WORK PLAN
REPAIR OF SHORELINE EROSION
REVISION NO. 1

GRATWICK-RIVERSIDE PARK SITE
NORTH TONAWANDA, NEW YORK

City of North Tonawanda
Department of Engineering
City Hall, 216 Payne Avenue
North Tonawanda, NY 14120-5493

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October 1, 2003

Reference No. 7987

Mr. James Drumm
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, NY 12233-7013

Dear Mr. Drumm:

Re: Shoreline Erosion
Gratwick-Riverside Park Site
North Tonawanda, New York

The purpose of this letter is the verification of the completion of construction of the Gratwick-Riverside Park Site remedy and the addressing of some minor erosion at the margins of the remedy along the shoreline. These issues were raised during a meeting with NYSDEC on September 12, 2003 and during a site visit on the same date.

The remedial construction at the Gratwick-Riverside Park Site in North Tonawanda was essentially completed in November 2000. During the spring of 2001, there was some activity on site to complete a few items that required warm weather in order to finalize the project. On May 24, 2001, an inspection of the Site was performed to confirm substantial completion of the work. With the exception of a few cosmetic items, the work was complete and a park dedication event was held in June 2001.

Since that time, the City of North Tonawanda, Niagara Mohawk Power Corporation, and Miller Springs Remediation Management, Inc. (the Performing Parties for the Site) have been awaiting final NYSDEC approval of the remedial action for this Site. It is recognized that some difficulties and delays have occurred as a result of the failure of the prime contractor for this project (The Hasley Companies - Hasley). None the less, the work has been completed with the assistance of Hasley's bonding company and been paid for in full by the PPs. The first quarterly monitoring report on the completed remediation was submitted to the NYSDEC in September, 2001. To date, the NYSDEC's final acceptance of the remediation has not been received. This situation has caused financial hardship to one of the PPs, The City of North Tonawanda, which has had to use other money to cover the NYSDEC's unreleased portion of the reimbursable costs under the EQBA funding program. The NYSDEC has committed to reimburse 75% of the City's costs, but currently retains 5% of the total construction costs, despite the completion of these activities (with minor, non-remedial punch list items) two years ago.

Over the past two years, various minor items have prevented the NYSDEC from providing final acceptance of the remedial action; the most recent of which is some shoreline erosion that has occurred immediately adjacent to the Niagara River. The PPs have maintained that the shoreline erosion is an Operation & Maintenance activity and that the loss of some soil along the shoreline has not affected the integrity of the remedial components that were constructed

nor does it have the ability to affect that integrity. In fact, in both the Record of Decision initially issued for the Site and in the Scope of Work originally prepared during the design phase of the Site, there was never any mention of the use of soil along the shoreline. The soil was added at a later point in the design process as a value-added feature, with the intention of improving the aesthetics of the shoreline and to make the shoreline more accessible to the public.

A number of inspections of the shoreline erosion have been performed. These inspections have verified the PPs expectation that vegetation from the overlying slope area and from the river's edge will establish downslope and upslope, respectively, into the eroded area. The vegetation is observed to be in the process of rooting directly into the stone that was placed to armor the shoreline. A Site inspection that was performed immediately following the September 12, 2003 meeting with the NYSDEC confirms that this is happening. At an earlier inspection that was performed at the end of the 2002 growing season, it was noted that approximately 5 to 10 percent of the eroded soil area was infilled with vegetation. During the most recent inspection, the vegetation had infilled 30 to 50 percent of the eroded soil area. The PPs and our engineer (CRA) expect that after another full growing season, the infilling will be close to being complete, if left alone. Photographs documenting the degree of infilling that was noted in last week's Site inspection are included in the attached revised Work Plan.

Although, as a consequence of the above, the PPs disagree that supplemental efforts to promote vegetative growth along the shoreline are needed, the PPs agree to execute additional work as discussed on September 12. The work will involve the placement of stone rip rap over all of the exposed gabion rock mats along the shoreline. The new rip rap will thin out from a thickness equal to the eroded topsoil face at the top of the eroded areas to being one rock thick along the shoreline or along the edge of vegetation that has already sprouted in the exposed rock areas. Care will be taken to insure that infilled vegetation is not covered or compromised by the new rip rap. A revised work plan describing the planned erosion control measures is provided in the attached document.

In addition to placing the new stone fill, the PPs agree to install 92 wattles of Dogwoods. As discussed at the meeting, each wattle will consist of approximately 1 cubic yard of topsoil (e.g., 4' x 6' x 1' thick or 3' x 8' x 1;' thick) wrapped in a filter material (e.g., Burlap) and each is to include a bundle of 4 or 5 Dogwood stems. The location of these wattles will be up to the discretion of the NYSDEC field supervisor with the expectation that they will generally be placed in areas where there is a sufficient eroded width to accommodate the wattle and still retain at least 3 feet of placed stone between the downslope edge of the wattle and the river's edge. It is noted that in order to fit a typical wattle into the eroded area, the eroded area will have to be on the order of at least 6 feet wide. Pursuant to the discussions held during the September 12, 2003 meeting, the placement of the wattles will relieve the PPs of any obligation for any additional embankment shrub plantings.

The PPs plan to undertake this work using LDC Construction. The work is tentatively scheduled to begin on October 13 and will be complete by November 7 except for the planting of the dogwood stems. The supplier of the dogwood stems does not believe that a growing period of sufficient length is available and recommends planting the stems in the spring of 2004. The medium rip-rap and encapsulated soil with overlying light stone will be placed this fall. The start date is subject to three conditions:

i) Weather permitting.

ii) That the NYSDEC recognize that the construction of the remedy is complete and provide the PPs with a certification that the remedial action for the Site is fully approved.

iii) That the NYSDEC provide the City of North Tonawanda with a letter guarantying that all money that has been withheld over the past two years will be paid to the City of North Tonawanda as soon as practical so that monies are available for the shoreline repair.

With regard to the NYSDEC concerns regarding the height of the islets in the Niagara River and the amount of exposed filter fabric in the created embayment areas, the PPs are in disagreement with the NYSDEC's position. The islets were intended to provide cover over the impacted sediments in the River and to protect the soil that was placed in the created embayments to cover the impacted sediment areas. Based upon the Site inspection that was conducted immediately following the September 12, 2003 meeting, the islets are performing as designed. The cover soil that was placed within the created embayments is still in place, aquatic vegetation has established over most of the submerged area, and the area is now a valuable habitat for aquatic and other species. There were no areas of exposed filter fabric seen at the time of the Site inspection with the possible exception of one fold area that was identified to be present about one half way along the first islet, adjacent to the islet itself. A more intensive inspection of the embayment area behind the first islet was subsequently performed by CRA personnel on September 16, 2003. The additional inspection confirmed that the noted fabric fold area is an area where excess filter fabric appears to have bunched up causing it to seem like there is less cover soil in this area. However, measurements made with a probe confirm that there is good soil coverage at this location. In fact, there is only one area where the filter fabric is exposed and that area is only 6 feet by 6 feet, located immediately adjacent to the large breakwater rocks at the beginning of the first islet. All of the other areas probed had at least 9 inches of cover soil in place.

Based upon these observations, extensive work in the islet areas is not necessary and may, in fact, be harmful to the intervening submerged habitat. The PPs are willing to perform some minor work regarding the first islet as described in the following:

i) A layer of 4 to 6 inch rock will be placed over the exposed filter fabric area (6 foot by 6 foot area behind the first islet).

ii) A few imported rocks will be placed at the junction between the large breakwater rocks and the portion of the first islet that runs parallel to the shoreline in order to attempt to further protect the embayment area from the typical river conditions. These rocks will be sized based upon the ability of the workers to safely carry these rocks into position by hand.

All of the work proposed in this letter deals with cosmetic changes that do not affect the integrity of the remedy that was implemented for the Site. They are superficial in nature and of minor consequence. The PPs believe that this project was essentially complete two years ago and should have been approved as being complete at least one year ago. This project has effectively moved into the Operation & Maintenance phase and should be formally recognized as such by NYSDEC so that the property can be transferred from Niagara Mohawk to the City of North Tonawanda.

The PPs are prepared to proceed expeditiously with this work upon receipt of appropriate NYSDEC documentation.

Yours truly,

Dale Marshall (City Engineer) for the City of North Tonawanda

for William Jones (Project Manager) for Niagara Mohawk Power Corporation

for David Steele (Project Manager) for Miller Springs Remediation Management, Inc. (Occidental Chemical Corporation)

JKK/cb/84
Encl. Photos and Revised Work Plan

c.c.: Senator Maziarz
Mayor of North Tonawanda
Jeffrey Konsella, P.E., NYSDEC

WORK PLAN
REPAIR OF SHORELINE EROSION
REVISION NO. 1

GRATWICK-RIVERSIDE PARK SITE
NORTH TONAWANDA, NEW YORK

Prepared by:
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OCTOBER 2003
REF. NO. 7987 (26)
This report is printed on recycled paper.

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1.0 INTRODUCTION

On October 21, 2002, the Performing Parties (PPs) for the Gratwick-Riversdie Park Site (Site) submitted the report entitled "Work Plan, Repair of Shoreline Erosion". The purpose of the Work Plan was to present the procedures to repair the erosion of topsoil that has occurred along the shoreline of the Site since completion of the Remedial Action construction in the spring of 2001. The erosion was caused by wave action during 2001/02 winter storms. The Site is located in North Tonawanda, New York as shown on Figure 1.1.

Since that time, additional erosion occurred during the winter of 2002/2003 and some self-mending of the erosion has occurred naturally. Over the past year, the NYSDEC and PPs have discussed various solutions to resolve the erosion issue. Based upon these discussions and the meeting held on September 12, 2003, a final remedy has been selected. The purpose of this report (Work Plan, Revision No. 1) is to document the planned erosion control measures.

This Work Plan will serve as the basis for the construction of the proposed repairs. It is anticipated that the repairs will be performed by the Contractor selected in April 2003 (L.D.C. Construction Company, Inc.).

Construction quality control procedures and health and safety procedures will follow those presented in Appendices E and F, respectively, of the document entitled "Final (100%) Design Report, Volumes I and II, Gratwick-Riverside Park Site, North Tonawanda, New York" dated December 1998. The 100% Design Report was approved by the New York State Department of Environmental Conservation (NYSDEC) on February 12, 1999.

2.0 SLOPED BANK STABILIZATION REPAIR

Cross-sections of the sloped bank stabilization as designed and constructed are shown on Figure 2.1. One cross-section presents the details for the shoreline area which has competent slag along the River's edge and the other where competent slag is not present. A plan view of the layout of the RA, including the sloped bank stabilization, is shown on Figure 2.2.

Also shown on Figure 2.2 are the areas where erosion of the overlying topsoil has occurred. It is noted that the underlying gabion mat and riprap contained within the gabion mat are in place and continue to prevent erosion of the underlying shoreline soil; thus protecting the constructed remedial components.

The width of the soil erosion ranges from 5 to 20 feet with an eroded area of approximately 4,640 square yards. The eroded area typically ends on the sloped bank at an erosion face which is on the order of 12-inches high.

2.1 DESIGN OBJECTIVES

The design objectives presented in the 100% Design Report for the sloped bank stabilization were:

i) to protect the barrier wall and groundwater collection systems;

ii) to prevent erosion of the shoreline soils underlying the constructed sloped bank stabilization;

iii) to be compatible with the proposed land usage, including water access and landscaping;

iv) to minimize disturbance of the River bottom soil and the extent of work within the River; and

v) to establish wetlands along the Site shoreline.

It is believed that, even in those areas where erosion of the overlying imported clean topsoil has occurred, the completed sloped bank stabilization has achieved the above objectives. The reason for this belief is that the gabion mat and riprap are in place, thereby preventing erosion of the underlying shoreline soil. Furthermore, based on the observed conditions during the September 12, 2003 walkthrough and the photographs provided in Appendix A for September 15, 2003, it is believed that the topsoil erosion that has occurred will be self healing as vegetation roots itself along the shoreline and in

the adjacent river bed. None the less, it has been requested that the topsoil erosion be repaired in the near future to accelerate the healing process.

2.2 DESCRIPTION OF REPAIR

Work related to repair of the sloped bank stabilization will consist of the following major tasks:

i) removal of manmade articles (plastic jugs, refuse, etc.) from the exposed riprap area;

ii) placement of medium stone over the exposed riprap gabion mats; and

iii) placement of 92 dogwood wattles in 1 cubic yard soil patches (wrapped in burlap and covered with one layer of light stone).

During the repairs, care will be taken to minimize the disruption of wetland vegetation and stalky vegetation already growing in the areas to be repaired.

2.2.1 AREA PREPARATION

Preparation will consist of the removal of reinforcing bars that are protruding from the ground surface along the shoreline. The reinforcing bars will be cut off at the ground surface to minimize damage that could occur if attempts were made to pull the base out. In addition, larger manmade objects (e.g., tires, plastic pails, etc.) will be removed from the shoreline and sent off Site for disposal.

2.2.2 USE OF NATURAL DRIFT MATERIALS

In many areas along the shoreline, natural drift material (e.g., tree branches, other vegetation, etc.) has settled over the exposed riprap gabion mats. These materials will be left in place to provide additional structure to help bind the stone/soil in place.

2.2.3 RIPRAP PLACEMENT

Medium riprap will be placed on top of the exposed gabion mat/riprap using a Gradall™ or similar type of equipment. The thickness of the riprap will be approximately one rock thickness (10 to 14 inch) where the repair meets the existing face

of the eroded topsoil to at the water's edge (see Figure 2.3). Thus, the average thickness of the riprap will be approximately 12 inches.

The riprap will meet the NYSDOT gradation requirements for light and medium stone as provided in Appendix B.

The source quality control will comply with Specification Section 02373.2.11 of the NYSDEC approved Contract Documents dated May 1999 (attached as Appendix B). All stone placement will be carefully performed so as not to encroach upon areas of healthy vegetation that has nestled into the exposed riprap gabion mats.

2.2.4 DOGWOOD WATTLE PLACEMENT

At the September 12, 2003 meeting it was agreed that wattles of dogwood would be placed at selected locations along the eroded shoreline area. The wattles will consist of approximately 1 cubic yard of imported topsoil wrapped in burlap or other suitable filter cloth material to keep the topsoil encapsulated. The topsoil will typically be 1 foot thick which results in wattles with the following dimensions (5' x 5', 4' x 6' or 3' x 8'). Given that the soil wattles should be kept at least 3 feet from the shoreline to help preserve their integrity, wattles will only be placed in areas where there is at least a 6 foot eroded width. The 3 foot area between the river and the wattle will be filled with medium stone (see Figure 2.4).

A survey of the shoreline area confirmed that approximately 2,300 feet of the 2,400-foot shoreline area behind the islets has an eroded width of at least 6 feet. It was further agreed at the meeting that the number of wattles will be determined based on an average placement of one wattle every 25 feet in the $\geq$6 foot width eroded areas. Based upon the information available, 92 wattles will be installed. Their exact location will be determined in the field in conjunction with the NYSDEC field representative at the time of installation.

Each wattle will have 4 to 5 dogwood stems set in the topsoil with the exposed stem ends facing out toward the river. The topsoil will be imported clean material similar to that used for the Site cap. The burlap will be folded back over the top of the topsoil to complete its encapsulation. The burlap will then be covered with one layer of light stone to help hold the topsoil and burlap in place.

The topsoil will meet the requirements of Specification Sections 02055.2.2 and 02055.2.4.B of the document entitled "Bid Documents dated March 2003.

2.2.5 VEGETATION ESTABLISHMENT

The wattles will be watered as needed during the period of vegetation establishment. The water will be obtained from either a potable source or the Niagara River.

3.0 SCHEDULE

It is planned to repair the eroded areas in the fall of 2003. It is anticipated that the repair will require approximately 3 weeks to implement. The repairs will include the placement of the topsoil pods. The dogwood wattles will be planted in the spring of 2004.

The initiation of the repairs depends on NYSDEC review, comment, and approval of this Work Plan.

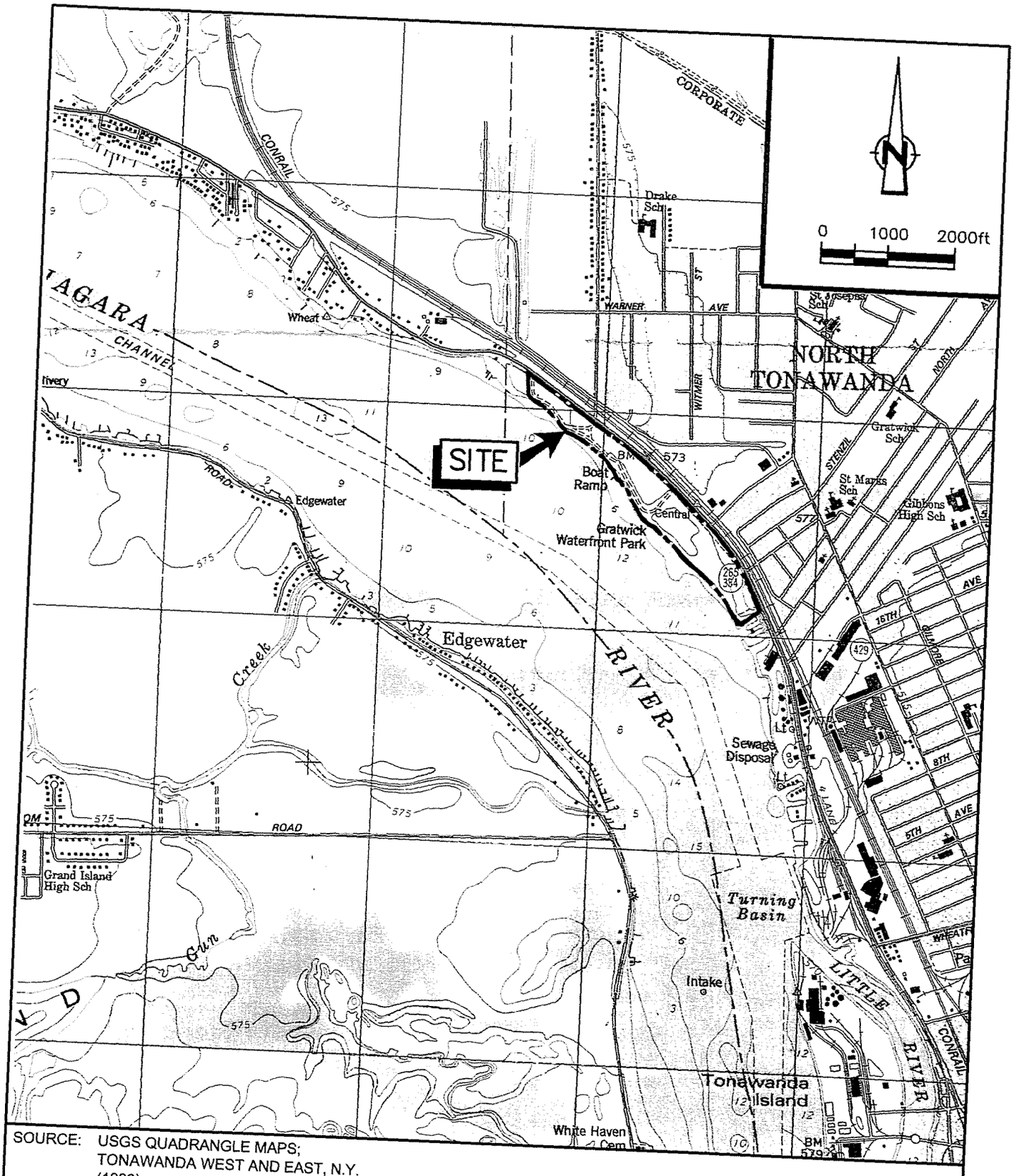
4.0 COST ESTIMATE

A cost estimate to repair the sloped bank stabilization is presented in Table 4.1. As shown in Table 4.1, the estimated cost is $161,200. A breakdown of the principal components of the cost estimate is:

Repair Oversight	$	8,400
Repair Construction	$	132,300
Repair Implementation Report	$	5,900
Subtotal	$	146,600
Contingency (10%)	$	14,600
TOTAL	$	161,200

The cost estimate in Table 4.1 was calculated using CRA's standard rates. The cost estimate using EQBA rates, as shown on Table 4.2, is $156,100.

FIGURES

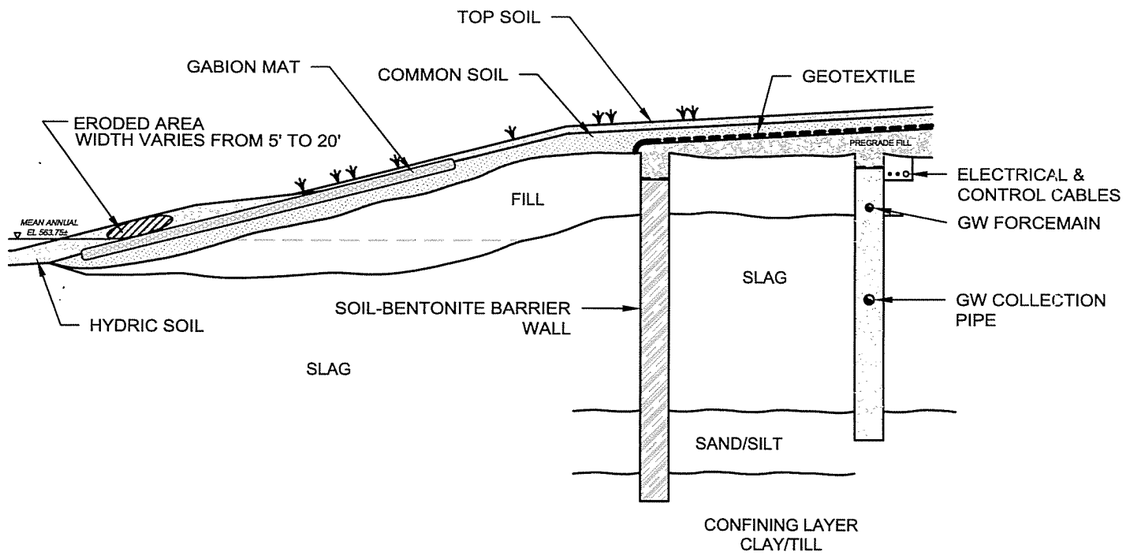


SOURCE: USGS QUADRANGLE MAPS;
TONAWANDA WEST AND EAST, N.Y.
(1980)

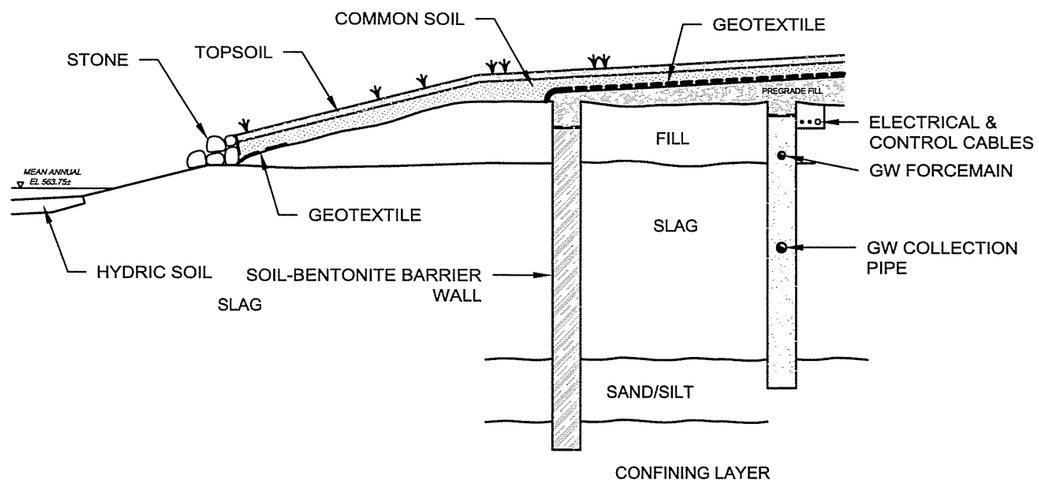
figure 1.1

SITE LOCATION
SLOPED BANK STABILIZATION REPAIR
GRATWICK - RIVERSIDE PARK SITE
North Tonawanda, New York

07987-00(026)GN-WA001 OCT 02/2003



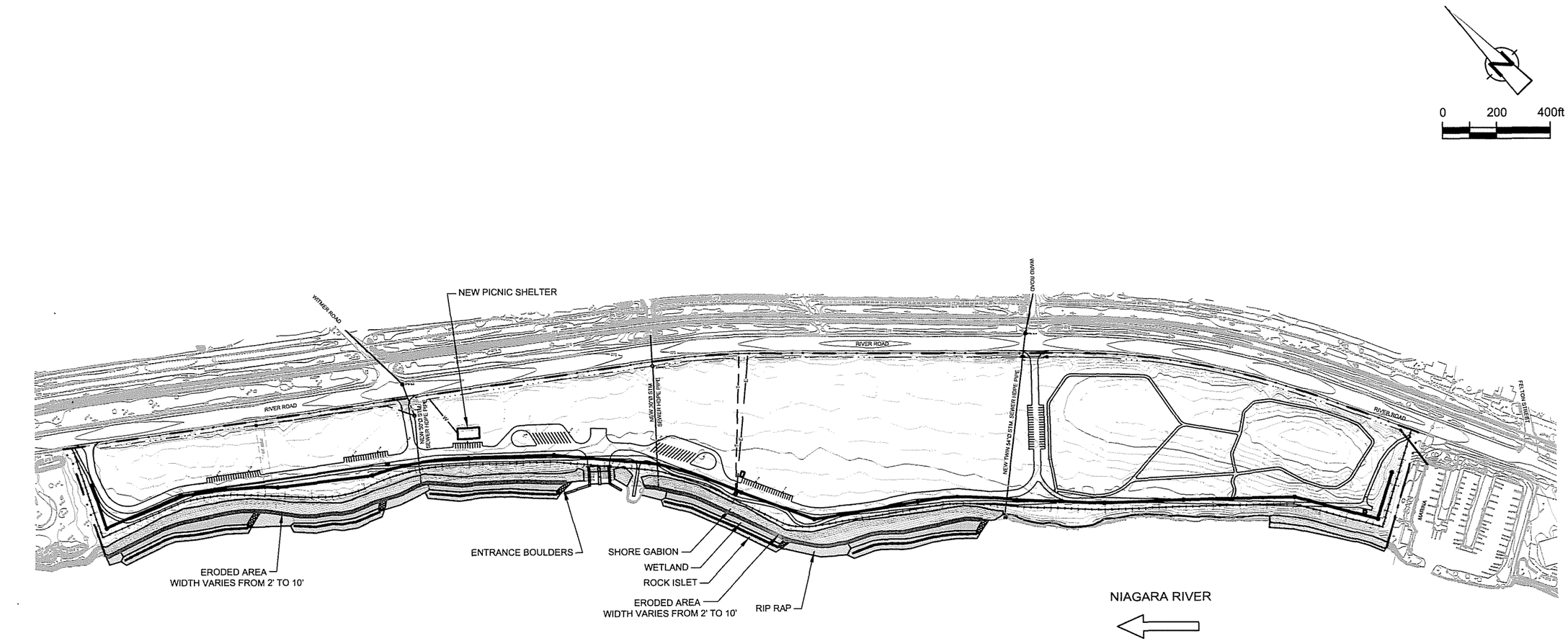
TYPICAL BARRIER SYSTEM
WITHOUT COMPETENT SLAG



TYPICAL BARRIER SYSTEM
WITH COMPETENT SLAG

figure 2.1

SLOPED BANK STABILIZATION AND BARRIER WALL/GROUNDWATER
WITHDRAWAL SYSTEM CROSS-SECTIONS
SLOPED BANK STABILIZATION REPAIR
GRATWICK-RIVER SIDE PARK SITE
North Tonawanda, New York

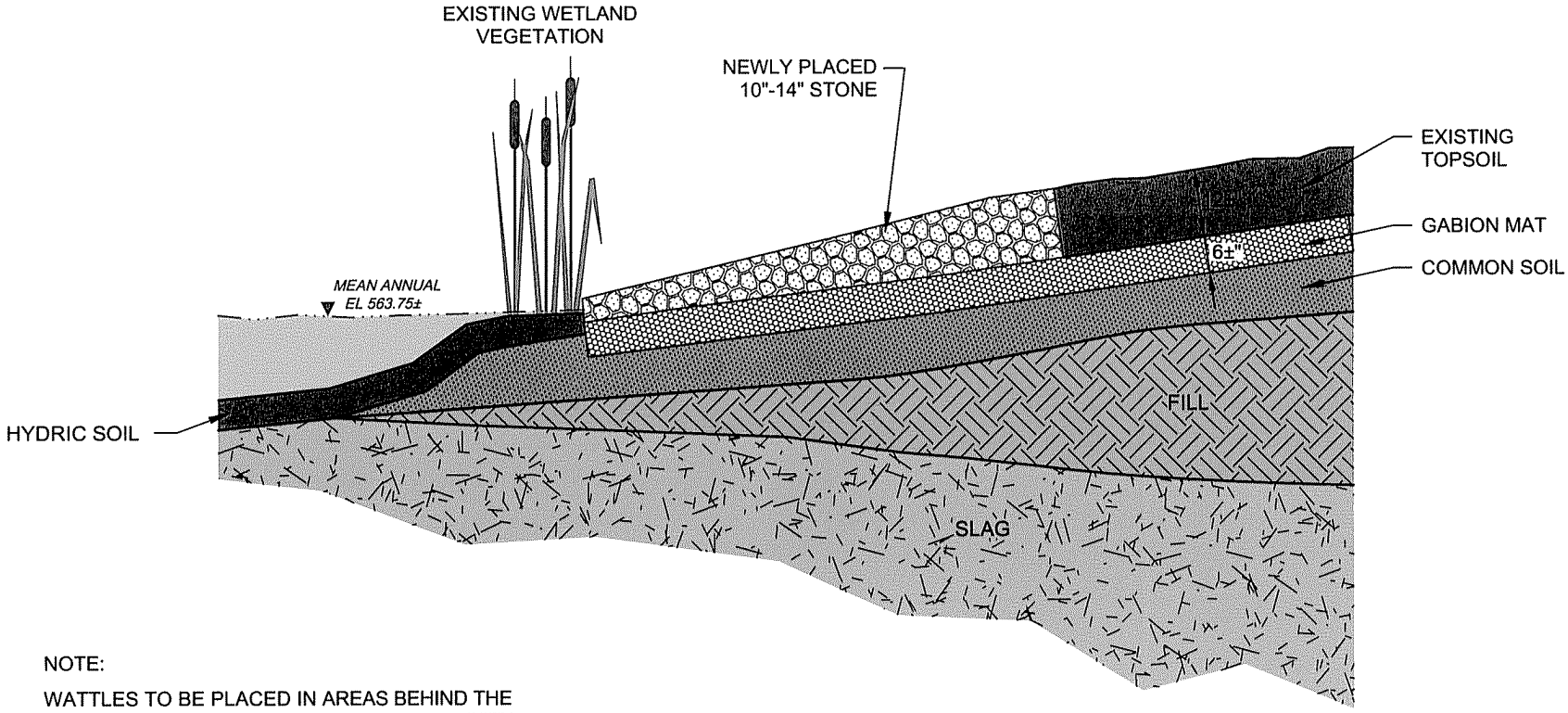


LEGEND

- W — POTABLE WATER SUPPLY LINE
- T — UNDERGROUND TELEPHONE LINE
- E — UNDERGROUND ELECTRICAL SERVICE
- BARRIER WALL
- GROUNDWATER COLLECTION SYSTEM

figure 2.2

SITE LAYOUT
SLOPED BANK STABILIZATION REPAIR
GRATWICK-RIVERSIDE PARK SITE
North Tonawanda, New York

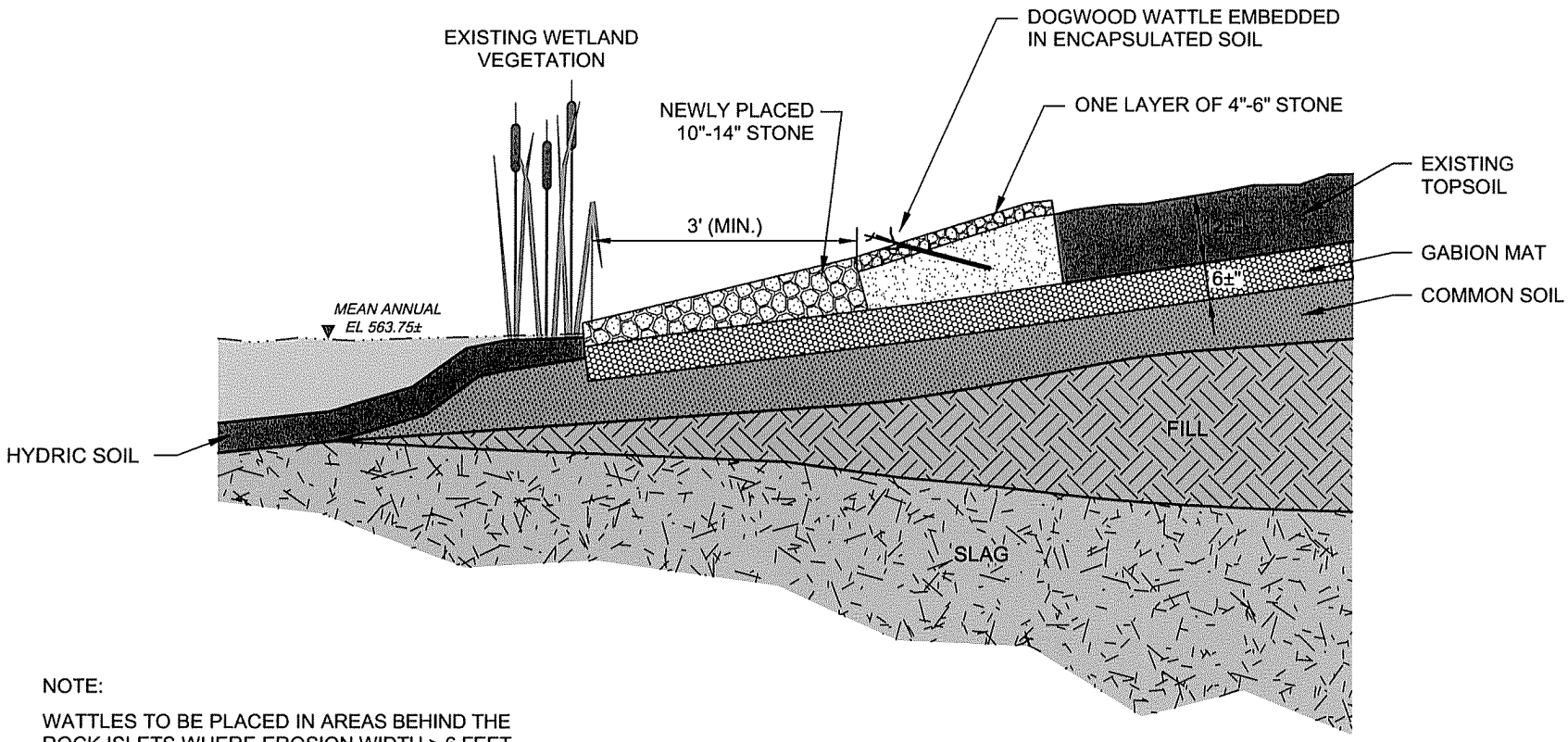


NOTE:

WATTLES TO BE PLACED IN AREAS BEHIND THE ROCK ISLETS WHERE EROSION WIDTH⊥ > 6 FEET.

figure 2.3

REPAIR WITH ROCK ONLY
GRATWICK-RIVERSIDE PARK SITE
North Tonawanda, New York



NOTE:

WATTLES TO BE PLACED IN AREAS BEHIND THE ROCK ISLETS WHERE EROSION WIDTH > 6 FEET.

figure 2.4

REPAIR WITH ROCK AND DOGWOOD WATTLES
GRATWICK-RIVERSIDE PARK SITE
North Tonawanda, New York

TABLES

TABLE 4.1

EROSION REPAIR COST ESTIMATE USING STANDARD CRA RATES
GRATWICK-RIVERSIDE PARK SITE

A) Oversight

Personnel	*Hours*	*Rate* [1]	*Total*
J. Kay	2	$ 139.80	$ 279.60
K. Schmidtke	4	$ 121.00	$ 484.00
R. Snyder	8	$ 102.40	$ 819.20
B. Zoltowski	80	$ 75.20	$ 6,016.00
			$ 7,598.80
Disbursements (10% of fees)			$ 759.88
			$ 8,358.68

B) Repair Eroded Areas

Activity	*Unit*	*No. of Units*	*Unit Price*	*Total*
Mobilization	L.S.		$ 2,500.00	$ 2,500.00
Remove Debris	L.S.	--	$ 13,235.00	$ 13,235.00
Place Medium Stone	S.Y.	4,380	$ 23.50	$102,930.00
Install Wattles with Topsoil	ea.	92	$ 73.00	$ 6,716.00
Place Light Stone over Topsoil	S.Y.	260	$ 18.80	$ 4,888.00
Demobilization	hr.	16	$ 125.00 [2]	$ 2,000.00
				$132,269.00

C) Repair Report Preparation

Personnel	*Hours*	*Rate* [1]	*Total*
J. Kay	2	$ 139.80	$ 279.60
K. Schmidtke	8	$ 121.00	$ 968.00
R. Snyder	12	$ 102.40	$ 1,228.80
B. Zoltowski	20	$ 75.20	$ 1,504.00
Drafting (Level III)	12	$ 74.60	$ 895.20
Word Processing	8	$ 49.80	$ 398.40
Printing	2	$ 42.80	$ 85.60
			$ 5,359.60
Disbursements (10% of fees)			$ 535.96
			$ 5,895.56

Total	$146,523.24
Contingency (10%)	$ 14,652.32
Grand Total	$161,175.56

TABLE 4.1

EROSION REPAIR COST ESTIMATE USING STANDARD CRA RATES
GRATWICK-RIVERSIDE PARK SITE

Notes:

(1) CRA's Standard Rates for 2002 (Applicable until December 31, 2002)

(2) Crew Consists of

1 Foreman @ $30/hr =	$	30
2 Laborers @ $23/hr =	$	46
	$	76
2 1/2% small tools	$	2
5% consumables	$	4
	$	82
Markup and Overhead (52.5%)	$	43
Total per Hour	$	125

TABLE 4.2

EROSION REPAIR COST ESTIMATE USING EQBA RATES
GRATWICK-RIVERSIDE PARK SITE

A) Oversight

Personnel	*Hours*	*Rate* [1]	*Total*
J. Kay	2	$ 124.77	$ 249.54
K. Schmidtke	4	$ 72.01	$ 288.04
R. Snyder	8	$ 83.37	$ 666.96
B. Zoltowski	80	$ 50.70	$ 4,056.00
			$ 5,260.54
Disbursements (10% of fees)			$ 526.05
			$ 5,786.59

B) Repair Eroded Areas

Activity	*Unit*	*No. of Units*	*Unit Price*	*Total*
Mobilization	L.S.		$ 2,500.00	$ 2,500.00
Remove Debris	L.S.	--	$ 13,235.00	$ 13,235.00
Place Medium Stone	S.Y.	4,380	$ 23.50	$102,930.00
Install Wattles with Topsoil	ea.	92	$ 73.00	$ 6,716.00
Place Light Stone over Topsoil	S.Y.	260	$ 18.80	$ 4,888.00
Demobilization	hr.	16	$ 125.00 [2]	$ 2,000.00
				$132,269.00

C) Repair Report Preparation

Personnel	*Hours*	*Rate* [1]	*Total*
J. Kay	2	$ 124.77	$ 249.54
K. Schmidtke	8	$ 72.01	$ 576.08
R. Snyder	12	$ 83.37	$ 1,000.44
B. Zoltowski	20	$ 50.70	$ 1,014.00
Drafting (Level III)	12	$ 55.42	$ 665.04
Word Processing	8	$ -	$ -
Printing	2	$ -	$ -
			$ 3,505.10
Disbursements (10% of fees)			$ 350.51
			$ 3,855.61
Total			$ 141,911.20
Contingency (10%)			$ 14,191.12
Grand Total			$ 156,102.32

TABLE 4.2

EROSION REPAIR COST ESTIMATE USING EQBA RATES
GRATWICK-RIVERSIDE PARK SITE

Notes:

(1) EQBA Rates for NYSDEC Fiscal Year 2002 (Applicable until March 31, 2003)
(2) Crew Consists of

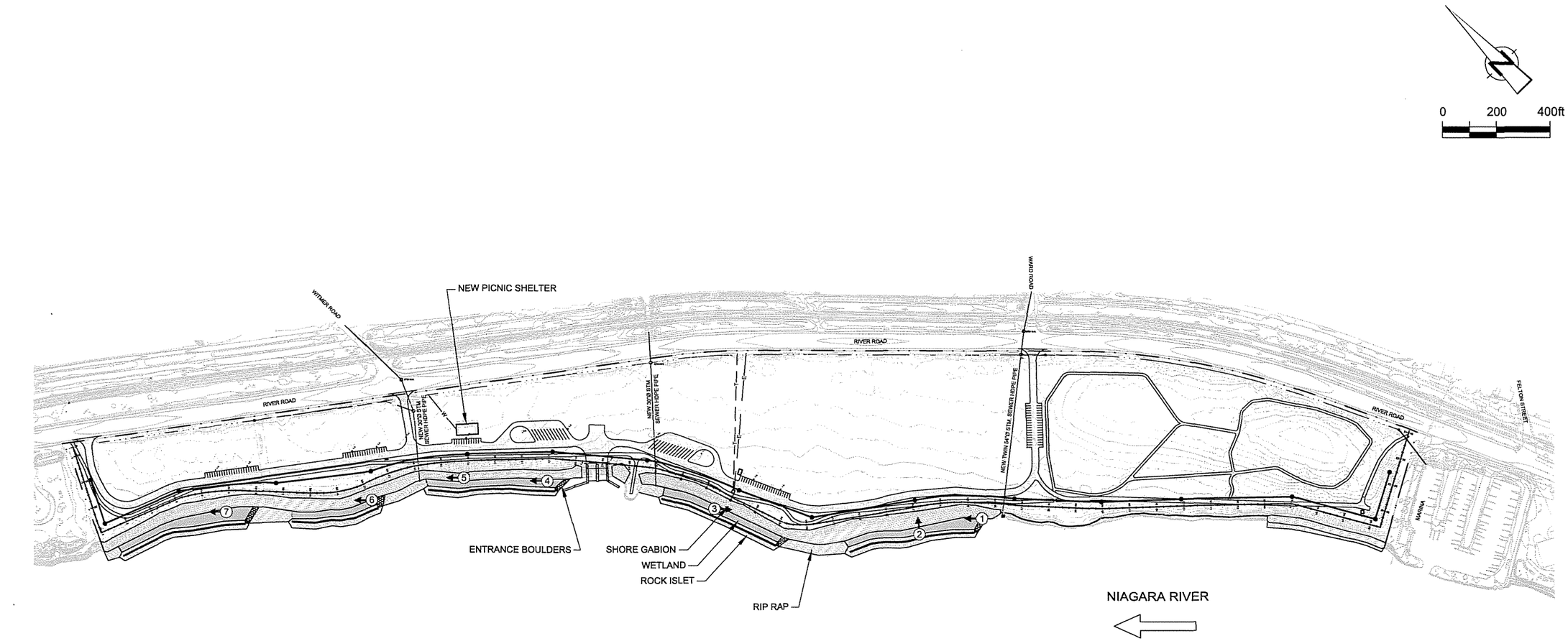
1 Foreman @ $30/hr =	$	30
2 Laborers @ $23/hr =	$	46
	$	76
2 1/2% small tools	$	2
5% consumables	$	4
	$	82
Markup and Overhead (52.5%)	$	43
Total per Hour	$	125

APPENDICES


A

APPENDIX A

PHOTOGRAPHS



LEGEND

- POTABLE WATER SUPPLY LINE
- UNDERGROUND TELEPHONE LINE
- UNDERGROUND ELECTRICAL SERVICE
- BARRIER WALL
- GROUNDWATER COLLECTION SYSTEM
- PHOTOGRAPH LOCATION AND DIRECTION (09/15/03)

figure A.1

LOCATION/DIRECTION OF PHOTOGRAPHS
GRATWICK-RIVERSIDE PARK SITE
North Tonawanda, New York

07987-00(DRUM084)GN-WA001 OCT 02/2003

(7)

B

APPENDIX B

SPECIFICATION SECTIONS

- NYSDOT STONE FILLING GRADATION REQUIREMENTS
- 02373.2.11 – SOURCE QUALITY CONTROL

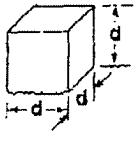
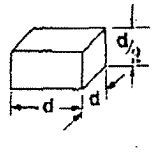
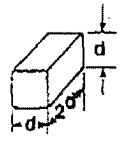
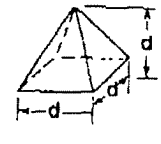
FIGURE 620-1 STONE FILLING GRADATION REQUIREMENTS

Stone Filling Item	See Notes	Stone Size[1]	Percent of Total by Weight
Fine	2, 3, 4	Smaller than 8 ins. Larger than 3 ins. Smaller than No. 10 Sieve	90 - 100 50 - 100 0 - 10
Light	2, 3, 4	Lighter than 100 lbs. Larger than 6 ins. Smaller than ½ in.	90 - 100 50 - 100 0 - 10
Medium	2, 4	Heavier than 100 lbs. Smaller than 4 ins.	50 - 100 0 - 10
Heavy	2, 4, 5	Heavier than 600 lbs. Smaller than 6 ins.	50 - 100 0 - 10

NOTES:

1. Stone sizes, other than weights, refer to the average of the maximum and minimum dimensions of a stone particle as estimated by the Engineer.
2. Materials shall contain less than 20 percent of stones with a ratio of maximum to minimum dimension greater than three.
3. Air-cooled blast furnace slag, cobbles or gravel having at least one fractured face per particle are acceptable substitutes for stone under these items, provided that soundness and gradation requirements are met.
4. Materials shall contain a sufficient amount of stones smaller than the average stone size to fill the spaces between the larger stones.
5. Heavier gradings of this item may be required on some projects, in which case the requirements will be stated on the plans or in the proposal.

TABLE 620-2

Specified Weights and Sizes	Approximate Shape				
				 Sphere	
600 lbs.	d = 18 ins.	d = 23 ins.	d = 15 ins.	d = 23 ins.	d = 27 ins.
300 lbs.	d = 15 ins.	d = 18 ins.	d = 12 ins.	d = 18 ins.	d = 21 ins.
150 lbs.	d = 12 ins.	d = 15 ins.	d = 9 ins.	d = 15 ins.	d = 17 ins.
100 lbs.	d = 10 ins.	d = 13 ins.	d = 8 ins.	d = 13 ins.	d = 15 ins.
d = 8 ins.	50 lbs.	25 lbs.	100 lbs.	25 lbs.	16 lbs.
d = 6 ins.	20 lbs.	10 lbs.	40 lbs.	10 lbs.	7 lbs.

2.6 RIPRAP FOR GABION MATTRESSES

A. Type R5: As specified below.

Size	*Maximum Percentage of Total Weight Smaller*
4 inches	100
3.5 inches	50
3.0 inches	5

2.7 GABION MATTRESSES

A. As manufactured by Maccaferri or approved equivalent.

B. PVC coated galvanized steel wire container with openings to contain 100 percent of riprap.

C. 9-Inch Thick: 9 feet wide, supplied in rolls (90-foot length) with end, sides, dividers, and diaphrams attached to base, 3 compartment type, wire mesh size 6 by 8, nominal opening 2 1/2 inch by 3 1/4 inch.

D. 6-Inch Thick: 6 feet wide supplied in rolls with end, sides, dividers, and diaphrams attached to base, 3 compartment type, wire mesh size 6 by 8, nominal operating 2 1/2 inch by 3 1/4 inch.

2.8 GEOTEXTILE

A. As specified in Section 02074.

2.9 EROSION CONTROL MATTING

A. As specified in Section 02074.

2.10 SILT CURTAIN

A. As specified in Section 02371.

2.11 SOURCE QUALITY CONTROL

A. Section 01400 - Quality Requirements: Requirements for source testing and analysis of riprap.

B. Gradation Testing: Perform quality assurance gradations at riprap source as follows:

1. Select a random sample of stone equal to a least 50 times the median stone weight in each classification except for Type R1.

2. Measure each individual piece in the sample along 3 mutually perpendicular axes.

3. Compute weights from measurements and record in table format using smallest axes size.

4. Using this recorded information, assemble a gradation curve.

5. Conduct 3 gradations for each stone type, unless gradation test results or observations of stone materials indicate additional gradations are required.

6. Methods used to weigh each individual stone must be accurate to plus or minus 5 pounds.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Do not place riprap over frozen or spongy subgrade surfaces.

C. Confirm geotextile placed in conformance with Section 02074.

D. Confirm that silt curtains have been installed for sediment control in conformance with Section 02371.

3.2 RIPRAP PLACEMENT IN GABION MATTRESSES

A. Place riprap by suitable methods to ensure minimum breakage of individual pieces during placing.

B. Ensure riprap does not mix with or damage foundation material, including geotextile fabric where used.

C. Place riprap in accordance with layer thicknesses and details shown on Drawings.

D. Place riprap in an approved manner to secure the surface and to provide a stable mass.

E. Uniformly distribute larger rock over the entire area and distribute the remainder uniformly with smaller pieces filling voids between larger pieces.

F. Finish surfaces in such a manner so as to ensure they are stable, reasonably uniform, free from bumps or depressions, with no excessively large cavities below or individual rock pieces projecting above the general surface.

G. Where riprap is to be placed on slopes, excavate a trench at toe of slope in accordance with dimensions shown on Drawings.

H. Place riprap as follows:

1. Use larger pieces in lower course and as headers for subsequent courses.

2. Stagger vertical joints and fill voids with rock spalls or cobbles.