Mississippi White Water Park
Design Report Outline
June 30, 1999

Acknowledgments

Minnesota Department of Natural Resources, Trails and Waterways Unit commissioned this study with funds appropriated by the State Legislature. Its purpose is to determine the technical feasibility and economic viability of an artificial white water course in downtown Minneapolis. A consultant team headed by McLaughlin Water Engineers of Denver, Colorado performed the study. Supporting team members consist of:

John Anderson, Architect ..... White Water Course
Council for Urban Economic Development.....Market Study and Financing
Damon Farber Associates .....Site planning and Illustrations
Loucks and Associates, Inc..... Civil Engineering

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Many thanks to the organizations and their citizens members who provided valuable comments and information for this report: The Minneapolis Park and Recreation Board, the City of Minneapolis, the University of Minnesota, The US Army Corps of Engineers, the non profit Mississippi Whitewater Park Development Corporation and Northern States Power.

EXECUTIVE SUMMARY

A white water course is technically and economically feasible on the east bank of the Mississippi River in downtown Minneapolis. It makes use of the vertical drop created by Lower St. Anthony Falls Lock and Dam and the abundant, year round water flow in the Mississippi River to create a recreational amenity that would serve a wide constituency. In a sense it would re-create the white water river that gave rise to the Twin Cities.

The proposed course is essentially a new river channel that bypasses the lower St. Anthony Falls Lock and Dam. The channel is approximately 2000 feet long, 40 feet wide, and has a vertical drop of about 25 feet. The "re-created" river will flow roughly parallel to the main stem of Mississippi River in a park setting.

This proposal is consistent with efforts to reclaim the Mississippi waterfront for recreation and tourism in the Twin Cities and it has the potential to be a signature project with an international reputation. The resulting juxtaposition of industry and recreation on a riverfront that is both natural and urban could be dynamic and exciting.

This project and the long-awaited extensions of the East River Road and bike trails will effectively join the surrounding neighborhoods to the river, to downtown and to the Twin City's extensive parkway and trail system. The whitewater park will draw visitors from the surrounding areas and from around the world. The project could catalyze economic renewal of the surrounding area by lessening its reliance on light industry and by promoting public access to the Mississippi River.

Project Impact

Economic Impact

It is conservatively estimated that the park will draw 50,000 paying visitors per year if properly managed and promoted. This is in addition to five to ten times that number who will come to watch from the shore. The whitewater course is not expected to pay for the estimated $7 million capital costs to build it. However user fees are expected to cover its operating expenses. The cost of the whitewater course and park as shown in the master plan, with roads, parking, trails, pedestrian bridges, fishing pier, and other park amenities is roughly estimated to have a construction cost of $15 million.

The direct economic impact would be on the immediate neighborhood and the commercial district of St. Anthony Falls. The impacts are primarily based on commercial rafting, with a lesser reliance on private boaters. We estimate an economic impact of $2 to $2.5 million annually. These impacts include both visitor spending and course user fees. About 30 percent of the spending is expected to come from out-of-state visitors.

Whitewater events bring exposure to the sport and temporary influxes of tourist spending to the local economy. Once established in paddle sports, world class whitewater courses can expect to host one Olympic-level international event and two or more national events every two years. It will also provide a needed close-to-home boating venue for the Twin City's and Minnesota's paddlers.

Site Impacts

The most significant site impact is the creation of an island in front of the University Steam Plant. This is necessary to create a longer channel. It might result in some alteration and fill on the edge of the Mississippi River. However utilizing fill material dredged from the river itself could mitigate this.

There are no known environmental problems with the site and no known archaeological sites will be disturbed.

The channel crosses a number of major and minor utilities. One major impact necessitated by the new channel is the relocation of a 54-inch water main.

Landowners Impacts

The St. Anthony Falls site is presently an industrial setting with three major landowners: Army Corps of Engineers, Northern States Power and the University of Minnesota. Their interests and utilization of the site will be affected by the proposed whitewater course and the viability of this concept hinges upon their acceptance of it. In order for the project to make the jump from being technically feasible to being practical, the following accommodations are needed:

1. Phase out the Corps of Engineers dredge spoil area below the Interstate 35W Bridge.
2. Make space available at one of the University of Minnesota buildings to serve the park. Ideally, the space would be within or adjacent to the Tandem Accelerator Lab.
3. Adjust the planned siting of the Northern States Power hydroelectric plant to allow sufficient room for the whitewater channel (there are no active plans to build the plant at the time of this writing).
4. Permit a pedestrian boardwalk on the river-side of the steam plant.

Management

Management Structure

Management of the park will likely be a combination of public and private entities and will be geared for four-season operation. Five public and private entities have expressed an interest in participating. We envision a flexible management structure that handles the summer peak season, allocating water time fairly to all user groups, as well as making the course available in the shoulder and low seasons for hard-core boaters and University and local athletic programs.

Public Ownership

Access to the river and utilization of this wonderful resource were the themes of the public comments we received. Suggestions for activities and programs at the site were imaginative, inclusive of a broad cross section of society and spanned all four seasons. The site master plan attempts to accommodate as many of these activities as possible within the narrow river gorge.

This proposal envisions increased access to the Mississippi and revitalization of the surrounding neighborhoods. The continued involvement of the public will be needed to ensure its success and their enthusiasm.

Safety Considerations

Although injuries at similar parks throughout the world are rare, the potential for injury-related liability must be addressed. Liability will be shared by requiring insurance from on-site operators, event organizers and collegiate users. Common sense site planning has been employed to facilitate self-rescue and to clearly mark the boundaries where boating is and is not permitted.

This site enjoys more flood protection than many other man-made whitewater venues in this country and abroad. It is perched above all but the most extreme flooding and is protected by the Lower St. Anthony Falls Lock and Dam. Nonetheless this proposal recognizes the inherent limitations and risks associated with construction within floodplains and employs survivable construction techniques where loss may occur.

Purpose: This section will provide background on the state of the art in artificial white water courses. While not a comprehensive literature search it uses four existing courses as examples.

- East Race Waterway, South Bend Indiana
- Olympic Parc de Segre, La Seu d'Urgell, Spain
- National Watersports Centre, Holme Pierrepont, England
- Augsburger Eiskanal, Augsburg, Germany

These venues were selected out of nearly 30 sites because of similarities in siting, operations, and hydraulics to the project at hand.

1.A. EAST RACE WATERWAY, SOUTH BEND, INDIANA, USA

1.A.1. CONTACTS

Betsy Harriman,
Director of the East Race Waterway
South Bend Parks and Recreation Department
301 South St. Louis Boulevard
South Bend, Indiana 46617
Phone: 219-235-5596
Fax: 219-235-9331
City Economic Development Office: John Hunt, 219-235-9375 or
Ann Collata 219-235-9374

1.A.2. GENERAL INFORMATION

Date completed:	June 1984
Original Cost:	$4.5m

1.A.3. HYDROLOGICAL AND PHYSICAL DATA

Length:	2100'
Width:	33' to 35'
Head:	12'
Average Gradient:	0.6%
High Flow:	1000cfs
Low Flow:	390cfs

1.A.3.1. KEY POINTS-SITING AND HYDRAULICS

The city of South Bend considers the East Race Waterway the most successful urban redevelopment project they have ever undertaken.

1. Course is located within a rehabilitated industrial waterway. There is a dam in the St. Joseph River that provides about 12' of head.
2. The course has provisions for anadromous fish passage though a secondary fish passage facility was constructed at the dam.
3. The channel is a shallow trapezoid with movable obstacles made of fiberglass or wood.
4. Water comes into the course via an inverted "V" gate. This type of gate is advantageous since it is boatable, though at low flow it can be intimidating for novices.
5. There are occasional water quality alerts on the St. Joseph during periods of drought when pollutants (fecal coliform) are concentrated.

1.A.3.2. KEY POINTS-OPERATIONS

1. The general recreation season is from the second week in June to the last week in August. Hours are 17:30 to 19:30 Wednesday and Thursday, 12:00 to 17:00 Saturday, and 13:00 to 17:00 Sunday.
2. The course is made available to a club from Ohio for slalom training during the shoulder and off-seasons. At present there are no local slalom athletes though a program will be attempted next summer[1].
3. Staffing includes two people to run food and equipment concessions, six bus drivers to shuttle equipment to the top of the course, and from 9 to 13 lifeguards. There is no staffing during off-season slalom training-coaches are expected to control the site.
4. Fees for rafting are $2 per person, per trip (including equipment).
5. Fees for private boaters are $3.00 during the week and $6.00 on weekends.
6. Operation is by South Bend Parks and Recreation Department, a public agency.

1.A.3.3. KEY POINTS-MARKET FORCES

There is a general lack of whitewater rivers in the region, making this the only boating of its type in the area.

[1] Phone conversation with Betsy Harriman, October 22, 1998

1.A.3.4. THINGS WE SHOULD LEARN

1. Lifeguard staffing requirement is excessive. This is mainly the result of the hydraulics of the course, there are few eddies or pools for self rescue. Manned rescue is the only rescue that will work here.
2. The course is generally considered to be too easy by contemporary international standards.
3. The movable obstacles are a good idea but one that has not been exploited to its full potential. The first round of fiberglass obstacles was widely considered to be unsuccessful and the present generation of obstacles is much better, though not fully implemented.

Integral safety features that facilitate self-rescue can help reduce lifeguard staffing .

1.B. OLIMPIC PARK DEL SEGRE, LA SEU D'URGELL, SPAIN

1.B.1. CONTACT

Sr. Francesc Ganyet or Sr. Ramon Ganyet
Parc del Segre
25700 LA SEU D'URGELL
Spain
Tel: 011-34-973- 36 00 92
Fax: 011-34-973- 36 01 92
Web site: http://www.sportec.com/www/fep/ctomun99/ing/main.htm

1.B.2. GENERAL INFORMATION

Date Completed: 1991
Cost: $10 million, including a mini-hydro/pumping station

1.B.3. PHYSICAL AND HYDROLOGIC DATA

Length:	1100’
Width:	25’
Head:	21
Average Gradient:	1.9%
Flow range:	530 cfs to 250 cfs

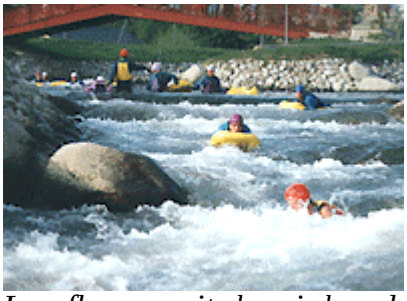
1.B.3.1. KEY POINTS-SITING AND HYDRAULICS

1. There is a long flat-water channel at the head of the course that is conducive to introductory kayak classes.
2. Variable flow in the channel combined with good water quality allows a variety of skill levels from Olympians to kids on boogie boards.
3. During periods of drought, water can be recirculated with electric pumps. The pumps function as a mini hydro station during the wet season.
4. This is one of the steepest and most challenging courses in the world. Because of the steep gradient and narrow channel it operates with comparatively little water.
5. The site is very compact and loops back on itself. There is a unique return system for boats via a flat-water channel and an agricultural conveyer.

Beginners training channel

1.B.3.2. KEY POINTS - OPERATIONS AND MAINTENANCE

1. Operator is Parc del Segre, S.A., Sr. Francesc Ganyet
2. Season for recreational boating is March through October
3. There is equipment rental available on site.
4. Season for athletic training is all year.



Low flow permits boogie boards. Note, however the steep, high banks.

1.B.3.3. KEY POINTS- THINGS WE SHOULD LEARN

1. The steep side slopes to the course are a problem for several reasons. Aesthetically the course appears to be in a ditch. Steep slopes can cause an unwary person to slip into the water. The slopes can also make self-rescue and assisted rescue difficult.

2. The loop layout is very convenient for a concessionaire to operate, since the transit from the take out to the put-in is very short.
3. The on-site electric generation is attractive, but would be difficult to license in the US.

1.C. NATIONAL WATERSPORTS CENTRE, HOLME PIERREPONT, ENGLAND

1.C.1. CONTACT

Andrew Haywood
National Watersports Centre
Adbolton Lane
Holme Pierrepont
Nottingham, England NG122LU
General Information: 011-44-115–982-1212
Fax: 011-44-115-945-5213
Web sites: http://www.nationalwatersports.co.uk/telephone.html
http://www.nationalwatersports.co.uk/centreinformation.html

Aerial view of course

1.C.2. GENERAL INFORMATION

Date opened:	September 1986
Original cost:	£2.25m

1.C.3. PHYSICAL AND HYDROLOGIC DATA

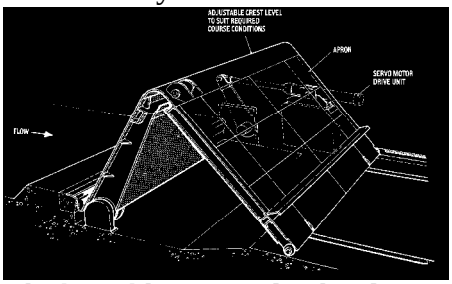
Length	2300’
Width	50’
Head	12’
Average Gradient	0.5%
High Flow	990 cfs
Low Flow	350 cfs

1.C.3.1. KEY POINTS - PHYSICAL LAYOUT AND HYDROLOGY:

1. Situated at a lock and dam structure on the banks of the River Trent in Nottinghamshire, a navigable river. The dam provides the necessary head for the course. The river has a relatively large mean discharge meaning

that it can supply water to the course year 'round, even in drought conditions (albeit in less than ideal flow rate).

2. The natural channel in the River Trent both above the course and below is relatively benign. This allows boating, fishing and sailing in the river near the site.
3. Relatively low head (only 12') using gravity flow.
4. Seasonally poor water quality (low flow concentrates pollutants).
5. Site is subject to flooding-rising tail water floods lower reaches of course. There is not enough head to perch the course above the annual flood plain as at Augsburg, Germany.
6. The head gates are the inverted V type and are navigable by all types of craft.
7. Ice is not a problem at the site.
8. Course includes an easy beginners stretch at the outflow to the river.
9. There is a world class flat-water sprint and rowing regatta course immediately adjacent to the whitewater site.
10. Other sports / activities at the site include water skiing, fishing, sailing, boardsailing, camping, and a conference center.
11. Geometry of the course is a shallow trapezoidal channel with occasional large pools. There is a secondary channel around the most difficult rapid allowing one to skirt the hardest water or paddle back up from the bottom.
12. Construction: bottom slab is 10" reinforced concrete over a drainage course. The slab has hydrostatic pressure relieve vents to atmosphere. The sloping side walls are sprayed concrete with an independent pressure relief system.



The boatable inverted V headgate structure.

1.C.3.2. KEY POINTS - OPERATIONS AND MAINTENANCE

1. General recreation season: April through October (for equipment rental).
2. Open for athletic training and private boaters with their own equipment all year.
3. Course runs 24 hours a day, 365 days a year in order to prevent hydraulic uplift resulting from an extremely high water table (in some cases 5 feet above the invert of the channel!).
4. The operator of the course is the English Sports Council, a public entity.
5. Open for general recreation on a paid admission basis including equipment rental and guided raft trips. No swimming or high body contact craft such as inner tubes or boogie boards. Water quality may not support these activities.

6. Private boating is done on a 4-hour time slot for a fee of £6 to £3.50. There are annual passes available for £130.
7. There is a program that provides a sliding fee scale for development and national team slalom and wild water athletes.
8. Insurance is the general public liability type.
9. There are two raft companies, one public and one private.
10. The attitude is that the course is run of river with minimal "policing." Staff ensures that boaters are equipped and skilled enough for conditions of the day. Other than that, participants are expected to self-rescue in the event of an upset.
11. Staffing is minimal: Summer level is 1 full time, 2 part time employees, along with 2 full time and 6 part time workers for the rafting operation.
12. Site is subject to backwater conditions when the River Trent is in flood. Headwater conditions are maintained by flood control gates at the nearby lock and dam. Clean up after floods is not excessive-workers with a small truck pick up floatable debris. Workers clean accumulated silt off of paved areas with a hose. There is little landscaping and site furnishings to be damaged by floodwater.

1.C.3.3. KEY POINTS-MARKET FORCES

The right to navigation that we take for granted in the US is not guaranteed in the UK. Navigation rights are usually privately held and jealously guarded. This combined with the general scarcity of natural whitewater rivers on the island make it a seller's market for a course that can provide year 'round white water.

1.C.3.4. KEY POINTS - THINGS WE NEED TO LEARN:

1. The unique pressure relief system of multiple small holes in the bottom may have some application to our site under flood conditions.
2. Course is generally considered to be too easy and too long for contemporary international slalom standards. This is largely a result of limited head at the site and is unavoidable.
3. Drought was a problem in the 1995 World Championships event when low water levels made the course too easy.
4. Flood can also be a problem when the whole course floods out, except the last 18" of drop[2]
5. High wind is a problem-despite windbreaks and berms.
6. Relatively open site allowed sneak ins by private boaters. Showers and a coffee shop near the course improved the fee participation considerably[3].

1.D. AUGSBURGER EISKANAL, AUGSBURG, GERMANY

1.D.1. CONTACTS

Klaus Pohlen or Jürgen Köhler 011-49-0821-559723

[2] Correspondence from course designer Frank Goodman 12/12/92
[3] Personal communication with user.

Web site: http://members.aol.com/Eiskanal/
Peter Michler's rafting company:
http://members.aol.com/RTAugsburg/index.htm

1.D.2. PHYSICAL AND HYDROLOGIC FEATURES

Length (upper):	800'
Length (lower):	1000'
Width (upper):	39'
Width (lower):	25'
Head (upper):	4.3'
Head (lower):	10.5'
Gradient (average):	0.8%
Flow (upper):	990 cfs
Flow (lower):	500(-) cfs

Aerial view of finish area. The return spillway to the Lech River is in the top center of the picture.

1.D.2.1. GENERAL INFORMATION

Built in 1971 for the 1972 Olympic Games. Cost is reported to be around $1M.

1.D.2.2. KEY POINTS-SITING AND HYDROLOGY

1. Course is situated at a working municipal canal system. The upper third of the course is co-aligned with part of the canal and the lower third is in a new channel that diverts water from the canal.
2. A dam and reservoir supply water.
3. The head gates are the undershot sluice type. This type of gate is not boatable and will not work well in situations with variable forebay water elevation.
4. The whole canal is perched above the flood plain to avoid flooding during competitive events. There is a screened spillway at the return to the river- it is not possible to enter the river from the canal.
5. Water quality is excellent.
6. The lower course runs through a manicured park setting.

1.D.2.3. KEY POINTS-OPERATIONS AND MAINTENANCE

1. Recreational Season is April to October.
2. For recreational boaters there are passes for half day, whole day and all season. There are discounted fares for youth.

1.D.2.4. KEY POINTS-THINGS WE SHOULD LEARN

1. The siting and water quality is beautiful.
2. Despite the modest water flow the whitewater is challenging and even with the passage of years the site is still able to attract world-class events.
3. The vertical sides of the channel are expensive and caused unpredictable hydraulics.
4. The sloped embankments work well for modest spectator turn output for a larger event bleachers are needed.

1.E. SUMMARY

There are several excellent examples of white water courses in the world from which to draw ideas on siting and hydraulics. The funding and operation structure for the projects we looked at on the other hand are very site specific and none can be applied directly to this site. Like some of the samples this project is located at a lock and dam along a very large river with reliable flow.

Purpose: Document the public input meeting at mid point of the project.

Contents

2.A. METHODOLOGY

Format: the program for each day's workshop was three hours, starting with a 45 minute presentation by the design team, followed by public input in small groups then concluding with a summary wrap-up session.

- Michael McDonough introduced the consultant team as well as individuals promoting the white water project
- John Anderson made a presentation of the literature search and background on white water courses
- Ed Gilliland made a presentation of economic issues of white water courses
- Joan MacLeod presented an overview of the urban context of the site

On each day the attendees were divided into three groups to gather input on the design and site issues. A standard set of questions and posting of responses helped to focus the discussion. Members of the design team facilitated the one-hour sessions.

Public officials and representatives of civic and neighborhood organizations (Army Corps, University of Minnesota, MCDA, Marcy Holme Neighborhood, NSP) constituted the majority of the attendance on Friday's meeting. Other individuals interested in the project – predominantly paddlers, attended Saturday's session.

The set questions used to gather input were:

1. Values What do you value most about the site?

2. Concerns Is there anything about the project that concerns you?
3. Amenities What activities and amenities would you like to see here?

2.B. PUBLIC INPUT

There were a total of 146 attendees over the two-day presentation. Considering the variety of interests represented in attendees on the two days there was a general consensus in their responses. There were two slight differences in priorities: civic organizations are more sensitive to the special features of the site and potential impact on the neighborhood while individuals focused on the specifics of the white water course. Both day's groups share the same concerns and are equally imaginative regarding the amenities.

2.B.1.1. VALUES

Environmental values, exemplified by the uniqueness of this site on the Mississippi, are the leading value. The participants universally value access to the river. Site history is a close second. Other values that received more than one mention includes the full range of ecological, social, and economic benefits that this project could generate.

Notable comments included:
1. Having access to the river will foster a sense of stewardship.
2. Water power and St. Anthony Falls as the birthplace of Minneapolis.
3. Heightened awareness of wildlife and natural setting.
4. Having a venue that is both a world-class competitive site and a recreational rafting site.
5. Keeping development along the river natural looking.
6. This project could be a catalyst for economic revitalization of the St. Anthony's Falls area.

Analysis

Participants are knowledgeable about the site, sophisticated in their outlook, and hopeful to have access to the river. They see the proposed project as a vehicle for environmental restoration, a tie into the community and a wide user base, as well as a source of economic activity and civic pride.

2.B.1.2. CONCERNS

- By far the most anxiety centers on site management issues (crowding, user conflicts, and length of the season).
- Neighborhood concerns with land use, parking and overall project impact also register highly.
- Safety is a universal concern, both in the existing condition and as proposed. A perception of poor water quality is an obstacle to overcome (though most respondents believe that the water quality of the Mississippi is good, they feel that this project would help change the poor water

quality perception and foster an awareness and public stewardship of the river).

- Many comments too, have to do with the course itself: how would it look, perform and be maintained.
- The fact that financial and environmental concerns are registered indicates that stakeholders have realistic perceptions of the project.

Notable comments included:

1. Perception of poor water quality and the opportunity to change that perception.
2. The concrete channels shown in the slide show were viewed as negative. People wanted a natural looking course with natural stone, if possible.
3. Shortage of parking not only in the day to day use but for special events. The possibility of using parking structures on both sides of the river was mentioned as a possible solution.
4. Pricing, crowding, time allocation on the water, length of season and other management issues were registered heavily.
5. The economic feasibility, viability and long term upkeep was a key issue.
6. The new steam plant was reported to be backing away from the commitment to a boardwalk along the river.
7. Concerns were raised about competing use for water if the NSP hydro plant moves forward.

Analysis

The stakeholders have a realistic, mature and long-term outlook on the project but lack information on how it will be managed. Therefore the operation plan that will be produced as part of this study needs to speak in specifics, not generalities. The operations alternatives must contain concrete images and firm language that provokes discussion. Likewise the risk management plan needs to portray realistic risks and integrated solutions as opposed to more staffing and policing. The funding plan must be creative and engage stakeholders for ideas.

2.B.1.3. AMENITIES/ACTIVITIES

Asking about activities and amenities gathered a wealth of insight. The information will help immensely in the preparation of the site master plan, the architectural program and in developing operations alternatives. The types of services desired and related facilities include youth programs, instruction and safety classes. A range of complimentary activities is suggested that will generate four-season use of the site.

Notable comments included:

1. Universal (ADA) accessibility.
2. A desire for as many kinds of non-motor water sports activities as possible, as often as possible.
3. A desire for a high quality "passive" recreational amenities like public parks, nature trails or historic views.
4. A need for a food vendor on site and with a view over looking the course is a high priority.

5. The boaters favor the longest course possible (alt. A combined with C).

Analysis

The suggestions are imaginative, lucid and appropriate to the site. The neighborhood and attendees are receptive to the project and see it as a way to fill in missing pieces to the local recreation offerings as well as fill a gap in the riverfront:

- Connecting the various parts of the trail system at the site
- Take into consideration related outdoors recreation activities that will satisfy a broad base of users and generate year-round activity.

The range and variety of potential activities will help generate interest in the outdoor retail market and attract the attention of potential private operators and concessionaires. Many of the specific related outdoors activities can be accommodated as "overlay" activities on the site through shared, well-planned site infrastructure.

2.C. SUMMARY

The public input process collected invaluable information for the site master plan, the operations alternatives and the risk management plan.

2.D. ATTACHMENTS

Table 2-1 Values
Table 2-2 Concerns
Table 2-3 Amenities / Activities

Note

The exhibits displayed in the January public meeting may be found in section 4, Site Design and are not included here to avoid repetition.

Table 2-1 Values

Date		1/15/99			1/16/99			
Group		1	2	3	4	5	6	
Moderator	Score	JA/PE	G/MJ	JM/CA	JA/CA	DF/JM	G/MJ	
Uniqueness of Site / Environmental	28							
Site History / archaeology	5	1		1	1	1	1	
Mitigation of past damage - restoration	4	1			1	1	1	
The mighty Mississippi	2	1		1				
Geology	2	1					1	
Power of the falls and dams	2	1		1				
Tension natural vs. urban	2	1			1			
Wildlife/natural habitat	3	1		1		1		
Change public perception of river	2	1			1			
Environmental Integrity	1			1				
Wilderness experience	2			1		1		
Natural views	1					1		
Industry	1	1						
Location in city is unique	1			1				
Access	18							
Improved access to river	6	1	1	1	1	1	1	
Can get close to river, an introduction	4	1	1	1	1			
Close to downtown and neighborhoods	2			1	1			
Public stewardship and awareness	2			1	1			
Recreation opportunity	2			1	1			
Fun place to watch	2			1		1		
Social	14							
Opportunity to include many users/uses	3				1	1	1	
Unify the community	2	1		1				
Adventure	2	1				1		
Increased visibility of MN paddlers	2			1	1			
Lessons for youth-managed risk	2			1	1			
A plus for U of MN	1					1		
More whitewater opportunities	2			1	1			
Economic	9							
Economic growth - redevelopment/viability/self sufficiency	4	1		1	1	1		
Increased tourism	1				1			
International exposure	2			1		1		
Extension of city park system/trails	1					1		
Paddling part of state Image (lic. plates)	1			1				

Table 2-2 Concerns

Date		1/15/99			1/16/99		
Group		1	2	3	4	5	6
Moderator	Score	JA/PE	D/MJ	JM/CA	JA/CA	F/JM	G/MJ
Management Issues	16						
How is site managed and controlled?	4	1	1		1		1
Too much demand - crowding	3		1		1	1	
User conflicts-how to share water time	3				1	1	1
Fee structure?	2	1	1				
Competition for water(hydro Army Corps)	2		1	1			
Name recognition-identity	1		1				
What happens to existing slalom area?	1				1		
Safety	15						
Site safety	6	1	1	1	1	1	1
Perceived poor water quality	6	1	1	1	1	1	1
Liability	2				1	1	
Site surveillance / security	1		1				
Physical Plant	14						
Natural look - not concrete	4		1	1	1	1	
Floods	3			1	1		1
Floating debris gets into course/training pool	2	1			1		
Buoys will wash away	1		1				
Boardwalk at steam plant may not be viable	1						1
Limited land area for spectators	1						1
Vandalism	1		1				
Obsolescence (Metrodome syndrome)	1			1			
Impact on Neighborhood / Landowners	13						
Where to park?	4	1		1	1		1
Where do dredge spoils go?	3	1	1	1			
Traffic	3	1		1	1		
Impact on neighborhood	3	1			1	1	
Industrial landowners (NSP - U of MN)	1					1	
Barge traffic	1					1	
Land use compatibility	1	1					
Retain mix of industrial/natural	1	1					
Environmental / Financial	11						
River flow so low that course not open	2	1	1				
Who needs to be convinced of this idea?	2			1	1	1	
Is this thing feasible?	1	1					
Storm water management	1				1		
Strong currents at channel outflow	1		1				
Funding, permits and approvals	1					1	
Timing of project	1					1	
Proposed road cuts will be damaging	1	1					

Table 2-3 Amenities / Activities

Date		1/15/99			1/16/99		
Group		1	2	3	4	5	6
Moderator	Score	JA/PL	ED/MJ	JM/CA	JA/CA	DF/JM	EG/MJ
Services + Facilities	29						
Restaurants-with viewing area	6	1	1	1	1	1	1
Bathrooms / changing house	5	1	1	1	1	1	
Boat storage/clubhouse	4		1		1	1	1
Information Kiosk, interpretive exhibits	4	1	1	1		1	
Lighting/night paddling	3	1			1	1	
Shuttle service for ww course	3			1	1	1	
Shuttle service (if parking on bluff above)	2	1				1	
Funicular (to top of bluff)	1	1					
Equipment rental	1				1		
Programs +Safety	23						
Fire and rescue training	5	1		1	1	1	1
Youth programs	5	1		1	1	1	1
Athletic training-center of excellence	3				1	1	1
ADA access	3	1		1		1	
Urban youth have opportunity	2	1		1			
Classrooms	2				1	1	
White water instructional programs	1					1	
Environmental demonstration project	1	1					
24 hour use = safety	1				1		
Related Outdoors Recreation	23						
Climbing wall	4	1		1		1	1
Picnic area	3	1		1	1		
Sledding/luge	3	1			1	1	
Fishing	3	1		1		1	
Roller blades	2		1		1		
x-country skiing/snowshoing	1				1		
Skateboard area	1				1		
Swimming beach	1	1					
Tubing	1					1	
Fly fishing casting pond	1					1	
Kiddies pool with boats	1					1	
Playground	1					1	
Water park rides (slides)	1	1					

Table 2-3 Amenities / Activities (continued)

White Water Course Specific	21						
Longest course possible-combine	3	A+C		1	1		1
RODEO HOLE!	3			1		1		1
Variable flow - different skill	2	levels		1		1		
Viewing area for competitive events	3					1	1	1
Convenient gates system	2					1		1
Potential for future Olympics	1				1			
Adjustable white water features	1					1		
Full range of ww features/difficulty	1					1		
Communications system for events	1							1
Portage	1						1	
Upstream put In (Hennepin Island)	1		1					
Year-round operation	1			1				
Reliable water flow	1						1	
Transportation + Site Circulation	17							
Convenient parking	6		1	1	1	1	1	1
Bike path connections	4			1	1	1	1	
Walking trails	2			1			1	
Boat / passenger drop off	2		1	1				
Footbridge	2				1		1	
Use parking garages across river	1				1			
Environmental	3							
Mini hydro-clean power	1		1					
Enhance wildlife habitat	1						1	
Hydrology research	1		1					

Purpose: Present possible economic and site impacts of white water course.

Contents

3.A. SOCIAL IMPACTS

The social impacts of developing the proposed white water park in St. Anthony's Falls are highlighted in both "Chapter 2. Public Input" and in the following discussion of economic impacts. The foremost impact of the white water park lies in its contribution toward a higher quality of life for users and visitors to the park. Because quality of life is indeed difficult to quantify, comments from the public meetings and individual interviews and observations during site visits serve as primary sources of information.

Individuals, families and members of the University community living or working within walking distance of the proposed park will be the primary beneficiaries of new recreation opportunities that it will present. These groups will be able to enjoy different kinds of recreation daily that were not previously available in a safe and natural environment.[1] Because only the use of the course would require an admission fee, the natural setting and other features of the park would be available to a wide variety of people at no cost.

Neighborhood residents and the University community near the site currently have only limited access to the riverfront. Development of the proposed park could contribute to restoration of the natural environment and may serve as a link between existing pedestrian trails along the parkway. Safe access to the natural world can generate interest in the natural world within Minneapolis' urban environment. This may broaden the experience of students and contribute to increased interest in protecting the environmental resources of the city.

The proposed park will also be able to offer many of these benefits to visitors from other parts of the Twin Cities metro area, Minnesota and out-of-state visitors. Competitive events can bring visibility to the immediate area of St. Anthony's Falls, the University, the Twin Cities, and Minnesota.

The advent of large crowds will also bring traffic and parking pressures. Parking will impact neighborhood residents, the University community and events participants. For this reason, parking will be a critical aspect of event planning and should be conducted with input from neighborhood and University voices.

[1] Currently, only one American university, Dartmouth has a white water slalom program.

3.B ECONOMIC IMPACTS

3.B.1 THE MARKET: SUPPLY AND DEMAND FOR WHITE WATER PADDLING

3.B.1.1. WHITE WATER PADDLING GROWTH TRENDS

In 1998 there were almost 32 million participants in the ***national paddle sports market***, which consists of canoeing, kayaking, and rafting.[2] Each of the three primary categories has specialized sub-groups, which require different equipment and training. For example, canoeing usually takes place on lakes or flat water rivers, but there are also specially designed open canoes and decked canoes (C-1s, C-2s) for white water. Kayaking occurs on flat water, white water and open seas. Though flat water kayaking is an Olympic sport, white water and sea kayaking are more popular as recreational pursuits in the United States. Rafting almost always takes place on white water rivers. Table 1 shows a general profile of the paddle sports industry. In this table, data for flat water and white water participation are aggregated for each category.

Table 1
Selected Facts: The Paddle Sports Industry

Total Participation 1998 *	32.0 million
Frequent Participants a % of All **	24.6%
% of All Paddling Activity by Frequent Participants	74.2%
Region of Highest Participation	Midwest
Region of Highest Per Capita Participation	South
Best Selling Paddlesports Item 1996	Kayak

Sources: Emerging Markets; USDA and SGMA; SGMA/American Sports Data, Inc.; and ORCA Outdoor Industry Distribution Study, Leisure Trends Group 1997.

Notes: * Those who participated in a paddle sport during 1998.

** Frequent participant data corresponds with "enthusiast" data from Emerging Markets 1997.

The term paddle sports industry is based on the Emerging Markets report of USDA Forest Service and SGMA. Paddle sports are comprised of canoeing, kayaking, and floating and rafting.

[2] Rafting also includes floating in this report. Floating includes activities like inner tube drifting that can take place on either flat water or mild white water rivers.

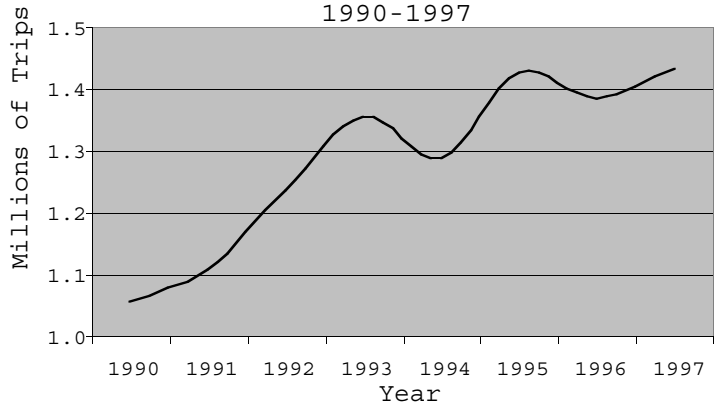
Table 2

Whitewater Rafting Participation Trends by River

Major River	Rafting Trips 199	Rafting Trips 199	% Change
Kern River, CA	12,540	24,699	97.0%
Ocoee River, TN	130,044	249,779	92.1%
New River, WV	85,173	156,925	84.2%
Gauley River, WV	38,958	62,768	61.1%
Arkansas River, CO	178,690	274,442	53.6%
Tuolumne River, CA	7,108	9,300	30.8%
Nantahala River, NC	166,178	208,831	25.7%
Colorado River, Cataract Canyon, UT	16,844	20,112	19.4%
South Fork American River, CA	78,430	90,750	15.7%
Chattooga River, GA/SC	50,148	56,328	12.3%
Middle Fork, Salmon River, ID	33,430	37,026	10.8%
Youghiogheny River, PA	54,512	57,969	6.3%
Colorado River, Grand Canyon, AZ	115,500	115,500	0.0%
Rogue River, OR	24,835	22,514	-9.3%
Lehigh River, PA	63,982	43,900	-31.4%
Total/Average	1,056,372	1,430,843	31.2%

Source: America Outdoors Rafting Study, Business Research Division University of Colorado at

Figure 1. U.S. Whitewater Rafting Participation 1990-1997

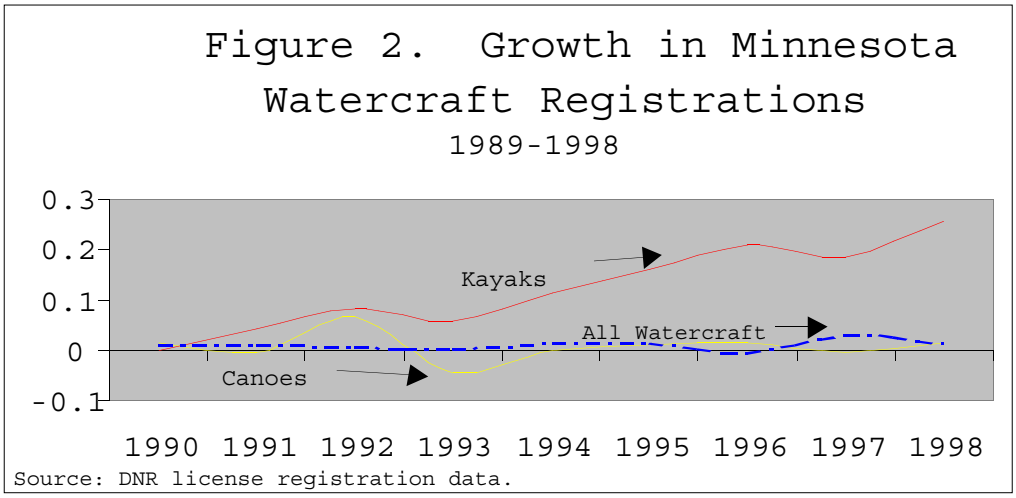


Source: University of Colorado Business Research Division, "America Outdoors Rafting Study," 1998.

The national white water rafting market comprises the bulk of white water paddling. Rafting requires less skill and investment at the individual level than either white water canoeing or kayaking, making it the most accessible form of white water paddling. As Figure 1 shows, rafting has increased steadily over the past ten years. Because natural rivers supply U.S. white water recreation almost exclusively, annual rainfall impacts the growth of rafting and other white water paddle sports significantly. Table 2 shows how white water rafting has grown among fifteen major rafting rivers in the United States. While most have seen significant increases in rafting use, two have seen declines in use. Also, restricted use of the Colorado River in the Grand Canyon kept its user number the same for

the past ten years. White water recreation at some of the rivers listed in Table 2, like the Gauley and the New River (WV), the Youghiogheny (PA) and the Arkansas (CO), are the source of the primary industry -- adventure tourism -- in their local economies of Fayettville, West Virginia; Ohiopyle, Pennsylvania; and Buena Vista, Colorado. White water recreation is an important economic activity in many rural and isolated localities.

Among paddle sports nationally, kayaking continues to perform well, though American Sports Data, Inc. posits that paddle sports did not gain a significant number of new participants in 1997.[3] Innovations in kayak design and exposure through Olympic competitions have helped expand the draw for kayak participation. White water kayaking usually requires an up-front expenditure to buy equipment, while sea kayaking, rafting or canoeing equipment may often be rented or included in trip fees.



The ***regional white water paddle sports market*** mirrors the national paddle sports market by exhibiting rapid growth, though its base figures are currently more modest. It consists primarily of white water kayaking and commercial rafting. The regional white water paddle sports market for the Twin Cities area can be drawn from several trends and indicators. Figure 2 shows how at the state level, *kayaking participation* growth has been steady over the past ten years. Based on Minnesota watercraft license registrations, white water kayaks account for about 34% of all 6,426 kayak registrations in 1998.[4] Though touring kayaks

[3]1998 State of the Industry Report, SGMA, presentation February 4, 1998; and *Human Powered Outdoor Recreation 1997 State of the Industry Report*, Outdoor Recreation Coalition of America (ORCA) and SGMA, 1997, page 15.

[4]Minnesota Department of Natural Resources (DNR) data. Kayaks longer than 12 feet touring kayaks and those 12 feet or less were considered white water kayaks. Water feet in length (as are many of the new designs of white water kayaks) do not have t DNR, so growth in this segment is not represented.

account for a larger portion of kayak growth in Minnesota, the growth in both types of kayaks eclipse all other types of water craft including motor boats and traditional canoes.

Regional commercial white water rafting participation trends have also been upward. Minnesota Canoe Association estimates that both kayak and rafting paddlers visited the St. Louis River and the Kettle River, the two white water venues closest to Minneapolis-St. Paul, approximately 11,000 times in 1998.[5] Superior White water Raft Tours draws heavily from the Minneapolis-St. Paul area for its customer base and conducts rafting trips on both the St. Louis and the Kettle Rivers. According to Superior White water, commercial business has been good and it has grown over the past five years. Superior White water anticipates that this trend would continue, all things being equal.

One way that outdoor retailers build their white water markets is by assisting paddle sports groups in building their membership, sponsoring white water paddling events and encouraging training. Paddling groups and organizations in Minnesota have about 1,300 members, many of whom live in the Minneapolis-St. Paul area.[6] Midwest Mountaineering suggested that many white water paddlers in Minnesota could be independent of white water membership groups. Midwest Mountaineering's annual "Canoe Event and Outdoor Adventure Expo" drew almost 9,000 people over three days in 1998.

Outdoor recreation retailers in the Minneapolis St. Paul area generally agree that demand would swell immediately and prodigiously, perhaps as much as 50% in the first year, if a white water venue were located in the Minneapolis-St. Paul area. The fact that community water parks in the suburbs of Minneapolis-St. Paul drew almost 1 million visitors in 1998, attests to the vast potential for users, and therefore sales of goods and services, of a white water park.[7]

3.B.1.2. DEMAND: WHO THE CUSTOMERS ARE

Drawing from the data of the National Survey on Recreation and the Environment, SGMA and the USDA Forest Service identified seven ***national market*** segments with varying levels of paddle sports participation. The seven segments range from virtually inactive to highly active people, all of whom engaged in a paddling activity at least once in 1995. When aggregated, these seven segments represent the general paddle sports market (see Appendix 3-1).

[5]Estimate of Minnesota Canoe Association. Paddlers making multiple trips were coun

[6]This figure does not account for double counts, or paddlers who belong to more tha

[7]Does not account for multiple visits by the same individual.

Table 3
General Paddle Sports Market Characteristics

Characteristic	
Total Number in Participation (in millions)	31.96
Canoeing	14.08
Kayaking	2.63
Floating and Rafting	15.25
Age group	
16-24	21.6%
25-39	39.3%
40-54	23.0%
Over 54	16.1%
Gender	
Female	45.4%
Male	54.6%
Household Income	
<$15,000	7.3%
$15,000-24,999	14.2%
$25,000-49,999	39.7%
$50,000-74,999	22.3%
$75,000+	16.4%
Educational Attainment	
Some High School	11.0%
High School	27.5%
Some College or Trade School	30.2%
College	31.2%
Number of Household Vehicles	
None	2.2%
One	19.1%
Two	43.2%
Three or more	35.6%

Source: Emerging Markets for Outdoor Recreation in the United States, SGMA and USDA, 1997.

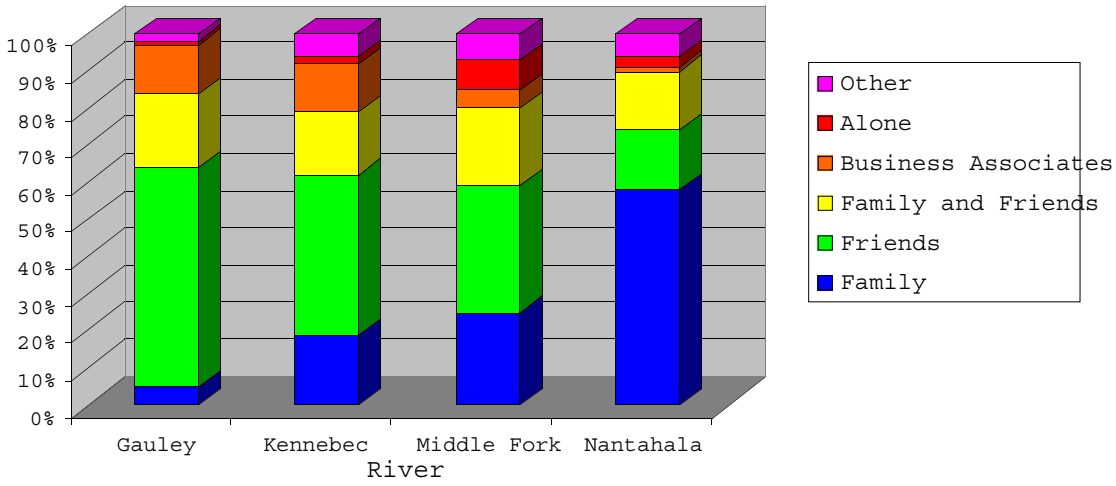
Note: General paddle sports market percentages are derived from proportional distribution of all market segments.

Table 3 demonstrates some demographic characteristics of all paddlers in 1996. Age, gender and educational attainment groups are fairly evenly distributed, though the percentage of paddlers in the 25-39 age group are more represented and those over 54 are less so. Race, income and vehicular access are less evenly distributed and these factors tend to be endemic to all outdoor sports, not just paddling. In that vein, there is a strong push on the part of outdoor recreation associations and organizations to reach out to groups that are currently under-represented.

Enthusiasts are people participating in paddle sports at least five full days per year. Though they represent only 24.6 percent of all paddlers, they account for the majority (74.2 percent) of paddle sports activity (see Table 1). The

resemblance of the enthusiast to the general paddle sports market is fairly strong (see Appendix 3-2). But unlike the general market, the enthusiast market includes a greater proportion of young adults, teenagers and people whose households have three or more cars.

Figure 3. Whitewater Rafting Participation by User Group



Source: USDA Forest Service, River Study Pilot Data, 1994.

White water rafting comprises the bulk of white water paddling participation. While kayakers are the fastest growing segment of the paddle sports market, they still comprise a small portion of the paddle sports market. Meanwhile most, but not all, canoeists are flat water paddlers. A focus on different kinds of rafting participants sheds light on critical variables that influence rafting customers' decisions to use different venues. The kinds of customers white water rivers attract vary depending on the location of the river, the difficulty of the run and the price charged for rafting on it. Figure 3 illustrates the differences in user composition among four rivers in the United States. Table 4 shows how user profiles vary according to river as well. Each one has unique features that contribute to its user composition trends and profiles.

Several factors contribute to the low incidence of family participation at the Gauley River in West Virginia. The Gauley is fairly isolated; a rafting trip takes an entire day, and both sections of the Gauley are very difficult — Class IV to V in the upper section and Class III to IV in the lower section (white water rapids are graded from Class I to Class VI in difficulty with I being the mildest and VI the most difficult). Rafting participants, as well as guides, must be experienced paddlers in order to raft on the Gauley. In combination, those two factors create a third — cost. A day trip on the Gauley starts at $120. The difficulty level may also explain the lower incidence of female rafters who choose to paddle the Gauley.

Table 4

Characteristics of Whitewater Rafters by River

	Gauley	Kennebec	Middle Fork	Nantahala	AVERAGE
Age group					
16-24	1%	29%	2%	9%	10%
25-35	47%	36%	18%	21%	31%
36-45	25%	19%	28%	40%	28%
46-55	13%	12%	28%	20%	18%
55+	1%	4%	24%	10%	10%
Gender					
Female	25%	50%	31%	41%	37%
Male	75%	50%	69%	59%	63%
Household Income					
<$40,000	34%	42%	13%	28%	29%
$40,000-65,000	29%	26%	14%	36%	26%
$65,000-95,000	22%	19%	18%	23%	21%
$95,000 +	15%	12%	55%	13%	24%
Educational Attainment					
High School or less	10%	17%	2%	11%	10%
Some College or Trade School	22%	22%	11%	26%	20%
College	40%	37%	33%	30%	35%
Graduate Degree	28%	24%	54%	33%	35%

Source: USDA Forest Service, 1993 River Study Pilot Data; Emerging Markets for Outdoor Recreation in the United States, SGMA and USDA, 1997.

Note: *includes tubers and floaters.

The Kennebec River in Maine appears to attract a larger number of youth, women and lower income users than the other rivers highlighted. According to the survey team, this may be attributed to serendipity alone, but one of the major outfitters on the Kennebec does market to youth and school programs more than others do. With trips starting at $50, the prices of rafting the Kennebec make it more available to a diverse group of customers.

Meanwhile, the Middle Fork of the Salmon River in Idaho appears to attract an unusual amount of wealthy and well-educated users. This can be attributed to the extremely isolated location and length of the run. A rafting trip on the Middle Fork lasts three to six days which increases the costs of rafting as well as getting to the river.

At the other end of the spectrum, the Nantahala is a Class II run that does not even require guides. A run down the Nantahala usually lasts about 3 hours or less. Even though the location of the Nantahala is a little remote, its prices — starting at $13 — and difficulty level make it the most-used river of the four highlighted here.

The existing ***regional market*** appears to have a dedicated core of existing kayakers and a large, diverse pool of potential rafters. The proposed white water park in Minneapolis would be highly accessible to a diverse market in terms of location, cost and course difficulty. The urban setting of the proposed park places it in the middle of a substantial population of potential users who have limited access to more isolated, natural rivers. The location also brings white water concessionaires in contact with potential urban customers that they tend to have difficulty reaching.

The speed and volume of water flow, and therefore the difficulty, at the proposed white water course would be controlled and could be altered to suit different user groups. This feature of artificial courses widens the appeal the course would have to different kinds of white water users. Also, the course would not be subject to low water levels during the summer except perhaps a few weeks during very low water years. In contrast, most natural white water rivers are unrunnable during the summer.

The cost of using the course has not been determined and could depend on the program under which a user comes to the course. Using the market rate for a daily entrance fee at several artificial courses in the U.S. and abroad, about $12, the proposed course fee appears to be fairly reasonable when compared with other white water trip fees (See Appendix 3-3). Non-profit programs could cost less and private concessionaire programs run on the course could cost more.

The ***immediate community*** surrounding the proposed white water park is also a customer of sorts since it would bear the brunt of both positive and negative externalities associated with the site. Despite their concerns about traffic and parking filtering into the neighborhoods, there appears to be the political will for the white water park to be developed within the St. Anthony's Falls area. Many residents of the adjacent neighborhoods seem to reason that the possible inconveniences associated with occasional special events would be outweighed by access to a body of water for recreation, which many other parts of the Minneapolis-St. Paul area already have.

Currently, the Mississippi River does not have a "hot spot" for the visitors and the community to enjoy a variety of leisure and recreational pursuits. Because of the band of industrial land use at the river's edge, people do not have direct access to the river. The proposed white water park could generate interest and investment in the St. Anthony's Falls area, and bring increased access to the river for the adjacent neighborhoods. The proposed white water course could host associated programs and amenities suggested at the public meetings (see Chapter 2). These passive and active amenities, like a climbing wall, bike trail, picnic areas or paved walking trails, will further broaden the market of users for the park.

Community centers with associated water amenities, like Shoreview Community Water Park and St. Louis Park Water Park, in the Minneapolis-St. Paul region have experienced a great deal of success in the past five years. Some public meeting participants believe that a white water park will tap into an intrinsically

Minnesotan desire to be in and near the water. These centers include aquatic facilities, but these aquatic facilities are not the focal point for the centers. The primary function of the facilities is to serve as community centers, not just as recreational facilities. Appendix 3-4 outlines profiles of three such community centers. When compared with the white water parks of Appendix 3-3, it is clear that the community centers, though popular, are a different kind of product in terms of season, budget, price, associated amenities / programs and events.

The white water park would be a unique facility within the state of Minnesota and have few peers within the nation.

3.B.1.3. DEMAND: COMPETITION AND EVENTS

Paddling events are an important vehicle for promoting a white water venue and increasing its attendance throughout the year. Though the economic impact of an event is short-lived, the long-term recognition of the venue will reap dividends in the future. Though high-level competitive events in the United States are usually held in rural areas or small towns, they can draw as many as 2,000 visitors. Events held in an urban area like the Twin Cities could draw even more visitors for regional or national level events.

Events can be classified first by competitive level (international, national and regional / local) and then by paddle sport genre (slalom, wild water and rodeo). Slalom races are the most traditional form of white water racing. Slalom competitors maneuver through a series of gates along the course and are penalized if they touch or miss them. Wild water races do not have any gates and competitors race down the course in pursuit of the fastest time possible. The newest competitive white water event, rodeos, revolve around surfing the holes generated where water falls and circulates at sharp drops in the riverbed. Rodeos are perhaps the most entertaining white water events for non-paddling spectators.

The International Canoe Federation (ICF) usually oversees international events. ICF has several classifications of races, but only two, wild water and slalom, take place on white water courses. In 1998, individual World Cup races drew up to 4,000 spectators.[8] The courses are chosen by ICF with input from its affiliated national associations around the world. Table 5 shows the locations of 13 major ICF international competitions for 1998.

[8]Based on attendance for the fourth World Cup race in Wausau, WI and the final race Spain. Both races drew approximately 4,000 spectators according to course operators

Table 5
International Canoe Federation Events, 1998

Event	Location
Slalom	
World Cup 1	Liptovsky Miklulas
World Cup 2	Tacen, Slovenia
World Cup 3	Augsburg, Germany
World Cup 4	Wausau, USA
World Cup Final	La Seu d'Urgall, Spain
World Championships for Juniors	Lofer, Austria
2nd University Championships	Metz, France
Wildwater	
World Championships for Seniors	Garmisch-Partenkirchen, Germany
World Cup 1-2	Mezzana Caldes, Italy
World Cup 3-4	Muothal, Switzerland
World Cup Final	Lofer, Austria
World Championships for Juniors	Lofer, Austria
1st University Championships	Metz, France

Source: ICF Calender from www.worldsport.com/calender/federation43_en.html
Note: Table does not include flatwater, polo or marathon events which do not t place on whitewater courses.

Locations for final events are chosen two to three years in advance and sites for other major races are chosen about one to two years ahead. Four locations — Augsburg, Germany; Bratislava, Slovakia; Le Seu d'Urgell, Spain; and Tacen, Slovenia — have recently hosted ICF international events for two or more consecutive years. Because Eastern Europe has a strong competitive environment for white water sports, it is not surprising that events tend to locate and relocate in that vicinity.

Because white water rodeos are still fairly new, international competition takes place biannually and planning begins two to three years in advance. International rodeo events are currently organized by the National Organization of White water Rodeos (NOWR) based in the United States.

Major U.S. national events are overseen by two primary governing bodies, the United States Canoe and Kayak Team (USCKT) and NOWR. These groups focus on different aspects of paddling with NOWR focusing on rodeo and USCKT primarily focusing on wild water and slalom. Table 6 lists major national events for three genres of white water paddling in the U.S.— rodeo, slalom, and wild water.

Table 6

Major US Whitewater Canoe and Kayak Events, 1998

Event	Location	Affiliation
Rodeo		
US Team Trials (1997)	Rock Island, TN	NOWR
US Team Trials (1997)	Burns, CO	NOWR
Wausau Whitewater Rodeo	Wausau, WI	NOWR
Bigfork Whitewater Rodeo	Bigfork, MT	NOWR
Kern River Festival	Kernville, CA	NOWR
Slalom		
US National Team Trials	Wausau, WI	USCKT
US Junior Team Trials	Webster, NH	USCKT
US National Championships	South Bend, IN	USCKT
Open Canoe Slalom Nationals	Arkansas River, CO	ACA
Wildwater		
Open Canoe Downriver Nationals	Golden, CO	ACA
US National Championships	Salida, CO	USCKT
US National Team Trials	White Salmon, WA	USCKT
US National Team Trials	Kernville, CA	ACA

Sources: National Organization of Whitewater Rodeos (NOWR) circuit calender from www.nowr.org/events/1998/index.htm; Amercian Canoe Association (ACA) 1998 national event schedule from www.aca-paddler.org/98events.htm; and United St Canoe and Kayak Team (USCKT) competition guide database.

Note: National and international events are held biannually. Major NOWR local rod are those that usually draw 2,000 or more spectators.

US national white water slalom and wild water events travel around the country. Proceeds from these events usually go to either an environmental cause or toward the administration of the sponsoring organization. Slalom and wild water team training also brings paddlers to specific sites regularly. Training leases usually cover the costs of operating the course during practices.

National championships for rodeo events take place biannually as do international rodeo championships. Regional rodeo competitions tend to be held annually at the same locations, usually as fund raisers for environmental organizations or causes. These events concentrate activity and spectators to a single area along the river and require fewer volunteers. A few local rodeos, such as the Bigfork White water Festival in Bigfork, Montana, can draw more than 2,000 visitors.

There are more than 70 slalom, 30 wild water and 30 rodeo events held at the local or regional level each year. Each year about 25 white water festivals or double headers host multiple kinds of events simultaneously. Local and regional events tend to stay in one location year after year. Depending on the level of organization and marketing, a local or regional event can draw between 100 and 2,000 people.

University events are still coming of age in both the U.S. and abroad. Only two university championships have been held in Europe. USCKT continues to work with a handful of U.S. university white water club teams to develop competitive university events.

Should a white water park be developed in Minneapolis, it is conceivable that the park could host several events each year. Major international events could occur every other year at the most, while major national events could occur more frequently. International and national event locations are usually decided a few years in advance, so a new venue would have to wait two to three years before hosting its first major events. A white water venue is also becoming increasingly important for cities that hope to host high profile international competitions like the Olympics, the Pan Am Games or the Goodwill Games. These kinds of events would occur at a white water venue perhaps once every ten to twenty years.

White water events held at the University of Minnesota's Kayak and Canoe Institute (KCI), a white water site on the St. Louis River, were important for drawing out-of-state visitors. The events during the 1993-1994 season including international competitions and were of a higher caliber than those in more recent years. When the St. Louis was on an international slalom event circuit, out-of-state visitor participation ranged between 55% and 48% and the economic impact for 1993-1994 was ($1.29 million). Since the discontinuation of the event, annual out-of-state visitation has dropped to around 35%.[9] The 1993-1994 season showed more than eight times the economic impact as last year's 1997-1998 season ($150,000).[10]

Depending on volunteer support and the growth of the sport in the region, the proposed white water park could host as many as three regional or local major competitive events (i.e., championships) annually.[11] Local associations provide critical support for winning and staging events. Paddling clubs, particularly those with national and international affiliations, are able to market their venues within the sport to draw competitions and recognition to their venue. Club members also offer volunteers and logistical support integral to the execution of events. Several white water paddling clubs serve the Minneapolis-St. Paul area. Among them are:

- Minnesota Canoe Association - 1,002 members,
- American Canoe Association - 95 Minnesota members,
- Rapids Riders White water Canoe and Kayak Club - approximately 180 members,
- Cascades White water Club - approximately 60 members, and
- Minnesota Rivers Outing Club - approximately 20 paddling members.

[9]University of Minnesota Duluth Kayak and Canoe Institute data.

[10]*Agency Review*, Minnesota Amateur Sports Commission, 1999, page 27.

[11]Frequent small events could take place among local schools and paddling clubs, perhaps even on a weekly basis. Major events would be planned to accommodate much greater numbers of spectators.

In addition to special events, membership groups offer a continuous demand for white water training and recreation throughout the year. Training leases are usually not money makers, but youth and collegiate paddling training helps to develop the sport within a region and provide strong base of recreational white water paddlers into the future.

3.B.1.4. SUPPLY: NATURAL RIVERS AND ARTIFICIAL VENUES

Opportunities to paddle on ***U.S. white water venues*** are numerous. Nationally, there are over 1,000 white water rivers suitable for white water paddling.[12] Though natural rivers are virtually cost-free to run, paddlers must often contend with restricted access, seasonal dry spells, and considerable travel time from population centers to rivers.

In addition to these natural rivers, there are four artificial white water venues in the US. This is relatively few when compared with more than 20 sites in Eastern and Central Europe. It should be noted that U.S. National Team Coach, Bob Campbell, attributes European dominance of white water racing, in part, to their access to artificial venues for training.[13]

Table 7 compares key figures of three U.S. courses and three of the most prestigious white water courses in Europe. Interestingly, once exchange rates and inflation have been accounted for, most artificial venues range between four and eight million U.S. dollars to construct.

Lower U.S. attendance is not necessarily indicative of lower demand since U.S. courses are not open as regularly as European courses during the high summer seasons. Both Ocoee and the Wausau courses must compete with power generation companies for water flows. Because power companies rely on water generated power for revenue, water releases for paddling at the Ocoee and Wausau are open no more than 20 days per year collectively. In that short time combined attendance at both courses reaches only about 27,000. Likewise, the South Bend course is only open for 15 hours per week during the high season, and still draws 14,000 visitors each summer.

[12]American White water Affiliation, Rivers Inventory.

[13]Campbell, Robert, A Glance at the Elite U.S. Slalom National Team, Canoe and Kay
December 1998, page 12.

Table 7
Artificial Whitewater Venues in the U.S. and Abroad

Location	Built	Cost of Construction in 1998 US Dollars	Recreational Attendance 1998	Special Event Attendance 1998	Operating Budget 1998
USA					
Wausau, Wisconsin	1974	$1,652,130	120*	6,850	$60,000
South Bend, Indiana *	1984	$7,055,342	14,000	1,250	$81,000
Ocoee River, Tennessee	1995	$4,275,591	27,000	1,375**	$52,000
Europe					
Augsburg, Germany	1971	$4,022,222	46,000	N/A	N/A
Nottingham, United Kingdom	1986	$4,957,786	100,000	N/A	N/A
Le Seu d'Urgall, Spain	1992	$7,930,200	60,000	N/A	$972,000

Sources: Individual interviews with park adminstrators.
Mississippi Whitewater Park Development Corporation, "Whitewater Parks Worldwide," 1998.

Notes: Ocoee and Wausau courses are natural rivers that have been altered for paddle sports use.
* 1998 operating budget N/A, 1997 figure.
** The Ocoee course hosted more than 42,000 people over three days during the 1996 Olympic games.
Attendance figures only for course users. For example the Ocoee River draws around 300,000 recreational tourists immedia course.
Original construction costs were coverted to US dollars for the year of original construction and then adjusted for infla first eleven months.
Rarely open to the public.

Appendix 3-3 provides a more detailed survey of these courses. In both the U.S. and abroad, marketing, management, frequency of headwater releases and course quality seem to influence attendance most. Because the flows of artificial venues are easier to control, the attraction for competitions, planned sometimes years in advance, seems obvious. But despite the distinct advantages of artificial venues over natural courses, artificial venues almost always cost more to operate than a natural river. However, user fees can partially or fully offset operating costs.

Paddlers generally reason that they must spend at least as much time on the water as the road. Paddlers also contend with low water levels during the summer when the air and water temperatures are best for recreational paddling. This travel time to paddling time ratio, plus seasonality of water flow generally limits ***Minneapolis-St. Paul white water venues*** to two natural rivers and two artificial venues in the summertime. Attendees at the public meetings about the proposed white water park indicated that they would like to paddle on weekdays, but no white water paddling venues exist within that distance.

The two natural venues, the St. Louis River and the Kettle River, are both two to three hours from the Twin Cities and attract recreational white water paddlers on the weekends. The Kettle and the St. Louis are the most popular of all the 542 miles of natural white water rivers in Minnesota.[14] The Minnesota Canoe Association estimates that the St. Louis River attracts 4,000 hard-boat (canoe and kayak) users and about 5,000 rafting users each year, while the Kettle River attracts a total of about 1,850 users each year.[15] The University of Minnesota at Duluth's KCI has a good reputation among paddlers nationally and within its

[14]See Appendix 3-5 for American White water Affiliation s inventory of natural white Minnesota.

[15]User trip counts do not distinguish double counted users from one-time users.

local community for providing instruction and access to the St. Louis River. Private rafting companies also operate on the St. Louis River.

When driving, the artificial venues at South Bend and Wausau are actually further than the unofficial paddlers' standard — even on weekends. However, people wishing to use the artificial courses for training or competitions will begrudgingly travel the distances of more than eight hours when necessary. This fact proved a source of grumbling among paddlers at the public meetings held January 15 and 16. A few parents expressed their desire for their children to be able to train competitively closer to home than having to travel as far as Wausau, Wisconsin to do so.

Swift water rescue professionals and volunteers also expressed their desire to train closer to home, if possible. Rescue training is best conducted in the controlled environment that an artificial white water course offers. Minnesota swift water rescue training sometimes takes place at the East Raceway Course in South Bend, Indiana. An artificial venue could complement the new fire and rescue training facility in northeast Minneapolis. Rescue groups from throughout the Midwest also train in South Bend. Some of these out-of-state groups would find it more convenient to travel to Minneapolis for comprehensive fire and rescue training.

3.B.2. SYNTHESIS OF WHITE WATER INDUSTRY TRENDS

In summary, the existing Minnesota white water market is fairly small and imitates the national market in terms of growth and customer demographics. The Minneapolis-St. Paul metro area potentially has a broader customer base that includes both typical paddlers and groups to whom outdoor recreationalists would like to reach out. The urban setting of the proposed white water park would facilitate this kind of outreach to an extent than has been not been possible at any other white water location. The adjustable water flow, urban location and fairly low prices of a white water park could appeal to diverse groups such as college students, at-risk youth, and corporate team building.

White water events bring exposure to the sport and temporary influxes of tourist spending to the local economy. Once established in paddle sports, world class white water courses can expect to host one international event and two national events every two years. If there is a committed core of paddling event organizers locally, such a site could expect to hold up to three local or regional events each year and possibly host a competitive paddling team.

The current supply of white water paddling opportunities is not meeting the demands of local paddlers. Swift water rescuers and recreational paddlers currently travel from an hour to more than eight hours in order to train and gain experience on white water venues. The presence of a white water park could also induce demand among other people within the community and provide a significant focus for revitalization and restoration of the waterfront and the St. Anthony's Falls area.

3.B.3. SPENDING AND SPINOFF: IMPACTS OF A WHITE WATER COURSE

3.B.3.1. ECONOMIC IMPLICATIONS

The principal area of direct economic impact would be the immediate neighborhood and the commercial district of St. Anthony's Falls. Visitors could spend money in the area and spur revitalization nearby. The quantifiable impacts to the state and metropolitan area economies would be less. However, a unique amenity, such as a white water park, can increase the visibility and appeal of Minneapolis.

3.B.3.2. ESTIMATING VISITOR SPENDING

There has not been a great deal of quantitative research on the economic impacts of white water paddling. Occasional local or regional studies have been attempted, but they hinge primarily on direct surveys of paddlers intercepted en route to the river. A survey of white water paddlers for Minnesota was not possible because of the season during which the report was prepared (winter), limited time and limited funds.

3.B.3.3. DIRECT SPENDING

Estimating economic impacts is fairly subjective in nature. For this reason, three different methods were used to estimate the potential direct expenditures of white water course users. Comparing the three methods shows that results vary depending on data parameters and assumptions. The methods show that user spending in the area could range from $700,000 to $3.2 million annually. Because each method mixes and matches data sources, the resulting figures *should not* be considered absolutes, but rather as *general* indicators. The assumptions of each method are offered to help explain their differences. All the methods:

- Use the same basic formula,
- Calculate the number out-of-state and in-state visitors,
- Use the same average spending per day figures,
- Assume a $12 entrance fee to the park, and
- Assume a 32 week season for the proposed white water park.

The basic formula of number of visitors per year multiplied by average visitor spending per day is:

ANNUAL VISITORS X DAILY VISITOR SPENDING = DIRECT ANNUAL EXPENDITURES

The proportion of out-of-state to in-state users is based on Minnesota Amateur Sports Association (MASC)/ University of Minnesota Duluth's Kayak and Canoe Institute (KCI) data. KCI has found that in the years where there are no international events, out-state visitors usually account for no more than 44% of annual users. Because of the proposed park's location in the urban Minneapolis-

St. Paul area, there may be a greater proportion of local users. Therefore, the out-of-state proportion was reduced to 20% for the first two methods.[16]

The average spending per day figures, $10 per day for in-state visitors, $24 per day for out-of-state visitors staying with friends and $57 per day for out-of-state visitors staying in lodging establishments, are derived from the *1998 Spring/Summer Survey* of the Minnesota Office of Tourism.[17] The in-state figure, reduced from the official statistic of $20 per day, also tries to account for the fact that most in-state users would be located within the metro-area and likely spend money only on gas and possibly food or drink.

This basic formula also assumes a one to one correspondence between the number of visitors and the number of days the visitor spends in Minnesota. Some visitors may spend more than one day touring, though not white water paddling. This can result in underestimation of spending impacts. Some users may return to the site repeatedly and are double counted. While this may contribute to overestimation of impacts, it is likely offset by repeated expenditures by the same individuals.

With regard to visitor seasons, the high season of Memorial Day to Labor Day is shorter (14 weeks) than the shoulder season during the early spring and late fall (18 weeks). They are *not* accounted separately in this analysis. This decision resulted from an interview with a representative from the Minnesota Office of Tourism, who indicated that, in Minnesota, outdoor activity is so great during the high season that it offsets lower participation during the shoulder season. Additionally, the proximity of university students during the shoulder season — when classes are in session — helps to offset lower participation by other demographic groups during the shoulder season.

Each of the following methods differs primarily in how they estimate the number of visitors to the proposed park. Appendix 3-6 outlines each method in detail.

Method 1: Total annual direct spending: $3,185,408

This method estimates the number of out-of-state white water paddlers based on the rafting data from the fifteen major rivers in Table 2. The annual number of users at each of the fifteen major rivers was averaged and that average was assumed for the proposed white water course. The national ratio of rafters to kayakers was than applied to this figure to produce an estimate for kayak users.

[16] According to Minnesota Office of Tourism, about 20% of visitors to the Mall of America are from out of state. Because of the Mall's popularity, this seemed a fairly generous estimate.

[17] Minnesota Office of Tourism, *Spring/Summer Survey*, 1998. The *Survey* indicates that in-state travelers spend, on average, $36 per day if they use lodging and $20 per day if they stay with friends or relatives. This figure has been reduced to $10 per day because the urban location of the proposed park would draw more residents than travelers, the group for which the original figure has been posited. Out-of-state travelers spend $57 per day if they use lodging and $24 per day if they stay with friends or relatives. Half of the out-of-state visitors were attributed to each category.

Together, these figures comprise the total number of projected annual users. The resulting estimate of total visitors coming to the park was then multiplied by the park entrance fee and the visitor spending data.

Method 2 Total direct annual spending: $1,333,264

This method uses the median daily visitation of the European courses in Table 7 to gauge expected visitor attendance. American courses were excluded because of their restricted access. The course at Augsburg, the Eiskanal, was the median with an average of 205 visitors each day. The median for annual attendance, Parc Olympic del Segre in Le Seu d'Urgell, has the lowest per day average of the European courses because it is open year-round. The Nottingham course's attendance estimate is the highest but it includes spectators in addition to course users. In-state and out-of-state visitors are divided proportionally, and then multiplied by the park entrance fee and the visitor spending data.

Method 3: Total direct annual spending: $692,848

The base calculations for this method are a combination of boaters and rafters on the St. Louis River but from two different sources, one public and the other an estimate. Because of the more remote location of the St. Louis River, the resulting figure is probably an underestimate for the proposed white water park. It does, however, provide something of a rock-bottom from which to view other estimation methods.

Table 8 compares the estimated expenditures of users according to each method.

Given the rising demand for rafting shown in Table 2, course use in Minneapolis could possibly equal that estimated in Method 1. The proposed course's location within a major metropolitan area and relatively low expected user fees could draw more users than the more popular natural rivers. However, Method 1 does have a drawback. The proposed artificial course would have a lower carrying capacity than most of the natural rivers used in estimating with Method 1. Therefore, they may not be a likely to host as many users in a year.[18]

[18]Despite their greater carrying capacity, many of the natural rivers have governmentally enforced user limits to prevent overcrowding.

Table 9

Estimated Annual Direct Expenditures Generated by Proposed Whitewater Course

	Method of Estimation		
	1	2	3
Whitewater Course Users			
User Days	111,837	45,920	18,368
Out-of-State	22,367	9,184	8,064
In-State	89,470	36,736	10,304
User Fees	1,342,044	551,040	220,416
Out-of-State	268,404	110,208	96,768
In-State	1,073,640	440,832	123,648
User Spending	1,800,564	739,424	429,632
Out-of-State	905,864	372,064	326,592
In-State	894,700	367,360	103,040
Total User Spending	3,142,608	1,290,464	650,048
Out-of-State	1,174,268	482,272	423,360
In-State	1,968,340	808,192	226,688
Event Spectators			
Spectator Attendance	** 2,000	2,000	2,000
Out-of-State*	700	700	700
In-State	1,300	1,300	1,300
Spectator Spending	42,800	42,800	42,800
Out-of-State	16,800	16,800	16,800
In-State	26,000	26,000	26,000
Total Estimated Visitor Spending			
Out-of-State	1,191,068	499,072	440,160
In-State	1,994,340	834,192	252,688
TOTAL	3,185,408	1,333,264	692,848

Sources: American Whitewater Affiliation; Minnesota Office of Tourism, Spring/Summe Survey, 1998; Outdoor Recreation Coalition of America, Emerging Markets; TIA Travel Survey; Domestic Pleasure Travel in Minnesota - Regional Analysis, 1997; University of Minnesota at Duluth's Kayak and Canoe Institute; University of Colorado at Boulder; interviews with whitewater course operators.

* 35% of total, based on University of Minnesota, Duluth's Kayak and Canoe Institut

** Total attendance based on estimated attendance for 1 national event, 1,500 spect 2 regional events, 250 spectators each. This is a conservative estimate of the bot attendance and event draws. Not included are international events which would draw considerably more spectators, but are unlikely to occur annually.

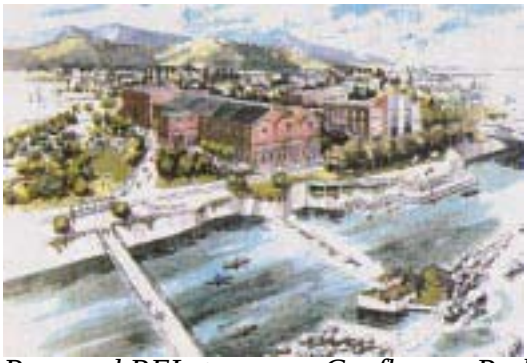
Of all the methods used, Method 2 seems to be the most reliable because it represents the experience of real-life water parks. Since the comparable white water courses used in Method 2 are located in less urban areas than Minneapolis-St. Paul, the $1.3 million estimate of Method 2 seems fairly conservative. This figure is twice the annual average of $646,000 that Minnesota Amateur Sports Association (MASC) estimates economic impact for the peak year of the two-year

period at KCI, 1993-1994, when international events generated high visitor counts. MASC used the same general equation shown on page 20, but relied on different underlying assumptions.[19] When taking into account the differences in location and difficulty, between the proposed park and KCI (the urban location and controlled flow creating a larger market at the proposed park), the result from Method 2 again could be fairly reasonable, though MASC prefers the result from Method 3.[20]

In summary, Method 1 is optimistic but possible, while Method 2 presents a more conservative scenario and Method 3 presents a very conservative view of user participation and impact. Based on the range of the three methods and the assumptions each one makes, it seems likely that the annual impact of the proposed white water course could range from $2 million to $2.5 million, between the method 1 and 2 estimates.

3.B.3.4. Effects of Increased Spending on the Surrounding Community

The direct spending of a single event can produce a wave of local merchant sales and short-term employment in the immediate vicinity of the park. The spending brought in by events dissipates generally over time. In contrast, a white water park with ongoing operations, programs and events can generate jobs and businesses year-round both directly and through increased spending and investment in the surrounding area. Increased investment can also lead to rising property values and public improvements of existing infrastructure. The East Race Waterway course in South Bend, Indiana contributed significantly to the revitalization of part of the city by attracting private sector investment in the area.



Proposed REI store near Confluence Park on the South Platte River, Denver, Colorado

[19]MASC also derives its economic impact by multiplying the number of out-of state visitors by a standard estimate for visitor spending. MASC's standard for out-of-state visitor spending was $100 per user day including lodging expenses and $0 per user day for in-state.

[20]MASC's preference rests with its estimation of low economic impact at the Carlton site for 1998, $77,000 when compared with the impact of its most successful site, Giants Ridge golf and ski resort. The estimated impact of the ski resort for 1998 was $6.5 million and had more than eight times the number of visitors that the Carlton white water site had.

3.B.3.5. ADDITIONAL ECONOMIC IMPACTS

Additional positive impacts resulting from the proposed white water facility include:

- Induced demand,
- Additional visitors who seek only to use the public park to be near the course, and
- Name recognition and notoriety for the Twin Cities.

Spin-off economic effects from the proposed white water park include induced demand. When a new product enters the market, it often appeals to people to whom it had never been introduced. This translates into new, or induced, demand. Given the urban location, the course is likely to induce demand from diverse demographic groups. By introducing more people to the sport, the course will stimulate rafting and kayaking in other parts of the state and bolster the adventure tourism industry in Minnesota.

The proposed white water park could also encourage paddlers living nearby to paddle more often. Paddlers from the Washington, DC area report that local paddlers use the nearby Potomac River between 10-20 times more often than they do sites out of the metro area. Because the proposed white water park in Minneapolis-St. Paul is fee-based, the ratio would probably be lower, perhaps five to ten times more often. Nonetheless, even a fivefold increase in local paddler activity would represent a significant amount of induced demand.

Non-paddling visitors, exclusive of events, would likely increase as well. Data from the St. Louis River show non-paddling visitors often exceed the number of paddlers by more than 100%. Events can influence the number of visitors even after the events have occurred. This spin-off impact will likely be experienced in the immediate neighborhood and throughout the city. In the immediate neighborhood, more dollars would be spent at restaurants and retail stores.

For the city, the course would provide a unique element to the city's identity. Many cities have sought to create urban entertainment centers with amenities such as festival marketplaces and aquariums. However, some of these facilities have experienced limited success as more cities adopt the same concept. In contrast, an international caliber white water course is a distinct amenity that would set Minneapolis-St. Paul apart.

3.B.4. SUMMARY

The principal area of direct economic impact would be the immediate neighborhood and the commercial district of St. Anthony's Falls. The impacts are primarily based on commercial rafting in the United States (method 1 projection) and the experiences of artificial courses in Europe (method 2 projection). Based on these two projections, CUED estimates an economic impact of $2 to $2.5 million annually. These impacts include both visitor spending and course user fees. About 30%-35% of the spending is expected to come from out-of-state visitors to the course.

We project paying attendance to range from 60,000 to 80,000 annually. However, to be conservative in making financial projections, we show first year paying attendance of 50,000. This is projected to grow over a ten-year period.

The projections exclude impacts from nonpaying visitors and the impact of the course on the image and appeal of the Minneapolis/St. Paul area. The park is likely to attract many nonpaying visitors that will help stimulate the neighborhood economy. The metropolitan area can also benefit. Besides attracting out-of-town visitors, the area will benefit from the presence of an attraction that is exciting and unique for an urban area.

3.C. SITE IMPACTS

The following documents were used to develop these observations:

University of Minnesota Steam Services Facilities, Final EIS, Complete Version with Revisions, MEQB, September, 1995

University of Minnesota Steam Services Facilities, EIS, Report to the Minnesota Legislature, MEQB, January, 1996

Water Quality Study, University of Minnesota Steam Services, Minneapolis and St. Paul Campus Facilities, Minneapolis and St. Paul, Minnesota. Prepared for MEQB by B. A. Liesch Associates, September 1994.

Soil and Groundwater Contamination Site Assessments-University of Minnesota Steam Services, Proposed Riverfront and Alternative Sites, Minneapolis, Minnesota. Prepared for MEQB by B. A. Liesch Associates, October 1994.

3.C.1. UTILITIES

Loucks & Associates, Inc. compiled an existing master utility plan based on documents from the City of Minneapolis Department of Public Works, the University of Minnesota, and the Minnesota Department of Transportation. Visual site observations were made to determine accuracy of these various drawings but a topographic field survey was not completed. The following are the existing utilities contained within the project area and potential impacts of the proposed plan.

3.C.1.1. SANITARY SEWER

An existing eight (8) inch sanitary sewer line that serves the Tandem Accelerator Laboratory connects to a lift station at the bottom of the access road near the Heating Plant. The sewer line generally follows the alignment of the lower existing service road.

Impacts to Sanitary Sewer

The course alignment will require the relocation of the existing sanitary sewer service to the Tandem Accelerator Laboratory. A new sanitary sewer line can be constructed closer to the toe of the bluff and the old sanitary sewer can be removed.

3.C.1.2. WATER

An existing six (6) inch water main serves the Tandem Accelerator Laboratory. The water line generally follows the alignment of the lower existing service road and runs to the Heat Plant building.

A fifty-four (54) inch water main is suspended from the 10th Avenue bridge and drops vertically to an underground water main at the first pier north of the river. After going underground, the water main heads diagonally in a northeasterly

direction. The water main is approximately seven (7) feet deep within the proposed channel area and transitions into a tunnel system as it enters the bluff.

Impacts to Water Main

The course alignment will require the relocation of the existing water main service to the Tandem Accelerator Laboratory. A new water main can be constructed closer to the toe of the bluff and the old water main can be removed.

The preferred plan impacts the 54-inch water main and its relocation will present challenges. The City of Minneapolis Water department has concerns with alteration of this main. The relocation may require extending the main overhead to the next inland bridge pier and then providing a new vertical drop where it would go underground and reconnection to the existing line.

3.C.1.3. EXISTING STORM SEWER

There are a few smaller culverts that run perpendicular to the river which are outlets from pavement and parking areas adjacent to the river. In addition, there are two main storm sewer tunnels that discharge to the river within the proposed channel corridor. A 12 foot by 12 foot tunnel runs parallel to Interstate-35W and discharges just downstream of the I-35W bridge. A 6.5 foot by 6.5 foot tunnel starts at the intersection of the 10th Avenue bridge and 2nd Street S.E. and outlets to the Mississippi River approximately 150 feet downstream of the 10th Avenue bridge.

Impacts to Storm Sewer

The course alignment will require the relocation of a few of the smaller storm sewer. Some of these culverts may become obsolete due to the removal of the existing roads and/or parking areas. These smaller culverts which remain can be connected into a new storm sewer mainline, which runs parallel to the course and discharges downstream. According to the tunnel drawing, the 12 foot by 12 foot storm tunnel is low enough to remain under the proposed channel. The tunnel roof will need to be protected from erosion and abrasion from the White water Channel. The 6.5 foot by 6.5 foot tunnel is downstream of the proposed course outlet and will not be affected by the proposed plan.

3.C.1.4. OTHER UTILITIES

There are several manholes indicating underground electrical systems. Although not specifically identified, gas and telephone lines must be present in order to serve the existing facilities.

An existing 10 foot by 10 foot heating/conveyor tunnel runs generally parallel to the access roadway and under the bluff. The tunnel bottom is at an approximate 752 elevation and top of tunnel is at 762.

If the access road is widened, the roadway will partially be over the top of the tunnel and the overburden on top of the tunnel will be lowered to approximately 770 elevation. This reduction in overburden may require reinforcement of the tunnel. As the project proceeds, further details will need to be evaluated as to the condition of the tunnel and impacts of the widening.

3.C.2. GEOTECHNICAL

In October, 1994, the EQB prepared a report entitled, "Soil And Groundwater Contamination Site Assessments." The report contained the following information regarding the Riverfront Site for the University of Minnesota Steam plant:

The ground surface of the Riverfront Site varies from approximately 725 NGVD (National Geodetic Vertical Datum) along the Mississippi River on the east end of the site to approximately 825 NGVD along the railroad tracks on top of the river bluff. Surface drainage is anticipated to flow from north to south to the river.

The general geologic profile on the top of the river bluff is characterized by varying depths of fill overlying 20 feet of interbedded glacial till and alluvium overlying bedrock of the Platteville formation. Along the river at the base of the bluff, the Platteville Limestone and underlying Glenwood Shale bedrock units are absent. These have been eroded away by the river. The uppermost bedrock unit is the St. Peter Sandstone that is overlain by varying depths of till and weathered limestone.

Based on information from the Minnesota Geological Survey (1979) and soil borings in the bluff areas of the Riverfront Site, the water table occurs in the surficial deposits at an elevation of approximately 800 NGVD or lower. At the base of the bluff, the water table is reportedly in the St. Peter Sandstone bedrock or in the alluvial sediments along the river bank. Surface water infiltrates into either the river bank sediment and enters the bedrock groundwater system or enters the Mississippi River directly. Limited vertical recharge through the confining layers may also occur with the recharge mixing with the St. Peter water table and ultimately discharging to the Mississippi River.

The elevation of the Mississippi River is approximately 750 feet NGVD upstream and 725 feet NGVD downstream of the lock and dam located at the western end of the Riverfront Site. Groundwater flow at the site is locally influenced due to the location of the lock and dam. Generally, the direction of flow in the water table at the Riverfront Site is to the southwest, discharging to the Mississippi River.

3.C.3. ENVIRONMENTAL

A review of existing relevant reports regarding the project site area was conducted. Areas of consideration were air quality, soil contamination, water quality, noise, and vehicular traffic. Recent (1995 and 1996) EIS studies conducted by the Minnesota Environmental Quality Board (EQB) regarding the University of Minnesota Steam Service Facilities contain the following summaries:

3.C.3.1. AIR QUALITY

As noted in the EIS, the proposed steam plant project would not create an unacceptable local health risk as long as emission controls are operated as designed. The White water Park would not be a source of any point source emissions. Possibly, as final project design evolves, including parking and traffic

patterns, an Indirect Source Permit (ISP) may be required by the Minnesota Pollution Control Agency (MPCA).

3.C.3.2. SOIL CONTAMINATION

Based upon soil samples taken in the area of the steam plant project, the soil samples were within regulatory limits, and fuel oil storage tanks on the site currently showed no sign of leakage. As final design evolves, it may be necessary to conduct additional soil sampling and evaluation on the project site.

3.C.3.3. WATER QUALITY

Water quality is not monitored in the immediate vicinity of the project site and limited data is available from the Metropolitan Council Environmental Services. Other agencies were also contacted regarding river water quality data in downtown Minneapolis:

- Minnesota Pollution Control Agency
- Hennepin County
- City of Minneapolis
- Minnesota Department of Health

The Environmental Services data is collected in the cities of Anoka and Fridley, and at Dam No. 1, several miles downstream of the project site. No data is collected at the water source for the white water channel, the middle pool of St. Anthony Falls. The data for the three sites above is complete through calendar year 1996. This database includes some typical parameters such as temperature, BOD, dissolved oxygen, turbidity, fecal coliform, etc. All monitoring sites do not collect the same data, however. The monitoring is intended to look at trends and serve as an indicator. Without a good understanding of the data quality and the number of point sources, no summary observations are provided. Additional monitoring data would need to be collected and analyzed for a health-based study. It is anticipated that the Metropolitan Council Environmental Services would be responsible for the overall study design. A risk assessment would likely be required on the part of the project applicant.

The Minnesota Pollution Control Agency water classifies water according to use. For example, Class I waters are for domestic consumption, and Class II waters are for aquatic life and recreation. The specific criteria for waters are found in Minnesota Rules, Chapter 7050.0222. A Class II criteria indicating suitability for recreation would be desirable for this project, indeed the University of Minnesota rowing team uses a stretch of the river just downstream. Swimming however is not observed near the project site.

The Minnesota Pollution Control Agency does collect Mississippi River water samples at the Minneapolis Waterworks facility in Fridley. They also collect data further downstream at the Wabasha Street Bridge in St. Paul. Based on discussions with the MPCA staff, the Agency uses fecal coliform as an indicator for swimmable activity determinations. Based on the Fridley data, in 1994 the Agency reported to the federal EPA, for federal Water Quality Act compliance,

that the Mississippi River upstream of the Fridley facility "fully supported swimmable use". The same data collected at the Wabasha Street location showed partial support.

3.C.3.4. NOISE

The White water Park is not anticipated to be a point source of noise. The area surrounding the Park is industrial. Noise should not be a project concern.

3.D. ATTACHMENTS

Figure 3-1 Utilities Impacts
Figure 3-2 Land Ownership Map

Purpose: 1.) Describe the white water course alternatives and selected alternative. 2.) Describe the building requirements for the whitewater river operation. 3.) Document the site master plan and supply background data.

Contents

4.A. THE WHITEWATER COURSE

The preferred alternative and the basis of this report resulted from three basic alternatives and one variation are presented in this section: Alternatives A, B and C as well as a scheme D that combines A and C. The starting point for the alternative analysis was a conceptual plan prepared by Cunningham, Hamilton and Quitter for the Mississippi Whitewater Development Corporation.

Please refer to Section 5 for the following topics related to the white water course:

- Flood Plain / Ice
- Head Gate / Outlet works
- Cost Estimate

4.A.1. THE ALTERNATIVES

The alternative plans are shown in the attached figures 4-1 through 4-4.

4.A.1.1. POINTS COMMON TO ALL ALTERNATIVES:

1. All start in the pool above the Army Corps Lock and finish in the river below the dam. The range in drop is 17 feet to 25 feet.
2. All have variable flow control structure such as an inverted V gate or inflatable weir. This will allow the course to run at varying degrees of difficulty. The anticipated flow range will be from 200cfs to 1000cfs.
3. All are perched above the likely flood level. All are graded so that a 1200-foot long international level racecourse ends at or above the likely high water mark.
4. All accommodate a future hydroelectric project at the Army Corps Dam.
5. All have a direct connection (without getting out of the boat) to the river. This will facilitate boating in the quiet pool at Hennepin Island.
6. All will accommodate a variety of adjacent dry land uses such as trails, interpretive exhibits, etc.
7. All will be made in part of natural materials such as rock to visually tie into the surrounding landscape.

8. All show basic road and trail connections that will be refined in the site master plan portion of the project.

4.A.1.2. BRIEF DESCRIPTION OF ALTERNATIVES:

Alternative A. 1870 feet long with 17 feet head. Starts above the University Steam Plant and ends above the Route 35W bridge. Similar to the Cunningham, Hamilton and Quitter concept.
Alternative B. 1650 feet long with 17 feet head. Starts at the earthen dam and ends near the barge mooring below the route 36 bridge. Displaces the dredge storage yard.
Alternative C. 2080 feet long. This alternative uses the entire 25 feet of potential head at the site. Under high tail-water conditions the bottom 600'of the channel will be inundated, however the course is long enough so it will still be usable under most river conditions.
Alternative D. 2580 feet long. Combines the starting point of A with the ending point of C.

4.A.1.3. SUMMARY OF PHYSICAL DIMENSIONS

	(feet)	(feet)	(feet)	(percent)	(CFS)	(CFS)
Alternative	A 1850	35 to 45	17	0.92%	200	1000
Alternative	B 1850	36 to 45	17	0.92%	200	1000
Alternative	C 2080	37 to 45	25	1.20%	200	1000
Alternative	D 2590	38 to 45	25	0.97%	200	1000

4.A.2. PREFERRED ALTERNATIVE

4.A.2.1. DESCRIPTION

The preferred alternative and the basis of design is a refinement of Alternative A - it is slightly longer than the original, this in response to public comments. It is illustrated in plan and profile (attached figs 4-5 through fig. 4-11).

4.A.2.2. FEATURES

The course starts off with a mild gradient of about 0.6 percent. This section is 500 feet long and is suitable for beginning to intermediate boaters under most flow conditions. There is a take out pool at the end of this section.

Following this there is a steeper section of white water that is 1150 feet long with fourteen feet of fall. Under high flow (800 to 1000 cfs) conditions, this section is intended for advanced intermediate to advanced boaters as well as competition. At low flow—400cfs, it is suitable for general recreation and beginning to intermediate boating.

At the end there is a take out pool and a spillway to the river. These items are described in section 5 of this report.

4.B. ARCHITECURAL PROGRAM

4.B.1. RESULTS OF PUBLIC INPUT

4.B.1.1. ACTIVITIES

Program elements arise from needs as expressed in the January public input meetings. In those meetings there was desire is for an inclusive, accessible, economically viable, four-season site. Selected activities* (in addition to the white water program) that demand an architectural response include.

1. Youth programs
2. Instructional programs
3. Bike trail connections
4. In line skating
5. Climbing wall
6. Sledding
7. Ski touring and snowshoe
8. 24-hour use and night paddling

Specific requests for facilities include:

1. Changing house
2. Restaurant
3. Boat storage and clubhouse
4. Classrooms
5. Information kiosk, interpretive exhibits

4.B.1.2. FACILITIES FOLLOW USER NEEDS

The proposed space falls into two categories:

1. Outfitters Headquarters
2. Club Space

4.B.2. FACILITIES

4.B.2.1. OUTFITTER'S HEADQUARTERS

The Outfitter's Headquarters should be located prominently with good sight lines to the white water course. It should be a four-season operation serving a variety of sports. It will have a large shaded porch for gathering and watching the action on the water.

The Headquarters facility will consist of the following main groups:

1. Sales / Rentals
2. Guest Services
3. Operations
4. Food

* The full range of activities mentioned in the public input meeting is included at the end of this section

4.B.2.2. SALES

Sales is comprised of sales windows, signage, and a store with seasonal goods.

Sales/Rental Windows

The sales windows will be located for maximum visibility from passing traffic and will have adequate covered queuing space. The primary mission of the windows will be sell admission to the white water river though it should have seasonal offerings such as bike and in-line skate rental, ski and toboggan rental, etc.

Outfitter's Store

The store should be located to maximize its visibility from the gathering porch and the restaurant. It should sell and rent sporting gear related to the sports found at the site—boating, climbing, biking, in-line skating, biking, etc.

Repairs (optional)

Repair and tune up services for bikes, skates and skis is a possibility given the location on the bike / hike trail system.

4.B.2.3. GUEST SERVICES

Guest service consists of those items required to assist the guest before and after boating. It includes changing rooms with lockers, showers, and toilets. These program elements should be generous, constructed of durable, easy to clean materials and scrupulously maintained. Lockers can be coin operated.

4.B.2.4. OPERATIONS

Headquarters operations will consist of river gear storage / drying, equipment dispensing windows, management, raft storage and a grounds and gear maintenance shop.

River Gear

River gear consists of safety equipment worn by guests: life jackets, paddles, and helmets. Life jackets need to be presented in a dry and hygienic condition. Therefore provisions must be made for storage of adequate numbers to meet peak demand, taking into account drying time. Passive induced ventilation and solar drying should be incorporated.

Dispensing Windows

Dispensing windows should be located near the changing rooms and should occur in adequate numbers to minimize waiting. They dispense river gear as well as other seasonal equipment.

Management

A suite of small business offices is needed for the management staff.

Raft Storage

General gear storage consists of floor space to store rafts and ducks in a deflated state as well as seasonal offerings of bikes, toboggans, skates, etc. During the day many boats will be stored on deck in stacks as they await guest use. On-deck storage needs to be well managed to avoid a cluttered appearance.

Grounds and Gear Maintenance Shop

A two or three bay garage for lawn and site equipment is needed. Storage and charging equipment for shuttle vehicle i.e. golf cart is needed. The floor space can double as inflatable boat maintenance. It should be equipped to contain and capture the various solvents and adhesives that are typically used for inflatable boat maintenance.

4.B.2.5. FOOD SERVICE

Public input revealed a unanimous desire for food offerings on site. This could include a walk-up window as well as sit down service. Food is a potentially large proportion of the on-site sales and therefore could make the difference between a site that is economically viable and one that is marginal.

The seating area can be small and should have an entrance through the store. There should be generous outdoors seating. Both seating areas should enjoy a commanding view of the site and have an ABC license.

A walk up window can serve convenience food and seasonal items such as ice cream and hot chocolate.

4.B.3. CLUB FACILITIES

Club facilities are required for private users of the site. These can include individuals, private clubs and university clubs. They are comprised of:

1. General Purpose Space
2. Support Space
3. Boat Storage

4.B.3.1. GENERAL PURPOSE SPACE

1. Two to three large rooms for classes, meetings, running special events, etc. At least one on ground level for ADA access.
2. Should be connected to site communications / timing / scoring system.
3. Can have movable partitions for maximum flexibility

4.B.3.2. SUPPORT SPACE

1. Bathroom changing rooms and showers for club members
2. Kitchen-next to ground level meeting room.
3. Small resident manager's loft

4.B.3.3. BOAT STORAGE

1. Three to four double-loaded bays for private boats and club boats
2. Small room for tools and repair materials.

4.B.4. THE BUILDINGS

The site master plan shows two potential building sites: one in front of the University Steam plant coal bunker and one in front of the Accelerator building. As an alternative to construction of new buildings adaptive re-use

of existing buildings should be explored for some or all of the building program. Likely candidates for re-use are:

1. University Accelerator Facility
2. The Old Main Power Plant

Due to the limited area of the site construction of new buildings should be considered only after possibilities of adaptive re-use are exhausted.

From the standpoint of location relative to the white water course and other site features the following suggestions should be considered.

The accelerator facility should be considered for the outfitters headquarters and restaurant due to its location near the lower third of the white water course.

The old main steam plant should be considered for the club facilities. Its location at the eastern end of the site near the University rowing dock allows a potential sharing of facilities with rowing and sprint kayak.

4.B.5. SQUARE FOOT TABULATIONS

Guest Services	
Changing room and lockers (coin op)	600
Toilets	600
Showers (pay?)	600
Operations	
River Gear	700
Customer check-in / gear dispensing windows	100
Management offices	400
Rafts and Inflatable Kayaks	750
Seasonal Gear (optional)	500
Food	
Indoor Seating	900
Carry Out Window	100
Outdoor Seating	2000
Kitchen	700
Grounds and Raft Maintenance	
Service Bays	
	600
Subtotal	
15% circulation and support	10200
Subtotal Outfitter's Facilities	1530
	11730
CLUB FACILITIES	
Boat Storage	
Storage Bays	1200
Repair room	120
General Purpose Space	
Ground floor meeting room	400
Upstairs meeting rooms	800
Support Space	
Kitchen	200
Bathrooms	800
Manager's Loft	400
Subtotal	3920
15% circulation and support	588
Subtotal Club Facilities	4508
GRAND TOTAL	16238

4.B.6. SUMMARY RESULTS OF PUBLIC INPUT

Services + Facilities
- Restaurants-with viewing area
- Bathrooms / changing house
- Boat storage/clubhouse
- Information Kiosk, interpretive exhibits
- Lighting/night paddling
- Shuttle service for ww course
- Shuttle service (if parking on bluff above)
- Funicular (to top of bluff)
- Equipment rental

Programs +Safety
- Fire and rescue training
- Youth programs
- Athletic training-center of excellence
- ADA access
- Urban youth have opportunity
- Classrooms
- White water instructional programs
- Environmental demonstration p
- 24 hour use = safety

Related Outdoors Recreation
- Climbing wall
- Picnic area
- Sledding/luge
- Fishing
- Roller blades
- x-country skiing/snowshoing
- Skateboard area
- Swimming beach
- Tubing
- Fly fishing casting pond
- Kiddies pool with boats
- Playground
- Water park rides (slides)

White Water Course Specific
- Longest course possible-combine A+C
- RODEO HOLE!
- Variable flow - different skill levels
- Viewing area for competitive events
- Convenient gates system
- Potential for future Olympics
- Adjustable white water features
- Full range of ww features/difficulty
- Communications system for events
- Portage
- Upstream put In (Hennepin Island)
- Year-round operation
- Reliable water flow

Transportation + Site Circulation
- Convenient Parking
- Bike path connections
- Walking trails
- Boat / passenger drop off
- Footbridge
- Use parking garages across river

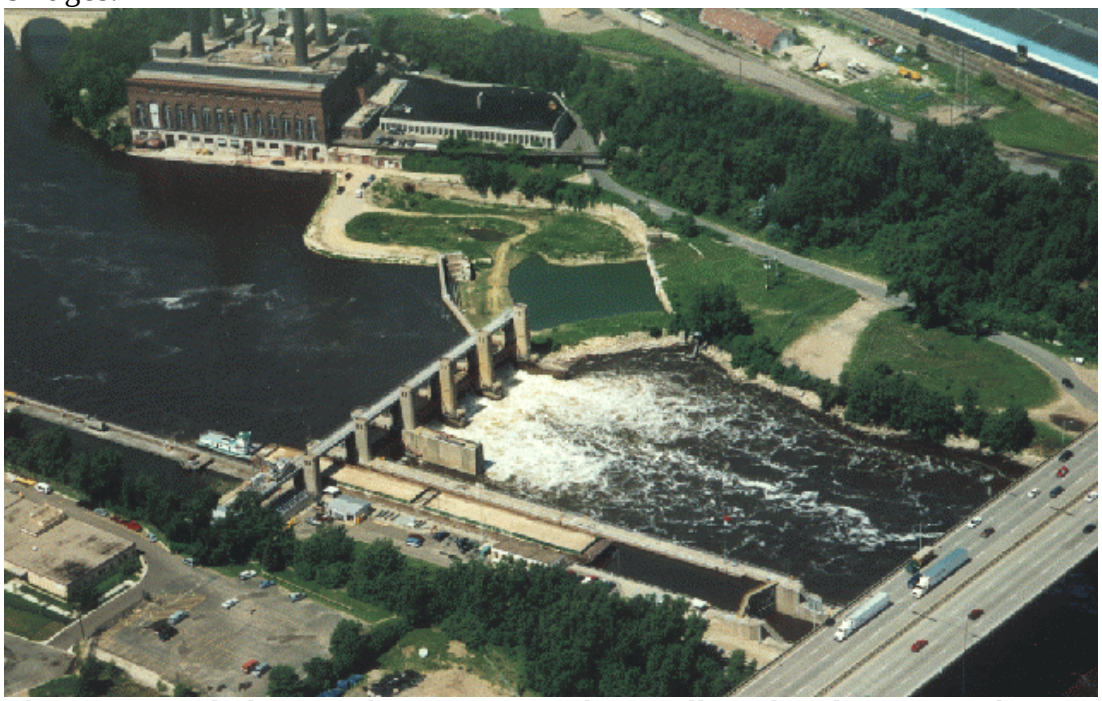
Environmental
- Mini hydro-clean power
- Enhance wildlife habitat
- Hydrology research

4.C. SITE MASTER PLAN

4.C.1. SITE CONTEXT

The site for the Mississippi White Water Park is located in downtown Minneapolis just downstream of St. Anthony Falls. Its urban context is contrasted by the natural setting of the upper Mississippi River gorge. High bluffs and steep wooded limestone embankments overlook the site and are occupied by the Marcy-Holmes neighborhood to the north and by the Mill Ruins district of Minneapolis to the south.

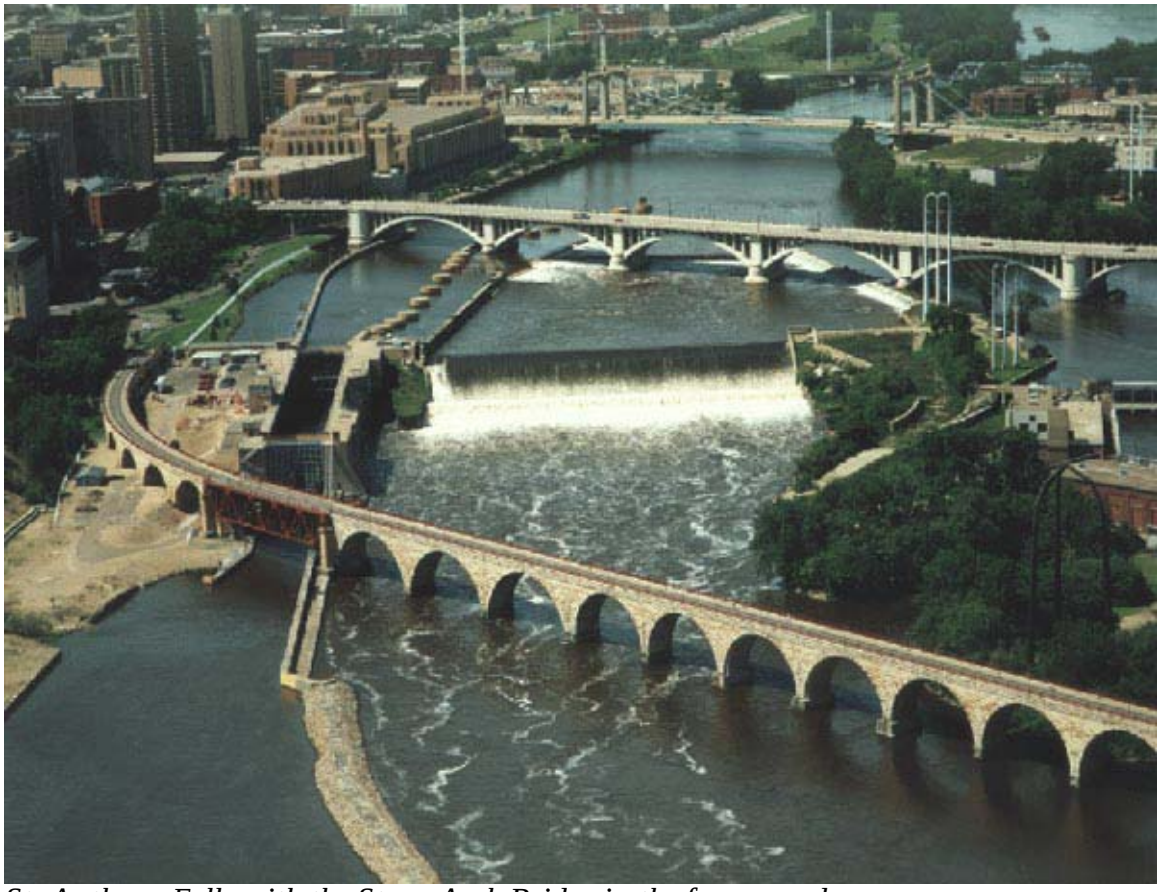
Because of the abundant water power at St. Anthony Falls this area was the nineteenth century industrial center of Minneapolis with wood and flour milling and later on, electric power generation. Unlike the mill buildings on the south side of the river which have fallen into disuse or ruin, the industrial tradition is carried on at subject site by the University of Minnesota, Northern States Power and the Army Crops of Engineers. Railroads, shipping lanes and roads serve their various facilities. The site is traversed by several high bridges that span recent history—they range from a drab modern interstate highway bridge to magnificent examples of stone arch and iron truss railroad bridges.



The project site looking north. Lower St Anthony Falls Lock and Dam is in the foreground and the University of Minnesota's steam plant and coal yard are in the upper left.

Because of the immense historical importance of the St. Anthony Falls as the original seed from which the Twin Cities bloomed, a concerted effort is being

made to reclaim the river's edge as evidenced by the Mississippi Mile. In the immediate area, the St. Anthony Falls Milling District is being preserved. A riverside coal gasification plant was cleared to make room for the West River Parkway, cleaning up its brown field in the process. Northern States Power is preparing a comprehensive river front park plan that extends from Father Hennepin Island and the falls, downstream to the study area. To the north and east, a long-overdue roadway and bike trail connection of the East River Road to the historic Stone Arch Bridge and Main Street is in the planning stages.



St. Anthony Falls with the Stone Arch Bridge in the foreground.

4.C.2. CONSTRAINTS

Countering the trend of river front reclamation, this site is the last remaining downtown industrial area along the river. Northern States Power maintains its option to rebuild its hydroelectric plant at the Lower St. Anthony Falls Lock and Dam. The Army Corps of Engineers has a dredge spoil storage yard below the highway 35W bridge crossing in addition to its ship lock and dam. The University of Minnesota is nearing completion of a major central steam plant on a prominent site along the banks of the river and is expanding its coal storage capacity along the bluffs over looking it. The University also owns several other facilities, the Tandem Accelerator Facility and the old Main Power Plant, both along the bluffs overlooking the site. The University's coal

storage yards are served by the Burlington and Northern, Santa Fe railroad that maintains a spur extending to Main Street for that sole purpose.

Steep limestone cliffs both constrict the site to a narrow riverside bench and define it spatially. They have always made access difficult and to this day the two roads leading down to the river from the bluffs are narrow, dangerously twisted and because of predominantly industrial-type traffic, uninviting. About a third of the site is flood plain, limiting development a narrow ribbon of land under the bluffs.

4.C.3. OPPORTUNITIES

Despite these drawbacks there is a strong desire to have access to the river. Industrial uses forgiven, the site has a surprising offering of natural attractions—limestone cliffs, wooded coves and bluffs, fishing spots and above all, the river. ***It is one of only a hand full of places along the many miles of urban Mississippi waterfront where one can actually get close to the water***. White water amenity aside, merely improving access to this area can help foster public notice and care for it. Increased stewardship and appreciation could lead in time to economic re-development along the bluff area, gradually transforming it from predominantly industrial area to a mixed use, residential and commercial one.

The success of this endeavor however will require a partnership with the University of Minnesota, the dominant landowner. In order to realize the full potential of this riverside setting and the value of the White Water Park as a way to serve its students, the University must resolve to be a "good neighbor" and to assume its rightful place among the many civic groups, governmental organizations and business leaders that are striving to reclaim the Mississippi waterfront.

4.C.4. RESOURCES USED IN PREPARING THIS PLAN

4.C.4.1. PUBLIC INPUT

Through a process of public meetings a variety of site and neighborhood issues, constraints, opportunities and values were revealed. (See section 2--Public Input). This dialog gave a strong direction to the designers and assisted immeasurably in producing this Site Master Plan. The plan depicts a level of development that is consistent with its location on the narrow river bench, but at the same time includes as many of the desired activities as possible.

Public input was obtained in meetings held in January 1999.

4.C.4.2. EXISTING PLANNING DOCUMENTS

Preparation of this master plan draws upon earlier studies / master plan documents. We have not sought to challenge the precepts put forth in these studies but have incorporated their direction and suggestions as valid components of this feasibility study. These studies envision a comprehensive system of parks, neighborhoods, industrial and institutional uses. Background resources used in this study include:

- University of Minnesota Twin Cities Campus Master Plan, September 1996 prepared by Berridge Lewinberg Greenberg Dark Gabor Limited.
- University of Minnesota Steam Facilities E.I.S.; Trail and Motorway Feasibility Assessment- August 26, 1994, prepared by James Robin
- Northern States Power Master Plan, prepared by Roger Martin
- East River Parkway Extension study commissioned by Minneapolis Department of Public Works

4.C.5. SITE MASTER PLAN

The White Water Course is the primary focal element of the Park and it extends nearly its entire length. The main Park Entry occurs from a new Sixth Avenue Turnaround. This provides a plaza terminus to Sixth Avenue and connects the White Water Park, the Stone Arch Bridge, Father Hennepin Bluffs Park, the future Lucy Wilder Park and the future extension of Main Street to the East River Road.

Entry Drive at the end of Sixth Street and the Stone Arch Bridge

An added feature is a pedestrian overlook that utilizes the remaining historic Sixth Avenue bridge abutment located near the start of the White Water Course. An upgrade of the University of Minnesota Steam Plant's rear façade, coal bunker and overhead coal conveyor are needed enhancements to this main entry point.

4.C.5.1. SITE CIRCULATION

The planned extension of Main Street from the historic Stone Arch Bridge to its connection to East River Road will provide a critical missing link in the historic Grand Rounds of the Minneapolis Parkway System. We prefer alignment "2-B" as shown in the Department of Public Works study. The long awaited road and bicycle trail segments through and around the site will be the final connections that join downtown to the Dinkytown / University District and Marcy-Holmes neighborhood. The trail connections include river crossings at the steel truss railroad bridge, the Stone Arch Bridge as well as the riverfront trail to the east.

The 100-foot decent from the high bluffs of Marcy-Holmes neighborhood to the Mississippi Gorge is challenging and is deserving of a serious design effort in it own right should the project move forward. The access road off of Sixth Street descends precipitously down the embankment and snakes behind the University's coal storage facility. This road will be regraded and widened to provide the primary access down to the Park and White Water Course. To accomplish this coal bunker will have to be reduced in size as shown on the plan. The road continues east with access to the Tandem Accelerator Facility, the Old Main Power Plant before ascending the hill to join the East River Road. Because of the steep grades at its entry and exit from the Mississippi gorge the road is not intended to be a through street—it will serve local traffic only. Nor is the parking generous—limited parking is shown next to the fishing pier and at the main drop off area. This may suffice in the low or shoulder season, however during the high season, demand will likely shift parking to the high bluff area.

It is important that future development in the Marcy-Holmes area embraces the concept of remote parking and provides for it in order to minimize impact to its residents. All new parking facilities should operate on a shared time-of-

use basis in which private lots are made available for public parking on weekends and evenings for the park. For large events local parking garages may be used. The nearest parking ramp is at the St Anthony Main complex and it has 900 spaces.

The remote parking scheme is linked to the lower site by several pedestrian stairways that descend from the bluff to the park. A funicular was suggested in the public meetings. A shuttle service may be provided during the high summer months and may be a necessity for large special events.

Vehicular arrival at the river bottom will be marked with a gateway that will reflect an artistic historical or sports motif (it could incorporate the steam plant's overhead coal conveyor, thereby disguising it). The road will continue to a turnaround and drop off area. It will have a passenger drop off and a fifteen-minute boat loading / unloading area. Parking will be limited to handicap spaces and short-term meter parking. This area will serve for emergency and service / official use during events or training sessions.

The constrained site suggests the placement of a bike trail adjacent to the road throughout most of its length. Pedestrian trails are shown along both sides of the watercourse. Four bridge crossings allow for a variety of circulation patterns and ADA accessible paths will be prevalent along the course. A thirty foot wide boardwalk extends along the entire front of the University of Minnesota Steam Plant and continues upriver to a connection to the Bluff Park trail system. This character of the boardwalk is wide and relatively free of plantings and furnishings, this to allow occasional vehicle access and to serve during special events as staging and kiosk / vendor areas.

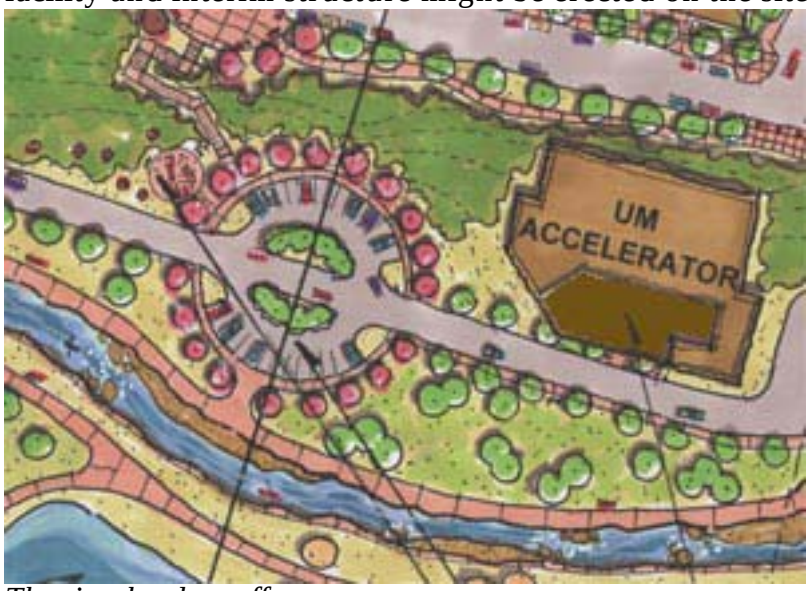
With the above elements in place the pedestrian and path and bike trail system will be essentially complete. It will connect the downtown area to the White Water Park, Father Hennepin Park, Lucy Wilder Park and a future link to the University river flats and the adjacent neighborhoods. Bike trails will link to the refurbished Railroad Bridge, the Stone Arch Bridge, East River Road, and extension of Main Street and up Sixth Street into the Marcy-Holmes neighborhood.

4.C.5.2. SITE DEVELOPMENT

All proposed new floor space should be located within the existing building, if possible. Adaptive re-use or additions to a university-owned structure will make the best use of limited land area and provide an historic context for the park. The site master plan shows potential a building site in front of the Accelerator Facility and another next to the University of Minnesota Steam Plant. The Steam Plant is a prominent brick building and is a wonderful example of early twentieth century industrial architecture but is marred by the presence of the adjacent coal bunker. An attractive building in front of the coal bunker would lessen its impact.

A new building next to the steam plant

The Tandem Accelerator Facility is of lesser architectural character, but is no less desirable because of its central location and its parking. Creative redevelopment of the old Main Power Plant can supplement the basic building program proposed earlier in this section. Barring use of a University facility and interim structure might be erected on the site.



The circular drop off

Near the drop-off area there is picnic facility and a children's play area nestled against the cliff. Signage for historical, cultural and natural interpretation will be located within this area.

Open grassy areas are shown at key locations to support picnicking, event viewing and unstructured play. They will enjoy outstanding views looking upriver to the Stone Arch Bridge, Mill Ruins and Downtown skyline. Indigenous vegetation will be added to reflect a native river bottom plant community, to aid in the stabilization of the riverbank, to enhance wildlife, reduce maintenance and to provide interpretative educational opportunities.

The trail along the river front

Site furnishings will include benches, picnic tables, grills, trash receptacles, drinking fountains. Appropriate railings, playground equipment, bike racks, event kiosks, and site shelters / arbors will also be provided.

The street, pedestrian paths and the white water course will be lighted. Light levels will be adequate for a safe environment and will be supplemented with decorative lights to create a enlivened / festive atmosphere.

The existing fishing pier will remain, though we recommend that its sheet pile wall be faced with simulated limestone texture concrete to improve its appearance from across the river. Numerous other spots along the Mississippi will be developed for fishing and wildlife viewing. An area with artificial climbing walls could be located close to the University of Minnesota boat dock or near the fishing pier to bring additional activities to the downstream portion of the site. The University's crew boat launch is maintained in its current location

4.C.6. THE MARCY-HOLMES NEIGHBORHOOD

The addition of this lively and visually exciting activity will effectively reclaim the riverside and it could be the catalyst that transforms the Marcy-Holmes neighborhood beyond. Its development combined with the road and trail links described above can greatly effect civic pride, enhance land values, support existing business and spawn new ones. If sensitively implemented this could ultimately promote the regeneration of the community fabric and transform vacant or industrial properties to higher and better uses.

This proposal has been met with enthusiastic support from the surrounding neighborhoods as evidenced by the attached letters of support.

Main Street converted from industrial to mixed-use

We envision this transformation as being market-based, though started by the public investment in the white water park, and augmented by some economic incentives to early comers. The first goal would be to shore up existing land values and businesses in the St. Anthony Main and then to develop the vacant lots and industrial areas closer to the site. If sufficient momentum can be sustained, private landowners could be enticed by the market value of their property to shift from industrial to mixed-use development. Loft and apartment/townhouses could be sited above and along side neighborhood-scaled retail/office/light industrial. Desperately needed University of Minnesota Student Housing could be added to the mix--Sanford Hall could enjoy unequalled access to the river for students. The gradual shift of land use away from heavy industrial will reduce the need for a rail connection.

The theme and character of the new mixed use development can take a variety of directions from an historic interpretation similar to St. Anthony Main, or a sports theme related to white water activity with vibrant colors and high-tech materials. The character might also take clues from the Marcy-Holmes neighborhood to reflect and strengthen the connection with neighborhood identity.

All of these pieces of the urban design fabric can enrich the life of the city, the neighborhood and the region in offering a park, which will serve local, regional and international community.

4.D. SUMMARY

4.D.1. THE CHANNEL

The preferred alternative white water course alignment is as long as reasonably possible, this in response to the public comments. It starts near the west end of the University Steam Plant and flows downstream to a point below the 10th Avenue Bridge. It enjoys the benefit of direct communication with the quiet water pool below Hennepin Island that will be beneficial for

novice training programs. The course meets the standard for an international level slalom and rodeo competition as well as accommodates unskilled users. The first 500 feet of the channel has a mild gradient for beginning white water boating and is followed by 1150 foot-long expert channel. The difficulty can also be varied by raising or lowering the flow with the range of 200 to 1000 cfs.

4.D.2. THE BUILDINGS

The white water course and surrounding park will be served by a building that operates in all four seasons. It will have public changing areas, a restaurant and space for an operator / outfitter. To conserve the scarce land area one of the existing buildings near the river should be adapted to house these functions.

4.D.3. SITE MASTER PLAN

The project is located below the St. Anthony Falls of the Mississippi River, the historic beginning point and milling center of Minneapolis. A water-powered recreational amenity is a logical extension of the area's industrial heritage as the Mississippi River front is gradually reclaimed for recreation and tourism.

Connections to downtown from the site and the Marcy-Holmes neighborhood will be achieved by extensions of the bike trail system and completion of the City's parkway system. These connections together with the white water park and the improvements to Father Hennepin Park could be the needed catalyst for renewal and revitalization of the neighborhoods along the north bluffs of the river.

Because of the constrained site along a narrow river bench, the level of park development is moderate. It will however be rich in activities and amenities for a four-season use. It will also be capable of hosting special events including international level white water competitions. The realization of this master plan concept however will depend on the flexibility of the industrial and institutional landholders at the site.

4.E. ATTACHMENTS

Purpose: Describe the inlet and outlet works, flood plain and ice issues.

Contents

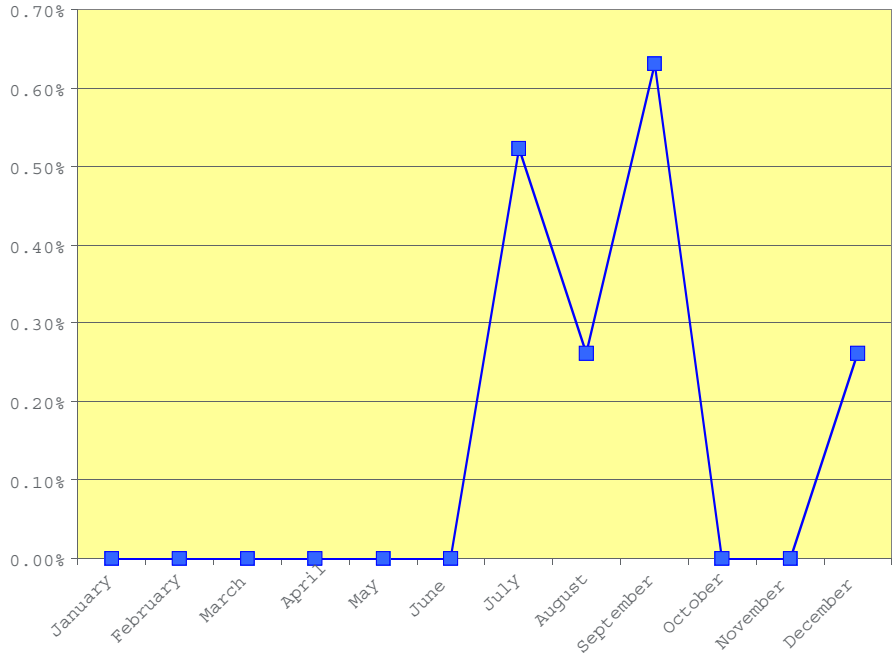
5.A. INLET AND OUTLET WORKS

5.A.1. SITE HYDROLOGY

5.A.1.1. FLOW RANGE

Reliable water flow is a key ingredient of a white water course. The upper Mississippi is a huge river with a large drainage area. This makes the St. Anthony Falls site an extremely reliable one with regard to available water. The median annual flow since 1960 is 6,500 cfs according to USGS data. With this in mind we propose a **flow range for the white water channel in the range of 200 to 1000 cfs with a target of 800cfs for international events.**

The river discharge rarely drops below 1000cfs due to drought. When it does it is presumed that the course will operate on a restricted basis with regard to the amount of water it may draw from the river. The chart below shows that the historical occurrence of flows less than 1000 cfs to be minimal.



Probability of river flow less than 1000 cfs

5.A.2. INLET WORKS

An inlet structure is needed to admit water to the course, screen debris and regulate flow in the channel. A permanent, low maintenance and durable gate is the centerpiece of the head works and a quality item is needed that will provide the operational flexibility that is worthy of a world class site.

The inlet works consists of:

1. Head Gate
2. Gate Housing
3. Debris Boom and Buoy System

5.A.2.2. HEAD GATE

Constant Water Elevation at Middle Pool
The course will draw its water from the middle pool of St. Anthony Falls. The Army Corps of Engineers (ACE) maintains the middle pool elevation of approximately 750 feet for the purpose of navigation. There is some variation however—the pool elevation can vary as much as plus or minus several feet from the 750' mean. The attached table 5-1 shows the range and probability of headwater variation.

A relatively fixed pool elevation is a great benefit to the project in that it simplifies the head works. This, because it does not have to respond to a wide range of river elevations while the course is in operation**. For the purpose of this level of study the regulating range is assumed to be 749' to 750.5' with a preferred target of 750'.** This is shown graphically in table 5-1.

Floods
The possibility of floods however is a factor and must be taken into consideration. During very high water there is only a slight rise in the middle pool, this is due to the degree of control exercised by the Corps (see discussion below on floods). The maximum recorded sustained pool elevation was 751.47 during the flood of 1965. The highest instantaneous pool elevation was in excess of 753.8' due to operator error at the Army Corps dam. At that time the temporary earth dam at the former NSP plant was overtopped briefly, prompting the Corps to request a more permanent armored structure of NSP. The fixed crest portion of the Army Corps Dam is 755' in elevation and has never been over topped[1].

For the purpose of initial feasibility the maximum crest elevation for the head works will be no lower than the Army Corps fixed crest of 755'.

Also it is assumed that if the Army Corps closes the river to navigation the white water course will also be closed to boating.

[1] Phone conversation with Bob Stahl, lock and dam operator for Corps, 3/29/99.

Navigation over the Head Gate
One of the great benefits of the selected site is the proximity to the calm water pool below Hennepin Island. This pool will be used for beginning boating instruction and warm up by boaters before entering the channel. The ability to paddle from a large pool directly into the white water course is a convenience that is appreciated by boaters wherever it is found.

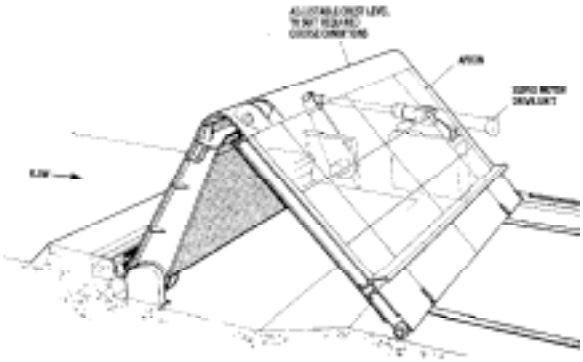
Boating from the Hennepin Island pool to the white water channel involves paddling over the head gate. This puts the additional requirement of boater safety on the head gate and limits the types of gates that are acceptable.

Need to Regulate Flow
Variable flow in the channel was requested at the public input meetings. Lowering the flow lowers the difficulty of the white water, making the channel accessible to a wider constituency. This is accomplished by raising the head gate, cutting off some of the flow.

For novices however, paddling over the head gate in a semi-raised condition can be frightening because of the steep drop on the downstream side. For this reason not only the geometry of the head gate is important but the downstream hydraulics as well. In any event it is advisable to have a beginner's put-in eddy below the head gate.

5.A.2.3. ALTERNATIVES FOR HEAD GATE AND DISPOSITION

Inverted V Crest Gate or Hinge Gate
This type structure, illustrated below has been successfully used at the artificial courses at South Bend, Indiana and at Nottingham England (see section 1-Literature Search).



Inverted V gate at Nottingham, England

Advantages

1. The chief advantage of this type structure is that it allows boaters to pass over it. This permits boaters to paddle in the middle pool then enter the course without getting out of the boat.
2. Adjustable height crest allows variable flow into the channel.
3. Somewhat responsive to varying headwaters (plus or minus one foot).

Disadvantages

1. Expensive
2. When operating in low flow conditions with fixed head water, care must be taken to design the region just downstream of the gate to avoid undesirable hydraulic conditions that can upset inexperienced boaters.

Disposition

The basis of design is a product manufactured by Obermeyer Hydro, of Fort Collins, Colorado, is illustrated schematically at the end of this section.

Fabric Dam

This type of dam is in wide use in industrial settings due to its low maintenance, simple controls and flexible geometry.

Sumigate, Japan. Bridgestone and Obermeyer make similar structures.

Advantages

- All the advantages of the inverted V crest gate plus
- Flexible geometry

Disadvantages

- High Cost
- Easily vandalized when inflated (as shown above)
- Difficult hydraulics when operating at low flow capacity. May not allow inexperienced boaters to paddle over it when partially inflated.

Disposition

- Not selected because this type of gate can vandalized so easily. It more appropriate for industrial sites that have 24-hour security.
- A variation on this type of gate can be used to create a surfing hydraulic. This application was illustrated at the final presentation.

Sluice Gate

This type of gate was used a the 1972 Olympic course in Germany. Working examples in can be found at the many industrial and research facilities in and around St. Anthony Falls.

The head gate structure for the 1972 Olympics near Munich, Germany.

Advantage

- Comparatively inexpensive

Disadvantages

- Does not allow passage of boats.
- Does not modulate flow—they work best under full-on or-full off position.
- Undesirable hydraulics (boils) in the region just below the gates.
- Potentially deadly hydraulics if headwaters vary more than a foot above normal.

Disposition

Could be used in combination with a boatable gate for additional operational flexibility.

5.A.2.4. GATE HOUSING

Together with the movable head gate, the gate housing is an integral part of the Army Corps lock and dam structure. For this reason the gate housing will be the subject of a design effort in its own right, should this project move forward.

Like the fixed crest of the Army Corps Dam the gate housing is not meant to be overtopped by floodwaters.

For the purpose of initial feasibility the gate housing is assumed to be a heavy concrete structure extending into bedrock and backed up with earth. The portion of the concrete exposed to view will have simulated limestone texture form work and color for aesthetics.

It will also have provisions for stop logs for maintenance.

The gate housing walls and head gate are illustrated conceptually in the attached figures 5-3 and 5-4.

5.A.2.5. DEBRIS BOOM

All rivers carry floating debris, including logs and other plant material, carrion, and man-made rubbish—all of which are unwelcome in the white

water channel. However, because the head gate does not filter flotsam, debris is a problem that must be dealt with. Fortunately, the entrance to the course is outside of the main channel of the river—the main conveyor of unwanted debris. The mouth of the channel faces the quiet pool below Hennepin Island which, to our knowledge, is a backwater area and has no major through current that would carry flotsam.

The first line of defense against flotsam will be a floating sectional boom that extends from the bottom of Hennepin Island downstream to the old stone bridge abutment at the beginning of the course. This geometry is ideal—a boom roughly parallel to the current that will deflect flotsam rather than confronting it head on and impinging it. The will lighten the maintenance burden of cleaning the accumulated debris. It will also keep the warm-up pool more tidy.

The debris boom will have the added benefit of clearly delineating the area where boating is allowed and where it is not. (The Army Corps is considering a prohibition on all recreational boating in the middle pool. However, ACE officials have responded favorably to a physical barrier and signage that confines boating to a discrete area that is outside of the main channel.[2])

5.A.3. OUTLET WORKS

The water in the white water canal must return to the river at a point below the Lower St. Anthony Falls Lock and Dam.

Components of the outlet works include:

- Take out pool
- Spillway

An outlet works that has recreational value (i.e., is navigable in a white water craft is desirable). It is impossible however to predict this result at this level of study. The outlet works is perched a considerable distance above the low pool of the river and must pass a large volume of water. This produces a large amount of energy that must be dissipated in a very short distance if the structure is to be boatable. Moreover, for boating, adequate water depths must be maintained.

In addition, boating in the lower river by novices or by persons in inflatable craft is problematic in that the river has strong currents in all but the lowest flows. There is also the problem of egress from the river in the region of the outlet works that must be addressed: steep, vegetated banks and vertical sheet pile river walls conspire to make boating and exit from the river difficult.

This section describes a structure that has basic safety features, will be aesthetically pleasing and has the **potential to be navigable in the event of**

[2] Phone conversation with Dennis Erickson, Army Corps of Engineers 3/24/99

accidental entry, but will need considerable design attention and modeling in order to achieve that result.

5.A.3.1. VARIABLE TAILWATER

Water elevations in the lower St. Anthony Falls pool varies according to flow and season. The Corps estimates the mean lower pool elevation at 725.6'. The arithmetic median is closer to 725' per the attached table 5-1.

Of particular concern is rising tail water due to flooding. At 40,000 cfs ACE restricts navigation on the river and for the purpose of this study the white water course will be closed as well. The tail water elevation at 40,000 cfs is roughly 733'. For the purpose of this study this will be the bottom elevation of the white water course[3]. This, in effect, perches the course above all but the highest flood stages. This lowers maintenance since the site will be flooded less often. It also makes the site a more reliable site for international competition (international events are bid years in advance and having to postpone one due to flooding is humiliating to the host site and will inhibit its ability to attract future events).

Also of concern from a hydraulic standpoint is extremely low tail water. The Corps of Engineers data shows the low pool at 521.56'—over eleven feet below the lowest elevation of the course.

The above concerns put a special demand on the outlet works—it must return a large volume of water to the river through a wide range of conditions. The amount of vertical fall at the spillway will vary from zero feet to a normal of about eight feet and up to a maximum of 11.44 feet. It must also do this safely—without creating dangerous hydraulics that can trap boaters.

5.A.3.2. THE TAKE OUT POOL

The take out pool is a 100-foot long calm water stretch at the end of the white water channel that gives boaters ample opportunity to exit the course. There will be a low slope (4:1) "beach" for pulling boats out of the water. For safety the beach will begin as far as possible above the spillway.

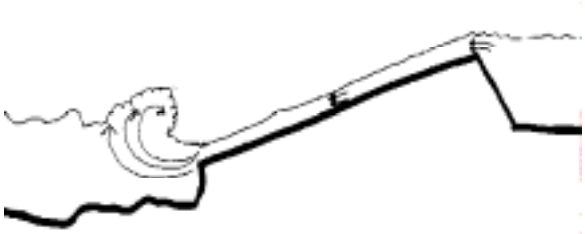
The design water surface of the take out pool is at elevation 733', seventeen feet below the middle pool and eight feet above the median water surface of the Mississippi River. The eight-foot perch above the normal pool serves to isolate the course from all but the highest flooding.

5.A.3.3. THE SPILLWAY

The spillway returns water to the river after it is finished in the white water channel. The eight-foot perch above the normal pool however means that there is considerable energy to be dissipated as it returns to the river. Energy

[3] A lower take out pool is possible but will entail increased risk of flooding. While selected elevation of 733 is admittedly quite high there is another factor that has a bearing on this—a large storm sewer crossing near the take-out pool. Making the pool lower will entail replacing this structure at considerable cost (at the time of this report undefined).

dissipation is required to prevent undesirable hydraulics from forming. In a typical low friction spillway such as illustrated below, water accelerates to high velocity over smooth concrete bottom. When the high velocity water enters the river pool, a hydraulic jump occurs that trap, and hold, buoyant objects and persons indefinitely.



The transition from a high velocity spillway to a calm pool can be deadly to boaters and swimmers and must be avoided.

To date no structure has been designed to pass such a large volume of water over an eleven foot drop in such a short distance in way that does not pose a hazard to boaters or swimmers. At this level of study it cannot be guaranteed that the spillway will have recreational value, as there are significant hydraulic problems to overcome for this to occur.

The spillway concept is illustrated in the attached figure 5-4.

The proposed spillway is about 170 feet long, 40 feet wide and has a stair-step profile. This dissipates energy through its geometry and its bottom roughness.

In anticipation of boaters entering the main river channel there will be provision for safe exit. This will include a landing below the spillway and a ladder at the vertical walled section of the shore below the old mooring.

5.A.3.4. SUMMARY

The outlet works must provide a safe exit from the whitewater course, return a large amount of water to the river and in so doing dissipate a large amount of energy. This will be accomplished by:

1. A quiet water take-out pool.
2. A unique spillway design that absorbs energy and reduces the chance of dangerous hydraulics.

5.B. FLOOD PLAIN

Most people view floods as something that impacts their property and their projects. This section does that and also looks at this project's impact on the flood conveyance of the Mississippi River.

5.B.1. FLOOD IMPACT ON PROJECT

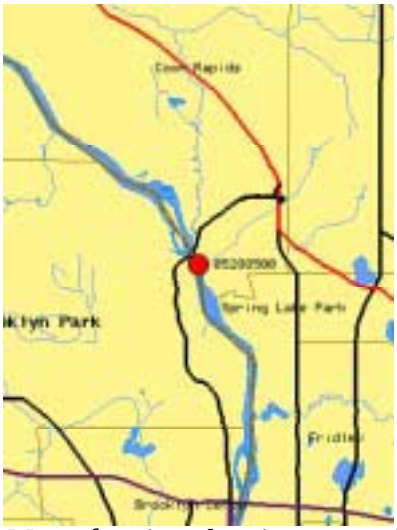
This section examines the effect of flooding on

- Headwaters, the white water channel and the head gate
- Tail water and the outlet spillway

5.B.1.1. HYDROLOGY

The Mississippi River above the site has a drainage area of over 19,000 square miles. We examined historical flow data from the nearest USGS from 1960 to 1996, the most recent calendar year of complete records. The gauge is located near Anoka MN and is known locally as gauge # 05288500.

The median annual discharge for the 36 years studied is 6500 cfs. The maximum recorded flow was on April 16, 1965 when the river crested at approximately 91,000 cfs. This flow is unprecedented since modern records have been kept, beginning in 1931. The lowest mean daily flow for the period is 728 cfs.



Map of region showing gauge location. (USGS)

The large drainage area of the Mississippi makes the site an extremely reliable from the standpoint of available water flow to run the course. It also makes it vulnerable to flooding.

5.B.1.2. HEADWATER CONTROL AT THE MIDDLE POOL

During high water, the Army Corps of Engineers (ACE) opens its gates at Lower St. Anthony Falls Lock and Dam in an attempt to maintain the middle pool elevation of 750 feet. There are four 56-foot wide tainter gates that can be opened in parallel. As the river rises, more gates are opened until all gates are fully opened. The final flood control measure is to open the lock itself for flood conveyance. Once this has been done, further local flood control is not possible. Corps operations manuals state that lock must be opened at 40,000 cfs. In practice however, this occurs at about a flow of 50,000 cfs[4]. In any event, ACE closes the river to navigation at 40,000 cfs.

For the purpose of this study, loss of headwater control is assumed to occur at 40,000 cfs, in accordance with ACE operations manuals. At this flow the white water course will be closed.

5.B.1.3. HEADWATER

As mentioned in the section on the head gate, the highest recorded sustained middle pool elevation was 751.47 during the 1965 flood. Of some concern to the project is the possibility of operator error at Lower St. Anthony Falls Lock and Dam. On at least one occasion operators were unable to open flood control gates in time to prevent a brief, uncontrolled rise in headwater at the middle pool. On that occasion, the headwater rose to 753.8 feet and briefly overtopped the temporary NSP earth dam[5]. No flood has ever overtopped the fixed crest portion of the Lower St. Anthony Falls Lock and Dam.

Impact of headwater control on the project

1. The course will not operate under extreme flood conditions when loss of headwater control occurs (flow greater than 40,000cfs).
2. The fixed crest of the project head works and movable crest head gate will not be less than the fixed crest of Lower St Anthony Falls Lock and Dam of 755'.
3. The whitewater channel should be constructed to sustain failure of its head gate during a major flood. In this scenario the head gate is assumed to be stuck in the open position in conjunction with a headwater elevation that is two feet above normal. In this situation the channel will be part of the flood conveyance of the river and will carry about 1700cfs flow. It will therefore be an armored structure and, together with the entire inlet works it will be an integral part of the adjacent lock and dam flood control system.

5.B.1.4. RISE IN TAIL WATER DUE TO FLOODING

The lower pool of St Anthony Falls Lock and Dam is actually the pool of Lock No. 1, four miles downstream. Unlike Lower St Anthony Falls, however Lock No.1 does not have flood control gates. It has a fixed crest spillway and fabric

[4] Phone conversation with Bob Stahl, ACE, March 31, 1999

[5] Phone conversation with Bob Stahl, ACE, March 29, 1999

dam flashboard that conveys floodwaters, but is incapable of exercising much control over flood levels.

The result of this is that the lower pool acts more like a real river—when the river flow increases so does the water level. This is shown graphically in figure 5-6—a tail water rating curve for the region below the Lower Lock and Dam.

For the purpose of this preliminary feasibility study the lower portion of the course is perched at a reasonable flood elevation of 733'. Army Corps data shows that this corresponds to a flow of around 40,000 cfs—the same level as ACE river closure. The maximum recorded flood elevation since 1965 for the lower pool is 739.01'.

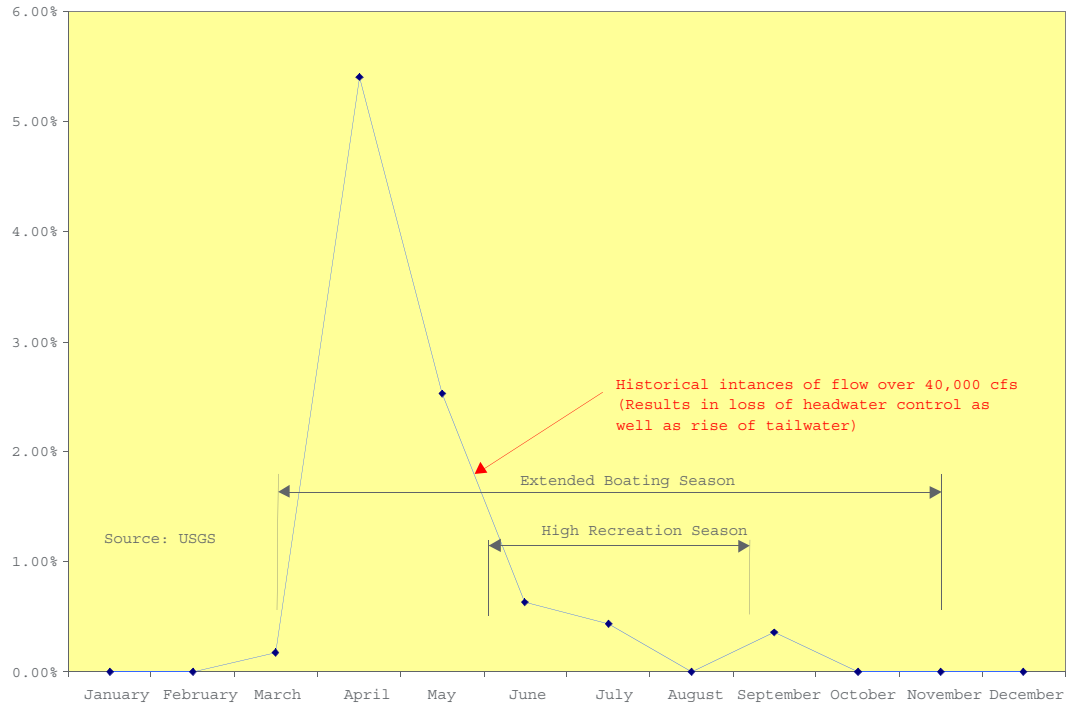


Chart showing the historical occurrence (1960 to 1996) of high water that would have an effect on course operations. Loss of headwater control and rising tail water typically governs.

5.B.1.5. LOCK OPERATIONS

A lockage at the lower St Anthony Falls lock takes a large volume of water from the river. This has the potential to impact the course during very low flow conditions. The amount of water needed for a lockage is about 80,000 cubic feet of water over an eight-minute period and could temporarily effect the white water course operation. In the event of a lockage during very low natural flow, the water flow in the channel could be reduced momentarily.

For normal course operations this is not a problem, however for competitive events it would be objectionable.

In the case of special competitive events there should be a moratorium on ship lockages, except during specified intervals. These could be during breaks in the action such as between classes or between runs. Typically competitive events occur on weekend and are scheduled months before hand. This means that shippers and lock operations can be briefed well in advance of the special needs of an event and make the necessary accommodation in their schedules.

Summary
The Mississippi has extremely reliable site from the standpoint available water flow. There is presently little competing use and the historical occurrence of low flow is rare. It is however subject to flooding.

During high water, the Army Corps of Engineers has good control over the headwaters at the middle pool, until the river reaches 40,000 cfs. However, there is little control over rising tail water at the lower pool. At the 40,000 cfs level two things could happen that effect the operation of the course—first, water may rise at the headworks and second the bottom of the course may be inundated by rising tail water.

For the purpose of this study, the operational range of the course is from 1000 cfs natural river flow to 40,000 cfs. Within this window, the course may operate without danger from flooding on one hand and restricted flow due to drought on the other.

5.B.2. PROJECT IMPACT ON FLOOD PLAIN

The impact of the proposed improvements on the floodplain will be minimal in aggregate. The attached figure 5-1 illustrates these impacts as described below.

5.B.2.1. IMPACTS ON REGULATORY FLOODPLAIN ELEVATIONS

A detailed hydraulic model (HECRAS or other) has not been completed at this level of study. However, expected impacts are anticipated to be small to negligible. The only increase in regulatory water surface elevation could occur in the middle pool. This could result because of encroachment on the river by the upstream divider berm and whitewater course. Based upon general modeling guidelines and photo analysis, the existing “Limit of Conveyance” line was estimated and shown on figure 5-1. This imaginary line can be interpreted to indicate that fill or encroachment between it an the north channel bank will not increase flood elevations. Only approximately 300 feet of the upper most portion of the course and berm extend outside of this line with a maximum intrusion of approximately 70 feet. This area would have some impact on the conveyance of the channel, however due to its location and size its impact on an increase in the regulatory flood plain elevations are anticipated to be minimal.

5.B.2.2. FILL WITHIN THE FLOOD PLAIN

An shown on figure 5-1, there is a projected net fill of 10,000 cubic yards expected to be placed within the floodplain as a result of this project. The bulk of the anticipated fill results from the Divider Berm and whitewater course upstream of the existing dam. Existing material downstream of the dam would be removed from the flood plain, however there would still be a net fill of 10,000 cubic yards. If regulatory requirements are ultimately determined to require no increase in the net fill, then dredging material out of the river bed for mitigation should be considered. There may be many areas where this could be effectively accomplished. One area worth considering is in a bar below Hennepin Island.

5.B.2.3. IMPACT ON WATER SURFACE AREAS

While fill is being added to the floodplain, the water surface area of the river is not being significantly impacted. At flood stage, the surface area of the water is about the same, while at lower flows the water surface area is somewhat increased because of the water surface area in the white water course.

5.C. PERMITS

The following permits, plan review and cooperative agreements may be needed for the white water park.

5.C.1. PERMITS

MINNEAPOLIS
Building Permit
Grading and Filling Permit

MINNESOTA DEPARTMENT OF NATURAL RESOURCES, DIVISION OF WATERS
Waters Permit (for work in the bed of public waters)
Water Appropriation Permit (if it is determined that water is appropriated)

MINNESOTA POLLUTION CONTROL AGENCY
Spoils Disposal Permit
NPDES (National Pollution Discharge Elimination System) permit
(if more than 5 acres of land are disturbed)

U.S. ARMY CORP OF ENGINEERS
Section 404 Permit

5.C.2. PLAN REVIEW

Minneapolis (city including utilities departments)
Minneapolis Park and Recreation Board
Minnesota Department of Natural Resources
Minnesota Department of Transportation
Northern States Power Company
U.S. Army Corp of Engineers
The University of Minnesota
Watershed District - Middle Mississippi Water Management Organization
(including review for the Wetland Conservation Act)

5.C.3. COOPERATIVE AGREEMENTS

BNSF Burlington Northern Santa Fe Railroad (if the final project includes their land ownership)
Minneapolis (city)
Minneapolis Park and Recreation Board
Minnesota Department of Transportation
Northern States Power Company
U.S. Army Corp of Engineers

The University of Minnesota
(All of the above are currently landowners of property on which the project is proposed)

5.D. ATTACHMENTS

Table 5-1 Middle Pool Elevation Exceedence Table

Source: Army Corps of Engineers
YEARS 1972 TO 1995
PERCENT OF TIME AT OR ABOVE INDICATED ELEVATION

ELEV	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ALL YEAR
755													
754													
753													
752													
751.75										0.13			
751.5	0.13									0.13			
751.25	0.13						0.13		0.14	0.13			
751	0.4	0.15	0.13	0.56	0.4	0.56	0.67	0.67	0.42	0.81	0.28	0.14	0.44
750.75	5.38	4.57	3.78	4.86	5.38	5.42	6.05	8.33	8.07	6.05	7.61	6.36	5.99
750.5	24.87	22.27	29.96	38.19	34.05	35.14	36.56	40.19	39.08	40.32	39.44	27.82	34.06
750.25	49.06	44.54	61	65.56	62.31	62.36	60.22	65.05	64.81	68.15	67.61	52.12	60.32
750	72.31	71.09	88.93	93.19	92.46	93.19	89.92	93.68	92.35	92.74	93.1	75.28	87.46
749.75	77.82	78.32	93.52	97.78	98.65	99.03	98.25	98.52	98.47	98.25	96.76	81.92	93.21
749.5	86.83	86.43	96.09	99.58	100	99.44	100	99.73	100	99.73	97.04	88.84	96.21
749.25	93.41	91.45	96.76	99.72	100	99.58	100	99.73	100	99.87	97.04	91.81	97.5
749	95.7	95.58	97.17	99.86	100	99.86	100	99.87	100	100	98.03	94.49	98.41
748.75	95.97	95.87	97.17	100	100	99.86	100	100	100	100	98.87	95.62	98.63
748.5	96.1	96.17	97.3	100	100	99.86	100	100	100	100	98.87	95.62	98.68
748.25	96.91	97.05	97.44	100	100	100	100	100	100	100	98.87	96.19	98.89
748	99.19	99.71	98.38	100	100	100	100	100	100	100	98.87	98.16	99.53
747.75	100	100	98.92	100	100	100	100	100	100	100	98.87	98.45	99.69
747.5	100	100	98.92	100	100	100	100	100	100	100	98.87	98.59	99.7
747.25	100	100	98.92	100	100	100	100	100	100	100	98.87	98.59	99.7
747	100	100	99.06	100	100	100	100	100	100	100	99.01	98.73	99.74
746	100	100	99.19	100	100	100	100	100	100	100	99.01	99.15	99.78
745	100	100	99.19	100	100	100	100	100	100	100	99.01	99.15	99.78
744	100	100	99.46	100	100	100	100	100	100	100	99.01	99.15	99.8
743	100	100	99.46	100	100	100	100	100	100	100	99.01	99.29	99.82
742	100	100	99.46	100	100	100	100	100	100	100	99.15	99.29	99.83
741	100	100	99.87	100	100	100	100	100	100	100	99.15	99.44	99.87
740	100	100	99.87	100	100	100	100	100	100	100	99.15	100	99.92
739	100	100	99.87	100	100	100	100	100	100	100	99.15	100	99.92
738	100	100	100	100	100	100	100	100	100	100	99.15	100	99.93
737	100	100	100	100	100	100	100	100	100	100	99.15	100	99.93
736	100	100	100	100	100	100	100	100	100	100	99.3	100	99.94
735	100	100	100	100	100	100	100	100	100	100	100	100	100
734	100	100	100	100	100	100	100	100	100	100	100	100	100

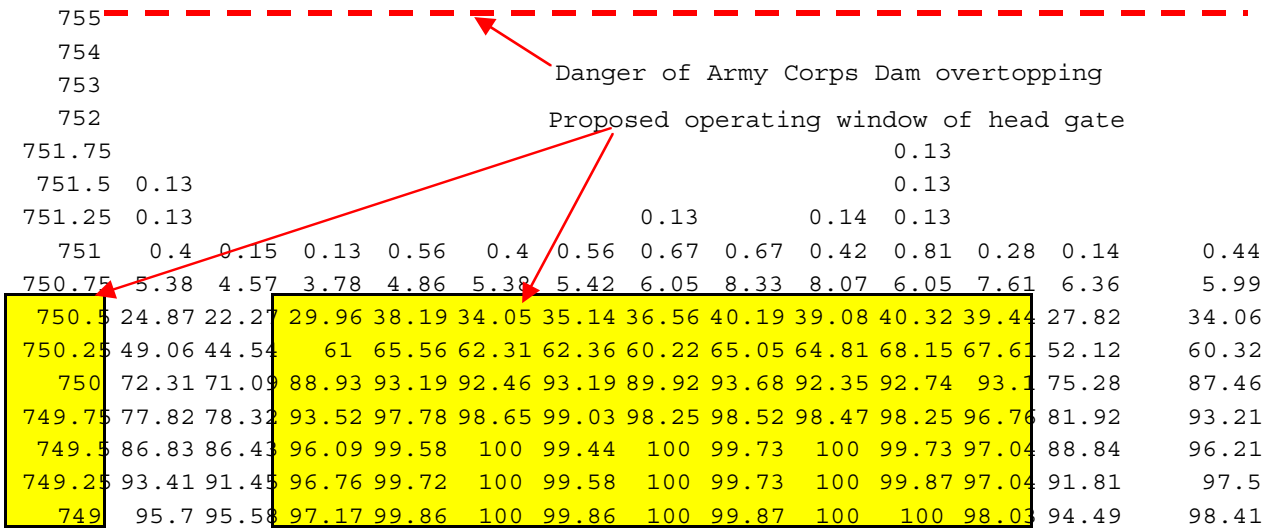


Table 5-2 Tailwater Variation at Lower Pool

Soruce: Army Corps of Engineers

YEARS 1972 to 1995

0% of values are missing

PERCENT OF TIME AT OR ABOVE INDICATED ELEVATION

ELEV	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ALL YEAR
339													
735.5													
735.25					0.27								
735					0.54								
734.75				0.28	0.67								
734.5				0.42	0.81								0.1
734.25				0.56	0.81								0.11
734				0.69	1.21								0.16
733.75				1.11	1.62								0.23
733.5				1.94	2.29								0.36
733.25				2.64	2.42								0.42
733				3.06	3.23	0.28							0.55
732.75				3.47	3.5	0.56	0.27						0.65
732.5				3.89	3.9	0.83	0.54						0.77
732.25				4.31	4.17	0.83	0.67		0.56				0.88
732				5	4.44	0.97	0.81		0.83				1.01
731.75				5.56	4.71	0.97	0.81		0.83	0.13			1.09
731.5				5.97	5.52	1.25	0.81	0.13	0.97	0.27			1.25
731.25			0.13	6.81	6.06	1.39	0.94	0.13	0.97	0.4			1.41
731			0.4	8.47	7.4	1.67	1.08	0.27	1.11	0.4			1.74
730.75			0.4	8.89	8.48	1.67	1.48	0.27	1.25	0.54			1.93
730.5			1.48	11.11	9.56	1.94	2.15	0.27	1.25	0.54			2.38
730.25			2.7	12.5	10.63	1.94	2.42	0.4	1.25	0.67			2.73
730			3.23	13.33	11.84	2.08	2.69	0.54	1.39	1.08	0.14		3.05
729.75			4.99	14.17	13.19	2.36	3.76	0.54	1.53	1.34	0.14		3.53
729.5			5.93	16.81	15.07	2.78	4.84	0.67	1.53	2.15	0.14		4.2
729.25			6.47	18.89	16.69	3.19	5.11	1.34	1.53	2.69	0.14		4.72
729			7.28	21.67	19.25	3.75	6.05	1.61	1.67	3.23	0.14		5.44
728.75			7.95	24.17	22.88	4.44	8.06	1.88	1.67	3.9	0.14	0.14	6.33
728.5			9.03	27.36	26.11	5.42	9.68	2.15	1.67	5.51	0.28	0.14	7.36
728.25			10.11	31.53	28.26	7.5	10.62	2.28	1.81	6.59	0.42	0.14	8.35
728			11.32	36.81	32.57	11.25	11.96	2.42	1.94	9.54	1.27	0.14	10.03
727.75	0.13	0.15	12.94	42.08	36.2	15.42	13.17	3.23	3.19	12.37	1.69	0.28	11.84
727.5	0.54	0.29	14.02	46.53	39.17	21.11	14.38	3.76	5.42	15.05	2.54	0.28	13.7
727.25	1.75	1.18	16.04	50.69	43.07	26.25	15.99	4.44	7.08	17.88	2.82	0.28	15.74
727	3.23	2.65	19	56.25	46.84	30.97	19.09	5.11	8.89	20.83	5.23	0.56	18.35
726.75	4.17	4.13	21.83	59.72	50.47	34.17	23.92	8.06	10	22.98	7.63	1.41	20.85
726.5	4.17	4.72	25.07	62.92	53.43	39.44	28.63	10.75	12.36	23.92	11.86	2.12	23.43
726.25	4.17	5.01	28.3	66.67	57.34	44.17	33.06	13.44	15.14	25.4	17.51	2.82	26.25
726	4.17	5.16	30.32	73.47	61.1	48.33	38.17	16.8	17.36	26.34	24.72	4.38	29.36
725.75	4.31	5.31	32.21	78.61	65.14	52.78	43.28	21.64	20.28	28.09	35.73	6.92	33.02
725.5	5.11	5.6	35.58	82.5	69.45	59.17	49.46	29.44	27.22	33.06	44.21	13.56	38.03
725.25	6.73	5.9	39.62	84.58	76.45	69.17	60.08	42.88	45.28	47.58	55.79	23.87	46.69
725	11.57	7.08	42.86	87.64	83.85	78.47	72.45	60.62	66.53	65.99	71.05	35.31	57.2

Maximum recorded flood elevation 339.01'

Lower part of course begins to flood

Mean Tailwater 725.6' per Army Corps

Median Tailwater 725'+/-

6.A. CULTURAL RESOURCES

MNDNR TRAILS & WATERWAYS UNIT
CULTURAL RESOURCES PROGRAM
PRELIMINARY PROJECT REPORT

OSA LICENSE NUMBER: 98-023

PROJECT NUMBER: 98-WR-HE-7

PROJECT NAME: Mississippi River Whitewater Trail/Park

PROJECT SCOPE: This project proposes the potential development of a formal Whitewater Trail/Park on the east bank of the Mississippi River, adjacent to the U.S. Army Corps of Engineers Lower St. Anthony Falls Lock and Dam, within the City of Minneapolis, Hennepin County. This facility is to include a recreational whitewater course for kayaking, canoeing and rafting as well as improved public access to the river and formal shorefishing opportunities. In addition to the formal recreational development, a principal objective is to provide the opportunity to upgrade, restore and protect a significant segment Mississippi River Bank within the urban corridor. This facility is to be constructed on a multiple acre parcel, which is currently comprised of 4 separate parcels bounded on the west by Northern State Power Company's former power facility and on the east by the University of Minnesota's main power plant. The majority of the property contained within the proposed development is presently owned by the University of Minnesota. Although property within this area is also owned by NSP, the Minnesota Department of Transportation and the City of Minneapolis. As currently proposed the Mississippi River Whitewater Trail/Park is to potentially include: the construction of whitewater course comprised of a gated, artificial channel placed parallel to the Mississippi River; formal staging, observation and picnic areas; shorefishing sites, and restrooms. Due to the preliminary stage of project proposal, formal designs and/or specifications have not yet been completed.

FUNDING/PERMIT STATUS: The feasibility study for this project is in completion of the requirements of Minnesota Laws 1998, 401, Section 4. Development of this proposed facility will be completed under the terms of a Special Permit from the U.S. Army Corps of Engineers.

LOCATION: This project is to potentially be developed within a narrow parcel situated on the east bank of the Mississippi River, adjacent to the U.S. Army Corps of Engineers Lower St. Anthony Falls Lock and Dam within the City of Minneapolis, Hennepin County.

MAP REFERENCE: N1/2,NE1/4,SE1/4,SE1/4,Section 23 and N1/2,SW1/4,SW1/4,Section 24,T29N,R24W
USGS Minneapolis South & St.Paul West Quadrangles, 1967 - Photorevised 1993, 7.5 min. series (Figure 1)

UTM COORDINATES:
Western Terminus - Zone 15, Easting 480400, Northing 4980580
Eastern Terminus - Zone 15, Easting 481000, Northing 4980420

ENVIRONMENTAL DATA:
Geomorphic Region (Ag. Exp. Stat. 1975, Twin Cities Metropolitan Sheet) Mississippi Valley Outwash
Physiographic Area (Wright 1972) Eastern St. Croix Moraine
Original Vegetation (Marschner 1974; Coffin 1988) Oak Openings and Barrens; Oak Woodland and Brushland
SHPO Archaeological Region (Anfinson 1989) 4e - Central Lakes Deciduous

DESCRIPTION OF PROJECT AREA: The Mississippi River Whitewater Trail/Park is to be constructed on the east bank of the Mississippi River, within the City of Minneapolis, Hennepin County. The proposed development as presently defined is to be confined to a narrow riverine terrace situated between the steep vertical limestone bluffs and the present river channel, immediately downstream from the U.S. Army Corps of Engineers Lower St. Anthony Falls Lock and Dam. This area is located on the south/eastern margins of the City of Minneapolis's historic milling district, an area of intensive industrial development during the late 19th and early 20th centuries. However, commercial development within the broadly defined boundaries of the proposed project area during this period was apparently limited to the western parcel/s, situated adjacent to the Lower St. Anthony Falls Dam. Currently the proposed whitewater park development area is comprised of 4 separate parcels, owned by the University of Minnesota (University), Northern States Power Company (NSP), the Minnesota Department of Transportation (MnDOT) and the City of Minneapolis. These parcels contain numerous extant improvements which have apparently resulted in the complete alteration of all natural terrain within the broadly defined project boundaries.

Within the currently defined boundaries of the proposed Mississippi River Whitewater Park/Trail, the improvements which remain extant, include: the University's main power plant and associated barge facility; the eastern terminus of the Lower St. Anthony Falls Dam; and the piers of the Interstate 35W and 10th Ave./Cedar Ave. bridges. However, use of the University's existing power plant is scheduled to be discontinued and operations transferred to an upgraded facility located in the former Twin City Rapid Transit Company Steam Power Plant, a facility located along the whitewater park's northern margins that was most recently operated by NSP. The parcel containing the University's existing power plant and associated improvements will presumably be available for redevelopment following the transfer of operations to the upgraded, former NSP facility. In addition to the extant improvements, the U.S. Army Corps of Engineers currently utilizes much of the property contained within the public roadway r/w corridors as a storage facility for dredge spoil which is subsequently trucked off site for final disposal. The development area for the proposed Mississippi River Whitewater Trail/Park in bounded by the University of Minnesota's main power facility and associated improvements on the east, the former Northern States Power Company facility and the associated segment of the Lower St. Anthony Falls Dam on the west, the Mississippi River on the south and the river valley's limestone bluffs on the north.

PREVIOUS CULTURAL RESOURCE INVESTIGATIONS/KNOWN CULTURAL RESOURCES: In an effort to assess the nature of extant cultural resource sites or data located within the proposed project's Area of Potential Effect (APE) as initially defined, a preliminary review of the records of the Office of the State Archaeologist, the files of the State Historic Preservation Office, and the Minnesota Historical Society was completed. These initial investigations determined that although the project is located within an area containing numerous significant archaeological and historical properties representing industrial and municipal development during the 19th and early 20th Centuries, based upon the preliminary concept design it does not appear that the development of the proposed whitewater park will affect any of the previous documented sites or data.

The initial investigations determined that the proposed development property contains or is located adjacent to three significant historic properties currently listed on the National Register of Historic Places (NRHP). The portion of the potential development area currently owned by the City of Minneapolis is comprised entirely of the r/w corridor for the 10th Ave./Cedar Ave. Bridge, a NRHP listed property (Figure 2). The eastern support piers for this historic bridge are located within the city owned property. These initial reviews also revealed that the proposed development area is located adjacent to two additional significant historic properties currently listed on the National Register of Historic Places. The western limits of the proposed development area are situated immediately east of the St. Anthony Falls Historic District's eastern boundary (Figure 3) and immediately adjacent to the Twin City Rapid Transit Company Steam Power Plant (Figure 4). These initial reviews also determined that there are no properties currently listed on the State Historic Sites Registry or the State Historic Preservation Office's, Architecture/History Inventory located within the boundaries of potential development.

Although the proposed Mississippi River Whitewater Trail/Park as presently defined is to be constructed within an area which contains members of the 10th Ave./Cedar Ave. Bridge, no alteration or modification to the bridge or it's support structure will be required under the current development concept. In addition, given the character of the potentially affected terrain, the extent of previous development, and the scope of the proposed project, it does not appear that either the St. Anthony Falls Historic District or the Twin City Rapid Transit Company Steam Power Plant will be affected this project as currently conceived.

The preliminary archaeological literature search and records review revealed that there are no currently documented archaeological properties located within the potentially affected parcels. These reviews did reveal, however, the presence of one potential historic archaeological site. This potential site is identified as "East Side Flats-North End" in an assessment of archaeological sites in the St. Anthony Falls Area, complied by Scott Anfinson, National Register Archaeologist for the Minnesota State Historic Preservation Office (Anfinson 1986). The "East Side Flats", as defined, was a Late 19th Century residential settlement of single story wood frame structures constructed along the riverbank terraces below St. Anthony Falls. These structures were, however, all apparently removed between 1895 and 1950 (Anfinson 1986: 24). Although, subsurface structural remnants or occupational debris representing this period may remain extant within the proposed project's APE, given the scope of 20th Century development it appears that the potential for the presence of significant intact cultural deposits within this area is extremely limited.

FIELD INVESTIGATIONS: In order to further define the relationship of the documented historic properties to the proposed development and assess the potential for intact subsurface archaeological deposits within the project area, preliminary field reviews were completed on 13 August 1998. Given the nature and location of the proposed project, in an effort to facilitate the definition of the project's potential affects, Susan Roth, State Historic Preservation Office (SHPO) National Register Historian, Scott Anfinson, SHPO National Register Archaeologist, and Michael McDonough, MnDNR Project Coordinator participated in the initial project assessment.

The initial pedestrian examination of the broadly defined project area confirmed that the proposed development of the Mississippi River Whitewater Trail/Park will be confined to a segment of a narrow riverine terrace, located immediately downstream from the Lower St. Anthony Falls Dam. These initial examinations also confirmed that the development of the extant improvements within this area appears to have resulted in the complete alteration of all terrain within the broadly defined project boundaries. Currently the potentially affected terrain is comprised principally of four distinct areas: a low lying parcel located immediately downstream and adjacent to the inplace Lower St. Anthony Falls Dam; a large segment of level terrain situated immediately north of the Interstate 35W r/w corridor that is currently being utilized as a staging area for the rehabilitation of the Twin City Rapid Transit Company Steam Power Plant by the University; the U.S. Army Corps of Engineers dredge spoil storage facility contained within the Interstate 35W r/w corridor; and the western margins of the University's existing barging facility. A roadway corridor currently traverses the proposed development parcels, parallel to the Mississippi River bank, providing vehicular access to the existing University power plant located on the projects eastern margins. Preliminary visual examination of the surface sediments present throughout the broadly defined project area, however, revealed that these sediments appear to consist entirely of fill materials and modern debris. Based upon the extent of previous terrain modification it was determined that additional archaeological field investigations do not currently appear warranted. However, based upon the results of these initial field studies it is recommended that additional consideration be given during final design and project development to the potential archaeological deposits that may remain extant.

The initial assessment and review also confirmed that the proposed Mississippi River Whitewater Park/Trail is to potentially be constructed within a property that is traversed by the Cedar Ave. Bridge and is located adjacent to the St. Anthony Falls Historic District and the Twin City Rapid Transit Company Steam Power Plant, all properties currently listed on the National Register of Historic Places. These initial reviews indicated, however, that it appears that due to nature of the extant terrain within the proposed project boundaries, the character of development within the demarcated area during the 19th and early 20th Centuries, and the relationship of the potentially

affected parcel to the defined historic properties, it does appear that the development of this new public recreational facility should affect the qualities or characteristics which contribute to the significance of these properties. However, given the preliminary nature of the development proposal, the effects of the variety of potential park designs on the NRHP listed properties within the broadly defined project area cannot currently be fully assessed. Therefore, it is recommended that efforts be made for the project design to compliment the historic, industrial nature of the Mississippi River waterfront throughout this area. It is additionally recommended that the SHPO be provided further opportunity to comment on the proposed project following completion of a final project design.

CULTURAL RESOURCE PROPERTY DATA: None

MANAGEMENT RECOMMENDATIONS: The cultural resource investigations for the proposed development of the Mississippi River Whitewater Trail/Park on the east bank of the Mississippi River within the City of Minneapolis were initiated during 1998. Due to the preliminary nature of the project development proposal, the completed investigations were necessarily restricted to archaeological and historical records reviews and initial field assessments. Based upon the results of these investigations it does not appear that the proposed development of the Mississippi River Whitewater Trail/Park as presently conceived should affect any significant archaeological or historic sites or data. Therefore it is recommended that the proposed development proceed as planned. However, as a result of the project's preliminary status, the potential indirect effects on the NRHP listed properties located within the broadly defined project area cannot currently be fully assessed. Therefore, it is also been recommended that consideration be given during project design to the historic, industrial nature of the Mississippi River waterfront throughout this area and the potential archaeological deposits associated with the historic period which may remain extant.

INVESTIGATOR: Kent Skaar, Trails and Waterways Archaeologist

SURVEY DATES: 13 August 1998 REPORT SUBMITTED: 5 March 1999

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1972b Quaternary History of Minnesota. In *Geology of Minnesota: A Centennial Volume,* edited by P. K. Sims and G. B. Morey, pp. 515-546. Minnesota Geological Survey, St. Paul.

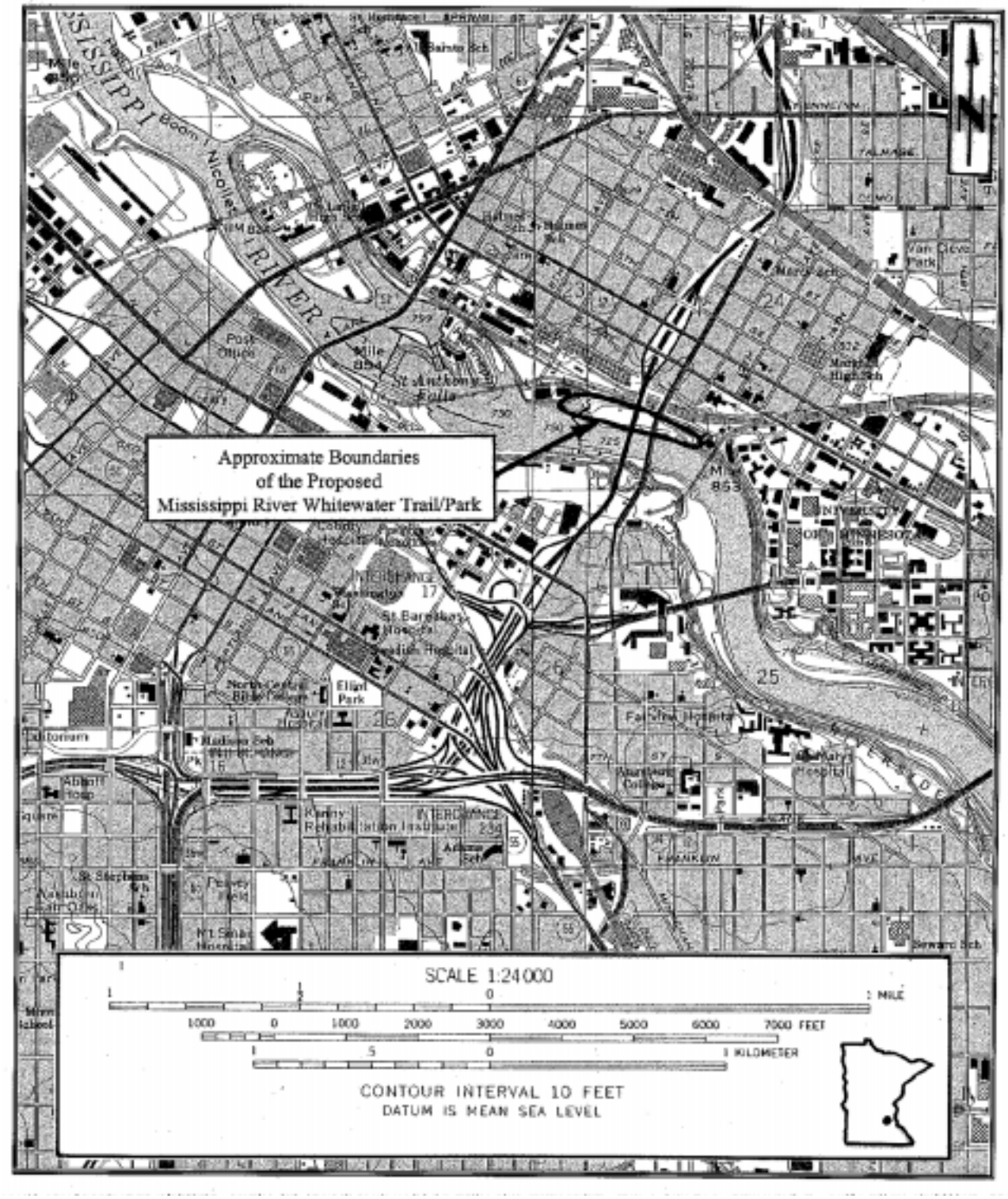


Figure 1. The location of the proposed Mississippi River Whitewater Trail/Park, located on the east bank of the Mississippi River within the City of Minneapolis, Hennepin County (USGS Minneapolis South & St.Paul West Quadrangles, 1967 - Photorevised 1993, 7.5 min. series).

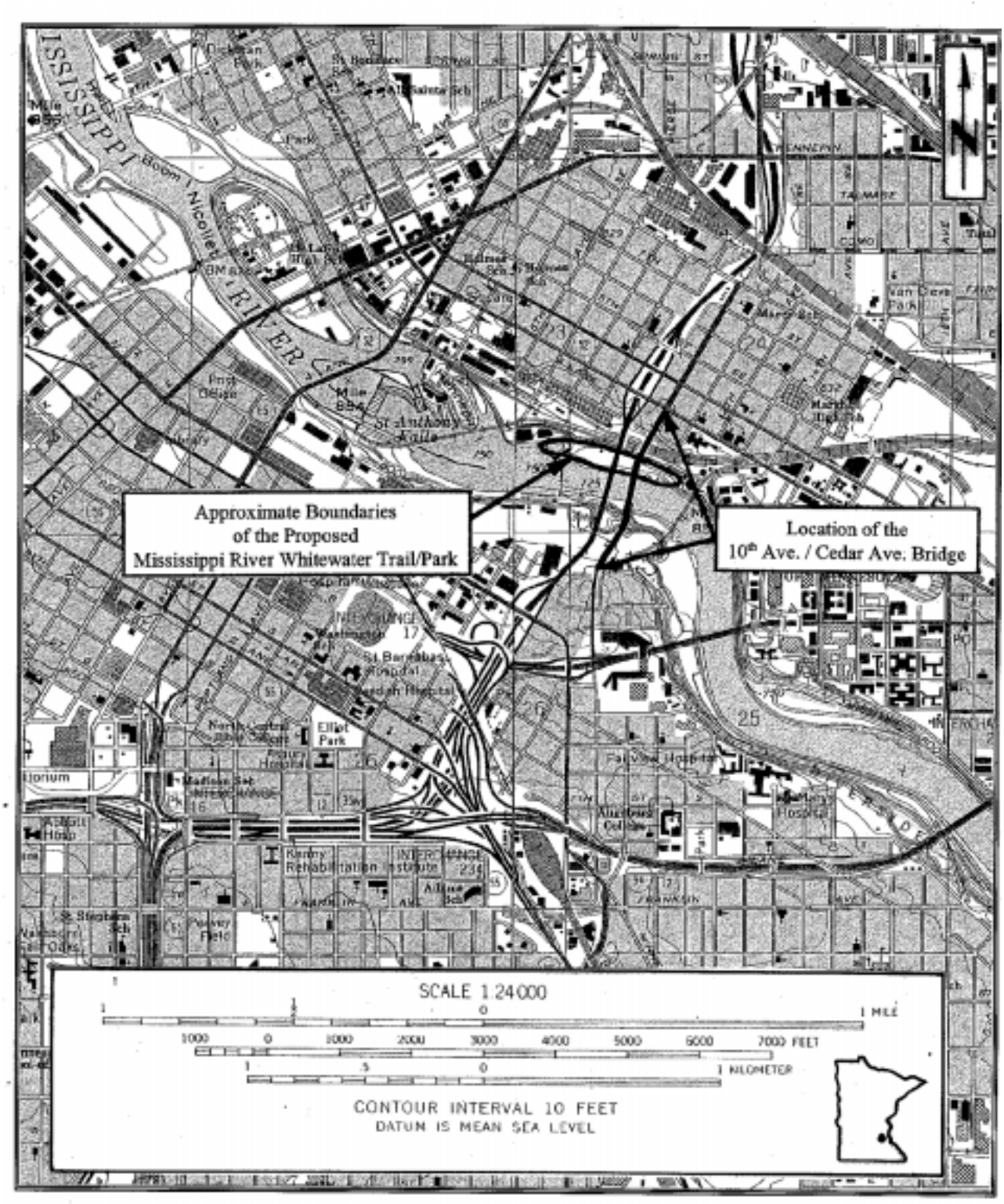


Figure 2. The relationship of the proposed Mississippi River Whitewater Trail/Park to the 10th Ave./Cedar Ave. Bridge, a property currently listed on the National Register of Historic Places (USGS Minneapolis South & St.Paul West Quadrangles, 1967 - Photorevised 1993, 7.5 min. series).

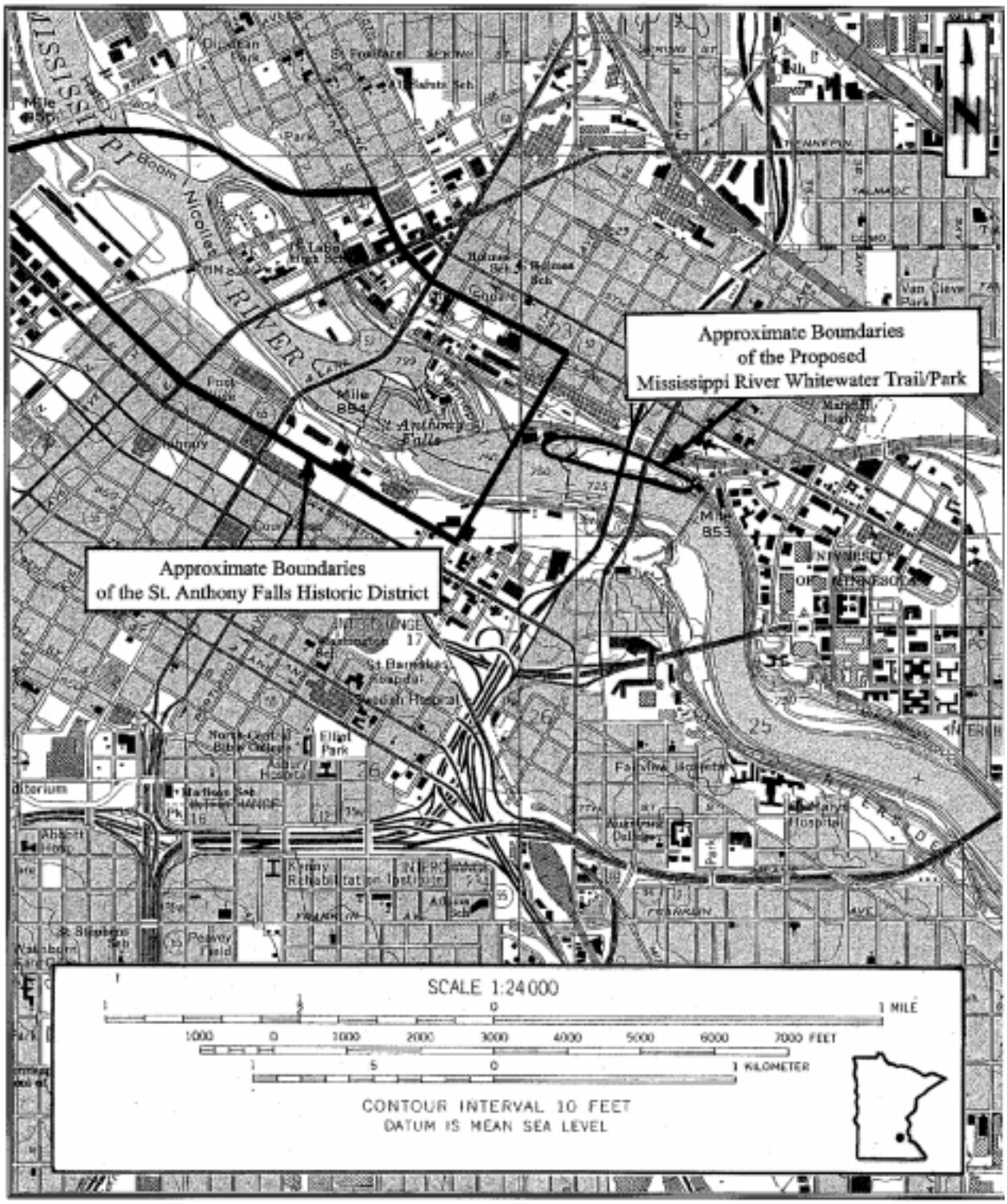


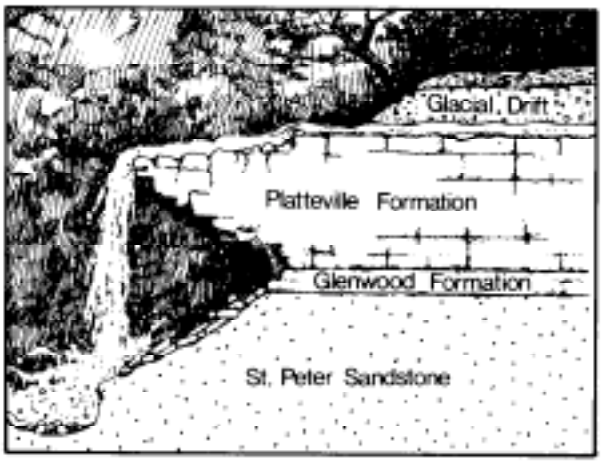
Figure 3. The relationship of the proposed Mississippi River Whitewater Trail/Park to the St. Anthony Falls Historic District, a property currently listed on the National Register of Historic Places (USGS Minneapolis South & St.Paul West Quadrangles, 1967 - Photorevised 1993, 7.5 min. series).

Figure 4. The relationship of the proposed Mississippi River Whitewater Trail / Park to the Twin City Rapid Transit Company Steam Power Plant, a property currently listed on the NRHP (USGS Minneapolis South & St.Paul West Quadrangles, 1967 - Photorevised 1993, 7.5 min. series).

6.B. NATURAL RESOURCES

6.B.1. GEOLOGY

There are steep slopes, bluffs and cliffs along this section of the river. The elevation varies from approximately 725 feet above sea level at river level to approximately 825 feet above sea level at the highest points on the bluffs. At the bluff top varying depths of fill overlie approximately 20 feet of interbedded glacial till and alluvium, which in turn overlie limestone bedrock of the Platteville formation. Along the bluffs there are some exposed outcroppings of the bedrock.



. The sequence of rocks at Minnehaha Falls is repeated in many outcrops throughout the Twin Cities area. (After a drawing by Ann Cross in Hogberg, 1971.)

Illustration from Minnesota's Geology, 1982, University Press

Along the river at the base of the bluff, the Platteville Limestone and underlying Glenwood Shale bedrock have been eroded away by the river. In this area the uppermost bedrock is overlaid by either varied depths of till or sedimentary material which is largely St. Peter Sandstone, a white friable sandstone with little cement, making it a very loose material.

6.B.2. WATER

6.B.2.1. GROUND WATER

In the bluff area, the water table reportedly occurs in the surficial deposits (glacial drift and alluvium) at a an elevation approximately 800 feet below the surface. At the base of the bluff, the water table occurs in the St. Peter Sandstone bedrock or in the river bank sediments at the elevation of the river. Ground water flow is influenced by the river but generally flows southwest and discharges into the river.

The ground water system at the top of the bluff differs from the St. Peter Sandstone bedrock ground water system below it. The two systems are separated by confining zones of low permeability soil (clays) or bedrock (shale) units. Ground water in the surficial deposits at the top of the bluff eventually discharges from the bluff at the overburden / bedrock contact point and follows the topography to the river as surface runoff. Surface water then either infiltrates in to the riverbank sediment and enters the bedrock groundwater system, or enters the Mississippi River directly.

Limited vertical recharge through the confining layers may also occur, mixing with the St. Peter water table and ultimately discharging in to the river. Limited recharge of the bedrock groundwater system by surficial runoff (or by the Mississippi during high water) probably occurs as well. Limited contamination of the bedrock aquifer by a river front spill or by contaminated river water is therefore possible.

6.B.2.2. FLOOD PLAIN

Part of the area is in the flood plain, so development had to be consistent with accommodating a flood and not decreasing the flood storage capacity of the area. The flood plain limit is shown on maps in the site planning section of this report.

6.B.2.3. WATER QUALITY

The water quality of the river in this area of the whitewater course is considered boatable and swimable. Its water quality class is ranked at 2b or better. There has been significant improvement in the water quality since steps have been taken to meet the standards of the Clean Water Act of 1972. The water quality was dramatically improved with the completion of the separation of the local storm and sanitary sewer systems. All sanitary waste is being treated at the Metro Waste plant (Pig's Eye Facility). The water quality of the Mississippi is also significantly better above the confluence with the Minnesota River, near the Ford Dam, before it is mixes with the waters of the Minnesota River. The Minnesota River has significantly degraded water quality because of the agricultural land use practices in the southwestern part of the state.

6.B.2.4. MISSISSIPPI RIVER CRITICAL AREA

The Mississippi River and its adjacent Corridor within the seven-county metropolitan area was designated a Critical Area in 1976 to protect and preserve a unique and valuable resource, as well as prevent and mitigate irreversible damage. Standards and guidelines for preparing plans and regulations for the Critical Area were outline in Executive Order 79-19. The University adopted a Critical Area Plan in 1979, in compliance with Minnesota State Statute, Section 116G.12, subdivision 3, to protect and preserve the Mississippi River corridor that is within the campus boundaries.

The proposed whitewater park development is with in the designated critical area. The facility would be designed and operated to meet and or exceed the criteria set forth in the Critical Area Plan.

6.B.3. VEGETATION

Vegetation is present on the steep slopes, it consists of natural succession woodland. The vegetation is mostly pioneer woody trees, shrubs and herbaceous plants, including Boxelder, Cottonwood, Elm, Sumac, Elder, Riverbank Grapevine and Cocklebur. Some of the steeper slopes that have not had as much disturbance over the years have a better mix of vegetation including some woodland wildflowers. Sandstone is not conducive to dense vegetation, but the vegetation that is present has developed an extensive root system that enables it to cling to and survive on the steep slopes. Disturbances of this vegetation can result in rapid erosion. It is difficult to reestablish vegetation in these conditions.

The flat areas on top of the bluffs has very limited vegetation typical of abandoned railroad yards. Where vegetation does occur, it is mostly weed species. The flatter areas on the lower level, closest to the river, has also has been highly disturbed, and the vegetation also consists of mostly weed species. Along the very edge of the river, mostly volunteer pioneer species like Boxelder, and Cottonwood are growing

The redevelopment of this site offers a great potential to re-vegetate the site in a more appropriate manner. Reintroduction of native species can restore it to a more natural state and enable it to be a healthier, more diverse and better functioning ecosystem.

6.B.4. WILDLIFE

Wildlife in this area consist mainly of song birds, gray squirrels, rabbits, ground hogs and other small rodents. Redevelopment of the site including re-vegetating with native species should benefit the existing birds and wildlife and allow a greater diversity to thrive in this area.

The site provides numerous opportunities for interpretation and education. Opening the site up to the public by developing the proposed whitewater course and park will bring people to the site that will be interested in the natural and cultural history of the site. Interpretation can enhance the experience of the user and foster a greater awareness and appreciation of this river environment.

This study is not of the scope to specifically define the interpretive and educational components that might be developed, but the following list is meant to give some suggestions of what might be included. While the information on this area is just a brief outline, it was included as a separate section in the study because of its potential to benefit the community. Because much of the proposal is on University property it also provides them an opportunity to share information with the general public in several areas of the University's teaching and research expertise.

NATURAL HISTORY

Fish and wildlife - past and present
Glacial - affects on the river formation
Geology - the geology of the river valley, the river's role in shaping the current topography
Vegetation - patterns and uniqueness
Hydrology - the Mississippi is one of the largest rivers in the world and drains 2/3 of the continental US

CULTURAL HISTORY

The Mississippi - place of myth legend and history
Native American - attraction to the falls
Settlement - the rivers role in both Pre-European and post-European settlement
Milling - Minneapolis as a world milling center due to the power of the falls
Historic buildings/structures, including the renovated steam plant (1903), Mines and Minerals Research building, historic housing on the river flats before the turn of the century(demolished), 10th Avenue bridge
Paddle boats - their role in immigration
Rail roads - stone arch bridge, bridge #9

CURRENT RIVER USES

Commercial navigation - Barging and the lock and dam system
Fishing - fish and aquatics that are present in the river
Hydro-power - historical, current and potential future use at both the upper and lower falls
University Hydrological Lab research
Recreational boating
-boating safety
-kayaking including slalom racing history
-white water rafting
-rowing

Purpose: Outline the risks associated with a whitewater course and describe a plan that addresses them.

Contents

8.A. THIRD PARTY LIABILITY

This section deals with risks and liability specific to a white water project. It does not attempt explain the general concepts of risk management and it does not offer details on risks normally associated with parks, recreation facilities, trails, etc. It assumes that these risks are fairly well understood and can be applied to the non-white water portion of the project.

This section outlines specific suggestions for risk management for the site:

- Risk Avoidance
- Risk Reduction
- Risk Transfer
- Retained Risks

8.A.1.1. RISK AVOIDANCE

These include measures to reduce the possibility of injury or loss at known or obvious hazards at the site. A hazard that readily comes to mind is the region upstream of the Army Corps lock and dam and shipping channel. Risk avoidance incorporated into the preferred alternative includes the following measures:

1. General prohibition on boating in the shipping channel (a total prohibition is currently being considered by the Army Corps though they have indicated a willingness to consider proposals to designate a safe boating area below Hennepin Island).
2. Delineate, with buoys and signage, the area of safe boating between the course start and Hennepin Island.
3. Signage and prohibition on rock climbing on the bluffs overlooking the site as well as other attractive nuisances that become known in the future.
4. General closure of the course during floods above 40,000 cfs (see section 5 for further discussion).

8.A.1.2. RISK REDUCTION

These include features that reduce the inherent risks of the activity or sport that cannot be completely avoided.

- Siting and design features that reduce the risk of injury.
- Integral features to facilitate self-rescue.
- Operational characteristics that reduce risk.

Siting and design features that reduce the risk of injury

- Signage posted warning of the inherent risks of white water. "Boat at own risk" if and when course is unmonitored.
- Reduced possibility of foot entrapment--bottom will not have cracks or places where a foot can become lodged.
- Reduced possibility of broaching by designing midstream features with a low angle of attack that will wash a buoyant object over or around, rather than side pinning.
- Reduced possibility of vertical pins by avoiding steep drops and falls.
- Fence or other barrier to prevent the unwary from accidentally entering the water.
- Shallow water at the course edge-- avoid sudden drop-offs into deep water where possible.
- A head gate control structure that is designed to pass boats safely.
- An outlet structure that does not create dangerous hydraulics regardless of tail water elevation

Features to facilitate self-rescue versus assisted rescue:

- Numerous eddies and slow water regions at the sides,
- Low side slopes (typically 3:1) that have footholds to allow unassisted exit from the water.
- A 100-foot long plus take out pool of calm water before the outlet to the river.
- Pedestrian path on each side of the course to allow easy exit.

Operational Practices That Reduce Risk

- Develop a maintenance program that addresses problems promptly and keeps records.
- Visually inspect the channel at the beginning of each day to insure that there is no foreign debris that could pose a hazard.
- Require users to wear basic safety equipment (helmet & lifejacket) and to have craft suited to the conditions of the day i.e., no inner tubes or boogie boards above a certain flow.
- Consider ways to levee fees that are not construed to be "admission" or "gate fees" such as charging for rental equipment or parking.
- Conduct regular training and drills for site personnel on specific emergency operations i.e. rapid shut down of water in the event of a serious accident or pinning.
- Encourage use of the site by swift water rescue teams for their training programs. In the event of emergency they will be thoroughly familiar the site and techniques to be employed there.
- Shut the course off when not monitored and secure the head gate.

8.A.1.3. TRANSFER OF RISK

This method transfers part of the risk to the end user.

End user agreement
Raft companies typically have guests sign a waiver acknowledging the risks of white water experience. Since this site has the potential to be a controlled environment, (depending on operation scheme) a hold harmless and indemnification agreement should not attempt to shirk legitimate responsibility for site conditions and operations. Rather it has the end user take responsibility for his own actions, for his ability to swim and for general fitness for the activity at hand, while acknowledging the assumed risk of all white water activity.

8.A.1.4. RETAINED RISKS

Risks that cannot be avoided or transferred are retained. Unacceptable retained risks should be insured by commercially available insurance policies, if possible. The state, by law, has limited liability for third party claims for loss and is otherwise self-insured. The current limits of liability and statutory references are listed in Appendix 1. These statutory limits however may render additional insurance meaningless.

All boating carries an element of risk. Grave risk of death is not as great as on a wild river, however the liability may be greater. The appended data compiled by the American White Water on deaths among boaters show that long swims, keeper hydraulics and entrapment under water (by trees, undercuts and unknown hazards) are leading dangers. These dangers can be significantly reduced at this site. More of a concern is casual attitude brought about by familiar and perceived to be risk-free surroundings. A mature operating staff capable of enforcing safety rules and behavior among guests is critical to avoiding “idiot”-type accidents.

8.A.1.5. RUN OF RIVER OPERATION

In the case of an unmonitored operation plan, outfitters will be attracted to the site. Typically qualified outfitters are granted permits to run natural rivers and this should be the case here. In this scenario the state would take a role in determining the carrying capacity of the resource and allocate launch permits accordingly. In this situation the third party liability exposure would be similar to that of natural rivers where outfitters are permitted.

8.A.1.6. INSURANCE

Third Party Operator
In the event that a private party is selected to manage the site he should be required to have insurance that includes the state and other concerns as additional insured. The policy limits should meet state standards then in effect.

Use of the site for athletic training
The American Canoe Association (ACA) has a general liability policy for its sanctioned training sites. Information on this policy is contained in Appendix 2.

Special Events
Organizers of special events typically are required to have event insurance. The state and other concerns that grant use of the site usually require that they be included as named insured on the event policy.

8.A.1.7. SUMMARY

In addition to proven techniques of loss prevention at recreation facilities, this project should incorporate integral design features and operational characteristics that reduce risk. At their core is common sense operation procedures and a channel that is challenging but allows for easy self-rescue.

8.B. PROPERTY LOSS

8.B.1. FLOODING

Property loss due to acts of God is generally insurable according to the degree of exposure and the willingness of the insured to pay the premiums. Unlike the usual perils of wind, hail, fire tornadoes, etc. that is a matter of chance floods are guaranteed to happen at this site.

Portions of the subject site are within the regulatory flood plain. Gainful use of flood plains and activities therein is common, however it is generally poor practice and not permissible to locate improvements there.

This project does not propose improvements such as buildings, enclosed structures for human occupation or use. There will however be the whitewater course and related appurtenances, walks, trails, bridges, landscaping, etc. For these items the best loss prevention measure is **common sense planning and survivable construction techniques**.

8.B.1.1. COMMON SENSE PLANNING

Volumes have been written on techniques for sensitive flood plain and wetlands planning that will be incorporated at Mississippi White Water Park at the appropriate time. The following are basic loss prevention techniques that will be employed in this project.

1. Minimize the amount of improvements within the flood plain
2. Locate bridges above the anticipated flood elevation
3. No delicate furnishings, waste receptacles or other items that cannot be securely anchored to heavy footings.

8.B.1.2. SURVIVABLE CONSTRUCTION TECHNIQUES

Landscaping—use native trees and plants that are adapted to flood plains and can withstand prolonged immersion and/or water velocity. Choose plants that stabilize soil and help man-made improvements survive scour.

Pavement—use sacrificial pavement i.e., wood chips, earth in the annual flood plain. Use durable pavement capable of surviving high velocities at high traffic areas that are subject to flooding or high velocities.
High velocity areas--armor banks with grouted or ungrouted boulders where high water velocities are anticipated. MWE's project list has examples of attractive buried and semi-concealed armoring schemes.
Hand railings, light standards, slalom gate system etc. can be built to withstand flowing water, however these items tend to attract flotsam and can fail under the weight. A fold-down design that collapses under shear load of floodwater will be employed.
Head Gates--are robust structures that are made for harsh flood environments. A model will be selected that minimizes the chance of accidental collapse or vandalism.
The White Water Channel—The channel is located in the floodplain, not in the floodway as are most of the projects by this design team. The section below anticipates that there is a remote possibility that with a dam emergency the white water course may be subject to severe flood conditions. A survivable channel is possible through proven channel armoring techniques. The key is to anticipate the velocities and loads (uplift, shear) under the worst conditions.

8.B.2. DAM EMERGENCY

This project is a beneficiary of the Lower St. Anthony Falls Lock and Dam—without it there would be no readily exploitable vertical drop, no controlled flow and no project.

Lower St. Anthony Falls Lock and Dam has an impressive array of floodgates, manual and automatic controls and a highly trained 24-hour staff to run them. It has never been overtopped by a flood since its construction in 1956, this despite a macro flood during its first decade of existence. It relies on continuous vigilant staffing to maintain this record however. The middle pool above the project has a surface area of only 50 acres and the freeboard of the dam is only five feet above normal pool. This amounts to roughly 250 acre feet of storage before overtopping the crest (the 1993 flood passed 250 acre feet of water every five minutes at its peak.). Compared to the behemoth dams elsewhere in the country Lower St Anthony was never intended to have flood storage and is a hair trigger that must be pulled the instant a rise in headwater is detected.

Fortunately, floods on the order of the summer of 1993 do not appear instantaneously and Corps personnel have time to prepare. On at least one occasion though there was a brief uncontrolled rise in headwater that came to within a foot and a half of the dam crest before dam operations could respond. The fixed crest portion of the dam next to the project site is not meant to be overtopped—only flood gates and lock itself can pass flood flows.

In the unlikely event of overtopping two things would happen to the white water course: the headworks and the earth divider berm would overtop and the fixed crest of the Army Corps dam would go under. The white water channel and the site area below the fixed crest dam can be designed with enough buried armoring to survive. In this scenario the white water channel will serve as a spillway, conveying flood flows to the lower pool. Presumably such an event would only happen during an extreme event.

Should the whitewater channel convey flood flows it will suffer damage including loss of soil cover and plants, paving, furnishing and other non structural elements. The amount of damage will depend on the severity of over topping (how high the headwater gets), its duration and the elevation of the tailwater at the time. The Army Corps will not accept liability for property loss due to its actions or failure to act to control floods[1].

Should the project move forward, the Corps might want to update its procedures and safety manuals to include considerations for the white water course. The existence of the channel however should not negatively impact the integrity of the existing lock and dam structure or flood procedures.

8.B.2.1. SUMMARY

Property loss due to flooding can best be avoided by recognition of the inherent limitations on development in flood plains and by survivable construction techniques designed by qualified consultants. A dam emergency is a remote possibility, but one that will result in some property loss. The amount of loss depends entirely on the severity and duration of the emergency. This site enjoys more flood protection than many of the other man-made white water venues in the country.

Please see Appendix 4 for the following materials:

- State limits of liability
- Sample state waiver form for participants
- Data on whitewater fatalities compiled by American Whitewater
- Event sanctioning packet from American Canoe Association

[1] Phone conversation with Dennis Erickson ACE 3/24/99.

Purpose: Present three alternatives for operations and identify key maintenance issues.

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9.A. MANAGEMENT AND OPERATION-3 ALTERNATIVES

This section lists the likely uses of the whitewater course portion of the park and models a typical operation season and a typical day during the season. It does not deal specifically with ancillary uses of the site except to state that accommodations for other sports such as biking, in-line skating, tobogganing, sledding, skiing, walking, rock climbing, etc. can only add value to the mix of recreation offerings, make the site a four season operation and increase its attractiveness to a potential operator.

9.A.1. BACKGROUND

9.A.1.1. LIKELY USERS

For the purpose of this report the potential users of the channel are divided into the following main categories (in descending order of numbers of potential users).

1. **Spectators.** Persons who do not get into the water, but come to the site to be near the water, or to watch a special event and people who come into contact with the course via another attraction such as the walkways and trails of the adjacent park.
2. **General Water Recreation.** This group includes people who do not have sophisticated equipment or knowledge of white water boating, but use the course in inflatable craft. An outfitter on site may provide their equipment.
3. **Instruction.** This includes classes of all sorts: white water boating, outward bound programs, “boot camps” for at-risk youth, fire and rescue training.
4. **Private Boaters** own their equipment and have the specialized knowledge that allows them to use this course as well as natural rivers without the assistance from an outfitter.
5. **Athletes** are people who are training for a specific competitive event such as whitewater slalom, down river racing or whitewater rodeo. High level athletes that train at the site can give notoriety to the course and will attract others and help establish on-going athletic programs.
6. **Competitors** are those participating in special events. This can include competitors from all over the country or the world.

9.A.1.2. SEASON

The season of operation is inseparable from weather and water flow. Most use will be in the summer and important international special events occur from late June through September.

- **The High Season** is from Memorial Day to Labor Day and will attract all users. It is the only season for general water recreationalists and for competitive events.
- **Shoulder Season.** For private boaters with their own equipment the season starts as early as March and extends into December.
- **Low Season.** For athletes and hard-core private boaters the season is virtually all year with only time off for ice-in conditions on the river.

In the final analysis the facility is in use whenever the adjacent river walks and trails are in use, and that is most of the year. This puts special demands on its construction materials, aesthetics and maintenance.

9.A.1.3. TYPICAL DAYS

This section creates a number of "typical days" throughout the year that reflect a seasonal variation in use. It takes into account general principles of demand for water based recreation—demand will be high in the summer and taper off in the shoulder season and be attractive only to the hard core users in the winter.

The projection does not presume to know how the course will be operated ultimately, however it does assume the following:

1. The operation will attempt to accommodate all reasonable user demand in a fashion that makes the most sense under the conditions of the day i.e., turning the course over to a slalom club for winter use.
2. The course will be well managed and well promoted with the goal of at least covering the cost of operations.
3. During peak demand days in summer where potential conflict exists between user groups, priority will be given to youth programs and general recreation.
4. The course will likely have a flexible management structure that changes according to season with the goal of maximizing use.
5. Both the easy channel and the difficult channel will be open concurrently so different groups can be on the water at the same time.

The typical days are shown in table 10-1. It does not show details for both channels, rather it shows a blended average and may not reflect a true picture. This is especially true for instruction and at risk youth programs. Much of the time for youth will be spent in the pool below Hennepin Island and on the easy channel, getting instruction on flat water and easy moving water skills. In addition the shoulder season instruction clientele will be different from the summer schools—there will be more collegiate instruction and programs for fire and rescue squads during cooler weather.

Table 10-1 Typical Day

High Season Weekday			72 days per year		
Group	Begin time	End time	Hrs./day	Hrs./year	Flow level (CFS)
Athletic training	6:30	9:00	2.5	180	800
Instruction	9:00	11:00	2	144	800
General Recreation	11:00	17:00	6	432	400
Private boaters	17:00	21:00	4	288	800
	Total		14.5	1044	
High Season Weekend			28 days per year		
Group	Begin time	End time	Hrs./day	Hrs./year	Flow level (CFS)
Athletic training	6:30	8:30	2	56	800
Private boaters	8:30	10:00	1.5	42	800
General Recreation	10:00	17:00	7	196	400
Private boaters	17:00	21:00	4	112	800
	Total		14.5	406	
Shoulder Season Weekday			116 days per year		
Group	Begin time	End time	Hrs./day	Hrs./year	Flow level (CFS)
Athletic training	6:30	9:00	2.5	290	800
Instruction	9:00	12:00	3	348	800
Private boaters	16:00	19:30	3	348	800
	Total		8.5	986	
Shoulder Season Weekend			44 days per year		
Group	Begin time	End time	Hrs./day	Hrs./year	Flow level (CFS)
Athletic training	6:30	8:30	2	88	800
Private boaters	8:30	10:00	1.5	66	800
General Recreation	10:00	15:00	5	220	800
Private boaters	15:00	18:00	3	132	800
	Total		11.5	506	
Low Season Weekday			72 days per year		
Group	Begin time	End time	Hrs./day	Hrs./year	Flow level (CFS)
Athletic training	7:00	9:00	2	144	800
Athletic training and Private boaters	15:00	17:30	2.5	180	800
	Total		4.5	324	
Low Season Weekend			32 days per year		
Group	Begin time	End time	Hrs./day	Hrs./year	Flow level (CFS)
Athletic training	7:00	9:00	2	64	800
Private boaters	9:00	17:00	8	256	800
Athletic training	15:00	17:00	2	64	800
	Total		12	384	
Total Hours per Year	3650				

9.A.1.4. PARKING DEMAND

Most course users will arrive by car and will need to park. At the high season and during special events this will create a demand for more parking than is available on site.

The following table is a rough guess of parking requirements for the course. It was created in response to a specific request for parking impact to the Marcy Holmes neighborhood.

Table 10-2—Parking estimate

User	Ridership Rate							
	(occupants/car)							
Student	3							
Private Boater/Fisherman	1							
Rafter	2							
Tuber	3.5*							
Event Spectator	3	**						
On-shore Spectator	4	***						
* assumes most are youth and will be dropped off and picked up								
** walk-in and bike-ins will be encouraged--actual ridership will be about 2.5/c								
*** many will arrive on foot or on bike via the many trails.								
Their turn over rate is higher at the course but may linger in the neighborhood								
enjoy other the St Anthony Main attractions								
	Predominant Use	Peak Instantious Attendance	Ridership rate	On-shore spectators	Ridership rate	Parking Required	On Site Parking Provided	Additional Parking Needed
High Season	Tubers	300	3.5	300	4	161	56	105
Shoulder Season	Private Boater/Fisherman	500	1.0	300	4	125	56	69
Low Season	Private Boater/Fisherman	200	1.0	40	4	30	56	
Small Special Event	Event Spectator			1000	3.0	333	20	313
Large Special Event	Event Spectator			5000	3.0	1667	0	1667

9.A.2. OPERATION ALTERNATIVES

9.A.2.1. INTRODUCTION

The management of the whitewater park and its development can ensue under several scenarios. A handful of organizations and agencies including, Minneapolis Park Board, Minnesota Department of Natural Resources, Mississippi Whitewater Park Development Corporation, Outward Bound and the University of Minnesota could be involved. There are a variety of roles — capital contribution, financial packaging, land assembly, site development, facility owner, facility operator, and program / event manager — at the proposed facility where the different players can participate.

9.A.2.2. THE PLAYERS

CUED asked different agencies with the capacity and expertise to participate, what, if any roles, they might be willing to play in the development of the proposed whitewater park. Of those interviewed, six indicated that they would be willing to participate:

- Minneapolis Community Development Agency (MCDA),
- Minneapolis Park Board,
- Minnesota Department of Natural Resources (DNR),
- Mississippi Whitewater Park Development Corporation,
- Outward Bound, and
- University of Minnesota, particularly the master plan committee.

MCDA's desire to be involved hinged primarily on the possibility that development of the park would have a strong private venture component. Since all of the other parties interested in developing the park are public or non-profit entities, this condition made MCDA involvement unlikely.

Private sector players could be recruited by the public sector to develop the site under an request for qualifications / proposals (RFQ / RFP) process. The solicitation should describe in detail the physical plant i.e., the channel and buildings, and the operational goals of the owner: general recreation, events, community outreach (youth programs), private boating, white water instruction, related off season activities, shoulder and low season boating, athletic programs and so on. Preparing an RFP requires a significant amount of thought and effort in order to receive a fair number responses of like quality. Once the proposed park was completed, private concessionaires could also be involved in operating programs.

9.A.2.3. OPERATION AND MANAGEMENT SCENARIOS

Involvement of the different players will depend, ultimately, on the structure chosen for the management and operation of the proposed whitewater park. Three general frameworks for management and operation would be unmanaged, single-track management and dual-track management. In the unmanaged

scenario, the whitewater channel would run non-stop year-round, without supervision. The single-track management scenario would have a single operator and manager throughout the year. The dual-track management scenario would have one operator / manger during the high season and another operator / manager during the low season.

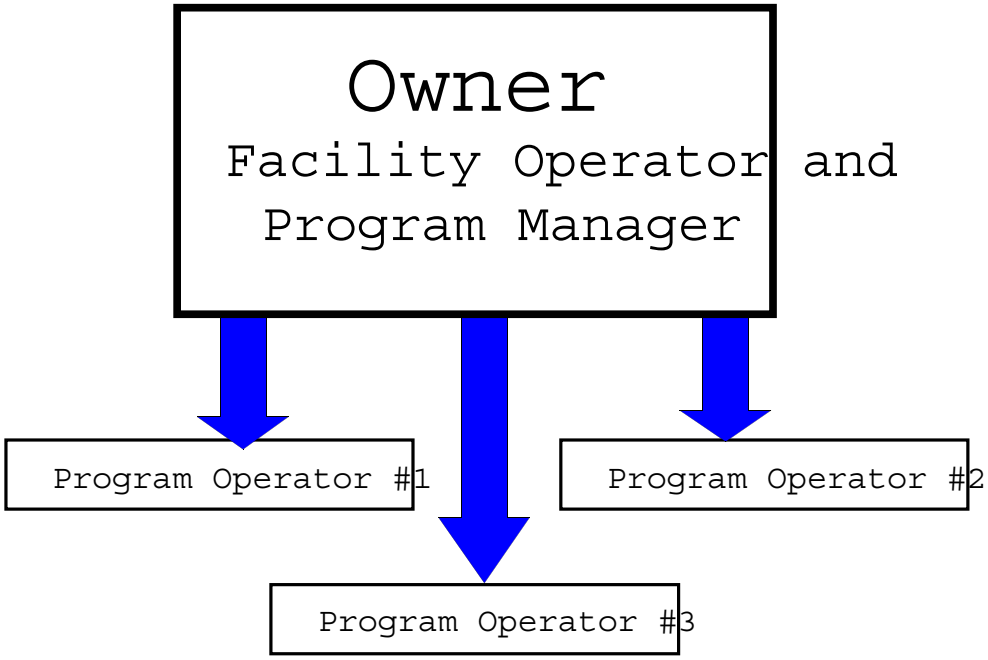
In the u*nmanaged scenario,* use of the whitewater channel would be "at one's own risk" on a first come, first serve basis. The grounds and adjacent park would be maintained as a public recreation resource by either the state or the municipality. This scenario would require the ownership and maintenance by the Minneapolis Park Board or DNR. The University could also have a secondary role in maintenance. The primary agency, also the owner of the facility, would be responsible for maintaining the ground and facilities of the park all-year long. The primary agency could contract out limited event and program management to other groups. This approach would be best if the course is experiencing limited use. If there are more users than course capacity, which is very likely in the high season, more control is needed.

An example of an unmanaged whitewater park is Confluence Park in Denver, Colorado on the South Platt River. People may come and go as they please and street vendors are permitted to set up shop on site and offer services (food, rubber rafts, bike or other equipment rental) as they see fit. The only obligation of vendors and / or concessionaires operating at Confluence Park is that they be licensed to do their customary business. They may (or may not) provide those services whenever they choose and at whatever level of quality that the market will bear.

Should the proposed park become too crowded under the unmanaged scenario, a more managed scenario may be appropriate. The transition could be an open solicitation (possibly with preference given to existing operators) to obtain the best quality and most committed vendors. The goal would be to reduce over supply of services during the high season and to insure an adequate coverage during the less busy times. This is similar to licensing vendors at popular swimming beaches or at National Mall in Washington, D.C.

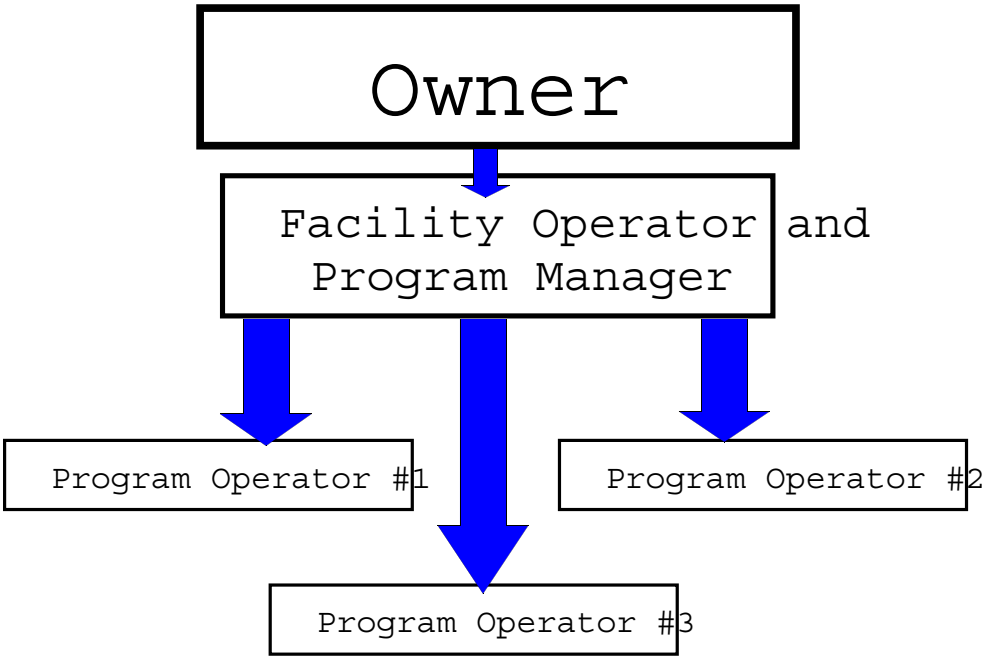
For a s*ingle-track management scenario,* the facility owner acts as the long pole in tent for the operation and management of the site. Whether the owner acts as the manager (see Figure 4) or the owner contracts management out to another entity (see Figure 5), the owner has the primary responsibility for choosing the management and programming at the site. In the single management scenario, the entity taking the role of facility operator and program manager continue in that role throughout the entire year. One agency may own and operate the facility (Figure 4) *or* one agency may own it and another operate it (Figure 5). The operator would be responsible for managing the schedule of events and programs hosted at the site by several concessionaires and groups.

Figure 4. Single-Track Management Scenario A



In this scenario, the Minneapolis Park Board would be a likely owner of the facility with development assistance from DNR. The University of Minnesota could partner with the Park Board by operating the facility and / or managing its programs. The University already manages a whitewater paddling program at its Duluth campus and could replicate its successful programs at the proposed whitewater park in Minneapolis. Outward Bound, an outdoor recreation non-profit, could also operate the facility and its programs. Outward Bound has a trained whitewater staff, experience with outdoor program management and a strong track record in youth outreach. A third group that could operate the facility and / or its programs is Mississippi Whitewater Park Development Corporation. Mississippi Whitewater Park Development Corporation is currently in the process of developing a staff, which could be in place by the time the proposed park has been completed.

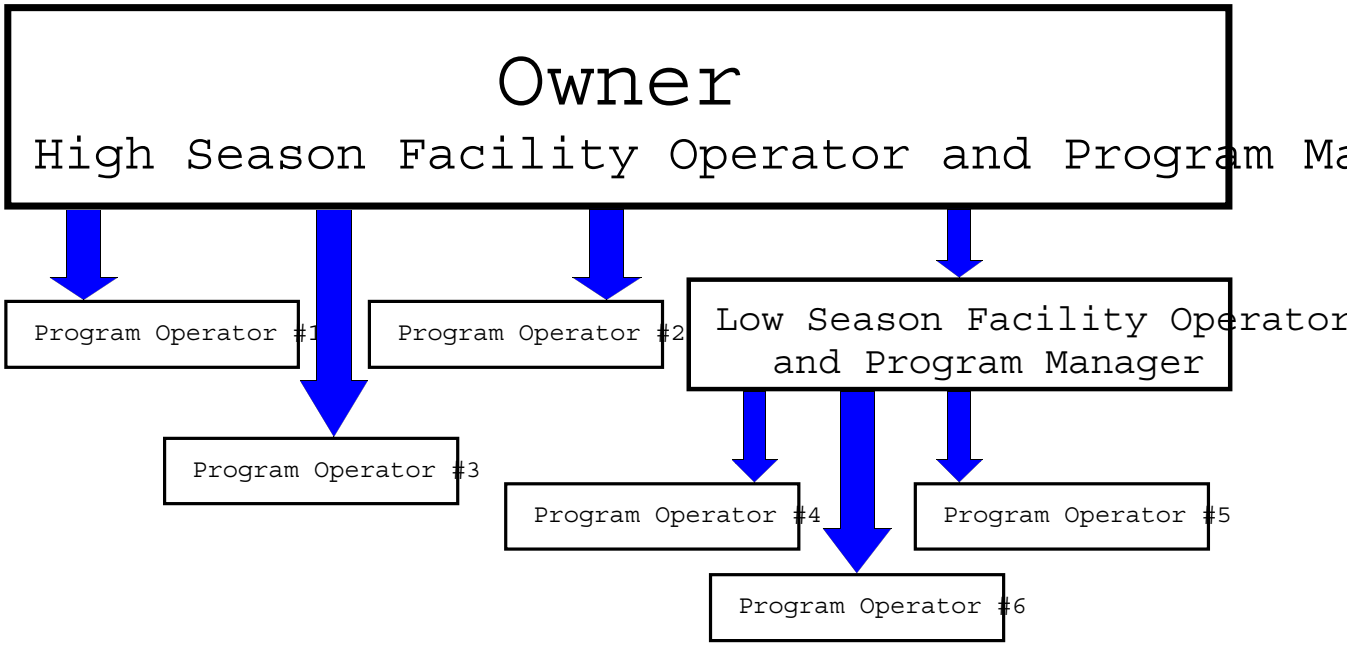
Figure 5. Single-Track Management Scenario B



The operator would manage its own programs, as well as allocate time for other groups and companies to operate at the park. These program operators could include food vendors, raft companies, raft or bike rental vendors, trainers and instructors, outreach and youth programs, safety classes or operators with experience in a block of these skills. A restaurant or seasonal grill could also be located at or near the site.

Delegating responsibility for the operation and management of the facility would fall on the facility owner. The facility owner could issue a facility and/or a program management RFP to interested parties under the organizational structure with which it is most comfortable. The terms and conditions that the University of Minnesota and other property owners may place on the Park Board's ownership have not been determined. One possibility is for the University to donate land for the site in return for exclusive use of the course during certain time blocks in order to achieve some of its recreational programming objectives.

Figure 6. Dual-Track Management Scenario A



In the *dual-track management scenario* roles are shuffled to take into consideration fluctuations of high- and low-season use at the facility. During the high season, the alternatives for operation and management mirror those for the single track-management scenario (see Figure 4). Because low-season users tend to be more serious paddlers, a second contractor, like a non-profit or paddling association, could maintain and operate the facility during the low-season. These kinds of groups would benefit from having greater access to the facility when other users are less interested. They could operate the facility at little or no cost using volunteer support in the low-season.

Other alternatives, shown Figures 7 and 8, are variations of the same theme with the owner hiring other entities for operating the park. The owner may decide to contract out management during the high season or during the entire year to different groups. The groups could be hired depending on their operating capacity or their management fees.

Figure 7. Dual-Track Management Scenario B

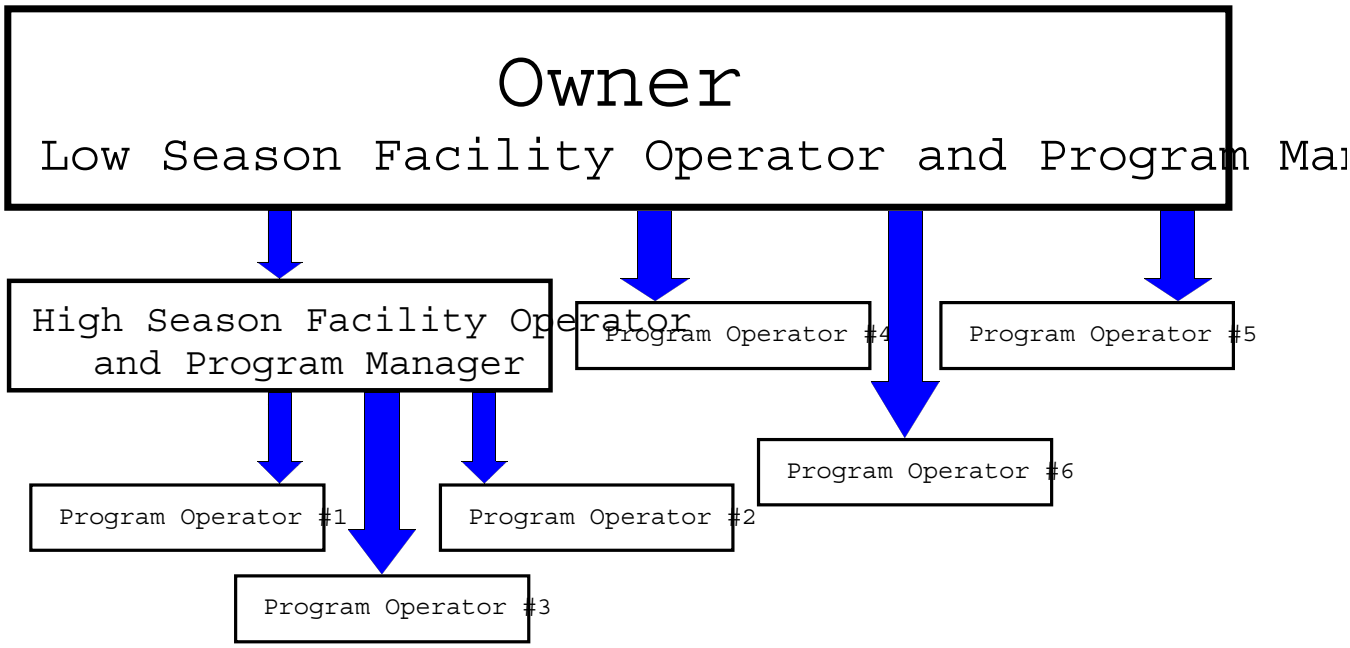
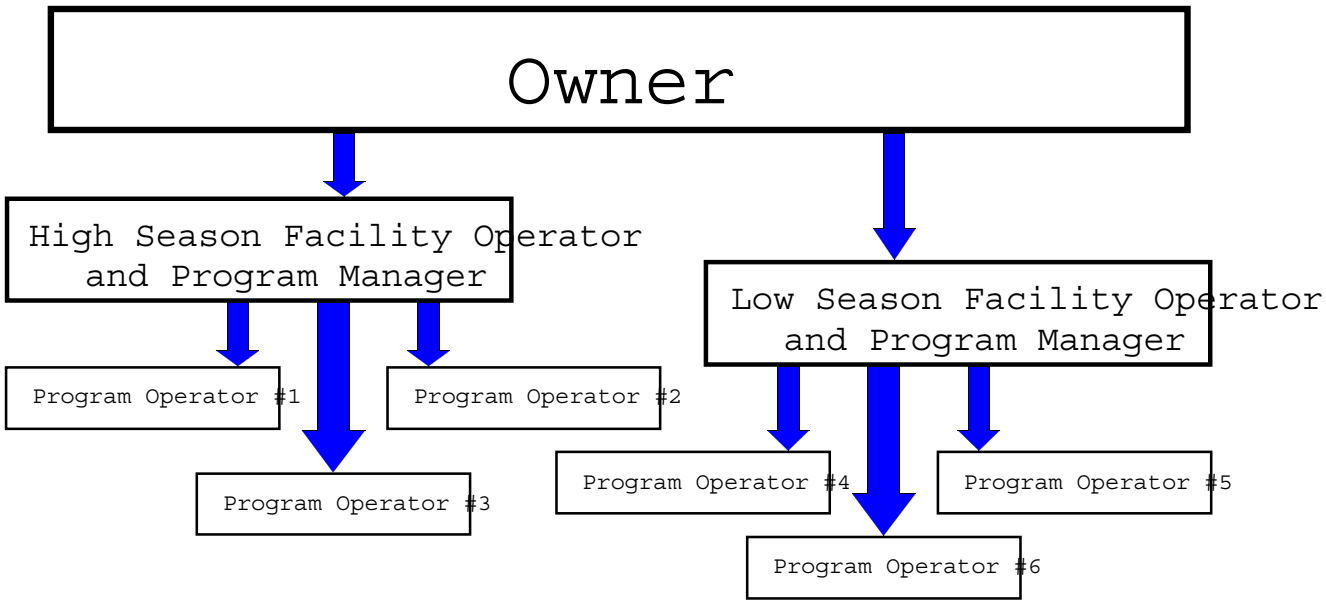


Figure 8. Dual-Track Management Scenario C



9.A.2.4. OPERATING BUDGET AND FUNDING

Appendix 10-1 shows a sample budget for operating the proposed whitewater park. Revenues from food and drink concessions and events fees as well as expenses for on-site staff, and maintenance / security at the park are based primarily on the experience of the East Race Waterway in South Bend Indiana. It assumes that attendance will increase gradually over time although unique, new attractions often have a very high attendance during the first year followed by a drop in attendance, followed by gradual increases in subsequent years. A $100,000 annual capital reserve was included to cover the cost of major repairs and improvements that could be desired after five to ten years of operation. Despite these costs, we project that the course revenues will support operating costs and generate a little profit. It should be noted that when public bonds are used to finance profit-making ventures, public and private sector gains may be limited by law. Therefore, any profit would be used to pay debt service on the bonds.

Because the whitewater course can not be expected to generate enough profit to support debt service, most of funding will have to come from public sources. The most likely source would be state bonds although the city or regional government could provide additional funding. If the private sector were to raise some money, it would likely improve the chances of state funding.

9.A.3. SUMMARY

Five public and nonprofit agencies have expressed an interest in playing a role in developing, owning or managing the course. There would be a lead agency, probably public, that would develop and own the course. That lead agency or another designated organization would operate the course. The organization operating the course could subcontract specific programs and concessions throughout the year. Alternatively, the course operator might change depending on whether it was the summer high season or spring and fall shoulder season.

9.B. MAINTENANCE PLAN

Maintenance is needed to keep the site attractive and safe. A maintenance program that defines staff responsibilities and one that promptly notes problems and takes corrective action should be instituted. A written log of noted problems and corrective action could increase accountability.

The subjects of general buildings and ground maintenance will not be covered here except to say that it will be required and that they will follow generally recognized principles for a high traffic site. A golf course grounds is a good comparison. The purpose of this chapter is not cover these items, rather it is to identify maintenance items specifically related to the white water course. These are divided into routine seasonal, daily and occasional tasks.

Likewise, the subject of recreational equipment maintenance will not be covered in this report. At the time of soliciting proposals and qualifications for a site operator, a section on equipment maintenance should be included.

The channel maintenance list is rather short because the channel has few moving parts. The main tasks have to do with keeping the channel and related inlet and outlet works clear of debris.

9.B.1. SEASONAL TASKS

1. Routine maintenance on the head gate per manufacturer's literature.
2. Clear debris boom of flotsam.
3. Inspect the channel for cracks, settling or other problems.
4. Renovate the slalom gate system--repaint the gates, replace worn ropes and cross wires, check hardware.

9.B.2. DAILY TASKS

1. Walk the course to check for lodged debris.
2. Check the screen for accumulated debris and clear.

9.B.3. OCCASIONAL TASKS

Occasional tasks occur because of unusual circumstances such as a special event or a flood.

9.B.3.1. IN ANTICIPATION OF MAJOR FLOODS

1. Close channel to recreation and secure site
2. Secure head gate, coordinate emergency operations with Army Corps Lock and Dam operators
3. Remove slalom gates, and light furnishings

9.B.3.2. AFTER MAJOR FLOODS

1. Remove flotsam and debris deposited by high water, especially at the lower end of the site.
2. Hose down paved areas to remove silt.
3. Replace sacrificial paving and any plantings ruined by high water.
4. Clear debris boom of accumulated flotsam.
5. Check head gate for lodged debris and clear if required.
6. Check outlet works screen for debris and clear.
7. Reinstall slalom gates and light furnishings (if any).

9.B.3.3. SPECIAL EVENTS

The burden of preparing the site for events is the rightful providence of the event organizers. Specific preparation items to be done by the site operator should be part of the agreement to host the event. Likewise site take down and clean up should be primarily the responsibility of the event organizers unless agreed differently in advance.

9.C. ADVERTISING AND PROMOTION

This section briefly outlines the major points of site promotion. These fall into three general categories 1) attracting private boaters and competitors 2) attracting general recreation and tourist visits, and 3) attracting special events.

9.C.1. PRIVATE BOATERS AND COMPETITORS

Private boaters are probably the easiest to attract since the private boating community is close knit and well informed about boating venues. The existence of the site will be quickly known nationally and internationally even before it opens. Once it is open it will be part of Minnesota boating lore and all subsequent newcomers to the sport will be informed of it.

This group is generally a well-educated and affluent crowd. Their greatest need will be up to the hour information on schedule, water levels, fee structure etc. Since many will travel long distances to come to the site this advance information will help greatly in planning their trip. A telephone hot line will serve this purpose and a well maintained web site would also be appreciated and well used. The web site for Nottingham England (http://www.nationalwatersports.co.uk/telephone.html or http://www.nationalwatersports.co.uk/centreinformation.html) is plain-looking but provides the kind of information boaters are looking for: hours of operation and fees. Web sites for other venues such as at Augsburg Germany (http://members.aol.com/Eiskanal/) and Seu d'Urgell Spain (http://www.sportec.com/www/fep/ctomun99/ing/main.htm) are geared more colorful but geared to rafters.

9.C.2. GENERAL RECREATION AND RAFTING

The general public that does not posses the specialized equipment and knowledge to run rivers by themselves is the most important component of the user mix. This is because they will be the largest group and will be willing to pay more for the experience than a private boater. In the experience of natural rivers that are rafted the commercially outfitted customer in that is the chief revenue producer, and the private boater is an incidental part of the economics of obtaining water releases, access, etc. In our opinion there is no white water site in the country that has tapped the potential customers as well as the rafting industry has done in promoting their offerings on natural rivers. This site could be a unique situation for a rafting operator since he will have control over both the experience and the venue.

The potential core offering at the site could include the following activities:

- Guided and unguided rafting
- One and two person inflatable kayaks
- Boogie boards and tubes (under low flow conditions)

In addition the operator could round out his offerings and promote weekend and multi-day stays (as opposed to a one-day visit) by packaging with related adventure sports:

- Instructional programs in canoe / kayak
- Corporate team building
- Related seasonal adventure sports including mountain biking, climbing, skiing, in-line skates, fly fishing, etc.

9.C.3. SPECIAL EVENTS

Please refer to Section 3—Economic Impact for a listing of regional, national and international white water events and their governing bodies. The following discussion pertains mostly to international level events although the logistics are similar for a regional or local event.

9.C.3.1. EVENT BIDDING

International events are awarded years in advance of the actual date. To be awarded an event, a bid must be made to the International governing body for the sport. The process is similar to awarding an Olympic Games to a host city only on a much smaller scale. The steps in securing a large event are outlined below:

1. Form a local organizing committee and build local support (sponsors).
2. Obtain the endorsement of the national governing body for the sport (there can be only one bid from each country).
3. Prepare and submit a detailed bid package for the event that responds to the particular event's bid information package.

9.C.3.2. LOGISTICS

The majority of the work in running an event falls to the local organizing committee. The task of running an event should not be underestimated—it is a daunting and for the most part a volunteer task including:

- Fund raising
- Government relations and permitting
- Preparing and submitting a bid
- Volunteer recruitment, screening and training
- Hospitality and home stay program for visiting athletes
- Temporary facilities
- Media and public relations
- Event and transportation planning
- Public Safety
- Site take down
- Parking and transportation

9.C.3.3. PERMANENT EQUIPMENT

- A complete set of slalom gates
- A set of training slalom gates
- A communication system
- A public address system
- Banners, flags, signage, etc.
- A timing and scoring system

9.C.3.4. RENTAL EQUIPMENT

- Tents and temporary structures
- Portable toilets
- A scoreboard
- Display televisions (optional)
- Temporary Bleachers

9.C.4. SAMPLES OF ADVERTISING BROCHURES

Figure 10-1—Brochure Cover from Nottingham, England

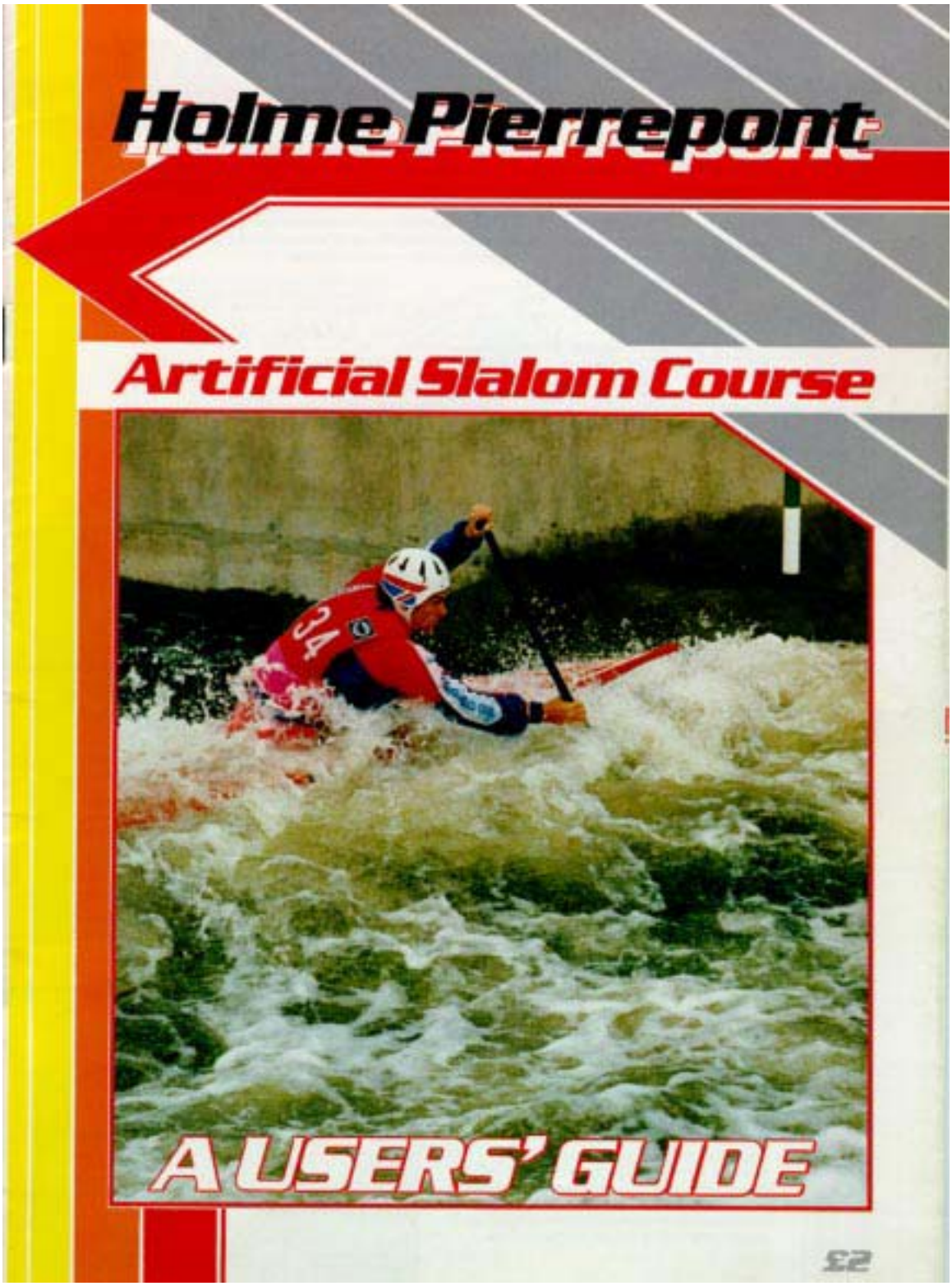


Figure 10-2—Brochure Cover from South Bend, Indiana

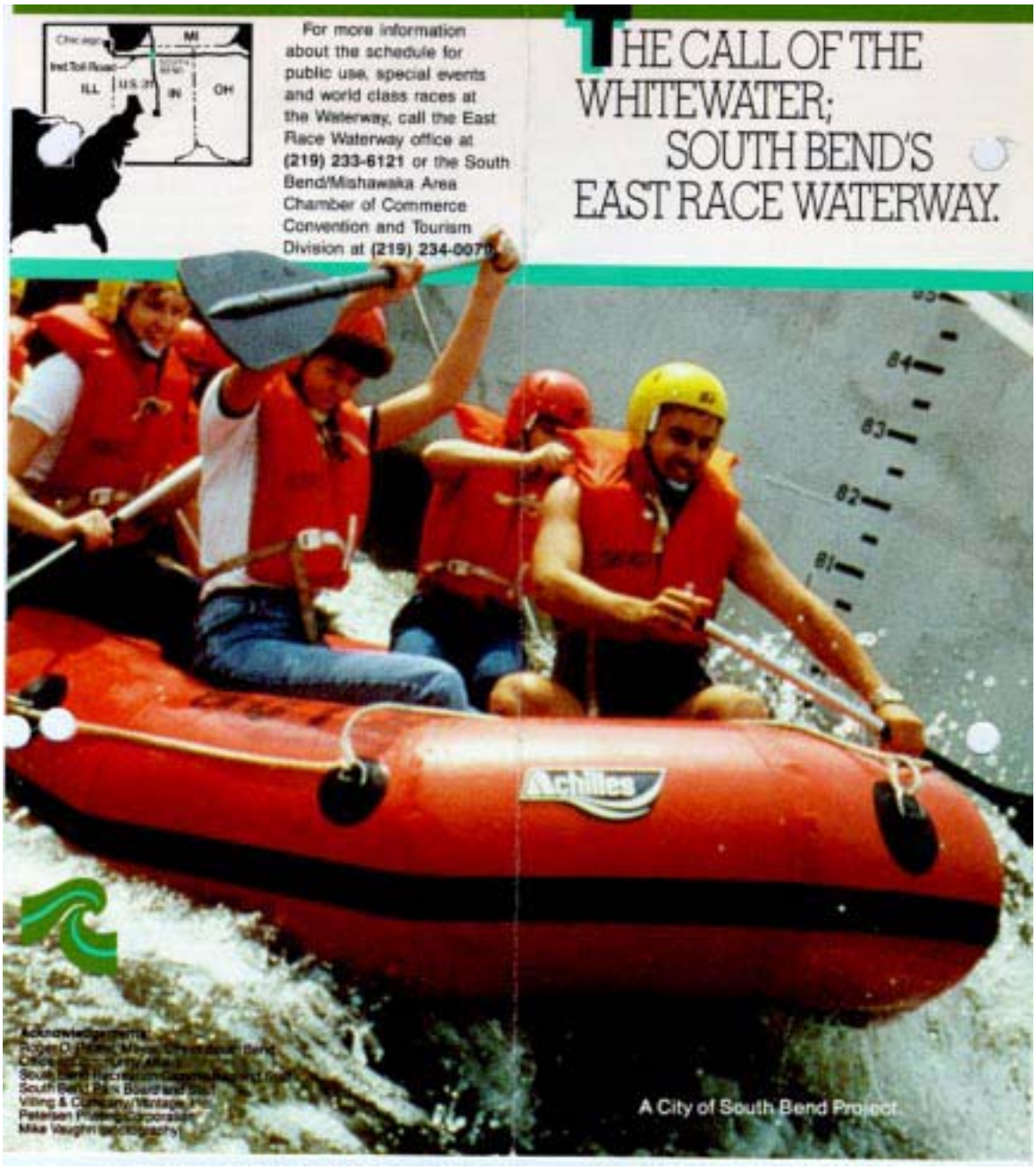
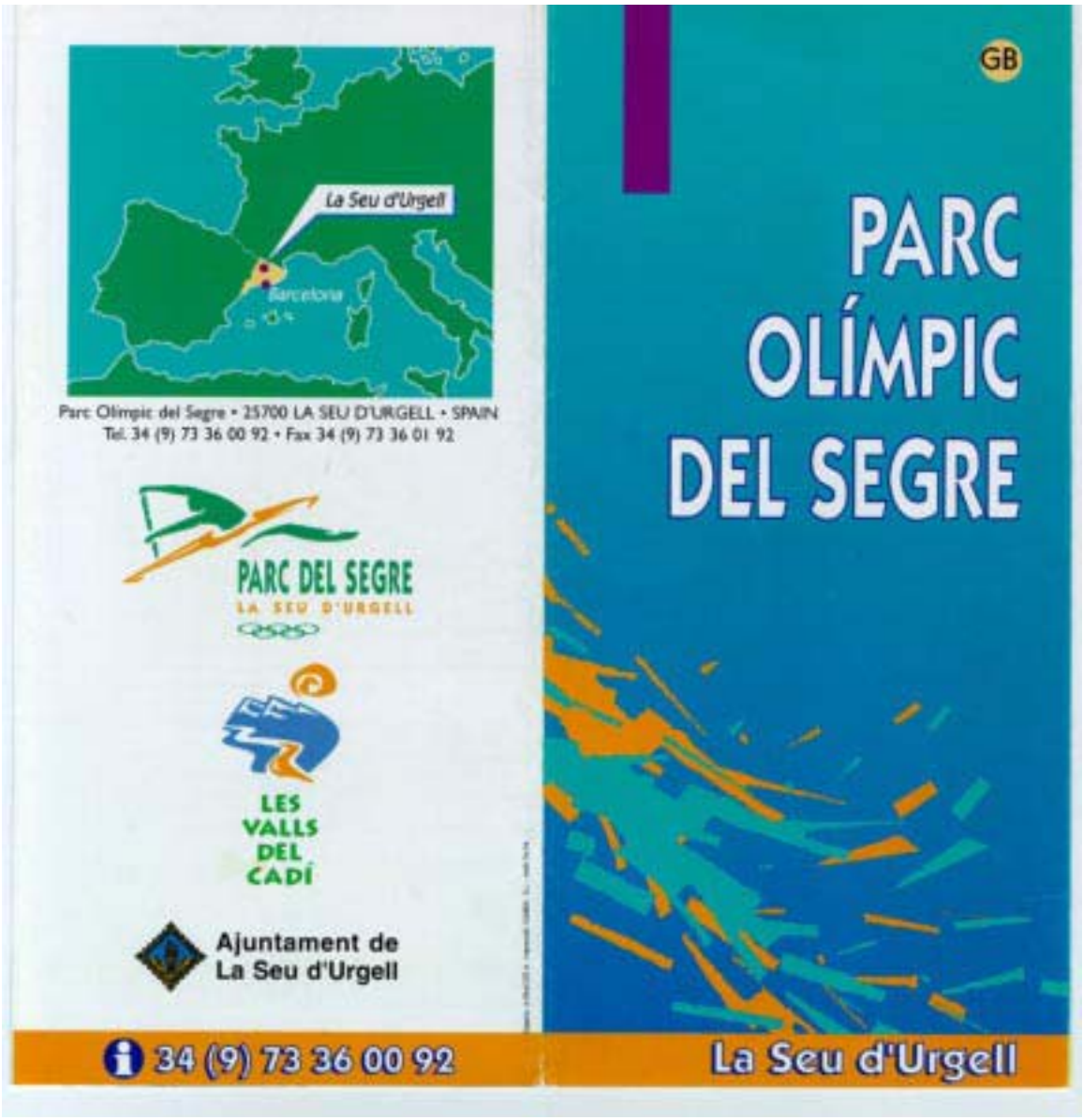


Figure 10-3—Brochure Cover from La Seu d'Urgell, Spain



Purpose: Present costs and a plan for funding the white water park.

Contents

10.A. COST ESTIMATE

10.A.1.1. PRELIMINARY ESTIMATE

The following estimate is cursory in nature and is intended to provide an "order of magnitude" construction cost for the proposed facilities. It is intended to be used for gross project feasibility and budgeting. We have divided the project costs into four categories:

- The white water channel
- Park, development
- Roads, utilities and parking
- Add alternates

The add alternates are not necessary to the completion of the project but would make the site more attractive, e.g., artificial rock in lieu of concrete.

10.A.1.2. QUALIFICATIONS

The budget does not include costs of:

- Land or easement acquisition
- Escalation beyond the current year
- Cost differences between the currently proposed hydroelectric re-construction and the concept as outlined in this study
- Improvements to existing roads beyond immediate project area such as 6th Avenue
- Modifications (if needed) to existing university buildings – except an allowance is included for some modification to the coal storage facility
- Project management
- Hazardous materials discovery / removal
- Temporary facilities, operation costs for special events
  NSP dam or abutment reinforcement
- A / E design, special, and construction services

If development of this project is pursued further, a statement of probable cost based upon a more detailed preliminary or final design effort should be conducted.

Table 10-1 **Conceptual Level Statement of Probable Cost**

Whitewater Channel		$	6,859,000	
	Channel construction	$		3,158,000
	Head Gate	$		555,000
	Outlet works	$		1,395,000
	Gates and Communications	$		168,000
	Contingencies	$		1,583,000
Park Developmen		$	5,181,000	
	Plant Materials	$		246,000
	Landscape Work	$		394,000
	Site Furnishings	$		2,012,000
	Utility Relocations & Improvements	$		297,000
	Paving/Walls	$		926,000
	Dredge Spoil Removal	$		70,000.00
	Contingencies	$		1,184,000
Roads and Access		$	1,196,000	
	Access Road	$		374,000
	Related Storm Sewer	$		20,000
	Allowance for Coal Plant/Access Modifications	$		300,000
	Miscellaneous Access Improvements	$		100,000
	Parking	$		126,000
	Contingencies, O&P, Design - 30 percent	$		276,000
Buildings		$	1,869,000	
	Outfitters, Club, Support facilities	$		1,438,000
	Contingencies	$		431,000
GRAND TOTAL - BASE PROJECT (ROUNDED)		$	15,100,000	
TOTAL ALL ADD-ALTERNATES		$	4,100,000	
(ROUNDED)	Sculpture	$		75,000
	Climbing Wall	$		150,000
	Funicular	$		500,000
	6Th Ave. Observation Bridge	$		400,000
	Faux Rock construction	$		1,732,000
	Natural and artificial rock facing for site walls	$1,282,500		

10.B. FINANCIAL PLAN

10.B.1. OPERATING BUDGET

A sample budget for operating the proposed whitewater park is shown in Table 10-2. Revenues from food and drink concessions and event fees as well as expenses for on-site staff, and maintenance/security at the park are based primarily on the experience of the East Race Waterway in South Bend Indiana. A $100,000 annual capital reserve was included to cover the cost of minor repairs and improvements that could be desired after five to ten years of operation. Revenue is based on a conservative, 50,000-person attendance. It assumes that attendance will increase gradually over time although unique, new attractions often have a very high attendance during the first year followed by a drop in attendance, followed by gradual increases in subsequent years. We project that the course revenues will support operating costs and generate a little profit. It should be noted that when public bonds are used to finance profit-making ventures, public and private sector gains might be limited by law. Therefore, any profit would be used to pay debt service on the bonds.

10.B.2. CAPITAL FUNDING

The most likely source would be state funds although the city, county or federal government could provide additional funding. If the private sector were to raise some money, it would likely improve the chances of public funding.

Other whitewater course funding approaches were unique to the site and its larger goals. For example, the Ocoee course was primarily funded through congressional appropriations and the U.S. Forrest Service to accommodate the desire for the Olympic games. Additional funding was raised by the private sector and matched by the state, but this funding was used for operating costs and furnishings and fixtures, for the Olympic games and other events. The Tennessee Valley Authority provided some funding for highway flood protection. The South Bend course was primarily funded through city general obligation bonds since the city used the whitewater course to stimulate downtown development. The state DNR provided support for about 20% of the cost for a fish ladder.

A Minneapolis course will need state funding, although it has the potential for federal support. Possible federal sources include the Department of Transportation (for trails), and the Army Corp of Engineers (to mitigate past environmental damage). State funding could come from a request by DNR or the Metropolitan Council. It is unlikely that DNR would request funds given the park's high capital costs and number of competing priorities within DNR. DNR could request and obtain a lessor amount of funds to do detailed design. Given the multi-year process to get state money through the Metro Council, DNR design money would be a good first step.

State capital funding would likely come through the Metropolitan Council Regional Park Grant Program. The steps for securing funding are:

1) The Park Board provides Metro Council with a masterplan amendment to the Central Mississippi Riverfront Park,

2) Metro Council approves amendment, making the project eligible for inclusion in the Metro Council's Capital Improvement Program (CIP) for parks,

3) The Park Board submits a request for funding through Metro Council's CIP,

4) Metro Council decides how much of the Park Board request to fund and prioritizes the request with other proposed projects,

5) Metro Council submits projects in the CIP to the state legislature,

6) The state decides how much of the CIP to fund, after which Metro Council provides a 40% match through Metro Council bonds.

If metro and state funding falls short of the total CIP request, Metro Council will fully fund each project according to its designated priority in the CIP. The Metro Council park CIP operates on a two year funding cycle with a total of about $25 million in capital funding ($15 million state and $10 million from Metro Council) for the ten local park agencies. The next CIP will be reviewed in the winter of 2001 and submitted to the state that spring. Given the magnitude of the whitewater park 's funding needs and the number of competing needs, it would take multiple funding cycles for Metro Council to fund the park if there were no other funding support.

If submitted, the two most likely state funding vehicles are proceeds from lottery winnings and general obligation bonds. There are two-year cycles, for each of these funding sources. The lottery proceeds (environmental trust funds) were just allocated for 1999 with the next allocation for 2001. The next bond funding cycle begins in 2000 and goes every other year.

Any effort for state funding would fare better if there were private or other government support. Private funds could be raised from corporate sponsorships and/or private donations. Local government funding could include the city, county or the Park Board. Other possible sources of funds include Northern State Power (NSP), as part of their relicensing agreement or state funds for brownfields redevelopment, if applicable. Existing environmental studies that focus on the area around the steam plant, indicate no contamination. However an investigation should be initiated in subsequent preliminary design or other phases to further evaluate this issue and its implicated costs.

10.C. ATTACHMENTS

Table 10-2 Operating Budget

Table 10-2 Sample Operating Budget for Proposed Whitewater Course

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Ye
Revenues										
	Daily admission									
	Adult Fee	$12.00	12	12	12	12	12	12	12	
	Projected Number of Users	30000	35000	40000	40000	45000	45000	50000	50000	
	Youth Fee	6	6	6	6	6	6	6	6	
	Projected Number of Users	20000	25000	30000	30000	35000	35000	40000	40000	
	TOTAL	480000	570000	660000	660000	750000	750000	840000	840000	1
	Seasons Passes									
	Fee	300	300	300	300	300	300	300	300	
	Projected Number of Users	300	350	400	400	450	450	500	500	
	TOTAL	90000	105000	120000	120000	135000	135000	150000	150000	
	Food and Beverage Consession	15000	16500	18150	19965	21962	24158	26573	29231	
*	Event Fees	2000	3000	3000	5000	7000	7000	7000	7000	
	TOTAL	587000	694500	801150	804965	913962	916158	1023573	1026231	1
Expenses										
	Staff									
*	On-site staff	400000	416000	432640	449946	467943	486661	506128	526373	
**	Administrative Overhead	80000	83200	86528	89989	93589	97332	101226	105275	
	TOTAL	480000	499200	519168	539935	561532	583993	607353	631647	
	Food and Beverage Consession	16000	16320	16646	16979	17319	17665	18019	18379	
*	Maintenance/Security	14000	14000	14000	14000	14000	14000	14000	14000	
	TOTAL	510000	529520	549814	570914	592851	615659	639372	664026	
	Revenues	587000	694500	801150	804965	913962	916158	1023573	1026231	1
	Expenses	510000	529520	549814	570914	592851	615659	639372	664026	
	Capital Improvements Reserve	100000	100000	100000	100000	100000	100000	100000	100000	
NET		(23000)	64980	151336	134051	221110	200499	284202	262205	

* Based on budget of East Raceway at South Bend Indiana. Their $80,000 operating budget (15 hours/wk, June - August)
12 hours per day of operation during the high season and include a shoulder season (at a lower daily cost). They consid

** Based on Minneapolis Park Board estimate.