTB

Exhibit #5 - Boat Conveyor Plan & Section



NHTB The NHTB Companies	Made by WRI	Date 6/24/05	Job Number 42180 PL
	Check by	Date	Sheet Number
For Boat Conveyors	Backchecked by	Date	

Exhibit #6 - Hinge Leaf (Obermeyer) Gate

0 100 200 300 Feet

Scale: 1 inch = 100 feet

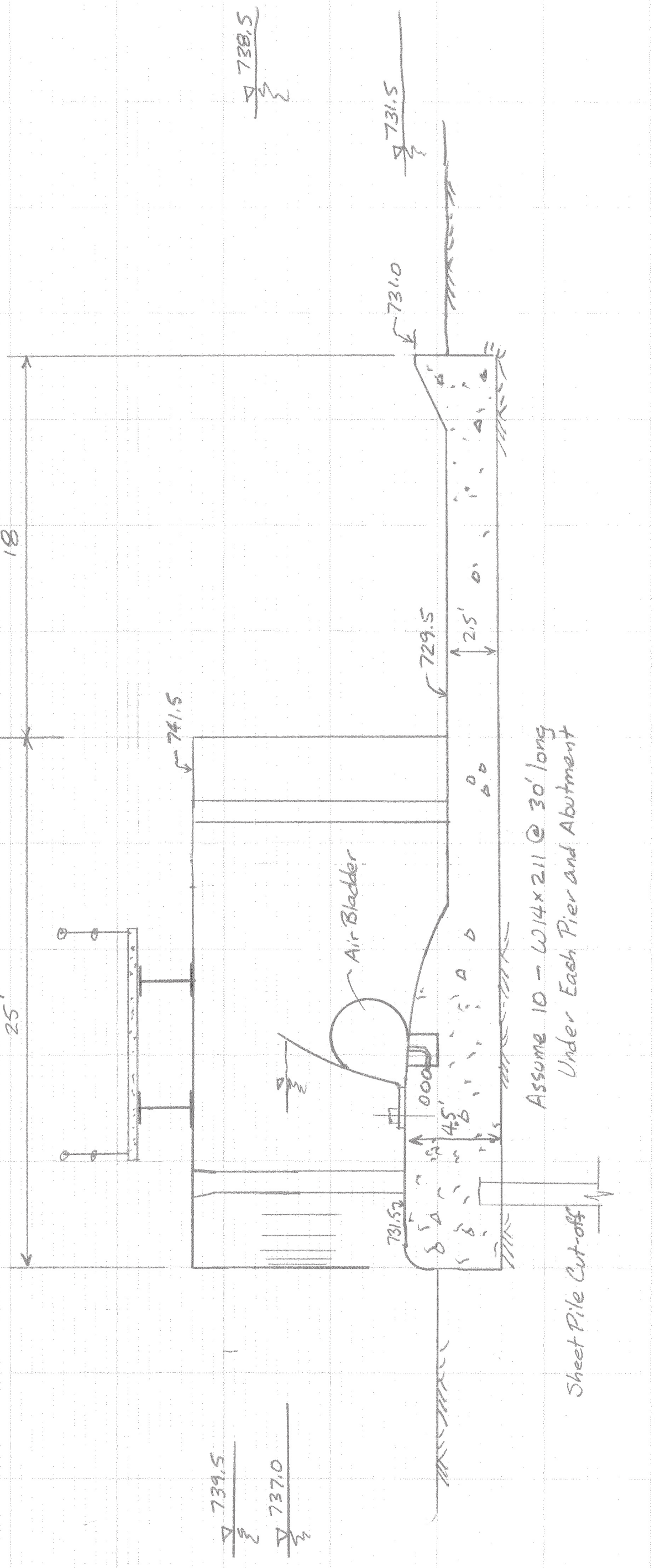
HNTB

Exhibit #7 - Hinge Leaf Gate Section

ME107-1093

3 Obermeyer Gates @ 30'w x 6'h
Piers and Abutments 5' Thick

Pneumatic Hinge Leaf Gate Section



The HNTB Companies	Made by WRI	Date 6/16/05	Job Number
For Hinge Leaf Gate	Check by	Date	Sheet Number
	Backchecked by	Date	

Exhibit #8 - Submersible Tainter Gate

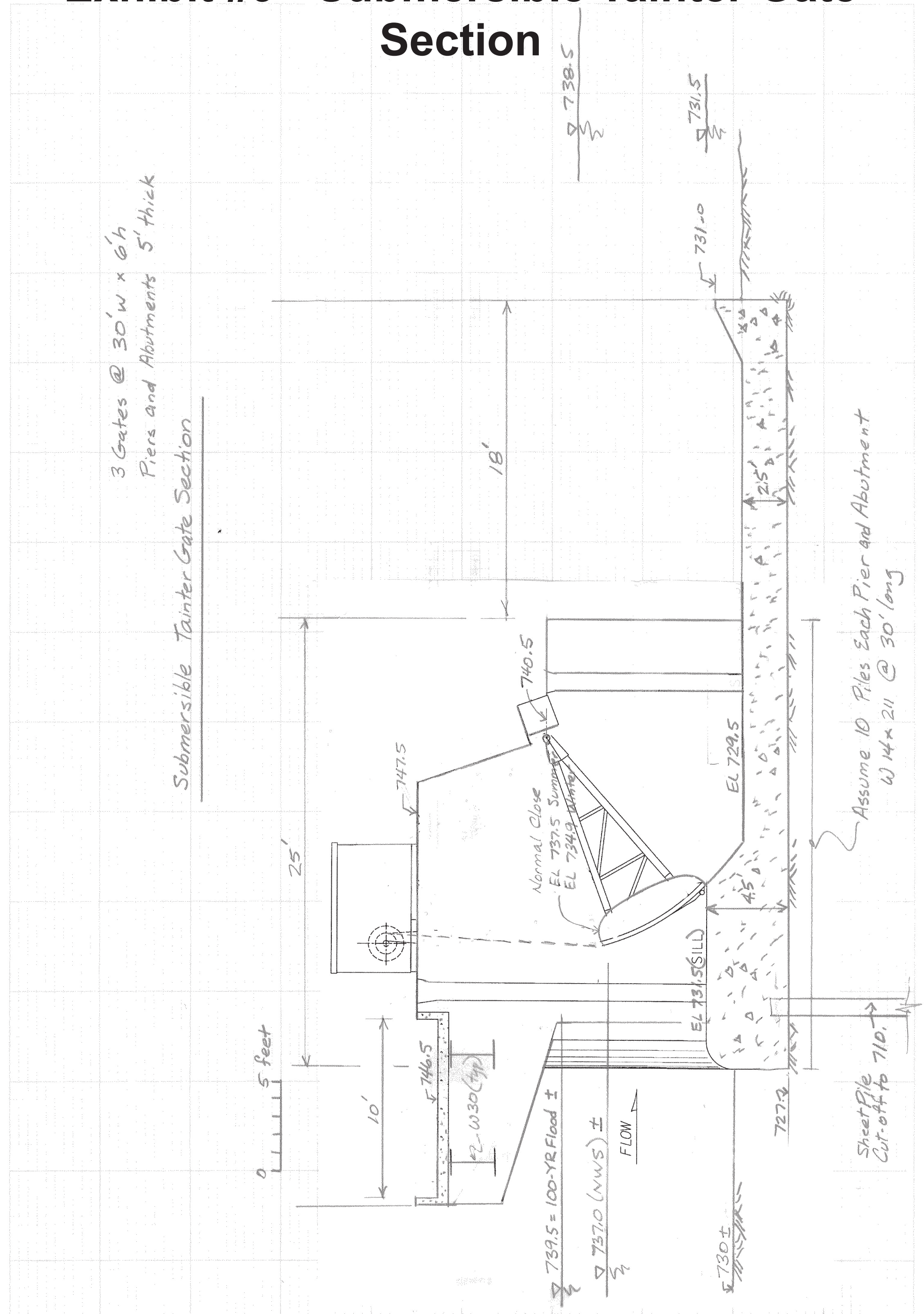
0 100 200 300 Feet

Scale: 1 inch = 100 feet

HNTB

Exhibit #9 - Submersible Tainter Gate Section

ME107-1093



HNTB The HNTB Companies		For Submersible Tainter Gate	
Made by WRI	Checked by	Backchecked by	Date
Date 6/16/05	Date	Date	Sheet Number
Job Number 42180 PL			

Exhibit #10 - Labyrinth Spillway

0 100 200 300

Feet

Scale: 1 inch = 100 feet

HNTB

Exhibit #11 - Labyrinth Spillway Section

Calculations For	Labyrinth Spillway Sec	Job No. 42180 PL	Sheet No. 1
Made by	WRI	Date	6/21/05
Checked by		Date	
Backchecked by		Date	

HNTB

Labyrinth Spillway Section

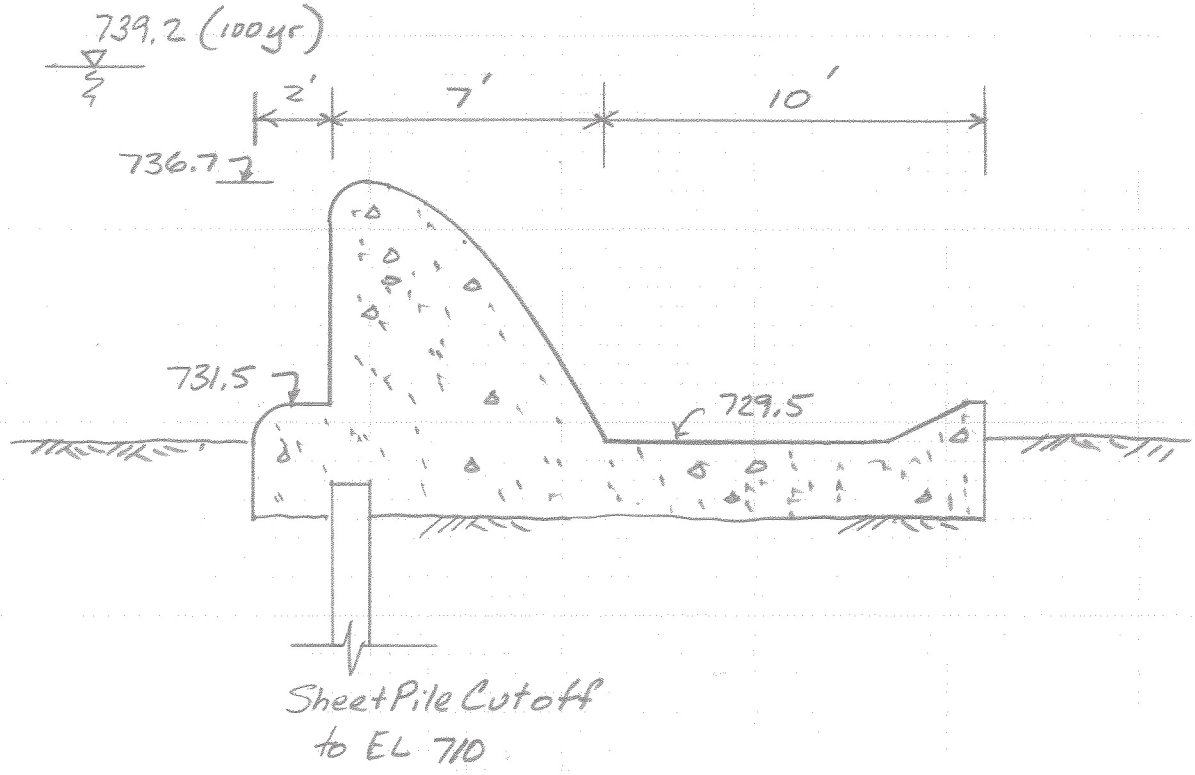


Exhibit #12 - Access Bridge

0 100 200 300

Feet

Scale: 1 inch = 100 feet

HNTB

Exhibit #13 - Access Bridge Elevation

Calculations For	Access Bridge to Island	Job No. 42180 PL	Sheet No. 1
Made by	WRI	Date	
Checked by		Date	
Backchecked by		Date	

HNTB

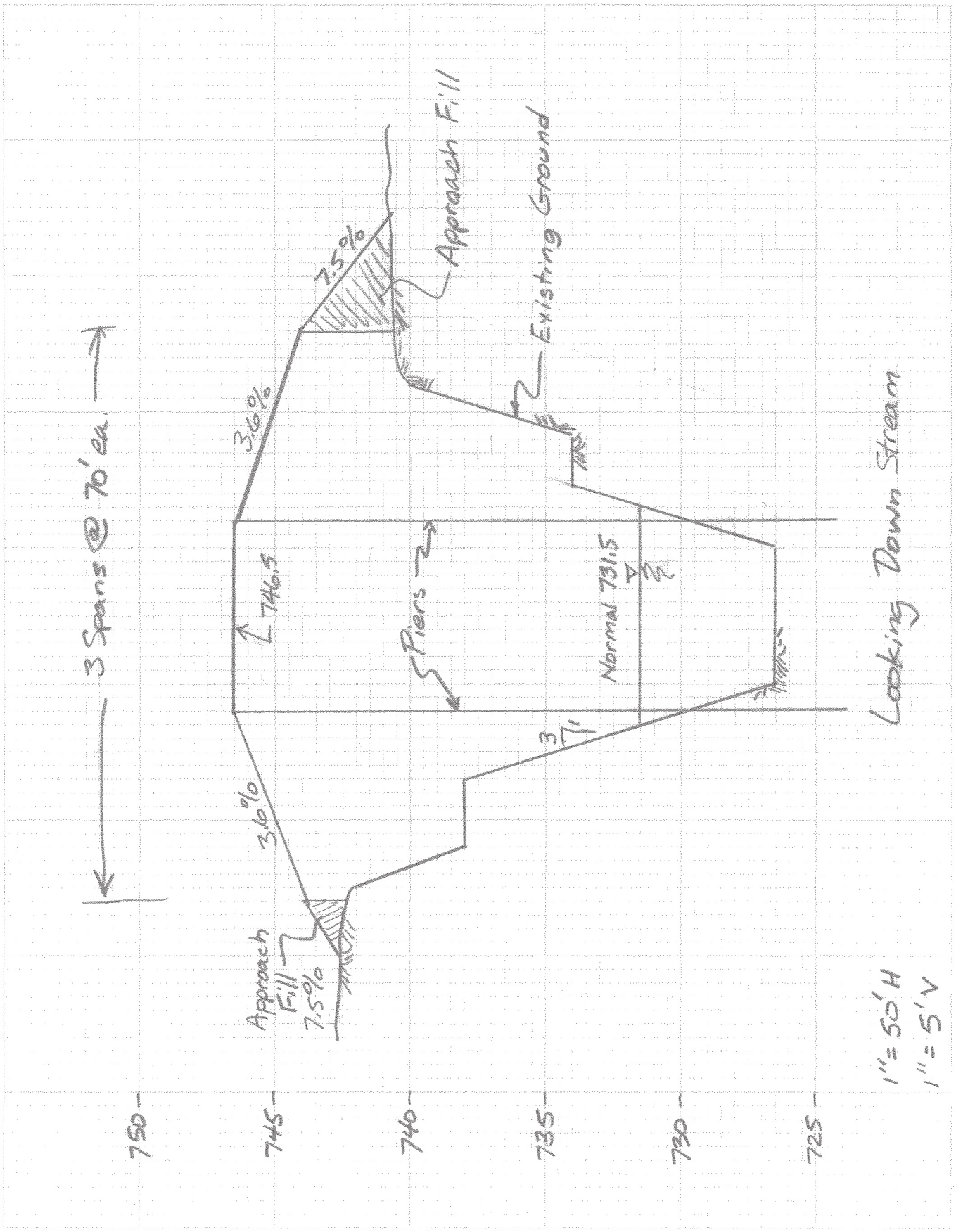
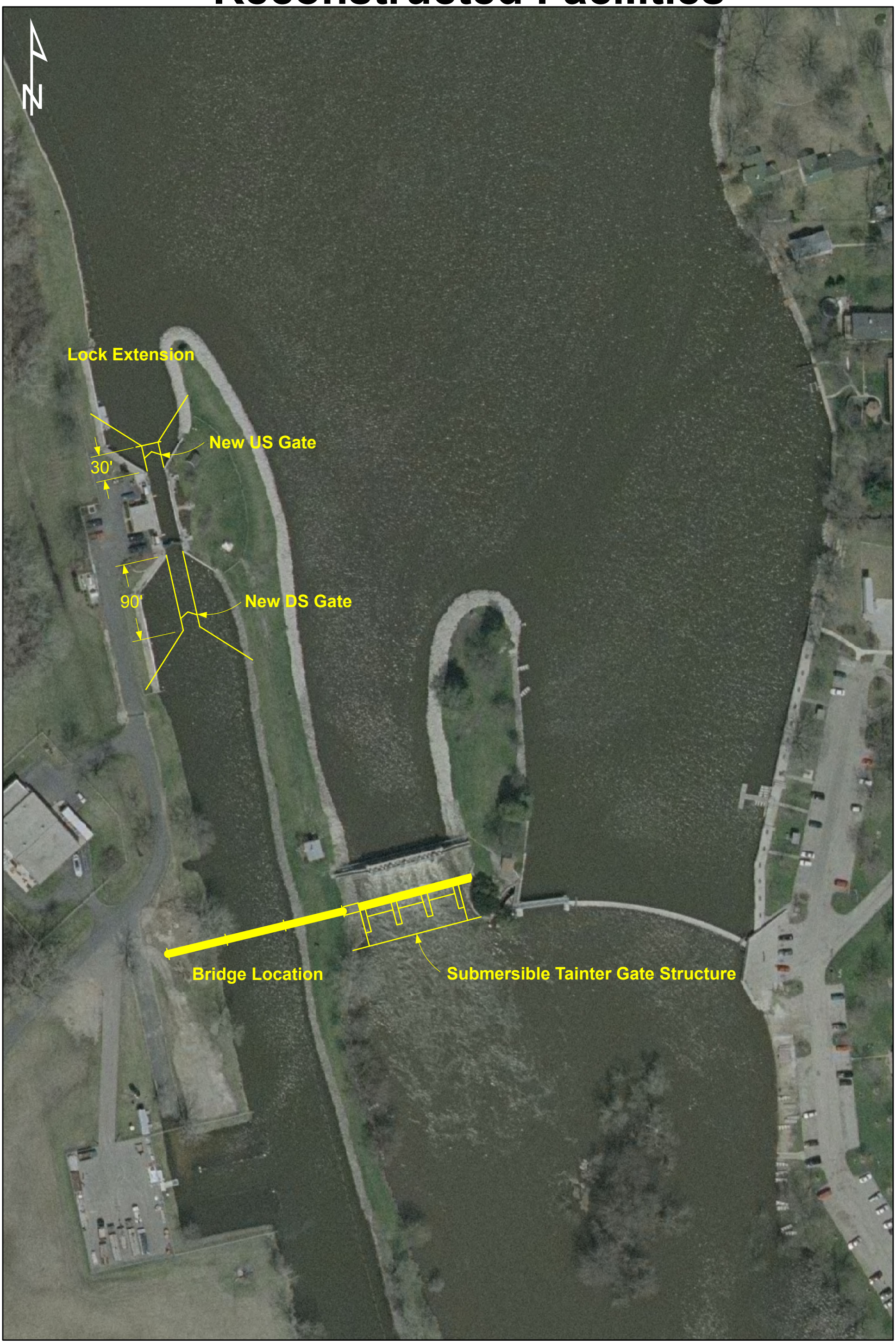


Exhibit #14 - Recommended Reconstructed Facilities



0 100 200 300 Feet

Scale: 1 inch = 100 feet

HNTB

Illinois Department of
Natural Resources
One Natural Resources Way • Springfield, Illinois 62702-1271
http://dnr.state.il.us

Rod R. Blagojevich, Governor
Joel Brunsvold, Director

May 23, 2005

Mr. Bob Ivarson
HNTB Corporation
111 North Canal Street
Chicago, Illinois 60606

RE: Life Extension Reconnaissance Study
Stratton Lock & Dam
Lockages & Electric Bills

Dear Mr. Ivarson:

On May 9, 2005, there was a site visit at Stratton Lock & Dam attended by yourself, Karl Augenbergs, and Benjamin Nurya, all from HNTB, and myself and staff from Stratton Lock & Dam. The site visit went well, with time spent looking at the 45 year old lock and its mechanical and electrical system, and at the 65 year old control structure with its mechanical, electric, and concrete structure.

Your staff requested the "Lockage and Boat" usage for the past few years and the "Electrical" usage for the past year. We have enclosed the "Annual Summary" for the years 2000 thru 2004, showing the lockage and boats for each month of the year. We have also enclosed the "Monthly Summary" showing the daily usage for the highest month for each of those years. The "Electrical Usage" is also enclosed showing the usage for each month from July, 2003 to February, 2005.

We will be happy to discuss these reports with you. If you or your staff determines that additional information is needed, please let us know.

Sincerely,

Terry Burke, P.E.
Operations Engineer

TEB:kmp

Enclosure

cc: Rita Lee

Printed on recycled and recyclable paper

WILLIAM G. STRATTON LOCK ---- McHENRY, ILLINOIS
RECORD OF OPERATIONS

2000 ANNUAL SUMMARY

MONTH	HOURS OF OPERATION	LOCKAGES					BOATS				
		8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL	8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL
MAY	496	113	214	177	59	563	112	317	268	52	749
JUNE	480	36	101	108	53	298	34	155	164	51	404
JULY	496	422	589	598	442	2,051	688	1,740	1,613	554	4,595
AUG	496	461	697	691	471	2,320	783	2,185	1,970	611	5,549
SEPT	480	317	515	457	208	1,497	441	1,177	1,088	219	2,925
OCT	496	238	411	268	72	989	268	769	442	46	1,525
TOTAL		1,587	2,527	2,299	1,305	——	2,326	6,343	5,545	1,533	——
HOURS	2,944	TOTAL LOCKAGES				7,718	TOTAL BOATS				15,747

Frank W. Novak
Lockmaster

WILLIAM G. STRATTON LOCK ------ McHENRY, ILLINOIS

RECORD OF OPERATIONS

AUGUST, 2000

DATE	HOURS OF OPERATION	LOCKAGES					BOATS				
		8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL	8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL
1	16	5	22	25	15	67	4	30	38	11	83
2	16	7	24	24	9	64	6	56	36	6	104
3	16	11	26	22	29	88	17	51	71	29	168
4	16	16	24	23	23	86	27	89	111	48	275
5	16	25	26	24	13	88	51	66	51	12	180
6	16	19	21	24	6	70	50	109	87	4	250
7	16	17	24	26	13	80	22	79	65	9	175
8	16	4	18	21	9	52	6	21	35	5	67
9	16	9	24	25	22	80	12	54	46	18	130
10	16	15	26	27	34	102	24	80	94	59	257
11	16	18	22	23	19	82	38	104	78	36	256
12	16	25	22	19	25	91	64	123	103	76	366
13	16	20	24	22	16	82	21	99	101	23	244
14	16	15	27	23	17	82	27	87	50	14	178
15	16	18	24	24	12	78	24	70	49	14	157
16	16	19	22	23	12	76	31	90	70	10	201
17	16	2	13	21	12	48	1	14	28	12	55
18	16	18	22	23	20	83	26	80	72	25	203
19	16	20	22	22	18	82	32	91	94	21	238
20	16	25	21	23	11	80	69	100	83	15	267
21	16	16	22	23	7	68	25	62	55	7	149
22	16	7	22	8	1	38	7	48	6	1	62
23	16	6	21	20	7	54	6	23	36	4	69
24	16	15	23	23	24	85	23	74	85	33	215
25	16	14	23	24	23	84	28	98	90	27	243
26	16	17	24	24	25	90	17	64	65	36	182
27	16	26	21	22	11	80	73	112	111	10	306
28	16	18	22	20	6	66	17	115	64	7	203
29	16	8	19	18	5	50	11	25	15	4	55
30	16	11	20	20	5	56	12	25	20	4	61
31	16	15	26	25	22	88	12	46	61	31	150
TOTAL		461	697	691	471	——	783	2,185	1,970	611	——
HOURS	496	TOTAL LOCKAGES				2,320	TOTAL BOATS				5,549

Frank W. Novak
Lockmaster

WILLIAM G. STRATTON LOCK ----- McHENRY, ILLINOIS
RECORD OF OPERATIONS

2001 ANNUAL SUMMARY

MONTH	HOURS OF OPERATION	LOCKAGES					BOATS				
		8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL	8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL
MAY	496	182	405	380	116	1,083	210	688	614	98	1,610
JUNE	480	283	372	365	243	1,263	430	981	966	317	2,694
JULY	496	508	691	701	474	2,374	901	2,009	1,813	645	5,368
AUG	496	442	659	687	402	2,190	701	1,721	1,596	474	4,492
SEPT	480	298	513	443	164	1,418	405	1,082	885	178	2,550
OCT	496	139	270	188	28	625	123	374	252	19	768
TOTAL		1,852	2,910	2,764	1,427	-----	2,770	6,855	6,126	1,731	----
HOURS	2,944	TOTAL LOCKAGES				8,953	TOTAL BOATS				17,482

Frank W. Novak
Lockmaster

WILLIAM G. STRATTON LOCK ---- McHENRY, ILLINOIS

RECORD OF OPERATIONS

JULY, 2001

DATE	HOURS OF OPERATION	LOCKAGES					BOATS				
		8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL	8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL
1	16	20	24	18	6	68	39	89	63	7	198
2	16	10	22	20	10	62	14	58	38	9	119
3	16	8	23	21	19	71	9	31	34	18	92
4	16	25	22	23	18	88	55	116	101	41	313
5	16	18	22	24	19	83	38	80	80	27	225
6	16	16	18	24	16	74	29	87	84	17	217
7	16	19	26	27	18	90	28	61	43	27	159
8	16	28	21	25	20	94	68	105	115	32	320
9	16	11	26	23	10	70	18	45	39	7	109
10	16	15	24	26	11	76	18	47	48	14	127
11	16	12	23	24	13	72	18	55	48	13	134
12	16	18	26	27	27	98	26	58	54	26	164
13	16	21	24	22	22	89	36	62	86	34	218
14	16	26	24	21	26	97	44	107	99	58	308
15	16	26	20	18	18	82	78	111	89	36	314
16	16	14	26	25	11	76	20	60	46	13	139
17	16	2	9	20	7	38	1	11	24	6	42
18	16	8	13	17	10	48	7	16	20	8	51
19	16	8	26	22	26	82	11	63	45	40	159
20	16	16	22	23	19	80	22	61	81	25	189
21	16	22	23	25	21	91	46	89	80	38	253
22	16	26	22	27	7	82	55	94	52	6	207
23	16	16	22	14	4	56	21	26	15	4	66
24	16	16	25	25	8	74	15	56	48	9	128
25	16	5	18	18	2	43	5	17	15	1	38
26	16	11	21	24	22	78	11	37	47	27	122
27	16	19	18	23	20	80	32	74	78	28	212
28	16	20	25	21	16	82	38	68	50	20	176
29	16	26	23	24	21	94	63	111	107	26	307
30	16	14	28	25	9	76	20	67	37	11	135
31	16	12	25	25	18	80	16	47	47	17	127
TOTAL		508	691	701	474	----	901	2,009	1,813	645	----
HOURS	496	TOTAL LOCKAGES				2,374	TOTAL BOATS				5,368

Frank W. Novak
Lockmaster

WILLIAM G. STRATTON LOCK ----- McHENRY, ILLINOIS
RECORD OF OPERATIONS

2002 ANNUAL SUMMARY

MONTH	HOURS OF OPERATION	LOCKAGES					BOATS				
		8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL	8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL
MAY	496	185	340	289	108	922	193	590	484	104	1,371
JUNE	480	283	445	421	292	1,441	496	1,211	1,134	445	3,286
JULY	496	461	714	720	530	2,425	793	1,959	1,939	723	5,414
AUG	496	434	693	676	430	2,233	703	2,028	1,820	555	5,106
SEPT	480	328	595	534	203	1,660	492	1,455	1,136	196	3,279
OCT	496	147	289	146	32	614	147	371	182	13	713
NOV	48	7	13	2	1	23	7	14	1	0	22
TOTAL		1,845	3,089	2,788	1,596	----	2,831	7,628	6,696	2,036	----
HOURS	2,992	TOTAL LOCKAGES				9,318	TOTAL BOATS				19,191

Lock opened for season at 8:00 AM on Wednesday, May 1, 2002, as scheduled.

Lock closed for season at 12:00 Midnite on Sunday night, November 3, 2002, as scheduled.

Frank W. Novak
Lockmaster

WILLIAM G. STRATTON LOCK ----- McHENRY, ILLINOIS

RECORD OF OPERATIONS

JULY, 2002

DATE	HOURS OF OPERATION	LOCKAGES					BOATS				
		8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL	8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL
1	16	11	27	23	15	76	14	46	51	14	125
2	16	15	24	26	17	82	28	51	70	26	175
3	16	14	24	26	26	90	19	56	53	37	165
4	16	23	21	24	22	90	57	92	80	27	256
5	16	22	22	24	24	92	53	99	95	42	289
6	16	24	23	23	28	98	43	97	88	39	267
7	16	25	26	22	20	93	75	117	92	29	313
8	16	12	26	25	5	68	17	43	35	3	98
9	16	7	20	24	9	60	10	34	22	9	75
10	16	8	23	22	5	58	7	51	29	4	91
11	16	8	21	22	25	76	9	35	45	31	120
12	16	11	24	23	24	82	21	74	85	32	212
13	16	23	23	24	22	92	40	88	108	54	290
14	16	23	24	21	20	88	49	105	104	52	310
15	16	15	21	24	12	72	18	70	66	14	168
16	16	18	23	26	11	78	17	42	55	18	132
17	16	22	25	24	15	86	26	51	47	17	141
18	16	12	23	24	27	86	13	42	58	32	145
19	16	13	24	23	19	79	9	72	68	26	175
20	16	17	23	24	20	84	50	97	94	37	278
21	16	23	22	24	13	82	54	88	90	19	251
22	16	3	24	20	7	54	3	37	21	6	67
23	16	8	24	20	8	60	8	41	36	5	90
24	16	17	24	22	17	80	16	65	51	15	147
25	16	9	19	23	27	78	8	18	40	21	87
26	16	14	21	25	22	82	27	72	62	33	194
27	16	8	21	24	23	76	6	31	67	27	131
28	16	21	23	23	13	80	56	121	98	21	296
29	16	10	21	19	8	58	6	35	22	5	68
30	16	14	24	23	14	75	17	44	57	13	131
31	16	11	24	23	12	70	17	45	50	15	127
TOTAL		461	714	720	530	----	793	1,959	1,939	723	----
HOURS	496	TOTAL LOCKAGES				2,425	TOTAL BOATS				5,414

Frank W. Novak
Lockmaster

WILLIAM G. STRATTON LOCK ----- McHENRY, ILLINOIS
RECORD OF OPERATIONS

2003 ANNUAL SUMMARY

MONTH	HOURS OF OPERATION	LOCKAGES					BOATS				
		8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL	8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL
MAY	496	172	335	319	121	947	202	582	525	110	1,419
JUNE	480	316	574	569	352	1,811	423	1,369	1,365	429	3,586
JULY	496	442	674	684	484	2,284	767	1,875	1,769	684	5,095
AUG	496	460	701	671	432	2,264	826	2,058	1,758	596	5,238
SEPT	480	254	509	459	160	1,382	297	1,024	815	143	2,279
OCT	496	158	314	236	39	747	155	581	360	26	1,122
NOV	32	3	6	3	2	14	2	5	2	1	10
TOTAL		1,805	3,113	2,941	1,590	----	2,672	7,494	6,594	1,989	----
HOURS	2,976	TOTAL LOCKAGES				9,449	TOTAL BOATS				18,749

Lock opened for season at 8:00 AM on Thursday, May 1, 2003, as scheduled.

Lock closed for season at 12:00 Midnite on Sunday night, November 2, 2003, as scheduled.

Frank W. Novak
Lockmaster

WILLIAM G. STRATTON LOCK ------ McHENRY, ILLINOIS

RECORD OF OPERATIONS

AUGUST, 2003

DATE	HOURS OF OPERATION	LOCKAGES					BOATS				
		8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL	8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL
1	16	15	27	26	8	76	20	52	32	11	115
2	16	21	23	23	11	78	36	97	89	20	242
3	16	18	24	16	4	62	38	61	17	2	118
4	16	4	20	18	0	42	3	24	15	0	42
5	16	18	23	22	13	76	13	66	46	13	138
6	16	8	20	10	6	44	12	40	8	4	64
7	16	12	25	27	20	84	20	58	47	24	149
8	16	16	24	24	16	80	18	53	46	28	145
9	16	20	22	23	21	86	40	95	103	54	292
10	16	19	20	22	19	80	63	102	103	41	309
11	16	11	14	10	1	36	7	13	7	1	28
12	16	8	26	14	4	52	7	50	25	3	85
13	16	13	24	22	13	72	19	65	67	16	167
14	16	8	21	21	30	80	10	56	59	40	165
15	16	17	23	24	22	86	36	68	80	28	212
16	16	20	22	22	25	89	41	112	83	27	263
17	16	26	21	22	11	80	70	124	104	26	324
18	16	17	22	26	7	72	32	132	46	5	215
19	16	12	22	24	14	72	13	64	64	17	158
20	16	16	23	24	11	74	25	56	55	10	146
21	16	12	20	26	24	82	13	36	50	32	131
22	16	11	25	23	23	82	25	82	80	35	222
23	16	19	22	23	27	91	43	93	100	56	292
24	16	22	21	23	12	78	75	112	109	13	309
25	16	10	26	22	6	64	10	42	36	4	92
26	16	6	14	21	7	48	7	13	26	4	50
27	16	11	26	21	10	68	12	42	35	12	101
28	16	12	26	22	22	82	13	46	39	22	120
29	16	20	27	23	14	84	26	54	62	12	154
30	16	19	24	23	22	88	35	73	83	30	221
31	16	19	24	24	9	76	44	77	42	6	169
TOTAL		460	701	671	432	——	826	2,058	1,758	596	——
HOURS	496	TOTAL LOCKAGES				2,264	TOTAL BOATS				5,238

Frank W. Novak
Lockmaster

WILLIAM G. STRATTON LOCK ------ McHENRY, ILLINOIS

RECORD OF OPERATIONS

2004 ANNUAL SUMMARY

MONTH	HOURS OF OPERATION	LOCKAGES 8:00 AM TO 12:00 NOON	LOCKAGES 12:00 NOON TO 4:00 PM	LOCKAGES 4:00 PM TO 8:00 PM	LOCKAGES 8:00 PM TO 12:00 MDNT	LOCKAGES TOTAL	BOATS 8:00 AM TO 12:00 NOON	BOATS 12:00 NOON TO 4:00 PM	BOATS 4:00 PM TO 8:00 PM	BOATS 8:00 PM TO 12:00 MDNT	BOATS TOTAL
MAY	496	91	160	131	41	423	76	194	142	29	441
JUNE	480	61	136	147	47	391	44	185	210	38	477
JULY	496	456	734	690	510	2,390	730	1,841	1,765	759	5,095
AUG	496	397	602	601	298	1,898	604	1,502	1,419	400	3,925
SEPT	480	411	631	599	295	1,936	602	1,661	1,475	307	4,045
OCT	496	151	307	172	23	653	139	463	244	14	860
TOTAL		1,567	2,570	2,340	1,214	------	2,195	5,846	5,255	1,547	------
HOURS	2,944	TOTAL LOCKAGES				7,691	TOTAL BOATS				14,843

Lock opened for season at 8:00 AM on Saturday, May 1, 2004, as scheduled.

Lock closed for season at 12:00 Midnite on Sunday night, October 31, 2004, as scheduled.

WILLIAM G. STRATTON LOCK ------ McHENRY, ILLINOIS

RECORD OF OPERATIONS

JULY, 2004

DATE	HOURS OF OPERATION	LOCKAGES					BOATS				
		8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL	8:00 AM TO 12:00 NOON	12:00 NOON TO 4:00 PM	4:00 PM TO 8:00 PM	8:00 PM TO 12:00 MDNT	TOTAL
1	16	15	24	25	20	84	17	58	54	32	161
2	16	16	25	24	25	90	25	93	90	45	253
3	16	23	25	24	16	88	37	72	32	14	155
4	16	15	26	23	30	94	14	81	88	55	238
5	16	23	23	24	12	82	63	98	88	14	263
6	16	5	25	16	3	49	4	21	17	5	47
7	16	5	10	7	0	22	3	8	6	0	17
8	16	10	29	27	26	92	13	66	69	30	178
9	16	14	25	22	7	68	18	30	19	8	75
10	16	16	24	24	29	93	28	94	109	58	289
11	16	21	23	24	14	82	62	101	92	20	275
12	16	13	25	24	8	70	16	45	40	8	109
13	16	8	19	22	2	51	6	20	28	1	55
14	16	14	29	26	14	83	24	54	55	15	148
15	16	14	25	26	27	92	17	58	78	43	196
16	16	17	27	26	11	81	17	35	41	14	107
17	16	23	25	24	24	96	45	77	83	42	247
18	16	23	23	22	20	88	53	104	113	62	332
19	16	16	26	17	15	74	20	46	27	10	103
20	16	17	23	20	10	70	14	55	38	9	116
21	16	7	14	14	5	40	5	10	10	5	30
22	16	10	20	25	21	76	12	42	23	18	95
23	16	14	23	25	20	82	14	54	66	19	153
24	16	21	25	25	19	90	37	88	71	22	218
25	16	25	23	21	22	91	58	102	94	48	302
26	16	8	26	14	1	49	19	41	15	2	77
27	16	14	23	25	19	81	13	40	63	17	133
28	16	14	25	24	15	78	19	84	70	17	190
29	16	9	28	25	28	90	10	64	63	38	175
30	16	6	21	24	19	70	6	23	35	17	81
31	16	20	25	21	28	94	41	77	88	71	277
TOTAL		456	734	690	510	------	730	1,841	1,765	759	------
HOURS	496	TOTAL LOCKAGES				2,390	TOTAL BOATS				5,095

Electric Usage For Stratton Lock & Dam

Meter Reading Date	kwH	kw	Cost
2-23-05	18,060	43.8	$1,357.28
1-25-05	25,320	43.8	1,694.72
12-21-04	16,980	41.4	1,280.37
11-18-04	8,100	20.4	633.90
10-20-04	6,420	8.7	425.59
9-21-04	5,040	13.8	461.13
8-21-04	4,400	13.8	433.24
7-23-04	4,260	10.8	382.15
6-23-04	5,040	12.6	444.04
4-22-04	6,600	17.0	530.78
3-23-04	9,900	24.6	764.31
2-24-04	15,180	33.0	1,103.66
1-26-04	19,200	33.0	1,300.11
12-22-03	14,280	30.6	1,035.10
11-19-03	7,020	19.2	570.56
10-21-03	4,800	16.0	440.59
9-22-03	4,260	13.8	425.00
8-21-03	3,600	10.2	343.04
7-24-03	3,660	11.2	362.93

Project Features Summary

NO		ITEM	UNIT	UNIT PRICE	HINGE LEAF GATE		TAINTER GATE		LOCK EXTENSION		BOAT CONVEYORS		MONORAIL		LABYRINTH		BRIDGE	
					QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST
		CIVIL																
1		**Concrete (Reinforced)**																
	a	Slab or Ogee	CY	$550	450	$247,500	450	$247,500							2,850	$1,567,500		
	c	Pier	CY	$650	100	$65,000	160	$104,000										
	d	Abutment	CY	$650	200	$130,000	320	$208,000										
	e	Lock Grade Beams	CY	$550					35	$19,250								
	f	Anchor Wall	CY	$650					135	$87,554	90	$58,500	90	$58,500				
	g	Gate Bays	CY	$550					860	$473,000								
	h	Footing	CY	$650									16	$10,400				
	i	Slab	CY	$600									35	$21,111				
2		**Structural Steel**																
	a	HP14x117 Piles	LF	$50	1,800	$90,000	1,800	$90,000										
	b	W12x87	LF	$174									160	$27,840				
	c	W18x106	LF	$212									82	$17,384				
	d	W10x49	LF	$98									180	$17,640				
	e	Sheet Pile	SF	$25	2,500	$62,500	2,500	$62,500	18,000	$450,000	10,440	$261,000	10,600	$265,000	20,000	$500,000		
	f	Sheet Pile Ties, 35' Long	EA	$2,100					106	$222,180			56	$117,600				
	g	Sheet Pile Ties, 20' Long	EA	$1,300							32	$41,600						
	h	Corbel	LBS	$2									45,000	$90,000				
3		**Miscellaneous Metal**																
	a	Hand Rail	LF	$200	630	$126,000	630	$126,000	240	$48,000	640	$128,000	320	$64,000				
4		**Dumped Stone/Riprap**	CY	$25	3,500	$87,500	3,500	$87,500	139	$3,467					200	$5,000		
5		**Timber Piles**	LF	$30					3,520	$105,600								
6		**Excavation**	CY	$10							1,150	$11,500	1,800	$18,000				
7		**Bridge**	SF	$100	1,350	$135,000	1,350	$135,000									2,330	$233,000
8		**Bridge Abutment and Piers**	LS	$100,000													1	$100,000
9		**Structure Demolition**	CY	$100	440	$44,000	440	$44,000							1,010	$101,000		
10		**Temporary Cofferdam & Dewatering**	LF	$2,000	400	$800,000	400	$800,000										
11		**Maintenance Bulkheads**	LF	$4,000	90	$360,000	90	$360,000										
12		**Dam Safety System**	LS	$100,000														
		MECHANICAL																
1		**Monorail Hoist and Controls**	LS	$30,000									1	$30,000				
2		**Lock Mitre Gates/Actuators/Controls**																
	a	Upper	SF	$2,600					280	$730,000								
	b	Lower	SF	$2,600					360	$940,000								
3		**Submersible Tainter Gates/Actuators/Controls**	SF	$2,000			540	$1,080,000										
4		**Obermeyer Gates/Actuators/Controls**	SF	$1,000	540	$540,000												
5		**Small Obermeyer Complete for use w/Labyrinth**	SF	$5,045											350	$1,765,750		
		ELECTRICAL																
4		**Panelboard 100 A Main, 12 Circuits**	EA	$1,225	1	$1,225												
5		**Air Compressor System**																
		5 HP Air Compressor & Control System	EA	$2,000	1	$2,000												
		Compressor Control Panel	EA	$1,500	1	$1,500												
6		**Automatic Remote Control & Monitoring**																
	a	Redundant Level Sensors	SYS	$3,000	2	$6,000	2	$6,000										
	b	Conduit and Wiring	SYS	$2,000	1	$2,000	1	$2,000										

NO		ITEM	UNIT	UNIT PRICE	HINGE LEAF GATE		TAINTER GATE		LOCK EXTENSION		BOAT CONVEYORS		MONORAIL		LABYRINTH		BRIDGE	
					QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST
	c	PLC Control System	SYS	$10,000	1	$10,000	1	$10,000										
	d	Remote HMI Hardware & Software	SYS	$12,000	1	$12,000	1	$12,000										
7		**Power for Hydraulic Power System**	SYS	$1,000	1	$1,000												
8		**2" Conduit for Abutment Heaters**	LF	$21	200	$4,100												
9		**#10 AWG (Abutment Heaters)**	CLF	$60	6	$360												
10		**Site Lighting - Dual Luminair - Pole Mtd**																
	a	400 W Metal Halide Luminair	EA	$705	16	$11,280	16	$11,280	32	$22,560	16	$11,280	16	$11,280				
	b	20' Aluminum Pole	EA	$1,225	8	$9,800	8	$9,800	16	$19,600	8	$9,800	8	$9,800				
	c	Dual Bracket Arms	EA	$257	8	$2,056	8	$2,056	16	$4,112	8	$2,056	8	$2,056				
	d	Concrete Base	SYS	$500	8	$4,000	8	$4,000	16	$8,000	8	$4,000	8	$4,000				
11		**Navigational signal lights**	SYS	$5,000	2	$10,000												
12		**Safety Beacons**	SYS	$1,000	4	$4,000												
13		**Color Video Cameras**	EA	$1,500	2	$3,000												
14		**Video Switcher**	EA	$2,500	1	$2,500												
15		**Video Monitor**	EA	$1,000	1	$1,000												
16		**Conduit & Cabling System**	SYS	$5,000	1	$5,000												
17		**30 HP Actuator Starter**	EA	$5,038			1	$5,038										
18		**2" Conduit for Actuator**	LF	$21			200	$4,100										
19		**#4 AWG (Actuator Power Wiring)**	CLF	$136			8	$1,088										
20		**4" RGS Conduit Underground (Power)**	LF	$56			500	$27,750										
21		**#4 AWG (Power Wiring)**	CLF	$136			20	$2,720										
22		**2" Conduit for Abutment Heaters**	LF	$21			200	$4,100										
23		**#10 AWG (Abutment Heaters)**	CLF	$60			6	$360										
24		**Navigational signal lights**	SYS	$5,000			2	$10,000										
25		**Safety Beacons**	SYS	$1,000			4	$4,000										
26		**Color Video Cameras**	EA	$1,500			2	$3,000										
27		**Video Switcher**	EA	$2,500			1	$2,500										
28		**Video Monitor**	EA	$1,000			1	$1,000										
29		**Conduit & Cabling System**	SYS	$5,000			1	$5,000										
30		**1P - 3P Phase Converter**	SYS	$10,000			1	$10,000										
31		**Lake Side Addition**																
	a	2" RGS Conduit Underground (Power)	LF	$21					130	$2,665								
	b	2" RGS Conduit Underground (Controls)	LF	$21					130	$2,665								
	c	4" RGS Conduit Underground (Power)	LF	$56					50	$2,775								
	d	4" RGS Conduit Underground (Controls)	LF	$56					50	$2,775								
	e	#4 AWG (Power Wiring)	CLF	$136					10	$1,306								
	f	#10 AWG (Control and Lighting Wiring)	CLF	$60					193	$11,592								
	g	Panelboard 100 A Main, 12 Circuits	EA	$1,225					1	$1,225								
	h	Stainless Steel Control Station	SYS	$10,000					2	$20,000								
	i	Navigational signal lights	SYS	$5,000					2	$10,000								
	j	Safety Beacons	SYS	$1,000					4	$4,000								
32		**Lock Side Addition**																
	a	2" RGS Conduit Underground (Power)	LF	$21					190	$3,895								
	b	2" RGS Conduit Underground (Controls)	LF	$21					190	$3,895								
	c	4" RGS Conduit Underground (Power)	LF	$56					50	$2,775								
	d	4" RGS Conduit Underground (Controls)	LF	$56					50	$2,775								
	e	#4 AWG (Power Wiring)	CLF	$136					17	$2,285								
	f	#10 AWG (Control and Lighting Wiring)	CLF	$60					304	$18,216								
	g	Panelboard 100 A Main, 12 Circuits	EA	$1,225					1	$1,225								

NO		ITEM	UNIT	UNIT PRICE	HINGE LEAF GATE		TAINTER GATE		LOCK EXTENSION		BOAT CONVEYORS		MONORAIL		LABYRINTH		BRIDGE	
					QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST	QTY	COST
	h	Stainless Steel Control Station	SYS	$10,000					2	$20,000								
	i	Navigational signal lights	SYS	$5,000					2	$10,000								
	j	Safety Beacons	SYS	$1,000					4	$4,000								
33		**Central Control and Monitoring System**																
	a	PLC System	SYS	$10,000					1	$10,000								
	b	Operator Interface System	SYS	$10,000					1	$10,000								
34		**Central Video Monitoring System**																
	a	Color Video Cameras	EA	$1,500					8	$12,000								
	b	Video Switcher	EA	$2,500					1	$2,500								
	c	Video Monitor	EA	$1,000					1	$1,000								
	d	Conduit & Cabling System	SYS	$5,000					1	$5,000								
35		**4" RGS Conduit Underground (Power)**	LF	$56							800	$44,400						
36		**#4 AWG (Power Wiring)**	CLF	$136							32	$4,352						
37		**Panelboard 100 A Main, 12 Circuits**	EA	$1,225							1	$1,225						
38		**Navigational signal lights**	SYS	$5,000							2	$10,000						
39		**Safety Beacons**	SYS	$1,000							4	$4,000						
40		**Conveyor Starters & Controls**	SYS	$5,000							2	$10,000						
41		**1P - 3P Phase Converter**	SYS	$10,000							1	$10,000						
42		**Boat Conveyor Equipment**	EA	$600,000							1	$600,000						
43		**4" RGS Conduit Underground (Power)**	LF	$56									800	$44,400				
44		**#4 AWG (Power Wiring)**	CLF	$136									32	$4,352				
45		**Panelboard 100 A Main, 12 Circuits**	EA	$1,225									1	$1,225				
46		**Navigational signal lights**	SYS	$5,000									2	$10,000				
47		**Safety Beacons**	SYS	$1,000									4	$4,000				
48		**6 Ton Capacity Boat Handling Monorail System**	EA	$20,450									1	$20,450				
49		**Adjustable Width Spreader Beam**	EA	$1,500									2	$3,000				
		Contingencies	LS @	30%		$834,096		$1,044,687		$990,567		$363,514		$255,611		$1,181,775		$99,900
TOTAL						**$3,615,000**		**$4,527,000**		**$4,293,000**		**$1,576,000**		**$1,108,000**		**$5,122,000**		**$433,000**