5/12/04

Report of the Promontory Point Mediator

This report was prepared at the request of Alderman Leslie Hairston and commissioned by the South East Chicago Commission. Its purpose is to provide an independent review of the feasibility of a "preservation" design for the restoration of Promontory Point.

The review was conducted by Wayne Brunzell. Mr. Brunzell is a civil engineer with a strong background in structural engineering. Since October of 2003, he has served as technical advisor to the Promontory Point mediation process. He was selected for this role with the agreement of the parties represented in the Promontory Point Working Group (the Chicago Department of Environment, the Chicago Park District, the United States Army Corps of Engineers, and the Promontory Point Community Task Force).

The report was written by Jamie Kalven, the Promontory Point mediator.

We have prepared this report with the assistance of STS Consultants, the engineering firm that developed the City's proposed design, and Shabica and Associates, consultants to the Community Task Force. The conclusions and recommendations are our own.

BACKGROUND

This review can be seen as a continuation of the mediation process in that it engages questions identified but not fully engaged by the Promontory Point Working Group. It departs from the mediation process in that it is not a consensus document emerging from the Working Group. It is, rather, an independent assessment, informed by and undertaken in the spirit of the mediation.

Promontory Point has been the focus of passionate public debate for several years. That debate has been particularly intense and polarized over the last few months. The dynamics of public controversy tend to heighten differences and eclipse areas of agreement. Positions harden and assume symbolic importance. Language is deployed strategically in an effort to seize rhetorical advantage.

CITY PLAN COST 24,278,317

The mediation process has been an effort to engender a different sort of discourse, a different sort of conversation. Among the things disclosed by this process are the extent to which both City plans and community plans have evolved over time and the degree to which each has affected the other. This dynamic is best seen not as a matter of "concessions" or "compromises" but of improvements.

The City started with an all-concrete and steel structure; the Task Force with an all-limestone and wood structure. Today both propose reinforced concrete structures, each of which incorporates some limestone. One way of framing the central question is: how much limestone in what configurations and proportions can be incorporated into the revetment design consistent with sound engineering and fiscal practices?

Why has this narrow question proved so resistant and volatile? Two values, both deeply felt and passionately advanced, have collided in the Promontory Point controversy. Community representatives have advocated "preservation." Discourse about what is and is not "true" preservation can have an abstract quality, but the passions that animate such debates are visceral. They arise from the weaving of place, memory and relationship into the identities of individuals and communities. For those whose sense of themselves is not grounded in the particular place at issue, this intensity of feeling can seem unreasonable and disproportionate. It can give rise to suspicions that "preservation" is being wielded as a moral absolute that trumps all other competing values.

Representatives of the government agencies involved in the Shoreline Protection Project have consistently and with equal passion expressed their sense of responsibility, in the words of Commissioner Marcia Jimenez, as "stewards of the public dollars." The weight of those responsibilities has discernibly grown in the course of the mediation process, as fiscal conditions at the federal level have become increasingly unstable and uncertain. In 2003, $15,000,000 appropriated for the Army Corps of Engineers for the purpose of the Shoreline Protection Project was pulled back and redirected. The Army Corps appears to be facing a similar shortfall in its 2004 funding. For preservation advocates, the intensity of the City's fiscal concerns can give rise to suspicions that it reflexively assumes any departure from its "baseline" plan must necessarily cost more.

Against this background, we make several broad assumptions for the purpose of this report:

- We do not purport to arbitrate the question of what is and is not "true" preservation. We assume that the government agencies involved in the Shoreline Protection Project are committed to the value of preservation. That commitment has repeatedly been voiced by government representatives in Working Group sessions. And it is reflected in the City's efforts over the years to come to terms with community concerns.

- Similarly, we assume that community members recognize that the government agencies have ultimate responsibility for constructing and maintaining the revetment structure and that they must do so in a context of fiscal constraints and realities. Acknowledging this in a Working Group session, Greg Lane of the Community Task Force described the common goal of the City and the community as "realistic preservation."

- The climate of fiscal uncertainty at the federal level is a serious problem. It is, however, a separate problem from the question addressed in this report. We strongly urge the parties not to allow fiscal anxieties to drive or preempt the design process.

METHODOLOGY

Is a "preservation approach" to the restoration of Promontory Point technically and fiscally feasible? That is what we have been asked to assess. We have done so within a comparative framework provided by the City's preliminary cost estimates for its proposed designs—the all-concrete revetment structure and the proposed modification of that design with two steps of limestone.

It is important at this juncture to distinguish between two types of questions: threshold questions that must be answered in order to go forward with the design process and various other questions that can only be answered sensibly once that threshold has been crossed over. The question of the appropriate design framework is a threshold question. The Promontory Point design process has been arrested since 2001, because the parties have been unable to agree upon an acceptable design framework. Once agreement is reached on this question, various other questions can be effectively engaged within that framework. Those questions cannot, as Rob Rejman of the Park District repeatedly pointed out in the Working Group, be productively addressed in isolation; they can only be rationally engaged in relation to one another within an agreed up framework.

In the course of this report, we will occasionally flag but not attempt to answer questions of the second sort. In so doing, we are not evading these questions, most of which have been much discussed in the Working

Group and elsewhere. Rather, we intend to keep this inquiry focused on the threshold question: is a preservation approach feasible? Once an answer to that question has been agreed upon, questions of the second sort can be quickly and readily answered.

The vehicle for this inquiry is review of a single design concept. The design we have chosen for this purpose is shown in Figure 1. The essential features of this design are four limestone steps and a promenade that incorporates limestone on the outer (lakeside) edge.

We chose this design, because we believe it will be generally recognized as a "preservation design," and because it allows a reasonable degree of comparability with the current Community Task Force proposal, the City's current proposal, and other design options assessed by STS in a report, dated January 27, 2004, that it prepared for the Promontory Point Working Group.

The design under review differs from the Community Task Force proposal in several respects:

- The Task Force proposal distinguishes six "zones" of the Promontory Point shoreline and proposes a different approach for each. Among other things, the structure on the east side of the Point—the so-called "coffin" structure—is to be "rearmored" and retained; and the south side of the Point is to be repaired rather than rebuilt. The design under review, by contrast, assumes a continuous and uniform approach to the entire length of the Promontory Point shoreline.

- The width of the promenade is 26 feet on the north and east sides and 16 feet on the south side as compared to 16 feet throughout in the Task Force design.

- The Task Force proposal incorporates limestone blocks into the promenade on both its inner and outer edges. The design under review incorporates limestone blocks only on the outer edge of the promenade.

- For the purpose of this review, we do not consider the "water accessibility stairs and ramp" that are part of the Task Force design.

The design under review can be loosely characterized as a combination of Option 3 and Option 4—see Figures 4 and 5—in the STS report of January 27 with the following differences:

- It has four rather than five limestone steps.

- There is no limestone incorporated into the inner edge of the promenade.

- A single rather than a double layer of limestone blocks is used in the step stone structure.

We have chosen to focus on the design in Figure 1 in the interest of analytic clarity. This should not be interpreted as a recommendation of this specific design. Nor should our use of Figure 1 be interpreted as a judgment that this particular design is "preservation" and others are not. We will refer to this design by the neutral term "Figure 1," in order to remind the reader that we are using it as an analytic tool.

In conducting our review, we have relied heavily on information provided by STS Consultants and Shabica and Associates. Both have provided us with their drawings and costs estimates; both have answered numerous inquiries from us. We have also had the benefit of the January 27, 2004 report in which STS provides its own assessment of several design options.

In assessing the feasibility of the Figure 1 design, we have made independent inquiries of suppliers and contractors regarding costs. And we have closely considered the analysis and cost projections provided by STS.

Our review is divided into three sections:

- Construction.

- Maintenance.

- Baseline budget.

The appendices contain drawings and budgets referred to in the body of the report.

CONSTRUCTION

Promenade Structure

The core structures are essentially identical in the City design and the Figure 1 design. Both are massive concrete and steel structures. Both are designed in conformity with the Manual M-3 design standards of the Army Corps of Engineers.

They differ in one minor respect. The Figure 1 design replaces the shear key in the City design with additional batter pile. [See Figure 2.] This modification is a different way of performing the same function at the same level of structural performance.

As noted above, in the design under review, as in the City design, the width of the promenade is 26 feet on the north and east sides of the Point and 16 feet on the south side. In the Task Force design, the width is 16 feet throughout.

Could the width of the promenade be reduced?

STS states in its January 27 report:

> Horizontal dimensions of the promenade and steps have been established by the Corps of Engineers who conducted physical model studies for the shoreline revetment.

For the purpose of this analysis, we have used the same dimensions and elevations as the City design. The question of optimum promenade dimensions is best addressed in the process of design refinement.

Inventory of Limestone on Site

The City has agreed to reuse all the limestone on site. In 2001, the City engaged Associated Geologists, Inc. to inventory and assess the limestone at the Point. Associated Geologists concluded:

> The petrographic examination and physical testing indicate that the Indiana Limestone blocks along the Lake Michigan lakefront at Promontory Point are high- priority limestone, with few internal rock weaknesses. The physical tests indicate a durable rock with a tight, non- porous structure.
>
> Since their emplacement in the early- to mid- 1930's, the Indian Limestone blocks at Promontory Point have been subjected to fluctuating water levels, wave and ice block actions and seasonal freeze- thaw cycles. . .
>
> Fewer than 10% of the blocks inventoried for this investigation display any breakage. At least 90% of the blocks do not appear structurally weakened after 70 years of freeze thaw cycles and wave action. . .

> The high durability of the Indiana Limestone blocks at Promontory Point is demonstrated by their high historical resistance to weathering and disintegration under freezing and thawing and wetting and drying conditions.

Both the City plan and the Figure 1 plan use this inventory as the basis for projecting the amount of reusable stone.

We should also note that, according to Associated Geologists, it is possible that substantially more reusable stone may be available than is reflected in the inventory. They note with respect to the east side of the Point—the so- called "coffins"—that "blocks can be seen underneath this concrete pad, but were not counted."

There are two possible uses of salvaged stone:

- It can be used as "toe berm." The primary function of toe berm is to protect the steel sheet piling from wave attack. A secondary function is to provide access to the water by means of stone block steps in locations favored by swimmers. We refer to these as "toe stones," in order to distinguish them from the step stones above the promenade.

- It can be used as step stones in the revetment structure above the promenade. (And, in the case of the Figure 1 plan, incorporated into the promenade, as discussed below.)

In the City's all- concrete plan, salvaged stone on site was to be used exclusively for toe berm. In the City's current plan, stone of appropriate dimensions will be diverted from toe berm to step stone.

Toe Berm

STS states in its January 27 report:

> Armor stone toe berms to be constructed on the lake side of the promenade will be constructed primary of blasted armor stone. Stone block step stones to be used in the toe berm structure is only being considered in two 300- foot long locations as agreed to previously with Task Force representatives.

The City plan and the Figure 1 plan both provide a double layer of stone to protect the steel sheeting piling.

A point of clarification: there was agreement in the Working Group about stone block step stones in the toe berm structure as a design element. There was not agreement about the dimensions. As stated above, the City plan includes two 300- foot stretches of "toe stone" structure for swimming access. The Figure 1 plan includes two 700- foot stretches of toe stone.

Unit Cost For New Bedford Stone

Bedford limestone is high quality, high density Indiana limestone. STS in its January 27 report assumes a unit cost of $150/ton to $350/ton for the in-place cost of new Bedford stone blocks. It cites several reasons for this unusually wide range in the unit cost. Below we present these reasons in italics and respond to each in turn:

> *Preparation of the subgrade for the placement of the stone blocks is more intricate than it would be for a typical blasted stone revetment. Since the shape of each stone block is not uniform, the subgrade will have to be refined for each stone placement to create a relatively uniform step stone surface. The type "C" underlayer stone cannot be placed on the slope all at one time. It will have to be placed in lifts so that each successive row of stone blocks can be placed on a level surface.*

We agree. This is the correct approach to the placement of the stone blocks. It should be reflected in the unit cost.

> *Transportation costs from Indiana to the site are reported to exceed $40/ton.*

As of April, 2004, we confirmed transportation costs of $22/ton by consulting a Bedford quarry which checked current prices with a cartage company they use.

> *Stone material milling and processing costs are estimated to be in the range of $50/ton.*

The Figure 1 design requires only limited milling of stone. The promenade stones will require milling, as will the bottom step stone. This represents roughly 40% of the stone to be used in the project.

> *Stone placement costs are difficult to tie down given the unique nature of the project. The bids received from the contractors for the Solidarity Drive Reconstruction Project indicated placement costs of anywhere from $50 to $700 per stone. These unit rates indicate that stone block*

placement costs could range anywhere from $20 to greater than $200 per ton.

We assume the City did not accept a bid at the extraordinarily high level of $700 per stone and do not see the relevance of such a bid to this analysis. On the basis of our discussions with contractors, we assume placements costs of $50/ton.

There are relatively few suppliers of stone blocks that meet the appropriate specifications. It is possible that there may be only one supplier. This fact will limit competition in the bidding process and could result in higher and uncertain prices.

We have talked with several suppliers and are confident that a bid cost for stone can be established with a reasonable degree of certainty.

In our judgment, the factors cited by STS do not justify such a wide range in the unit cost for new Bedford stone in place. Nor do we see why stone, in contrast to all other items in the budget, should be represented by a range rather than a single number.

In order to develop an accurate unit cost for new stone, we queried suppliers and contractors as to current pricing. Our principal sources for information were Ralph Morgan of Elliott Quarry in Bedford, Indiana, regarding stone costs; and Gary Jackson, President of Gillen Marine in Milwaukee, Wisconsin, regarding placement costs. The following unit cost for Bedford limestone in place is based on prices quoted in April, 2004:

Item	Cost per Ton
Base Stone Cost	$65.00
Cartage	$22.00
Placement	$50.00
Total	$137.00

Although we are confident this estimate is reliable for present purposes, we have increased it by 30 %, in order to address the possibility of variable pricing (and to absorb the modest milling costs described above). This yields a unit cost of $178/ton.

Step Stone Structure

STS states in its January 27 report:

> If stone steps are considered as an element in the shoreline revetment structure, their design must consider the fact that these

stones serve in a wave management capacity subject to direct wave attack. Therefore, any stone step solution will include a minimum two armor stone layer thickness.

The use of "two armor stone layer thickness" is recommended for "random placement" of stone" as in the toe berm configuration shown in the STS Options 1–4 [Figures 2–5] in which rounded, irregularly shaped stones are placed in courses. As the stones move around, they interlock. A double layer of stone is not required in "special placement" of stone such as the step stones above the promenade in the Figure 1 design in which squared, well-defined stones of similar dimensions are placed in a precise, orderly fashion.

Although the Army Corps of Engineers design standards do not speak directly to the particular step stone configuration in Figure 1, our interpretation of those standards supports the conclusion that one layer of stone is adequate. That conclusion is also supported by the condition of the existing step stones, largely intact after seventy years, despite the failure of the promenade substructure.

STS makes the following estimates of stone costs for three different design options (assuming a double layer of stone and employing the unit cost range of $150/ton to $350/ton):

Bedford Stone Blocks	**Option 1**	**Option 2**	**Option 3**
If Unit Cost = $150/Ton	$0	$1,700,000	$2,900,000
If Unit Cost = $350/Ton	$0	$3,900,000	$6,800,000

Option 1 is the City's proposed design incorporating limestone blocks as the two upper steps of the revetment. [See Figure 2.] STS writes: "this option replaces the upper portions of the concrete steps with two stone steps to be constructed of reused limestone blocks. . . . There appears to be sufficient available stone on site for reuse so that new stone blocks would not have to be imported."

Option 2 includes a first step of concrete and five limestone steps. [See Figure 3.] "This option is similar to Option 1 except that the majority of the steps would be constructed of stone. The one concrete step to be constructed at the bottom will serve as a buttress to the step stones constructed above."

Option 3 most closely resembles the step stone configuration in the design under review in that all the revetment steps are of limestone. [See Figure 4.] It differs from the Figure 1 design in that it has five rather than four steps and makes use of ten rather than four stones.

Taken on its own terms, the STS analysis yields an inexplicable result. Option 1 uses three stones; Option 2 uses nine stones; and Option 3 uses ten stones. Assuming the stones used in each option are the same dimensions, what explains the pronounced difference in estimated costs between Option 2 and Option 3, the all- stone design?

Option 2: $1,700,000 (low) and $3,900,000 (high)

Option 3: $2,900,000 (low) and $6,800,000 (high).

($1,200,000)   ($2,900,000)

The only difference between these option is the addition of *one stone* to Option 3.

Another way of stating the discrepancy is that the incremental cost of Option 2 vs. Option 1 implies a cost per "stone" of $650,000 (high) and $283,333 (low), while the incremental cost of Option 3 vs. Option 2 implies an incremental cost per "stone" of $2,900,000 (high) and $1,200,000 (low).

Does Option 3 assume that all stone for the revetment structure will be purchased? Does it not include the reusable stone on site reflected in Options 1 and 2? In light of that possibility, we decided to assume for analytic purposes that the entire step stone structure will be built of new stone and that stone on site will be used exclusively in the toe berm structure.

As noted, the design under review is a four step structure constructed with a single layer of stone. The shoreline of Promontory Point is 3215 feet. We have assumed 2.87 tons of stone per foot. This yields a total of 9,240 tons:

9,240 tons x $178.00 / ton = $1,644,720.00

Again, our assumption that the steps would be constructed completely of new stone as opposed to stone on site is for the analytic purpose of clarifying the issue of cost. The question of how to allocate stone on site between toe berm and step stone can best be addressed in the process of refining the design, once the basic framework has been agreed upon.

The STS report of January 27 raises another concern about the construction of the step stones:

> Differential movement and settling of the stones can be expected over time. The City may have to incorporate low- strength grout in

voids that will be created between adjacent blocks to avoid safety hazards.

We agree that this need should be anticipated in the construction budget. Again, the existing structure provides guidance. Grout appears to have been applied as part of the original construction to fill some of the more pronounced gaps between stones.

Promenade

The Figure 1 design incorporates limestone blocks into the outer (lakeside) edge of the promenade. [See Figure 1.] We have assumed 0.46 cubic yards of stone per foot. This yields a total of 2, 888 tons:

2,888 tons x $178.00 / ton = $514,064.00

STS has raised two issues about the construction of this feature. We present their comments in italics below and respond to each in turn.

The reinforced concrete portion of the promenade must be constructed with a minimum bottom of slab elevation of 2.5 lwd [low water datum]. Construction of reinforced concrete below this level would require underwater construction which is considered unfeasible in an open coast environment. Since the minimum concrete thickness at the edge of the promenade where the stone would be constructed is 2.5 feet, the stone would be placed on top of elevation of 5.0 lwd. . .

This option requires raising the promenade by 2.5 feet. Therefore, the promenade will be approximately 6 feet above the normal water level and 2.5 feet above the existing promenade level (+7.5 lwd). As the height of the structure is increased, the entire shoreline revetment will appear to be different than the existing structure. The stone toe berm will take on a great visual significance as this structure is raised higher out of the water.

In our judgment, it is possible, if necessary, to construct the reinforced concrete portion of the promenade by means of an underwater construction technique called a tremie pour. (And the issue may be moot, if the lake remains at its current low level through the construction period.) The fact that it is *possible* to build this design feature, however, does not necessarily mean that it is *advisable* to do so. We share STS's concerns.

STS also questions the proposed means of securing the promenade stone, in view of its highly exposed position:

> *The single stone block located on the edge of the promenade does not meet normal stone design standards for a structure subjected to direct wave attack. This stone is located in an area that will be subjected to frequent and intense breaking wave attack. Normal design standards call for stone structures to be incorporated into an interlocked revetment. The placement of a single stone on a concrete slab held in place with a simple steel angle at its toe is not a standard approach. There is not design guidance available that we are aware of for this approach; however, it is clear that the potential for stone movement and dislocation could be significant. The variable nature of wave attack will result in the rocking and displacement of these stones due to ice jacking and wave attack. We expect that the steel angle constructed on top of the sheet pile will periodically be bent and otherwise damaged by both moving toe stones and stone blocks. Although the toe berms would be initially constructed to the same elevation as the promenade stone block, the toe berm can be expected to move and settle differentially resulting in some of the promenade stone blocks being exposed to direct wave attack with no fronting stone.*

These are legitimate concerns. For the purpose of evaluating the adequacy of the limestone step stones in the Figure 1 design, directly relevant evidence is available to us: the condition of the existing structure. Such evidence is not available with respect to the incorporation of limestone blocks into the concrete promenade.

The question of whether this design feature is advisable is best answered in the course of the design refinement process. We strongly urge that the concerns raised by STS be heavily weighed in that process.

MAINTENANCE COSTS

Assuming the Figure 1 design can be constructed within budget, the issue of maintenance remains. This issue is of great concern to the City. It is arguably the heart of the matter. As STS states in its January 27 report, "the baseline design developed by the City and the Army Corps, is constructed entirely of concrete and steel and was developed to keep maintenance at a minimum." In other words, a major objective in the design of the revetment—second only to the objective of building a competent structure for the purpose of shoreline protection—has been minimal maintenance.

The priority the City has given this objective arises from the acknowledged failure of the Park District to adequately maintain the shoreline in the past. City officials reported to the Working Group that, as a consequence of that history, the Park District is obligated under an agreement with the Army Corps to provide adequate maintenance. If it fails to do so, the Army Corps will perform the necessary maintenance and bill the Park District.

In preparing its "preliminary opinion of probable annual maintenance costs" of various stone options in its January 27 report, STS was sensitive to the needs of its client. In response to an inquiry from us, STS wrote:

> Given the uncertainty in predicting a precise maintenance budget due to the unique nature of the designs, a wide cost range is provided. This allows the Owner to better understand the risks and costs. Furthermore, the estimates recognize the fact that the Owner is required to commit to a formal maintenance program in order to receive federal funding. Thus, maintenance will no longer be an option in the future – it will be a requirement.

In light of this history and these requirements, we understand the aspiration of the City to address the issue of maintenance through design. We further understand the professional obligation of STS to protect its client by providing maintenance estimates based on conservative assumptions.

Yet we are concerned that these pressures have seriously skewed the analysis of maintenance costs. In this section of our report, we review STS's analysis, consider some factors that may not have been weighed sufficiently, and suggest a different analytic approach that might yield cost estimates that are both more reliable and significantly lower.

Step Stones

The table below presents STS's estimates for the maintenance of limestone steps under three different options:

Option 1 is the City's proposed design incorporating limestone blocks as the two upper steps of the revetment. These figures presumably represent a level of maintenance that the City is prepared to assume.

Option 2 includes a first step of concrete and five of limestone. The concrete step acts as a buttress.

Option 3 most closely resembles the step stone configuration in the design under review. All the revetment steps are limestone. (We will consider maintenance costs for the promenade separately.)

Maintenance Item	Option 1	Option 2	Option 3
Grout Step Stone Voids and Gaps			
Low Estimate	$8,000	$24,000	$36,000
High Estimate	$30,000	$90,000	$135,000
Replacement of Dislodged/Cracked Step Stones			
Low Estimate	$2,000	$6,000	$9,000
High Estimate	$20,000	$60,000	$90,000
Total Annual Budget			
Low Estimate	$10,000	$30,000	$70,000
High Estimate	$50,000	$150,000	$225,000

STS's analysis of estimated maintenance costs proceeds from the assumption that "as more stone blocks are incorporated into the design, the level of required maintenance will increase." The analysis unfolds in several steps. With respect to Option 1—the City's proposed design—STS writes:

> The two stone steps will be subjected to some movement due to the interaction of wave attack and run- up. Maintenance activities will involve periodic grouting of voids that form between stones to minimize safety hazards. It is possible, though unlikely, that individual stones could be dislodged and have to be replaced. It is probably reasonable to assume that additional maintenance efforts associated with this option would include annual attention by a grouting crew, and the replacement of dislocated or cracked stones every five years.

It writes of Option 2:

> Since this option includes the construction of stone blocks lower on the revetment profile in an area subjected to a greater frequency of direct wave attack, the likely displacement of stones and the formation of gaps and voids between the stones will increase. While it is difficult to estimate the amount of maintenance effort for this type of structure, it is probably reasonable to assume an annual budget in the range of 3 times that which would be required for Option 1.

And of Option 3:

> This option involves the construction of all revetment steps out of stone blocks. Since the stone block construction would extend down to below the design water level and the buttressing effect of the concrete steps included in Option 2 does not exist, the likelihood for stone movement and dislodged stones is significantly greater than Option 2. We estimate the maintenance requirements would be on the order of 1½ times that required for Option 2.

The projected maintenance costs for the step stones (independent of the promenade stones) in Option 3—the design most closely resembling the Figure 1 design—are thus derived by multiplying the estimated Option 1 costs x 3 x 1½ .

Is the assumption that "as more stone blocks are incorporated into the design, the level of required maintenance will increase" warranted? Perhaps, but this approach to quantifying it yields questionable results.

Consider, for example, the second category of maintenance costs —"replacement of dislodged/cracked step stones." Having observed with respect to Option #1 that "it is possible, though unlikely, that individual stones could be dislodged and have to be replaced," STS goes on to state that it is "probably reasonable to assume" that "the replacement of dislocated or cracked stones" would be required "*every five years*." Yet it assigns *annual* maintenance costs for this purpose of $2,000 to $20,000. These figures then become the basis for the exercise in multiplication (Option 1 costs x 3 x 1½) that yields annual maintenance projections of $9,000 to $90,000 for this category of repair under Option 3.

Perhaps the annual figure for Option 1 reflects a prorating of costs for maintenance performed at five year intervals. If so, however, the high estimate yields the five year total of $100,000 which seems excessive for a maintenance need described as "possible, though unlikely."

Beyond such questions about the reliability of the STS analysis on its own terms, we have several broad concerns about this approach to the issue of maintenance:

(1) No comparison is provided between the maintenance costs of the all-concrete option and the stone options. At the end of its analysis of maintenance costs for the stone options, STS notes that "these costs are additive to normal maintenance costs associated with the all-concrete option." Despite different proportions and configurations of concrete and stone under the different options, the maintenance costs for the stone options are treated as above and beyond the maintenance costs for the all-concrete option. Unless the assumption is that there are *no* maintenance costs associated with the all-concrete option, this approach

necessarily inflates the maintenance costs for the stone options. It would be useful to know what the projected maintenance budget is for the all-concrete structure. Also, some sections of the all-concrete revetment were constructed as long as ten years ago. What has been the maintenance experience with the all-concrete structure thus far? This information would be helpful in making informed judgments as to probable relative maintenance costs of the Figure 1 design.

(2) No effort is made to define "maintenance." Different materials have different maintenance requirements. In the case of concrete, it is necessary to maintain a certain uniformity and continuity. Exposed concrete is subject to deterioration. If there is cracking or spalling, you are obligated to repair it, because it is symptomatic of potential material failure. By contrast, in the case of limestone, irregularities in the individual stone blocks and, within a certain range, in the arrangement of the blocks are an aspect of its aesthetic appeal.

(3) The analysis makes no apparent use of the history of the existing structure as a basis for predicting maintenance costs. STS emphasizes that the reason it is difficult to predict the maintenance requirements of the stone options is the "unconventional" and "unique" nature of those designs. Here it is important to distinguish between the step stones and the promenade. Whatever might be said about the incorporation of limestone blocks into the concrete promenade, the step stone design is neither "unconventional" nor "unique." Rather, it is the reconstruction of the existing step stone structure as part of a larger structure that will restore lateral support. Thus, the history and current condition of the existing structure are directly relevant to the question of future maintenance costs.

What is the history of maintenance by the Park District of the shoreline in general and the Point in particular? A record of past repair costs would help provide a basis for predicting future costs. In response to an inquiry from us, STS indicated that they had not used Park District repair records in preparing their maintenance projections and that they are unsure whether such records exist.

What can be learned from the current condition of the existing structure? As all parties agree, it is the substructure not the step stones that can be said to have failed. Nonetheless, for the most part, the step stones remain structurally coherent, and individual stones are intact.

In response to our request to "provide more detail regarding probable maintenance costs," STS provided the following information about the basis for its maintenance estimates:

Grout Step Stone Voids and Gaps. "We simply made an estimate of numbers of grouting crew days and applied that to a unit cost for a typical day of a grouting crew." The daily rate for a grouting crew was assumed to be $4,000. "This rate includes a pump operator, laborers and materials."

Replacement of Dislodged/Cracked Step Stones. "Daily crew costs assume crane rental of $1,200 and labor of $1,800."

These unit costs enable us to translate STS's maintenance estimates into operational terms. For Option 3, the step stone design that most closely resembles the existing structure (and the plan under review), STS projects the following level of annual maintenance for the 3215 foot shoreline of Promontory Point (not including the additional maintenance costs projected for the promenade stones discussed below):

Low estimate for grouting: 9 days of work by a grouting crew composed of a pump operator and an undisclosed number of laborers.

High estimate for grouting: 33¾ days of work by a grouting crew composed of a pump operator and an undisclosed number of laborers.

Low estimate for stone replacement: 3 days of work by a crew of undisclosed size employing a crane.

High estimate for stone replacement: 30 days of work by a crew of undisclosed size employing a crane.

While the low estimates seem to be within a reasonable range, the high estimates do not. Judging from what is known of its maintenance history, Promontory Point has not received in the entirety of its seventy year life a fraction of the maintenance attention projected by STS on an *annual* basis for the rebuilt step stone structure. Yet despite exposure to every imaginable lake condition over seven decades, despite the lack of adequate maintenance, and despite the loss of lateral support due to the failure of the substructure, the stone steps remain substantially intact.

We would, of course, not suggest that the City continue practices of inadequate maintenance as an economy measure. We applaud its commitment to maintain what it builds. We are reassured by the Army Corps' intention to monitor and enforce an appropriate maintenance regime. And we appreciate the difficulty STS faced in making future maintenance projections in the absence of past maintenance records. In our judgment, however, this analysis of maintenance costs is fundamentally flawed and should not be relied upon.

We strongly recommend that maintenance costs be reanalyzed, giving proper weight to the history and current condition of the existing structure.

We further recommend that the City and Army Corps negotiate precise definitions and expectations of what constitutes adequate maintenance of the Promontory Point structure. It is important, in designing such a maintenance regime, to anticipate and minimize the costs borne by the community—down time, restricted access, and so on—as well as those borne by the City.

Promenade

STS's estimates of probable maintenance costs for the promenade stones flows from its analysis, described above, of construction issues. In its January 27 report, STS states:

> Maintenance problems would include the bending of the steel angle iron welded on top of the steel sheet pile, and displacement and subsequent replacement of promenade stone blocks. If 100 to 200 feet of the steel retaining angle had to be replaced in any given year, a maintenance budget of $10,000 per year should be established for this item. If we further assume that 20 blocks are dislodged each year and have to be replaced, a likely annual maintenance budget for this activity may be in the range of $10,000 to $20,000.

In its January 27 report, STS provides the following summary of maintenance projections:

Maintenance Item	**Option 4**
Steel Repairs at Edge of Promenade	
Low Estimate	$5,000
High Estimate	$10,000
Dislodged Promenade Stone Replacements	
Low Estimate	$10,000
High Estimate	$20,000
Grout Promenade Stone Voids and Gaps	
Low Estimate	$10,000
High Estimate	$25,000
Total Annual Maintenance Budget Estimate	
Low Estimate	$25,000

High Estimate	$55,000

In response to our request for more detail, STS elaborated on probable maintenance needs:

> *Steel Repairs at the Edge of Promenade*: The maintenance cost estimate for this item reflects channel repairs that will be necessary due to wave induced stone rocking and movements. Steel damages at stone/steel interface in the active wave attack zone are estimated to require the annual replacement of anywhere from two to five percent of the "steel stone retainer" that is proposed on the outside edge of the Option 4 promenade.
>
> *Dislodged Promenade Stone Replacements*: Option 4 includes stones that rest on concrete and are unrestrained for the most part in the wave attack zone. The maintenance budget addresses the fact that dislodged stones will be replaced requiring mobilization of a crane. Daily repair crew costs including $1,200 crane rental and $1,800 labor are estimated to be $3,000. The annual costs assume an average of two to four days of repair efforts each year. The maintenance activity would include recovering the dislodged stones from the lake bottom or from the toe berm. There may also be the need to obtain replacement stones periodically if the stones crack. The maintenance costs include a surcharge to account for the procurement of replacement stones, and occasional difficulties recovering stones that fall in the water.
>
> *Grout Promenade Stone Voids and Gaps*: This item reflects the fact that Option 4 includes stones on the promenade. We used the same rationale as that for the first maintenance item. The amount of anticipated grouting on the promenade is similar to the budget anticipated for the Option 1 step grouting.

The history and current condition of the existing structure provide reliable guidance as to probable maintenance costs for the step stone structure. They do not provide comparable guidance for the promenade stones. The incorporation of limestone into the concrete promenade is, as STS puts it, a "unique design." In the absence of model studies testing this design, the extent of maintenance it will require is inherently uncertain.

BASELINE CONSTRUCTION BUDGET

The City's baseline construction budget assumes an all-reinforced concrete structure with no limestone steps. [See Table 1.] These cost estimates, as STS takes care to point out, are preliminary. The baseline construction budget is based on "75% level of design." In response to an inquiry from us, STS stated:

> This estimate is the most recent estimate. Unit costs have not been inflated from the original estimates. The baseline estimates were complied in 2001 and are the most recent estimates completed for the entire project extending from 54th to 57th Streets.

This budget, totaling $24, 278,000.00, was used by STS in its January 27 report for the purpose of assessing "additional cost above baseline condition" of different design alternatives.

Apart from the central question of the relative cost of a preservation design, our review of the baseline construction budget yielded several possible revisions:

#1 Mobilization and Demobilization - $1,800,000.00

"Mobilization" refers to the costs a contractor incurs in gearing up for a project and getting equipment, materials, and personnel to the site; "demobilization" to the cost of removing equipment and personnel from the site. The baseline budget assigns a value of $1,800,000.00 to this function. In response to a request to "divide that number into smaller understandable parts," STS stated:

> The mobilization and demobilization cost is a bid item that is traditionally included in the shoreline projects to cover the significant costs to set up and break down the construction effort. The estimate represents eight percent of total construction cost which is similar to other recent bids for similar projects with the same complexity.

This cost estimate seems excessive. It is standard practice to charge two to three percent of the total construction cost for mobilization and demobilization.

It is possible that this budget category serves a function other than meeting the costs of mobilization and demobilization. It is sometimes used to enable the contractor to get money upfront, thereby offsetting cash flow problems in billing for work performed. This practice, while understandable, is also problematic in that it runs the risk of double billing.

Were a 3% basis used for this item rather than an 8% basis, item #1 in the City's baseline budget would come to $666,249.52.

#2 Temporary Field Office, Project Sign And Safety Sign - $578,532.50

In response to a request for more detail on how this value was developed, STS provided the following breakdown:

Temporary Field Office, Project Sign and Safety Sign

Description	Quantity	Units	Unit Price	Amount
Temporary Fencing and Gates:				
8' Chain Link Fence:				
Phase 2 with 30' Gate	3,210	LF	$12.50	$40,125.00
Phase 3 with 30' Gate	2,220	LF	$12.50	$27,750.00
Snow Fence to Protect Trees:				
Phase 2	805	LF	$3.50	$2,817.50
Phase 3	2,240	LF	$3.50	$7,840.00
Site Security	30	MO	$16,666.67	$500,000.00
Subtotal				**$578,532.50**

The name of this item is somewhat misleading. As the above breakdown makes clear, the major cost within this category is security. The value assigned to this function seems high. It assumes 30 rather than 24 months for a two year project. And it appears to assume that security personnel would be on site at all times when work is not in progress over that 30 months period—that there would be no down time in the course of the project. Were the budget for security computed on the basis of 24 rather than 30 months, the total would be $400,000.08.

#45 Beach House Area Misc. Architectural - $80,000.00

In response to our query, STS described this item as follows:

> The beach house is an existing structure located at 57th Street. The $80,000 bid item reflects the level of effort associated with the transition structure from the existing beach house revetment to the new revetment.

In response to a query from us, STS indicated that this item should not be included in the cost estimate, for it refers to another project already in progress. We have left the item in the budget in the interest of comparability but note that it is not strictly speaking a cost associated with the Promontory Point revetment structure.

#47 Beach Nourishment - $192,000.00

STS described this item as follows:

> Beach nourishment was included in the project to offset the area of beach lost as a result of the revetment necessary near the 57th Street underpass. At the end of both CDPT underpass and Shoreline Project construction, the area of the 57th Street Beach will remain the same. Beach nourishment involves the placement of sand at the 57th Street beach at the transition from the old to the new revetment.

As with item #45 above, this could be removed from the cost estimate because it refers to another project already in progress. Again, we have left it in the budget with the caveat that it is not a cost directly associated with the Promontory Point revetment structure.

Were items # 1 and #2 revised along the lines suggested and items #45 and #47 removed from the budget, it would yield a reduction of $1,505,750.40.

CONCLUSIONS AND RECOMMENDATIONS

The controversy over Promontory Point has been widely seen as a conflict between two fundamental values: preservation and fiscal responsibility. Our analysis has delivered us to the conclusion that preservation and fiscal responsibility need not be in opposition. What is required at this juncture is a renewed design process and political statesmanship.

We have organized our conclusions and recommendations into three broad categories: design framework, maintenance, and relationships.

Design Framework

We have concluded, on the basis of information made available to us by STS Consultants and Shabica and Associates, that a preservation approach to the restoration of Promontory Point is technically and fiscally feasible. The plan we have reviewed conforms to the dimensions and specifications of the City plan. And it yields cost estimates, developed with conservative assumptions, that are significantly lower than the budget for the City plan:

Total budget for City plan:	$24,278,317.36
Total budget for Figure 1 plan:	$20,742,233.35

As we emphasized at the outset, the design reviewed in this report is an analytic tool. We are not recommending this specific design. Rather, it is our conclusion on the basis of our assessment of this design that a spectrum of different preservation strategies are technically and fiscally feasible.

A range of questions remain open. How wide should the promenade be? Is it advisable to incorporate limestone blocks in the promenade? How might access for persons with disabilities best be achieved? What are the merits of the Community Task Force proposal to "rearmor" and retain the "coffins" on the east side of the Point and to repair rather than rebuild the south side of the Point? And so on.

Most of these questions have been much discussed, but they can only be resolved once agreement has been reached on the threshold question addressed in this report. And they must be resolved within a fiscal framework as well as a design framework. Some proposed design modifications would increase the total budget; others would reduce it.

Once a design framework has been agreed upon, the process of design refinement can swiftly and definitively work through these questions. If agreement is not reached on the threshold question, however, the process will remain stalled as it has been for the past three years.

We recommend that a preservation design framework be adopted by the City and that an appropriate design team be constituted for the purpose of refining that design concept.

Maintenance

Our critique of STS's cost estimates for maintenance of a limestone step stone structure should not be interpreted as a discounting in any way the City's concerns about maintenance. We would not want to be understood as minimizing the issue of maintenance in an era of chronic fiscal uncertainties. Maintenance is, we believe, the central issue. Greater clarity and creativity in addressing this issue might yield a plan for Promontory Point of which all parties could be proud.

In view of the flawed analysis on which the City has relied, we recommend that it reanalyze maintenance costs, giving proper weight to the history and current condition of the existing structure. This will yield a more realistic statement of probable maintenance needs. It will not, however, eliminate all uncertainties.

We recommend that the City explore with the Army Corps of Engineers the possibility of creating a maintenance reserve as part of the construction budget. This is a common practice for addressing precisely the sorts of maintenance needs and uncertainties that the City confronts at Promontory Point.

The maintenance reserve would be held in escrow, earning interest, subject to an agreement entered into by the Army Corps and the Park District that stipulates the conditions under which the funds can be accessed. Such an agreement might also designate appropriate alternative uses of the funds, in the event they are not needed for maintenance.

Assume for the moment that the maintenance reserve was set at 10% of the total budget for the Figure 1 plan of $20,742,233.35 or $2,074,233.34. This would bring the Figure 1 budget to $22,816,466.69—still well under the total for the City's all-concrete baseline design.

Maintenance of the revetment structure is event-driven (i.e., the storm of the century could occur in the first year of its fifty year life). Hence one cannot project maintenance costs on an actuarial basis. In the absence of better information regarding past maintenance costs, it is difficult to predict how quickly the reserve would be drawn down. A wide range of different scenarios are possible. But a simple example will suggest the potential effectiveness of this approach: Assume a maintenance reserve of $2,000,000. Assume further that over the first twenty years of the structure's life, the reserve is drawn down $50,000 per year. Making conservative assumptions as to interest rates on the original sum, it is reasonable to assume that after twenty years the amount of the reserve would be over $2,000,000.

Relationships

We have been privileged to witness the quality of effort that both community members and government officials have made to reach agreement on the best possible plan for the restoration of Promontory Point. That effort in itself is an important resource. The moment is at hand to harvest it in such a way that relationships between the City and the community are strengthened.

Wayne Brunzell
Jamie Kalven

May 17, 2004

City Plan Cost Estimates

Item	Description	Quantity	Units	Unit Price	Amount
1	MOBILIZATION AND DEMOBILIZATION	1	LS	$1,800,000.00	$1,800,000.00
2	TEMPORARY FIELD OFFICE, PROJECT SIGN AND SAFETY SIGN	1	LS	$578,532.50	$578,532.50
	SITE PREPARATION AND DEMOLITION				
3	Existing Structure Removal and Demolition	1	LS	$179,523.25	$179,523.25
4	Existing Promonade/Wave Deflector Removal and Demolition	35,000	CY	$4.86	$170,100.00
5	Controlled Reclamation of Armor Stone	64,160	CY	$11.07	$710,251.20
	EARTHWORK AND EMBANKMENT				
6	Earth Fill	23,240	CY	$8.00	$185,920.00
7	Topsoil Placement	7,625	CY	$11.00	$83,875.00
	SEPARATION / FILTRATION GEOTEXTILE				
8	Geotextile (Above Water)	75,080	SF	$0.23	$17,268.40
9	Geotextile (Below Water)	110,810	SF	$3.35	$371,213.50
	STONE PLACEMENT AND CONSTRUCTION				
10	Type A-1 Stone (0.8 to 1.3 tons) reused limestone	5,775	TON	$60.50	$349,387.50
11	Type A-2 Stone (1.0 to 1.7 tons)	3,230	TON	$34.00	$109,820.00
12	Type A-3 Stone (2.3 to 3.8 tons) reused limestone	1,250	TON	$58.50	$73,125.00
13	Type A-4 Stone (2.3 to 3.8 tons)	3,750	TON	$38.30	$143,625.00
14	Type A-5 Stone (3.3 to 5.5 tons)	1,490	TON	$40.50	$60,345.00
15	Type A-6 Stone (5.1 to 8.5 tons)	3,435	TON	$40.50	$139,117.50
16	Type A-7 Stone (8.3 to 13.8 tons)	11,970	TON	$42.00	$502,740.00
17	Type A-8 Stone (3.0 to 5.0 tons) reused limestone	1,215	TON	$62.00	$77,500.00
18	Type C-Stone (1 to 150 lbs)	7,300	TON	$30.60	$223,380.00
19	Bedding Stone (IDOT CA-1 gradation)	7,805	TON	$20.00	$156,100.00
20	Bedding Stone (IDOT CA-6 gradation)	1,215	TON	$18.80	$22,842.00
21	Bedding Stone (IDOT CA-7 gradation)	465	TON	$30.00	$13,950.00
22	Select Stone (IDOT CA-7 crushed limestone)	16,630	TON	$22.55	$375,006.50
23	Stone Fill	23,130	TON	$15.85	$366,610.50
24	Bedding Stone Special (IDOT CA-1 gradation)	67,395	TON	$22.00	$1,482,690.00
25	BITUMINOUS CONCRETE PAVEMENT	18,275	SF	$4.30	$78,582.50

City Plan Cost Estimates

Item	Description	Quantity	Units	Unit Price	Amount
26	ARTICULATING CONCRETE MAT	7,500	SF	$6.50	$48,750.00
27	SOD	411,255	SF	$0.40	$164,502.00
28	DECOMPOSED GRANITE PATHWAYS	1	LS	$10,540.00	$10,540.00
	CAST-IN-PLACE REINFORCED STRUCTURAL CONCRETE				
29	Furnish and Place Reinforced Concrete for Promenade Level	7,283	CY	$280.00	$2,039,240.00
30	Furnish and Place Reinforced Concrete for New Step Stones	12,484	CY	$250.00	$3,121,000.00
31	Furnish and Place Reinforced Concrete for Wave Deflector	743	CY	$380.00	$282,340.00
32	Furnish and Place Reinforced Concrete for Drainage Gaps	1,083	CY	$250.00	$270,750.00
33	Furnish and Place Reinforced Concrete for Universal Access Zone	747	CY	$380.00	$283,860.00
34	LADDERS AND MISCELLANEOUS METALS	1	LS	$40,000.00	$40,000.00
	STEEL H-PILES				
35	Battered HP 12x53	7,009	FT	$35.90	$251,623.10
36	Battered HP 14x73	12,584	FT	$41.90	$527,269.60
37	Vertical HP 12x74	35,144	FT	$27.60	$969,974.40
38	Test Pile Load Test	1	LS	$45,000.00	$45,000.00
	METAL SHEET PILING, WALERS AND STRUTS				
39	Steel Sheet Pile (PZ22)	67,200	SF	$16.80	$1,128,960.00
40	Steel Sheet Pile (PZ22 with hydrophilic seals)	22,771	SF	$21.16	$481,834.36
4	Steel Sheet Pile (PZ27)	100,895	SF	$17.30	$1,745,483.50
42	Steel Walers	1	LS	$1,050,000.00	$1,050,000.00
43	TIE RODS AND CASING	1,924	LS	$27.00	$51,948.00
44	FLOOD PREVENTION GATE	1	LS	$20,000.00	$20,000.00
45	BEACH HOUSE AREA MISC. ARCHITECTURAL	1	LS	$80,000.00	$80,000.00
46	TYPE A-1 TO A-8 STONE, Reused Limestone Randomly Placed, Landside	1,000	TON	$35.00	$35,000.00
47	BEACH NOURISHMENT	6,400	TON	$30.00	$192,000.00
	SUBTOTAL				**$21,111,580.31**

Figure 1 Plan Cost Estimates

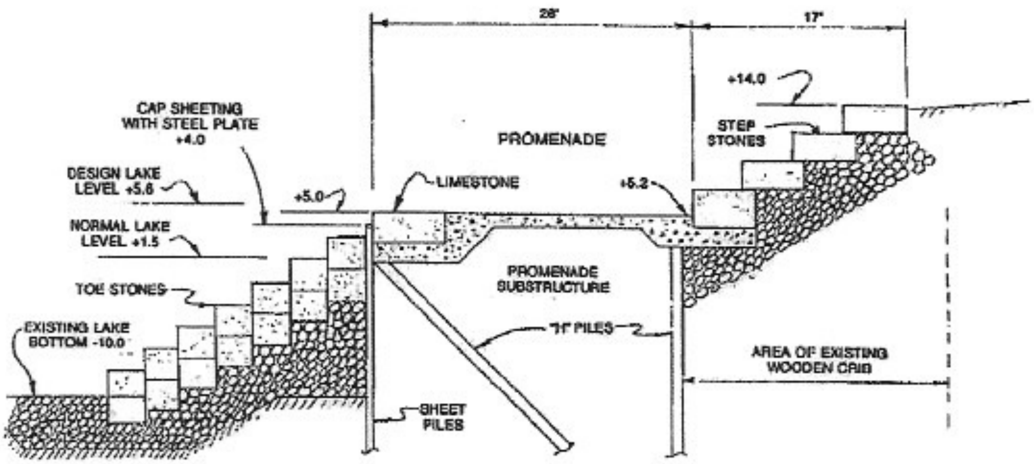
Item	Description	Quantity	Units	Unit Price	Amount
001	MOBILIZATION AND DEMOBILIZATION	1	LS	$1,800,000.00	$1,800,000.00
002	TEMPORARY FIELD OFFICE, PROJECT SIGN AND SAFETY SIGN	1	LS	$578,532.50	$578,532.50
	SITE PREPARATION AND DEMOLITION				
003	Existing Structure Removal	1	LS	$179,523.25	$179,523.25
004	Existing Promenade/Wave Deflector Removal and Demolition	35,000	CY	$4.86	$170,100.00
	EARTH WORK AND EMBANKMENT				
005	Earth Fill	23,240	CY	$8.00	$185,920.00
006	Topsoil Placement	7,625	CY	$11.00	$83,875.00
	SEPARATION/FILTRATION GEOTEXTILE				
007	Geotextile (Above Water)	75,080	SF	$0.23	$17,268.40
008	Geotextile (Below Water)	110,810	SF	$2.00	$221,620.00
	STONE PROCUREMENT, PLACEMENT AND CONSTRUCTION				
009	Type A- Stone (Promenade cut stone delivered and placed)	2,888	TON	$178.00	$514,064.00
010	Type A-Stone (Step stone delivered and placed)	9,240	TON	$178.00	$1,644,720.00
011	Random size, reclaimed toe stone (reused limestone)	17,188	TON	$60.00	$1,031,304.00
012	Special Toe Stone Block Placement (reused limestone)	8,275	TON	$60.00	$496,500.00
013	Type B-Stone (200 to 800 lbs.)	2,140	TON	$60.00	$128,400.00
014	Type C-Stone (1 to 150 lbs.)	3,900	TON	$55.00	$214,500.00
015	Select Stone (IDOT CA-7 crushed limestone)	16,630	TON	$50.00	$831,500.00
016	Bedding Stone Special (IDOT CA-1 gradation)	48,000	TON	$50.00	$2,400,000.00
017	SOD	411,255	SF	$0.40	$164,502.00
018	BITUMINOUS CONCRETE PAVEMENT	26,300	SF	$4.30	$113,090.00

Figure 1 Plan Cost Estimates

Item	Description	Quantity	Units	Unit Price	Amount
019	CONCRETE ARTICULATING MAT	3,750	SF	$6.50	$24,375.00
	CAST-IN-PLACE REINFORCED STRUCTURAL CONCRETE				
020	Furnish and Place Reinforced Concrete for Promenade Level Including Stair Sections, ramps, storm gaps	5,921	CY	$435.00	$2,575,635.00
	STEEL H-PILES				
022	Battered HP 12x53	6,150	FT	$35.90	$220,785.00
023	Battered HP 14x73	12,470	FT	$41.90	$522,493.00
023	Vertical HP 12x74	18,415	FT	$27.60	$508,254.00
024	Test Pile Load Test	1	LS	$45,000.00	$45,000.00
	METAL SHEET PILING, WHALERS AND STRUTS				
025	Steel Sheet Pile (PZ27)	142,495	SF	$17.30	$2,465,163.50
026	Steel Whalers and Struts for Steel Sheet Pile	1	LS	$794,000.00	$794,000.00
027	Stainless Steel Railing	960	FT	$110.00	$105,600.00
	Beach House			$80,000.00	$80,000.00
	Beach Nourishment			$192,000.00	$192,000.00
	SUBTOTAL				**$18,036,724.65**
	CONTINGENCY 15%				$2,705,508.70
	TOTAL				**$20,742,233.35**

This cost estimate assumes a 2 year construction schedule.

Figure 1



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

Figure 2

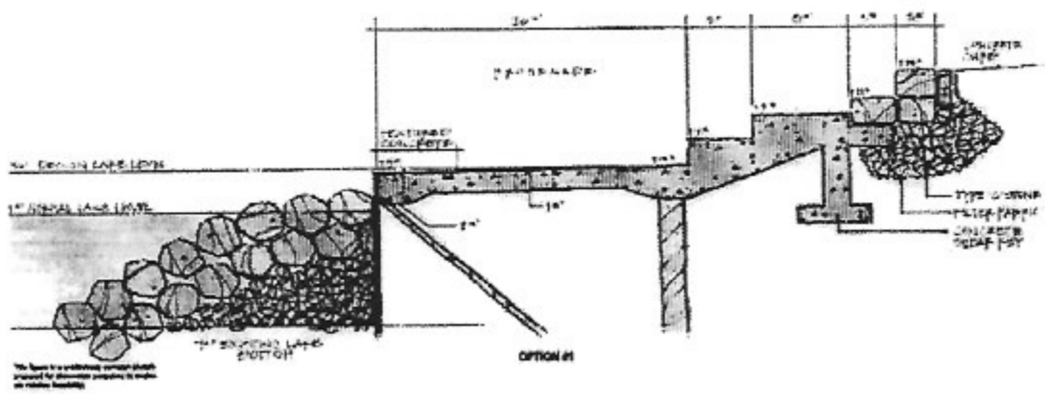
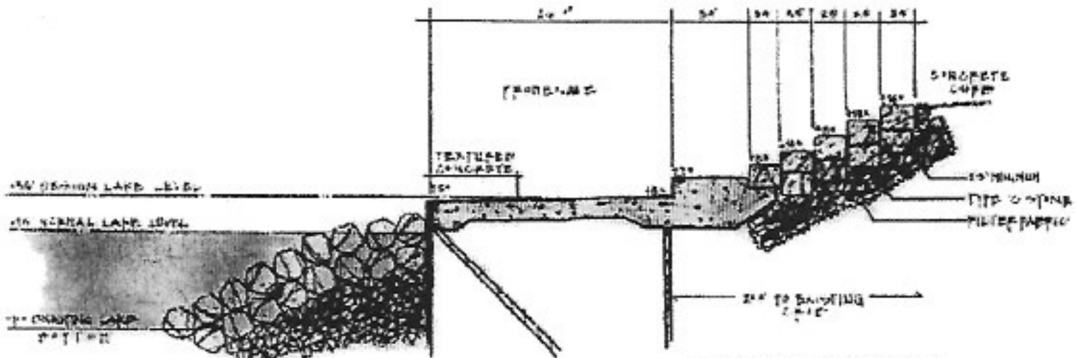


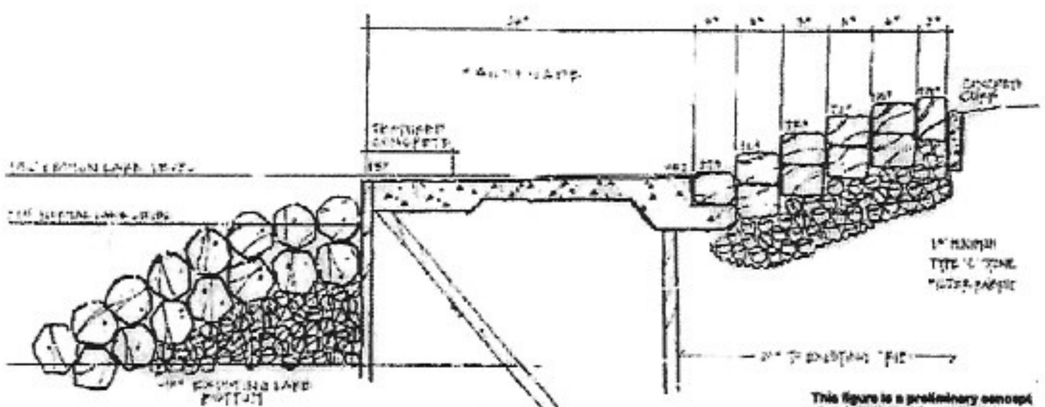
Figure 3



Option #2

This figure is a preliminary concept sketch prepared for discussion purposes to evaluate the relative feasibility.

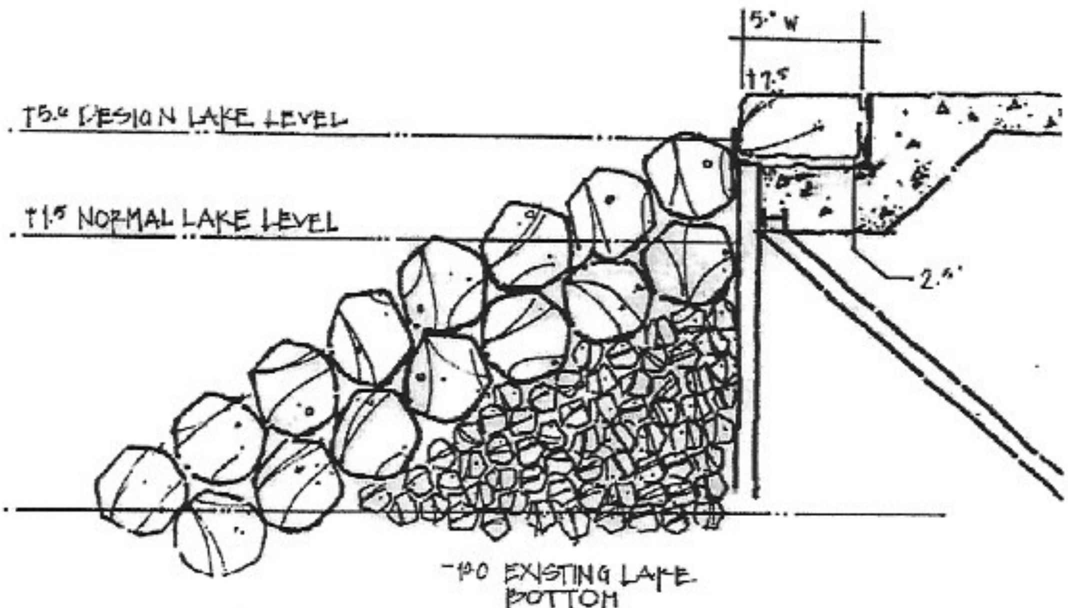
Figure 4



Option #3

This figure is a preliminary concept sketch prepared for discussion purposes to evaluate the relative feasibility.

Figure 5



This figure is a preliminary concept sketch prepared for discussion purposes to evaluate relative feasibility.

OPTION #4